

FLORA
OF
UPPER GANGETIC PLAIN

AND OF THE
SIWALIK AND SUB-HIMALAYAN TRACTS.

Vol. II

BY
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SOLANACEÆ TO CYPERACEÆ

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BOTANICAL SURVEY OF INDIA
CALCUTTA

FLORA OF THE UPPER GANGETIC PLAIN AND OF THE ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

LXXVIII—SOLANACEÆ.

Herbs, shrubs or rarely small trees. *Leaves* alternate, often in unequal pairs, rarely clustered, never opposite, entire lobed or pinnatisect, stipules none. *Flowers* regular or rarely 2-lipped, usually hermaphrodite, very rarely dioecious, arranged in terminal or lateral axillary or extra-axillary cymes, or on solitary or clustered pedicels, bracts and bracteoles none. *Calyx* inferior, limb usually 5-lobed or -toothed, persistent and often much enlarged in fruit. *Corolla* funnel-shaped, campanulate or rotate, often plicate; lobes 5, rarely 10, or the limb subentire. *Stamens* on the corolla-tube, 5, or fewer in zygomorphic flowers; anthers dehiscing by apical pores or longitudinally. *Ovary* 2-celled or imperfectly 1- or 4-celled, rarely 3—5-celled; style linear, stigma capitate or shortly lobed; ovules usually many, on prominently peltate placentas. *Fruit* a berry or a circumscissile or valved usually 2-celled capsule. *Seeds* many, compressed or subreniform, embryo (in the indigenous British Indian genera) curved.—Species about 1,400, in tropical and subtropical regions of the world, but chiefly in Central and South America.

Fruit a berry:—

Corolla rotate or campanulate, lobes plicate in bud:—	
Anthers connivent in a cone, dehiscing by apical pores ; calyx small	1. SOLANUM.
Anthers not connivent, dehiscing longitudinally ; calyx much enlarged in fruit	2. PHYSALIS.
Corolla urceolate, lobes valvate in bud, calyx accrescent	3. WITHANIA.
Corolla funnel-shaped, lobes imbricate in bud, calyx not enlarging in fruit	4. LYCIUM.
Fruit a capsule	5. DATURA.

1. SOLANUM, Linn.; Fl. Brit. Ind. iv, 229.

Herbs or shrubs, sometimes subscandent, rarely small trees, unarmed or prickly. *Leaves* alternate, or subopposed in unequal pairs, entire lobed or pinnatifid. *Flowers* in dichotomous racemose lateral or terminal cymes. *Calyx* 5- or 10-lobed, rarely 4-lobed or subentire; accrescent or not in fruit. *Corolla* rotate, rarely campanulate, tube short; limb usually 5-lobed, plicate in bud. *Stamens* 5, rarely 4 or 6, attached to the corolla-throat; filaments short, anthers oblong, often narrowed upwards, connivent in a cone, opening by terminal pores or short slits. *Ovary* 2-celled, rarely (in cultivated forms) 3—4-celled, style columnar,

stigma small. *Fruit* a globose or elongated berry. *Seeds* many, discoid, embryo peripheric.—Species about 800, chiefly in S. America.

Unarmed:—

- | | |
|--|-------------------------------|
| A small usually glabrous herb with white flowers | 1. <i>S. nigrum</i> . |
| A shrub or small tree densely clothed with grey or yellowish stellate tomentum | 2. <i>S. verbascifolium</i> . |

Armed:—

- | | |
|---|-----------------------------|
| A very prickly diffuse bright-green herb with purple flowers | 3. <i>S. xanthocarpum</i> . |
| Shrubs or undershrubs:— | |
| Flowers bisexual, in racemose extra-axillary cymes | 4. <i>S. indicum</i> . |
| Peduncles lateral, paired, one bearing a solitary fertile flower, the other a raceme of males | 5. <i>S. incanum</i> . |

1. ***S. nigrum***, *Linn. Sp. Pl.* 186; *Royle Ill.* 279; *F. B. I. iv*, 229; *Watt E. D.*; *Collett Fl. Siml.* 341; *Prain Beng. Pl.* 745; *Cooke Fl. Bomb. ii*, 263. *S. rubrum*, *Mill.*; *Roxb. Fl. Ind. i*, 565.—Vern. *Makoi*. (Black Night shade).

An erect nearly glabrous annual with much branched and somewhat angular stems. *Leaves* petioled, 1—3½ in. long, ovate or oblong, sinuate-toothed or lobed, petioles about ¾ in. long. *Flowers* small, drooping-subumbellate on rather stout extra-axillary peduncles ¼—¾ in. long; pedicels 5—8, slender, ½ in. long. *Calyx* ½ in. long, 5-toothed, glabrous or sparsely puberulous; teeth small, oblong, obtuse. *Corolla* white, rarely purple, ½ in. in diam., divided to below the middle into 5 oblong subacute lobes, glabrous outside. *Filaments* hairy at the base. *Ovary* globose, glabrous, style hairy towards the base. *Berry* ¼ in. in diam., supported by the saucer-shaped calyx, black, less often red or yellow, smooth and shining. *Seeds* yellow, minutely pitted.

A common weed, especially in cultivated ground. Flowers chiefly during the cold season in the plains. **DISTRIB.**: Throughout India and up to 9,000 ft. on the W. Himalaya; also in Afghanistan, Baluchistan and in all temperate and tropical regions of the world. The berries and juice are used medicinally, and the leaves and young shoots are eaten as spinach.

2. ***S. verbascifolium***, *Linn. Sp. Pl.* 184; *Royle. Ill.* 279; *F. B. I. iv*, 230; *Watt E. D.*; *Kanjilal For. Fl.* 253; *Gamble Man. Ind. Timb.* 508; *Collett Fl. Siml.* 342; *Prain Beng. Pl.* 746; *Cooke Fl. Bomb. ii*, 263; *Brandis Ind. Trees* 489. *S. pubescens*, *Roxb. Fl. Ind.* 564. *S. cernitum*, *Don Prod.* 96.—Vern. *Aseda* (Bijnor), *ban-tamaku* (Dehra Dun).

A tall erect unarmed shrub or small tree, densely tomentose with yellowish or grey scurfy stellate hairs. *Leaves* 4—8 in. long, elliptic-lanceolate, acute or acuminate, entire, softly pubescent above, densely woolly beneath, thickly herbaceous; base usually acute, sometimes rhomboid or rounded, main lateral nerves about 8 pairs, petiole 1—2 in. *Flowers* many, densely clustered in woolly 2-chotomous corymbose subterminal cymes; peduncles erect, stout, 1—4 in. long; pedicels ¼—¾ in. long, stout. *Calyx* ¼ in. long, densely stellate-tomentose,

enlarged in fruit but shorter than the berry; teeth triangular, acute. *Corolla* white, $\frac{3}{4}$ in. across, stellate-hairy outside; lobes $\frac{1}{2}$ in. long, acute. *Ovary* hairy, style glabrous. *Berry* $\frac{1}{2}$ in. in diam., globose, yellow. *Seeds* minutely dotted.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Bundelkhand and in other parts of the area, frequently met with in hedges near villages. Flowers during the greater portion of the year.—*DISTRIB.*: Throughout India in the tropical and sub-tropical zones and up to 3,000 ft. on the Himalaya; also in Ceylon, extending to the Nicobar Islands, Malaya, N. Australia and N. America. The roots, leaves and fruit are used in native medicine, and in S. India the plant is said to be cultivated for its fruit which is eaten.

3. *S. xanthocarpum*, *Schrad. & Wendl. Sert. i, 8, t. 2; F. B. I. iv, 236; Watt E. D.; Collett Fl. Siml. 343; Prain Beng. Pl. 746; Cooke Fl. Bomb. ii, 265. S. diffusum, Roxb. Fl. Ind. i, 568. S. Jacquinii, Willd. Roxb. Fl. Ind. i, 569; Royle Ill. 279.*—Vern. *Kateli*.

A very prickly bright-green perennial herb, young parts stellate tomentose. *Stem* flexuose, woody at the base; branches many, armed with compressed straight or somewhat curved yellow glabrous shining prickles up to $\frac{1}{2}$ in. long. *Leaves* 2—4 in. long, ovate or elliptic, sinuate or subpinnatifid, rounded and unequal-sided at the base, clothed especially beneath with stellate hairs, ultimately glabrous, the midrib and often the main lateral nerves armed with long straight yellow spines, petioles up to 1 in. long. *Flowers* few, in extra-axillary shortly peduncled cymes or solitary; pedicels curved, stellately hairy. *Calyx* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, densely stellate-hairy and prickly; lobes linear-lanceolate, acute. *Corolla* bluish-purple, 1 in. in diam.; lobes acute, hairy outside. *Filaments* glabrous. *Ovary* ovoid, glabrous as also the style. *Berry* $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., yellow or white streaked with green. *Seeds* glabrous.

Abundant within the area by roadsides and on waste ground. Flowers during the greater part of the year. *DISTRIB.*: Throughout India, ascending to 7,000 ft. on the Himalaya; also in Ceylon, extending to Malaya, Trop. Australia and Polynesia. All parts of the plant are used as ingredients of native medicines, and the fruits are said to be sometimes eaten.

4. *S. indicum*, *Linn. Sp. Pl. 187; Roxb. Fl. Ind. i, 570; Royle Ill. 279; F. B. I. iv, 234; Watt E. D.; Kanjilal For. Fl. 273; Gamble Man. Ind. Timb. 507; Collett Fl. Siml. 342; Prain Beng. Pl. 746; Cooke Fl. Bomb. ii, 266; Brandis Ind. Trees 489.*—Vern. *Bhut-kataia*.

An erect very prickly undershrub, 1—6 ft. high; prickles large, compressed at the base, usually somewhat curved. *Stem* stout, often tinged with purple, the branches minutely stellate-hairy. *Leaves* 2—6 in. long, ovate, acute, subentire or sinuate-lobed, cuneate or truncate at the base and often unequal-sided, sparsely prickly and stellate-pubescent on both sides, the upper surface with also a few bulbous-based hairs.

Flowers in extra-axillary racemose cymes; peduncles and pedicels short, clothed with grey stellate pubescence and sometimes prickly. *Calyx* 5-toothed, about $\frac{1}{4}$ in. long, sometimes with a few straight slender spines, teeth triangular. *Corolla* blue, rotate, $\frac{3}{4}$ -1 in. in diam.; with purple stellate hairs outside; lobes $\frac{1}{2}$ in. long, broadly triangular. *Berry* $\frac{1}{2}$ in. in diam., globose, orange-yellow when ripe, usually glabrous, supported by the scarcely altered calyx. *Seeds* $\frac{1}{8}$ in. in diam., minutely dotted.

Common within the area on waste ground. **DISTRIB.:** Throughout India, ascending to 5,000 ft. on the Himalaya; also in Ceylon and extending to Malaya, China and the Philippines. The roots and berries are used in native medicine, and the latter as a vegetable in some parts of India. Allied to the above is *S. torvum*, Swartz, a common plant in Bengal. It is less prickly and has white flowers and larger berries, and may very possibly occur within this area.

5. *S. incanum*, *Linn. Sp. Pl.* 188; *Cooke Fl. Bomb.* ii, 267; *S. coagulans*, *Forsk. Fl. Ægypt.-Arab.* 46; *F. B. I. iv*, 236; *Watt E. D. Vern. Asind* (Merwára).

A stiff prickly shrub, densely clothed with soft yellowish stellate pubescence; prickles stout, recurved, shining above, broad and usually tomentose at the base. *Leaves* petioled, 3-4 $\frac{1}{2}$ in. long, ovate-elliptic sinuate or lobed, stellate-tomentose above with soft fulvous hairs, densely woolly beneath, midrib and sometimes the lateral nerves with scattered prickles, base subcordate or truncate, rarely cuncate, petioles prickly. *Peduncles* lateral, usually in pairs, one bearing a solitary fertile flower, the other a raceme of males. *Calyx* densely stellate-hairy, $\frac{1}{4}$ in. long, usually prickly in the fertile flowers; lobes triangular, acute. *Corolla* blue, under $\frac{1}{4}$ in. long, stellate-hairy on both sides. *Filaments* glabrous. *Ovary* globose, hairy at the summit, style hairy below. *Berry* about 1 in. in diam.; ovoid or subglobose, yellow. *Seeds* minutely pitted.

Siwalik range (Royle), Merwára (Duthie). Flowers Jan.—May. **DISTRIB.:** Punjab Plain and eastwards to the *bhábár* and lower hills of Kumaon ascending to 4,000 ft.; also in S. India extending to Baluchistan, Arabia Egypt and to Tropical and S. Africa. The fruit is said to be eaten by natives either raw or pickled. This plant is more rigid and more tomentose than *S. Melongena*, and the tomentum is usually tinged with yellow; the calyx-tube is often strongly spinous, and the deeply divided corolla is more densely hairy outside.

SOLANUM MELONGENA, L. The Egg-plant or Brinjal (Vern. *Baigan* or *baingan*) is largely cultivated within the area and in all warm countries. It is not truly wild in India, and its native country is not quite certain. DeCandolle regarded it as a native of Asia, and not of America, whilst others believed it to have come from Arabia. Many distinct forms or races are recognized according to the shape or colour of the fruit. The plant is more or less prickly according to the nature of the soil. In rich garden soil the prickles almost or entirely

disappear. When cultivated as a field crop it becomes rather prickly, and very much so as an escape, under which conditions the peduncles bear 3—4 small and usually roundish fruits. Prain mentions two varieties: 1. *ESCULENTA* (*S. longum*, Roxb.), a stout prickly herb with the fruit always cylindrical, and, according to Roxburgh, a distinct species; and 2. *INSANA*. (*S. insanum*, Roxb.) which is a very prickly herb found in a semi-wild state near villages. Its fruit is quite round, and the fruiting peduncles usually bear more than one. The fruit of the egg-plant is always eaten cooked. Its value as a vegetable is increased by its coming into season during the autumn months when other kinds are scarce. The leaves possess narcotic properties, and the seeds are regarded as stimulant. See also Roxb. *Fl. Ind. i*, 556; D. C. *L'Orig. Pl. Cult.* 229. *Field and Gard.*; *Crops N. W. Prov. and Oudh*, part iii, 31, t. 95; *F. B. I. iv*, 235; *Watt E. D.*; *Comm. Prod. Ind.*; *Prain Beng. Pl.* 746; *Cooke Fl. Bomb. ii*, 269.

SOLANUM TUBEROSUM, Linn. The Potato. Vern. *Alu*. A native of temperate regions in S. America. Introduced into Europe during the sixteenth century it reached India in the early portion of the seventeenth century. Largely cultivated within the area of this flora and on the neighbouring parts of the Himalaya. Acclimatized varieties are sown in the plains from about the middle of September, and the hill kinds and those imported from Europe later on. For further information, see DC. *L'Orig. Pl. Cult.*, 36; *F. & G. Crops N. W. Prov. and Oudh*, part iii, 15; *Watt E. D.*; *Comm. Prod. India*.

2. PHYSALIS, Linn.; *Fl. Brit. Ind. iv*, 238.

Annual or perennial herbs. *Leaves* alternate, entire, sinuate or shortly lobed. *Flowers* solitary, axillary, pedicelled. *Calyx* campanulate, 5-fid, much enlarged in fruit and loosely enclosing the berry; teeth small, connivent. *Corolla* campanulate, lurid-yellow, often with purple spots near the base. *Stamens* 5, attached near the base of corolla; anthers oblong, shorter than the filaments, dehiscing longitudinally. *Ovary* 2-celled, style linear, stigma obscurely 2-lobed. *Fruit* a globose berry. *Seeds* many or few, compressed, smooth or faintly tuberculate, embryo peripheric.—Species about 30, mostly tropical American.

P. minima, Linn. *Sp. Pl.* 183; Roxb. *Fl. Ind. i*, 563; *F. B. I. iv*, 238; *Watt E. D.*; *Collett Fl. Siml.* 343; *Prain Beng. Pl.* 750; *Cooke Fl. Bomb. ii*, 270.—Vern. *Ban-tipariya*.

Annual. *Stem* erect, 6—18 in. high, striate, more or less pubescent and often viscid. *Leaves* petioled, thin, 1—2½ in. long, ovate, acute, sinuate-toothed or almost lobed, more or less pubescent, base cuneate, petioles about 1 in. long. *Flowers* solitary, on long slender deflexed pedicels. *Calyx* (in flower) ¼—½ in., not angular, base truncate; lobes triangular, acute, nearly equalling the tube, ciliate. *Corolla* ¼ in. long, clear yellow, or with 5 basal spots inside, limb with very short lobes. *Berry* ¼—½ in. in diam., completely enclosed within the enlarged membran-

ous 5–10-ribbed reticulately-veined calyx. *Seeds* discoid or reniform, muriculate, orange-yellow.

Common within the drier portions of the area, usually on waste ground. Flowers May–Aug. **DISTRIB.:** Common on the plains of Punjab and Bengal, and in Peninsular India, also in Ceylon, and up to 7,000 ft. on the outer Himalaya, extending to Afghanistan, Baluchistan and to Tropical Africa and Australia.

VAR. indica, *F. B. I. iv*, 238; *Watt E. D.*; *Prain Beng. Pl.* 750. *P. indica*, *Lamk. Encycl. ii*, 102. The leaves and fruiting calyx are glabrescent, and the latter is distinctly 5-angular. The corolla has no basal spots. Common within the area and throughout India in similar situations.

P. peruviana, *Linn.*; *Roxb. Fl. Ind. i*, 562; *F. B. I. iv*, 238; *Watt E. D.*; *Prain Beng. Pl.* 750; *Cooke Fl. Bomb. ii*, 270.—**Vern. Tipari.** A small shrub, resembling *P. minima*, but much stouter and with larger flowers and fruit. It is a native of Trop. America, whence it was introduced into India and S. Africa, and hence its name of “*Cape Gooseberry*” by which it is usually known. The plant is much cultivated in India, and the bright amber-coloured fruit is eaten either raw or cooked.

3. WITHANIA, Pauq.; *Fl. Brit. Ind. iv*, 239.

Unarmed shrubs. *Leaves* entire. *Flowers* axillary, sessile or shortly pedicelled, fascicled or solitary, sometimes polygamo-dioecious. *Calyx* campanulate, 5- or 6-toothed, enlarged and sub-globose in fruit. *Corolla* campanulate; lobes 3–6, short, valvate in bud. *Stamens* attached near the base of the corolla; anthers oblong, dehiscing longitudinally. *Ovary* 2-celled, style linear, stigma shortly 2-fid. *Fruit* a globose berry. *Seeds* very many, discoid, embryo peripheric.—Species 4 or 5, from S. Europe to N. Africa and the Canary Islands, also in W. Asia.

W. somnifera *Dunal in DC. Prod. xiii, pt. 1*, 453; *F. B. I. iv*, 239; *Watt E. D.*; *Gamble Man. Ind. Timb.* 508; *Prain Beng. Pl.* 750; *Cooke Fl. Bomb. ii*, 271; *Brandis Ind. Trees* 490. *Physalis somnifera* *Link*; *Royle Ill.* 279. *Physalis flexuosa*, *Linn.*; *Roxb. Fl. Ind. i*, 561.—**Vern. Askand, asind.**

An erect branching undershrub up to 5 ft. high, nearly all parts more or less stellately tomentose; branches flexuose, terete, densely tomentose. *Leaves* petioled, 2–4 in. long, ovate, subacute, base acute; main lateral nerves about 6 pairs, prominent, petioles $\frac{1}{4}$ – $\frac{1}{2}$ in. long. *Flowers* greenish or lurid-yellow, usually about 5 together in subsessile umbelliform cymes, pedicels $\frac{1}{4}$ in. long or less. *Calyx* (in flower) $\frac{1}{2}$ in. long, stellate-tomentose; teeth linear from a broad base, acute. *Corolla* $\frac{1}{2}$ in. long; lobes lanceolate, acute, hairy outside. *Berry* $\frac{1}{4}$ – $\frac{1}{2}$ in. in diam., enclosed in the much enlarged inflated somewhat 5-angled pubescent calyx, red when ripe.

Abundant within the area in dry situations. **DISTRIB.:** Throughout the drier portions of India and in Ceylon, extending to Persia, Arabia,

the Mediterranean region, the Canaries and to Trop. and S. Africa. The roots and other parts of this plant are used medicinally, and the fruit possesses the same property as that of the allied *W. coagulans* of coagulating milk. The latter species, known as *punirband* (Cheese maker), is found in the drier parts of the Punjab and of Sind, also in Afghanistan and Baluchistan, and is very generally employed as a substitute for *rennet*.

4. LYCIUM, Linn.; Fl. Brit. Ind. iv, 240.

Spinous shrubs, usually glabrous. *Leaves* small, alternate or often fascicled at the nodes, entire, linear-terete or flat. *Pedicels* usually solitary, rarely fascicled at the nodes, flowers small. *Calyx* campanulate, at first 5-merous, then 3—5 lobed or 2-lipped, not or slightly enlarged in fruit. *Corolla* funnel-shaped; lobes 5 or 4, imbricate in bud. *Stamens* 5 or 4, on the corolla-tube; anthers oblong, exerted or included, dehiscent longitudinally. *Ovary* 2-celled, style filiform, stigma subcapitate. *Fruit* a small globose or oblong berry. *Seeds* several few or solitary, compressed, embryo peripheric.—Species about 50, in temperate and sub-tropical regions, especially in S. Africa and S. America.

L. europæum, Linn. *Sp. Pl.* 192; *Royle Ill.* 279; *Brandis For. Fl.* 345; *Ind. Trees* 490; *F. B. I. iv*, 240; *Watt E. D.*; *Gamble Man. Ind. Timb.* 508.—Vern. *Achmehandi* (Ajmere), *Chirchitta* (Delhi).

A glabrous thorny shrub, sometimes pubescent when young. *Leaves* $\frac{1}{2}$ —1 in. long, linear-oblong or oblanceolate. *Flowers* white or pale-purple, $\frac{1}{2}$ in. long, solitary, on slender pedicels which are shorter than the flowers. *Calyx* $\frac{1}{2}$ in. long, teeth rarely less than five. *Corolla* $\frac{1}{2}$ in. long, tube cylindrical, gradually widening upwards and somewhat curved; lobes less than half the length of the tube, rounded. *Filaments* glabrous at the base, anthers almost included. *Berry* $\frac{1}{2}$ in. in diam., sub-globose, yellow or red. *Seeds* many.

Found in Merwára and Rajputana. Flowers Oct. to March. **DISTRIB.:** Abundant in the Punjab plain, Sind and Gujarát; also in Afghanistan, Baluchistan and Persia, extending through W. Asia to the N. African and Mediterranean coasts and to the Canaries. In Europe and W. Asia the flowers are usually purplish. The berries are eaten by natives, and camels and goats feed on the branches. The wood affords fuel and is used also in the construction of wattled frames for the walls of huts.

5. DATURA, Linn.; Fl. Brit. Ind. iv, 242.

Coarse rank shrub-like herbs, glabrous or minutely pubescent. *Leaves* large, entire sinuate or deeply toothed. *Flowers* large, solitary, pedicelled, purple or white. *Calyx* long, tubular, herbaceous, 5-toothed, circumscissile above the base in fruit. *Corolla* long, funnel-shaped, mouth wide; limb plicate, entire or shortly 5- or 10-lobed. *Stamens* attached near the base of the corolla-tube, filaments filiform; anthers included, linear, longitudinally dehiscent. *Ovary* 2 or spuriously 4-celled, style

filiform, stigma 2-lobed. *Fruit* an ellipsoid 4-celled usually spinous capsule, 4-valved or irregularly bursting near the apex. *Seeds* very many, compressed, rugose, embryo peripheric.—Species about 15, widely distributed in the temperate and tropical regions of the world.—For historical and economic information regarding the different species see *Bentley and Trimen Med. Pl. and Watt's Commercial Products of India*.

Capsule deeply 4-valved, erect; corolla 5-toothed. (§*Stramonium*):—

Flowers white

Flowers purple or blue

1. *D. Stramonium*.

2. *D. Tatula*.

Capsule opening irregularly near the apex, reflexed or spreading (§*Datura*):—

Whole plant densely clothed with greyish-green tomentum, corolla white, 10-toothed; capsule globose, reflexed, covered with long slender spines

3. *D. Metel*.

Plant glabrous or minutely pubescent, corolla 5-toothed, usually purplish outside; capsule reflexed, covered with blunt tubercles

4. *D. fastuosa*.

Plant glabrous or nearly so, calyx and corolla puberulous outside, corolla 5-toothed, white or cream-coloured; capsule spreading, covered with sharp spines

5. *D. alba*.

1. **D. Stramonium**, *Linn. Sp. Pl.* 179; *F. B. I.* iv, 242; *Watt, E. D. ; Comm. Prod. Ind.* 488; *Collett Fl. Siml.* 344.—Thorn-Apple.

A coarse annual. 2—4 ft. high, glabrous or farinose-puberulous. Leaves stalked, about 7 in. long, ovate, deeply toothed or sinuate, pale-green. *Calyx* 1—1½ in.; lobes ¼ in. long, ovate-lanceolate. *Corolla* 3—6 in. long, white, 1—3 in. in diam.; lobes 5, cuspidate. *Capsule* erect, ovoid, deeply 4-valved, covered with rigid long and short prickles surrounded below by the enlarged reflexed base of the calyx.

Occasionally met with as an alien in the Sub-Himalayan districts also in Merwára. **DISTRIB.**: Himalaya from Kashmir to Sikkim up to 8,000 ft.; also in the hilly districts of Central and S. India, and generally throughout the temperate and warmer regions of the world. It occurs in Britain as a casual weed. DeCandolle regarded the plant as having come originally from the countries bordering the Caspian, and to have entered India, by way of Persia and Afghanistan. The Himalayan form has been referred to *D. Wallichii*, Dun., which is a taller plant more canescent and with larger flowers.

2. **D. Tatula**, *Linn. Sp. Pl.* 256; *Nees in Trans. Linn. Soc.* xvii, 76. *D. Stramonium* var. *Tatula*, D.C.; *F. B. I.* iv, 242; *Watt E. D. ; Comm. Prod. India ; Prain Beng. Pl.* 750; *Collett Fl. Siml.* 344.

Similar in many respects to *D. Stramonium*, but the stems are more branching and usually tinged with purple; the leaves are more sharply toothed and they are often cordate at the base; the flowers are larger and bluish or purple in colour, and the longer prickles of the capsule are more of one size.

The distribution of this species in India is like that of the preceding. It is found at Simla and in other parts of the Himalaya, also near

villages in the Sub-Himalayan tracts and in the hilly districts further south. Believed by DeCandolle and others to be a native of Central America. In Britain it is known as a casual weed, and it has been introduced into Australia.

3. *D. Metel*, *Linn. Sp. Pl.* 179; *F. B. I.* iv, 243; *Watt E. D.*; *Comm. Prod. Ind.*; *Cooke Fl. Bomb.* ii, 273.

Whole plant densely clothed with greyish tomentum. *Stem* erect, 3—4 ft. high, stout, herbaceous, terete. *Leaves* 6—8 in. long, ovate-lanceolate or broadly ovate, acute or acuminate, unequal at the base and often cordate, entire or repand-dentate, densely tomentose on both surfaces and generally glandular, petioles $2\frac{1}{2}$ — $3\frac{1}{2}$ in. long; peduncles at first erect, afterwards nodding. *Calyx* about 3 in. long, inflated towards the middle, persistent and reflexed in fruit; teeth lanceolate, acuminate, unequal. *Corolla* about twice as long as the calyx, white tinged with green below, pubescent outside, limb 10-toothed. *Capsule* globose, nodding, covered with long rather slender spines.

I have seen no record of this plant having been found within the limits of this flora, though probably occurring near habitations in the Sub-Himalayan tracts. It is found not infrequently in Kashmir and in other parts of the North-West Himalaya. It is not uncommon in S. Europe, but it is supposed to have originally spread from S. America to all other parts of the world. It is regarded in India as being the most poisonous of all the species of *Datura*, and for this reason it is much resorted to for criminal purposes. The plant is at once recognized by the characters given above.

4. *D. fastuosa*, *Linn. Syst. ed. x*, 932; *Roxb. Fl. Ind.* i, 561; *F. B. I.* iv, 242; *Watt E. D.*; *Comm. Prod. Ind.*; *Collett Fl. Siml.* 344; *Prain Beng. Pl.* 751; *Cooke Fl. Bomb.* ii, 273.—Vern. *Kāla dhutra*, *Kāla dhatura*

Glabrous or slightly puberulous. *Stem* erect, 4—5 ft. high, woody below; branches zigzag, purplish and with scattered white spots. *Leaves* up to 8 in. long, ovate-lanceolate, acuminate, sinuate or repand-dentate, base unequally cuneate. *Flowers* erect, often double when cultivated. *Calyx* about 2 in. long; teeth 5, triangular-lanceolate, acuminate; base persistent and reflexed in fruit. *Corolla* violet or purplish outside, white within, limb 5-plicate and 5-angled, folds long-cuspidate. *Capsule* nodding, dehiscent irregularly, covered with stout tubercles.

Throughout India, in gardens and on waste ground, often appearing as if wild. This is the species most commonly met with in the hotter parts of this country. It is found also in Africa and throughout the tropics of both hemispheres.

5. *D. alba*, *Nees in Trans. Linn. Soc.* xvii, 73; *Wight Ic.* 852; *Dun. in D. C. Prod.* xiii, pt. 1, 542. *D. Metel*, *Roxb. Fl. Ind.* i, 561 (non *Linn.*). *D. fastuosa*, var. *alba*, *Clarke in F. B. I.* iv, 243; *Watt E. D.*; *Comm. Prod. India*; *Prain Beng. Pl.* 751; *Cooke Fl. Bomb.* ii, 273.—*Hummatu*. *Rheede Hort. Mal.* ii, 47, t. 28; *Rumph. Herh. Amb.* v, 242, t. 87, fig. 1.—Vern. *Dhatura*.

Stem 5—6 ft. high, herbaceous or slightly woody below. *Leaves* stalked, 6—7 in. long, ovate, acuminate, repand-dentate, unequal at the base, glabrous, bright green. *Flowers* white or cream-coloured, erect, shortly stalked. *Calyx* about $1\frac{1}{4}$ in. long, deeply 5-toothed; teeth triangular-lanceolate, acuminate. *Corolla* $4\frac{1}{2}$ —5 in. long, 5-plicate, puberulous outside, limb obscurely 5-lobed, lobes cuspidate. *Capsule* globose, spreading or nodding, aculeate.

Dr. T. Thomson's Moradabad specimen at Kew, obtained from a garden is the only one I have seen which represents the species as occurring within the limits of this flora, although doubtless it exists in other localities. **DISTRIB.:** Common in Bengal and throughout India in gardens, as well as in waste ground near villages, flowering and producing fruit all through the year. It is found in Hongkong, and according to Bentham is probably of Asiatic origin. The seeds are described as intensely narcotic, and as being used both medicinally and for criminal purposes.

Datura suaveolens, H. & B. (*Brugmansia suaveolens*, G. Don). A handsome shrubby plant with large white fragrant flowers. It is often grown in the gardens of both natives and Europeans, and is usually known as the "trumpet flower." It is a native of Mexico.

LYCOPERSICUM ESCULENTUM, *Mill.* is the Tomato or Love-apple. Vern. *Vilayati baigan*. It is extensively cultivated in gardens throughout India, both on the hills and in the plains, and is occasionally found as an escape. It came originally from Peru. See *Roxb. Fl. Ind. i*, 565 (*Solanum*); *DC. L'Orig. Pl. Cult.* 231; *F. B. I. iv*, 237; *Watt E. D.*; *Prain Beng. Pl.* 743; *Cooke Fl. Bomb. ii*, 275.

CAPSICUM, *Linn.* This genus contains the various forms of Chillies and Red and Yellow Peppers so widely cultivated in India and other tropical countries. It is indigenous in S. America and is believed to have been introduced into India about the middle of the seventeenth century. The very large number of cultivated forms, many of which were previously recognized as distinct species, have by recent authors been reduced to the two original Linnean species: *C. annum* and *C. frutescens*, the one an annual and the other a perennial. Moreover, there is some probability that these two may have originated from a single very variable S. American species; for, as Prain remarks, the forms of *C. annum* are often not truly annual in the tropics, and in temperate regions the perennial tropical forms rarely persist for more than one season. (See *Prain in Journ. As. Soc. Beng. Vol. lxxiv*, part 2, extra number (1905), 335; *Beng. Pl.* 747; *Cooke Fl. Bomb. ii*, 276; *DC. L'Orig. Pl. Cult.* 229; *F. B. I. iv*, 238; *Watt E. D.*; *Comm. Prod. India* 264.

The following key, taken from Prain's "Bengal Plants," shows the distinguishing characters of the varieties or forms of the two now recognized species as met with in N. India:—

Pedicels solitary, erect or reflexed; fruit erect, spreading or pendent usually longer than the pedicel. Annual or perennial plants:—

Flowers white; berries red, orange or yellow when ripe:—

Fruit not globular:—

Berries tapering, much longer than broad:—

Fruit stout; flesh thick, usually mildly pungent; calyx not enclosing base of berry

C. annuum.

Fruit slender; flesh thin, keenly pungent; calyx enclosing base of berry

C. annuum var.
acuminata.

Berries not or hardly longer than broad, usually blunt; calyx not enclosing base of berry:—

Berries circular in section, flesh thin, pungent

C. annuum var.
abbreviata.

Berries swollen, angular in section, flesh very thick, hardly at all pungent

C. annuum var.
grossa.

Fruit globular, extremely pungent

C. annuum var.
cerasiforme.

Flowers purple; berries dark-purple, becoming orange-red, longer than broad, slightly pungent; calyx hardly enclosing the base

C. annuum var.
nigra.

Pedicels 2 or more, erect; fruit always erect, red, shorter than the pedicel, pungent. Perennial plants with white flowers:—

Berries elongate, tapering

C. frutescens.

Berries globose or nearly so

C. frutescens var.
baccata.

C. annuum, L., Watt E. D.—A shrubby herb, cultivated sparingly in gardens of Europeans. It includes the majority of the mild forms of chillie usually raised from European seed.

Var. *acuminata*, Fingerh. *C. frutescens*, Roxb. *Fl. Ind. i*, 574; *F. B. I. iv*, 239; Watt E. D.—A shrubby herb, generally cultivated. The forms with erect fruits are the true Red and Yellow Chillies; those with pendent fruits are the Gachh mirich or Lal gach-mirich, Lanka mirich or Lal lanka mirich of native cultivators, according as the fruits are yellow or red. Prain is of opinion that these forms must have been evolved since *C. annuum* was first introduced to India, for in America they are only known as having been raised from Indian seed.

Var. *abbreviata*, Fingerh. *C. annuum*, Roxb. *Fl. Ind. i*, 573. Cultivated sparingly in gardens of Europeans. This includes the majority of the pungent forms of Chillie usually raised from European seed.

Var. *grossa*, Sendt. *C. grossum*, Roxb. *Fl. Ind. i*, 574; *F. B. I. iv*, 239; Watt E. D. A shrubby herb, cultivated in gardens both European and native. Vern. *Kaphari mirich*. Spanish Pepper.

Var. *cerasiformis*, Mill. *C. cerasiforme*, Roxb. *Fl. Ind. i*, 574. *C. grossum*, var. *cerasiformis*, *F. B. I. iv*, 229.—A shrubby herb, cultivated occasionally in European gardens. Cherry-pepper.

Var. *nigra*. *C. purpureum*, Roxb. *Fl. Ind. i*, 574. A shrubby herb, cultivated occasionally in native gardens. Purple chillie.

C. frutescens, Linn. *C. minimum*, Roxb. *Fl. Ind. i*, 574; *F. B. I. iv*, 239; Watt E. D.—A much-branched shrub; cultivated, but not very

extensively; quite naturalized in waste places. Birds-Eye Chillie of Europeans. Vern. *Dhan gachh mirich* or *Dhan lanka mirich*.

Var. *baccata* Irish. *C. minimum*, *F. B. I. iv*, 239 in part.—A much-branched shrub, cultivated occasionally. Brazil pepper or Pimentas.

HYOSCYAMUS NIGER, *Linn.* (Henbane). Vern. *Kharasani-ajwain*. A coarse herb, clothed with viscid hairs; the flowers lurid-green, veined with purple. It is wild on the N. Himalaya up to 11,000 ft., and extends through W. Asia to Europe and N. Africa. The plant has for many years been cultivated in the Saharanpur Botanical Garden during the cold season for supplying the medical depôts in India with leaves and extract.

NICOTIANA, *Linn.* contains the well-known tobacco plant, *N. Tabacum*; also a second species, *N. rustica*, both of which are cultivated within the area of this flora. An important monograph of the genus by Professor Comes of Naples was published in 1899. See also: *F. B. I. iv*, 245; *Watt E. D.*; *Comm. Prod. Ind.* 793; *DC. L'Orig. Fl. Cult.* 111; *Field and Gard. Crops, N. W. Prov. and Oudh, part i*, 69. *t.t. xvi & xvii*; *Prain Beng. Pl.* 752; *Cooke Fl. Bomb. ii*, 276. *N. rustica* differs from *N. Tabacum* in its smaller stature, its sub-orbicular leathery leaves, and in the greenish-yellow flowers, the segments of which are much shorter.

Petunia. Varieties of *P. nyctaginiflora*, *Juss.*, and of *P. violacea* *Lindl.* both natives of Argentina, are largely grown in gardens throughout India. They thrive remarkably well, especially in Upper India, and are very showy. They appear to hybridize freely, and when self-sown or as escapes, the colour of the flowers reverts to dull-white, the characteristic colour of *P. nyctaginiflora*. The flowers are very fragrant during the evening, and this is characteristic of *P. violacea*.

LXXIX—SCROPHULARIACEÆ.

Herbs or shrubs, rarely trees, often semi-parasitic. *Leaves* all, or the lower only, opposite, rarely all alternate or whorled, stipules none. *Flowers* hermaphrodite, usually more or less irregular; inflorescence centripetal or composite. *Calyx* inferior, usually persistent; lobes 5, rarely 4. *Corolla* hypogynous, more or less 2-lipped or sometimes personate, 4- or 5-lobed. *Stamens* usually 4, didynamous or subequal, with or without a staminode, rarely 5 or only 2; anthers variously shaped, 1- or 2-celled, the cells distinct or more or less confluent. *Disk* annular glandular or cup-shaped. *Ovary* 2-celled, style simple, stigma capitate or 2-lobed or 2-lamellate; ovules many, rarely few or only 2 in each cell, anatropous or amphitropous. *Fruit* capsular, rarely a berry, placentas on a free central axis or remaining attached to the margins of the valves. *Seeds* small, albumen fleshy, rarely none.—Species about 2,200, in all parts of the world.

- Leaves all alternate, corolla sub-rotate:—
 Stamens 5 1. VERBASCUM.
 Stamens 4 2. CELSIA.
- Leaves all opposite or the lower only:—
 Corolla spurred or saccate at the base in front:—
 Corolla spurred in front 3. LINARIA.
 Corolla saccate in front 4. ANTIRRHINUM.
- Corolla not spurred or saccate at the base in front, capsule opening by valves:—
 Corolla with the upper lip or the 2 upper lobes outside in bud:—
 Corolla elongate, tube cylindric with a more or less expanded throat, limb with sub-equal lobes or 2-lipped, stamen 4 or 2:—
 Stamens 4, inserted within the corolla-tube:—
 Corolla not distinctly 2-lipped; lobes rounded, sub-equal:—
 Anther-cells confluent towards the apex, divaricate downwards, capsule septicidal 5. SUTERA.
 Anther-cells parallel, contiguous but distinct, capsule septicidal and loculicidal 6. MONIERA.
- Corolla distinctly 2-lipped:—
 Corolla with a 2-gibbous throat:—
 Calyx 5-angled and 5-toothed; anther-cells confluent, often 1-celled 7. MIMULUS.
 Calyx widely campanulate, 5-lobed, anther-cells contiguous but distinct. 8. MAZUS.
- Corolla-throat not gibbous, anther-cells distinct:—
 Placentas either separating in fruit or, if conjoined in a column, the column not winged, seeds terete 9. STEMODIA.
 Placentas always united in a column which is winged by the remains of the septa, seeds angular 10. LIMNOPHILA.
- Stamens 2, perfect, the lower pair reduced to staminodes, all inserted within corolla-tube, capsule loculicidal 11. DOPATRUM.
- Stamens if 4 the lower pair, if 2 the staminodes inserted in corolla-throat, the upper or only perfect pair inserted in the corolla-tube, capsule septicidal:—
 Stamens 4 with perfect anthers:—
 Calyx winged or keeled, mouth oblique 12. TORENIA.
 Calyx not winged or keeled, segments equal 13. VANDELLIA.
- The 2 upper stamens only with perfect anthers, the two lower reduced to staminodes and inserted on corolla-throat:—
 Leaves with parallel veins, staminodes bilobed, capsule ovate or shortly oblong 14. ILYSANTHES.
 Leaves pinnate-veined, staminodes entire, capsule linear-oblong 15. BONNAYA.
- Corolla small, tube very short, uniform, stamens 2, anther-cells diverging at the base, the tips confluent, capsule loculicidal.—A minute glabrous creeping herb 16. GLOSSOSTIGMA
- Corolla with the upper lip or the 2 upper lobes innermost in bud or, if corolla-lobes imbricate as in *Scoparia*, lobes 4 and stamens 4:—
 Corolla-tube very short, subrotate, throat narrow:—
 Corolla-lobes 4, sub-equal, imbricate, stamens 4, capsule septicidal 17. SCOPARIA.

- Corolla-lobes 4 or 5, unequal, one or both the lateral outermost in bud, stamens 2, capsule loculicidal 18. VERONICA.
- Corolla-tube elongate (except in *Sopubia*); lobes 5, the two upper innermost in bud; stamens 4, didynamous, capsule loculicidal.—Plants often parasitic or partially so:—
- Calyx tubular, 5-toothed or -fid:—
- Corolla-tube straight or nearly so, lobes sub-equal 19. BUGINERA.
- Corolla-tube abruptly incurved at or about the middle, the 2 upper lobes smaller 20. STRIGA.
- Calyx spathaceous, compressed, split in front; corolla somewhat ventricose at the throat, limb obscurely 2-lipped, anthers with one perfect and one sessile empty cell 21. CENTRANTHIDA.
- Calyx campanulate, 5-lobed or fid.
- Corolla tubefunnel-shaped; tube short, throat dilated; anthers 2-celled, one of the cells sterile, leaves pinnatisect 22. SOPUBIA.
- Corolla-tube cylindric, anther-cells both fertile, leaves toothed 23. LINDENBERGIA.

1. VERBASCUM, Linn.; Fl. Brit. Ind. iv, 250.

Erect, tomentose or woolly, usually tall herbs. *Leaves* all alternate. *Flowers* yellow, often tinged with purple or red, rarely white, arranged in simple or paniced terminal racemes or spikes, bracteate. *Calyx* 5-lobed or partite, lobes imbricate. *Corolla* rotate; lobes 5, broad, the 2 posterior ones (upper lip) outside in bud. *Stamens* 5; filaments all, or only the 3 upper ones, bearded; anthers transverse or oblique, cells confluent. Style dilated towards the apex, stigma simple. *Fruit* a globose oblong or ovoid capsule, septicidally 2-valved, the valves separating from the axis. *Seeds* many, not winged, rugose, embryo straight.—Species about 150, occurring in Europe, N. Africa and in Western and Central Asia.

V. Thapsus, Linn. *Sp. Pl.* 177; Roxb. *Fl. Ind.* i, 560; F. B. I. iv, 250; Watt *E. D.*; Collett *Fl. Siml.* 347. Vern. *Gidar-tamaku* (Jackal's tobacco), known also by the name "Mullein" in England.

An erect herb, densely clothed with soft greyish-yellow stellate tomentum. *Stems* usually stout, simple, winged with the prolonged leaf-bases. *Leaves* entire or crenate; radical and lower cauline stalked, 6—18 in. long, obovate-lanceolate; upper oblong, acute or acuminate. *Flowers* crowded in a simple terminal woolly spike, 6—10 in. long, yellow, bracts often longer than the flowers. *Calyx* 5-lobed. *Corolla* $\frac{1}{4}$ —1 in. across, concave, woolly outside. *Stamens* with 3 of the filaments clothed with white hairs, the other 2 longer and glabrous. *Capsule* ovoid, tomentose.

This species has been collected in Dehra Dun, N. Oudh and in the districts of Moradabad and Agra, also in Bundelkhand. *Flowers* in April. **DISTRIB.:** Punjab Plain and throughout the Himalayan ranges from Bhutan to Kashmir, ascending to 13,000 ft. in N. Kumaon. It is found also in Afghanistan and extends to Britain. The plant has narcotic properties, and the seeds are sometimes used for stupefying fish.

2. CELSIA, Linn.; Fl. Brit. Ind. iv, 251.

Annual or biennial herbs. *Leaves* alternate, crenate, sinuate-dentate or incised. *Flowers* in terminal simple or rarely branched spikes or racemes. *Calyx* deeply 5-fid, lobes imbricate. *Corolla* rotate, tube very short; lobes 5, broad, somewhat unequal, the upper outside in bud. *Stamens* 4, didynamous or nearly equal, filaments all woolly; anthers transverse or oblique, with confluent tips. *Ovary* 2-celled, ovules many, style entire, stigma compressed, terminal. *Fruit* a globose or ovoid septically 2-valved capsule, valves usually 2-fid. *Seeds* many, minute, transversely rugose, not winged.—Species about 40, extending from W. Asia to Abyssinia, N. Africa and S. Europe.

C. coromandeliana, *Vahl Symb. Bot. iii, 79; Roxb. Fl. Ind. iii, 100; F. B. I. iv, 251; Watt E. D.; Collett Fl. Siml. 347; Prain Beng. Pl. 757; Cooke Fl. Bomb. ii, 281.*

An erect pubescent annual herb. *Stem* 2—3 ft. high, glandular above. *Radical leaves* petioled, crowded, 2—4 in. long, lyrate-pinnatifid; the large terminal lobe usually oblong, obtuse, toothed; cauline sessile, smaller, and passing upwards into bracts, oblong-ovate, cordate, toothed, hairy on both sides. *Flowers* in simple or branched terminal racemes which are 1—2 ft. long, pedicels $\frac{1}{4}$ — $\frac{1}{3}$ in. long; bracts shorter, ovate. *Calyx* shorter than the pedicels, deeply divided; segments linear-oblong, subacute, entire or serrulate. *Corolla* $\frac{1}{2}$ inch across, yellow. *Filaments* all densely bearded with purple hairs. *Capsule* $\frac{1}{4}$ — $\frac{1}{3}$ in. in diam., sub-globose, glabrous. *Seeds* oblong, truncate, verrucose.

Frequent within the area and often as a weed in cultivated ground, flowering in the plains during the cold season. **DISTRIB.:** Throughout India from the Punjab to Ceylon, ascending to 5,000 ft. on the Himalaya, extending to Afghanistan, Burma and China. The juice of this plant is used for dysentery and also as a sedative.

3. LINARIA, Juss.; Fl. Brit. Ind. iv, 251.

Herbs. *Leaves* usually opposite, or whorled below and alternate above. *Flowers* axillary, solitary or passing into terminal racemes or spikes with the floral leaves reduced to bracts. *Calyx* 5-partite, segments imbricate. *Corolla* 2-lipped and personate, tube spurred in front at the base; upper lip erect, 2-lobed; lower spreading, 3-lobed, throat usually closed by the tumid palate. *Stamens* didynamous, ascending, included; anther-cells distinct, parallel. *Style* filiform, stigma minute. *Fruit* an ovoid or globose 2-celled, capsule, each cell or the anterior only opening by an apical pore. *Seeds* angled, rugose, wingless or discoid and winged.—Species about 150, chiefly in temperate regions of the world.

L. ramosissima, *Wall. Pl. As. Rar. ii, 43, t. 153; Royle Ill. 290; F. B. I. iv, 251; Watt E. D.; Collett Fl. Siml. 347; Prain Beng. Pl. 757; Cooke Fl. Bomb. ii, 282.* Toad-flax.

A glabrous or slightly pubescent perennial herb, often much branched from the rootstock; branches slender, 1—2 ft. long, usually prostrate

and glabrous. *Leaves* alternate, petioled, very variable in size and breadth, glabrous or the lowermost somewhat pubescent; lower 5—7 lobed, triangular-hastate; upper usually lanceolate, with acute diverging basal lobes; petioles filiform, $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* on slender axillary usually solitary ebracteate pedicels longer than the petioles. *Calyx* $\frac{1}{2}$ in. long, hairy but often glabrous when in fruit; segments linear-lanceolate, the margins membranous towards the base. *Corolla* (including spur) nearly $\frac{1}{2}$ in. long, yellow, hairy outside; spur straight obtuse, shorter than the tube; lobes of both lips oblong, obtuse. *Filaments* somewhat pubescent. *Style* stout. *Seeds* small echinulate.

On walls and rocks within the drier portions of the area, common in the Jumna and Chambal ravines in the districts of Agra and Etawah also in Bundelkhand. Flowers during the cold season. **DISTRIB.:** Throughout India in the plains and up to 5,000 ft. in Kumaon, extending to Afghanistan and Upper Burma.

4. ANTIRRHINUM, Linn.; Fl. Brit. Ind. iv, 253.

Annual or perennial herbs. *Leaves* entire or lobed, lower opposite, upper alternate. *Flowers* solitary and axillary or passing into terminal racemes with bract-like floral leaves. *Calyx* 5-partite, segments imbricate. *Corolla* 2-lipped and personate; tube compressed, saccate in front at the base; upper lip erect, 2-lobed; lower spreading, 3-lobed; palate broad, bearded, closing the throat. *Stamens* didynamous; anther-cells distinct, parallel. *Style* filiform, stigma 2-lobed. *Fruit* an ovoid or globose capsule, each cell opening by one pore, or the posterior by a pair of toothed pores. *Seeds* many, minute, oblong, rugose or pitted.—Species about 35, in temperate regions of the northern hemisphere, chiefly in N. America.

A. orontium, Linn. *Sp. Pl.* 617; *Royle Ill.* 290; *F. B. I.* iv, 253; *Collett Fl. Siml.* 348. Corn Snapdragon.

An erect herb, 6—18 in. high. *Stem* much branched from the base, more or less glandular-hairy above. *Leaves* 1—2 in. long, subsessile, linear or oblong-lanceolate, entire. *Flowers* $\frac{1}{2}$ in. long, pale-pink streaked with purple. *Sepals* narrow, spreading, longer than the corolla. *Capsule* $\frac{1}{4}$ in. long, pubescent. *Seeds* compressed, concave on one face, back keeled, margins thickened.

Common within the area, in cornfields. Flowers during the cold season. **DISTRIB.:** Punjab Plain, Salt Range and W. Himalaya up to 6,000 ft., mostly in cultivated ground, extending to N. Africa, Europe and the Canaries.

5. SUTERA, Roth; Fl. Brit. Ind. iv, 258.

Annual or perennial herbs, or small shrubs, glabrous pubescent or sometimes viscid. *Leaves* opposite or the upper often alternate, pinnatifid toothed or subentire. *Flowers* axillary or in terminal usually simple racemes; bracts small, leafy, not adnate to the pedicels. *Calyx* usually 5-partite; lobes narrow, more or less imbricate in bud. *Corolla* tubular,

not spurred; tube slender, cylindrical or funnel-shaped, straight or somewhat curved, throat dilated or not; lobes 5, subequal, obtuse, imbricate in bud, the 2 upper outside in bud and rather smaller than the 3 lower. *Stamens* 4, didynamous, included; anthers 1-celled by confluence. *Ovary* 2-celled; style filiform. *Fruit* an ovoid-oblong septicidal capsule, valves bifid. *Seeds* many, rugose.—Species about 120, chiefly in S. Africa.

S. glandulosa, Roth. Nov. Sp. 291; F. B. I. iv, 258; Prain Beng. Pl. 759; Cooke Fl. Bomb. ii, 285.

A diffuse or suberect glandular-pubescent annual, branched from or near the base, branches 6—12 in. long. *Leaves* shortly petioled, $\frac{1}{4}$ — $\frac{3}{4}$ in. long, ovate in outline pinnatifid, the segments more or less deeply toothed. *Flowers* nearly sessile, solitary in the axils, or the uppermost in racemes. *Calyx* $\frac{1}{10}$ — $\frac{1}{8}$ in. long; segments linear-oblong, subacute. *Corolla* white, about twice as long as the calyx, glabrous; lobes subequal, oblong-obtuse. *Capsules* $\frac{1}{8}$ in. long, viscid-pubescent or glabrous. *Seeds* minute, yellowish.

Common in the tracts of the Jumna ravines, and in the black soil of Bundelkhand. Flowers in Jan. and Feb. **DISTRIB.**: From Behar and Rajputana to the Deccan and S. India, extending to Arabia, Nubia and Egypt.

6. MONIERA, B. Juss.

UNDER HERPESTIS IN FL. BRIT. IND. IV, 272.

Glabrous herbs. *Leaves* often punctate, entire or toothed, or multifid when submerged. *Flowers* axillary or in racemes, yellow blue or white, bracteoles small or none. *Calyx* 5-partite; segments subequal, imbricate, upper largest; lateral innermost, usually narrow. *Corolla* slightly 2-lipped, tube cylindrical; lips spreading, the upper outside in bud and emarginate or 2-lobed, lower 3-lobed. *Stamens* didynamous, included; anther-cells contiguous, distinct, parallel. *Ovary* 2-celled, style dilated at the top, stigma entire or 2-lobed. *Fruit* a globose or ovoid 2-grooved capsule, valves 2 or 4, separating septicidally and loculicidally from the placentiferous dissepiment. *Seeds* many, minute.—Species about 50, in tropical and subtropical regions, chiefly in America.

Leaves obovate-oblong or spatulate, flowers stalked;

capsule ovoid, acute

1. *M. cuneifolia*.

Leaves linear-lanceolate, flowers sessile; capsule globose 2. *M. Hamiltoniana*.

M. cuneifolia, Michx Fl. Bor. Amer. ii, 22; (Monniera); Cooke Fl. Bomb. ii, 286. *Herpestis Monniera*, H. B. & K.; Royle Ill. 291; Collett Fl. Siml. 352; Prain Beng. Pl. 765; H. Monniera, Benth.; F. B. I. iv, 272; Watt E. D. Gratiola Monniera, Linn.; Roxb. Fl. Ind. i, 141.

A creeping somewhat succulent herb. *Stems* several, 4—12 in. long, rooting at the nodes, terete, branches ascending. *Leaves* sessile, decussate, $\frac{1}{4}$ —1 in. long, obovate-oblong or spatulate, entire, nerves obscure, lower surface dotted. *Flowers* axillary and solitary; pedicels slender, $\frac{1}{4}$ — $1\frac{1}{4}$ in. long; bracteoles linear, shorter than the pedicels. *Calyx* divided to the base, glabrous; upper segment ovate-acute, longer and broader than the others. *Corolla* $\frac{1}{2}$ in. long, blue or white with purple

veins; lobes nearly equal and rounded, glistening with shining dots when fresh. *Anthers* bluish-purple, pollen white: *Capsules* $\frac{1}{3}$ -in. long, ovoid, acute, glabrous.

Abundant within the area in wet places. **DISTRIB.:** Throughout India, ascending to 4,000 ft. on the Himalaya, and in all warm countries. The juice of this plant mixed with petroleum is used by Hindus externally for rheumatism.

M. Hamiltoniana, *T. Cooke Fl. Bomb. ii*, 286. *Herpestis Hamiltoniana*, *Benth.*; *F. B. I. iv*, 272; *Collett. Fl. Siml.* 353; *Prain Beng. Pl.* 765.

An erect glabrous herb up to 10 in. high. Stem stout, simple or branched, often decumbent at the base. *Leaves* subsessile, $\frac{1}{2}$ —1 in. long, linear-lanceolate, acute, tapering to the base, entire or sub-serrate, nerves indistinct. *Flowers* sessile, opposite and solitary, bracteoles linear-subulate. *Calyx* $\frac{1}{3}$ in. long, upper lobe broadly ovate, acute, the 2 lateral narrowly lanceolate. *Corolla* pink with a bluish tinge; tube about as long as the calyx, narrowed upwards, upper lip deeply emarginate. *Anthers* white. *Capsules* $\frac{1}{3}$ in. in diam., globose, glabrous.

Moradabad (T. Thomson), sub-Himalayan tracts, in marshy ground. **DISTRIB.:** Punjab ascending to 3,000 ft. and extending south to the Konkan and eastwards to Assam and Sylhet; also in Trop. Africa.

7. MIMULUS, Linn.; Fl. Brit. Ind. iv, 258.

Erect prostrate or creeping herbs, often viscid. *Leaves* opposite. *Flowers* solitary, axillary. *Calyx* tubular, 5-angled; lobes 5, short. *Corolla* 2-lipped; upper lip 2-lobed, erect or reflexed; lower 3-lobed, spreading, throat usually with a swollen 2-lobed palate. *Stamens* 4, didynamous; anthers attached near the base of the corolla-tube, with divergent sub-confluent cells. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* an oblong obovoid or sublinear loculicidally 2-valved capsule. *Seeds* many, minute, oblong.—Species about 90, chiefly in extra tropical and mountainous regions of W. America, Asia, Australia and Africa.

M. gracilis, *R. Br. Prod.* 439; *F. B. I. iv*, 259; *Collett Fl. Siml.* 350; *Prain Beng. Pl.* 759; *Cooke Fl. Bomb. ii*, 287.

An erect ascending or decumbent glabrous perennial herb, 6—20 in. high, often branching from the base; stem and branches 4-angular, striate. *Leaves* $1\frac{1}{2}$ —3 in. long, rather fleshy, turning black when dry, sessile or the lowermost shortly stalked, $\frac{1}{2}$ -amplexicaul, narrowly oblong or oblong-lanceolate, obtuse, entire or slightly toothed, glabrous. *Flowers* on slender pedicels, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long. *Calyx* (in flower) $\frac{1}{2}$ in. long, somewhat enlarged in fruit; teeth short, deltoid, acute. *Corolla* about $\frac{1}{4}$ in. long, white or pale-blue spotted with yellow, glabrous; lobes shallow, rounded. *Stamens* included, filaments glabrous, anthers subreniform. *Ovary* glabrous. *Capsules* $\frac{1}{4}$ in. long, included in the slightly enlarged calyx. *Seeds* smooth.

Wet places near Saharanpur, also in Dehra Dun and in the sub-Himalayan tracts of N. Oudh. Flowers during April and May. **DISTRIB.:**

Punjab Plain, and N. Bengal; Himalaya from Kumaon to Kashmir up to 5,000 ft.; extending to China, Australia and to Trop. and S. Africa.

8. MAZUS, Lour; Fl. Brit. Ind. iv, 259.

Small herbs, often with runners. *Leaves* opposite, sometimes rosulate, those of the flowering branches mostly alternate. *Flowers* in terminal sub-secund racemes; bracts minute, bracteoles none. *Calyx* broadly campanulate; lobes 5, leafy. *Corolla* 2-lipped, tube short, upper lip erect, 2-fid.; lower much larger, spreading, 3-fid., throat with a 2-lobed palate. *Stamens* didynamous, anther-cells contiguous but distinct. *Ovary* 2-celled, short, stigma 2-lamellate. *Fruit* a small globose or compressed loculicidal capsule included within the calyx, valves entire. *Seeds* many, minute, ovoid. Species about 6, extending from China to India and Australia.

M. rugosus, Lour. Fl. Cochinch. 385; Royle Ill. 291; F. B. I. iv, 259; Collett Fl. Siml. 351; Prain Beng. Pl. 759. *Columnnea tomentosa*, Roxb. Fl. Ind. iii, 98.

A small glabrous or sparsely hairy annual. *Stems* tufted, without runners. *Radical leaves* crowded, 1–3 in. long, oblong or obovate-spathulate, coarsely crenate, narrowed to the base into a short petiole. *Scapes* many from the root, 2–10 in. long, leafless or with a few spatulate leaves. *Racemes* terminal, 1–6 in. long, bracteoles none. *Flowers* pale-blue or white streaked with blue. *Calyx* $\frac{1}{4}$ in. long; lobes half as long as the tube, ovate-lanceolate, acute, spreading in fruit. *Corolla* $\frac{1}{4}$ – $\frac{1}{2}$ in. long. *Capsule* $\frac{1}{2}$ in., globose. *Seeds* very minute, pale-yellow.

Chiefly in the northern districts of the area, in the sub-Himalayan tracts from Dehra Dun eastwards, Moradabad (T. Thomson). Agra (Munro). **DISTRIB.:** Punjab Plain, Himalaya from Kashmir to Bhutan up to 7,000 ft., Bengal, Burma and the Malay Peninsula; also in Afghanistan, extending to China, Japan, Java and the Philippines.

9. STEMODIA, Linn.; Fl. Brit. Ind. iv, 265.

Herbs, sometimes woody below, glandular-pubescent and often aromatic. *Leaves* opposite or sometimes whorled. *Flowers* solitary, axillary, passing into terminal leafy spikes or dense racemes; bracts leaf-like, bracteoles 1 or 2. *Calyx* 5-partite; segments narrow, imbricate, equal or the upper somewhat larger. *Corolla* 2-lipped, tube cylindrical; upper lip suberect, entire or notched, outside in bud; lower spreading, 3-lobed, throat not plicate. *Stamens* 4, didynamous, included; anther-cells distinct, stipitate, all fertile. *Ovary* 2-celled; style filiform, dilated but not winged at the apex, stigma usually 2-lobed. *Fruit* a globose ovoid or acuminate capsule; valves 2, bifid and dehiscing septicidally, or 4-valved and dehiscing both septicidally and loculicidally. *Seeds* many, minute.—Species about 30, in tropical regions of both hemispheres.

S. viscosa, Roxb. Cor. Pl. ii, 33, t. 163; Fl. Ind. iii, 94; F. B. I. iv, 265; Watt E. D.; Prain Beng. Pl. 761; Cooke Fl. Bomb. ii, 288.

An erect viscidly pubescent aromatic herb, 3—24 in. high; stem and branches angular. Leaves $\frac{1}{2}$ — $1\frac{3}{4}$ in. long, sessile, usually oblong, tapering to the base, or the upper cordate-amplexicaul, acute or rarely obovate at the apex, glandular-pubescent or subglabrous, margins serrulate or subentire. Flowers axillary, solitary or in terminal, few-flowered racemes; pedicels filiform, $\frac{1}{4}$ — $\frac{1}{3}$ in. long, bracteoles 2, close under the calyx, linear-subulate. Calyx $\frac{1}{8}$ in. long; segments narrowly lanceolate, acute, glandular-hairy and ciliate. Corolla twice as long as the calyx, violet, glabrous, tube compressed, lower lip hairy in the throat, lobes about equal in length. Filaments glabrous; anther-cells shortly stalked sub-orbicular. Ovary glabrous. Capsules $\frac{1}{4}$ in. long, ovoid-oblong, acuminate, 4-valved and glabrous.

Common within the area, especially in rice-fields and in swampy ground. Flowers during the cold season. DISTRIBUTION: W. Bihar, C. and S. India; also in Afghanistan.

10. LIMNOPHILA, R. Br.; Fl. Brit. Ind. iv, 265.

Glabrous or pubescent aromatic herbs, often aquatic or paludine. Leaves with transparent dots, opposite or whorled, toothed or incised, often multifid when submerged. Flowers sessile or pedicelled, axillary, solitary or passing into terminal spikes or racemes; bracts leaf-like, bracteoles small or none. Calyx 5-partite, segments sub-equal or the posterior larger. Corolla 2-lipped, tube cylindric; upper lip outside in bud, suberect, entire or 2-fid.; lower spreading, 3-lobed, throat not plicate. Stamens didynamous, included; anther-cells usually separate, stipitate. Ovary 2-celled; style slender, deflexed at the tip, stigma 2-lamellate. Fruit an ovoid or oblong capsule, opening both septically and loculicidally, the placentiferous dissepiment separating with the valves. Seeds many, small, angular, reticulate.—Species about 30, in the warmer parts of Africa, Asia and Australia.

Flowers sessile or nearly so	1. <i>L. sessiliflora</i> .
Flowers stalked, the pedicels usually longer than the calyx:—	
Stems 1—2 ft., corolla $\frac{1}{2}$ in. long or more	2. <i>L. racemosa</i> .
Stems 3—8 in., corolla $\frac{1}{4}$ in. long	3. <i>L. gratioloides</i> .

1. **L. sessiliflora**, Blume Bijdr. 749; F.B.I. iv, 270; Prain Beng. Pl. 764; Cooke Fl. Bomb. ii, 290.

A small pubescent or subglabrous herb. Stem rather stout, 4—8 in. long. Leaves sessile or nearly so, usually 3—6 in a whorl; the upper often undivided, lanceolate, acute, serrate or dentate, 3-nerved, the lower divided into numerous very narrow segments. Flowers solitary, axillary. Calyx less than $\frac{1}{4}$ in. long, glandular hairy, divided about $\frac{1}{2}$ way down; tube hemispheric in fruit, membranous not striate; lobes ovate, long-acuminate. Corolla $\frac{3}{8}$ in. long, pink. Capsule $\frac{1}{8}$ in. long, subglobose, glabrous. Seeds truncate at both ends.

In rice-fields and swampy ground. Flowers in rainy and cold seasons. **DISTRIB.:** From Punjab Plain and Bengal to C. India and the Deccan; also in Ceylon, Malay Peninsula and Burma, extending to China, Japan, Java and Trop. Africa. This species closely resemble short-flowered forms of *L. gratioloides*, also states of *L. heterophylla* in which the multifid submerged leaves are not present.

2. *L. racemosa*, Benth. Scroph. Ind. 442; F. B. I. iv, 271; Prain Beng. Pl. 764; Cooke. Fl. Bomb. 291. Cyrilla aquatica, Roxb.; ii, 115.

An aquatic herb with creeping roots; stems stout, erect, attaining 12 ft. or more in deep water, glabrous or slightly hairy. *Upper leaves* sessile, $1\frac{1}{2}$ —2 in. long, opposite or 3-nately whorled, ovate or oblong-lanceolate, serrulate, glabrous, $\frac{1}{2}$ -amplexicaul and somewhat rounded at the base, 3—5-nerved; lower leaves capillaceo-multifid, often deflexed and root-like. *Flowers* rather large, usually in erect terminal leafy racemes, 2—4 in. long, bracteoles linear-subulate; pedicels filiform, longer than the bracteoles. *Calyx* $\frac{1}{2}$ in. long, lobes as long as the tube, deltoid, acute or acuminate, often coloured, membranous and not striate in fruit. *Corolla* $\frac{1}{2}$ in. long or more, pale-violet with yellow tube; lobes of upper lip rounded, of the lower acute. *Capsules* $\frac{1}{2}$ in. long, subglobose, enclosed in the membranous calyx. *Seeds* truncate at both ends.

Merwára (Duthie), C. India (Edgeworth) on black soil. **DISTRIB.:** Rajputana, N. & C. Bengal, Deccan, Ceylon extending to Java. Small states of this species are with difficulty distinguished from *L. gratioloides*.

3. *L. gratioloides*, R. Br. Prod. 442; Royle Ill. 291; F. B. I. iv, 271; Prain Beng. Pl. 264; Cooke Fl. Bomb. ii, 291. Columnea balsamica, Roxb. Fl. Ind. iii, 97.

A small herb, 3—8 in. high, with a strong scent of turpentine, roots creeping; stems much branched from the base, erect, stout or slender, sub-4-angular, rooting from the lower nodes, glabrous, striate. *Leaves* sessile, usually all whorled, pinnatifid or the lowest multifid, the upper occasionally opposite and entire, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, linear-oblong, serrate-dentate, 1-nerved. *Flowers* pedicelled, usually axillary and solitary, rarely racemose, bracteoles linear-subulate; pedicels longer than the leaves, filiform, spreading. *Calyx* (in flower) $\frac{1}{2}$ — $\frac{1}{3}$ in long, membranous, glandular, hemispheric and not striate in fruit; lobes narrowly triangular, acute or acuminate. *Corolla* $\frac{1}{2}$ in. long, pink. *Capsules* $\frac{1}{2}$ in. long, subglobose. *Seeds* truncate or obscurely rounded at each end.

Saharanpur dist. (Royle), Moradabad (T. Thomson), Merwára (Duthie), Rohilkhand and Bundelkhand (Edgeworth), in swamps and rice-fields. Flowers during the rainy and cold seasons. **DISTRIB.:** Punjab Plain Rajputana and throughout the greater part of India, also in Ceylon, extending to Baluchistan, Trop. Africa, the Malay Archipelago, China, Japan and Australia.

VAR. *intermedia* F. B. I. l.c.—Stem robust. *Leaves* all close-sec. *Flowers* sometimes racemose with opposite entire bract-like leaves. Moradabad

(T. Thomson). Patli Dun (Strach. & W. No. 2). Sub-Siwalik tract Edgeworth. **DISTRIB.:** Punjab Himalaya 3—4,000 ft., extending to Baluchistan.

VAR. *elongata* Benth.—*Stem* very long; upper leaves opposite, entire; submerged leaves capillaceo-multifid.—Moradabad (T. Thomson), Oudh (Wallich), extending to the Central Provinces and the Deccan.

11. DOPATRIUM, Buch.-Ham.; Fl. Brit. Ind. iv, 273.

Glabrous slender annual marsh herbs. *Leaves* few, opposite; lower pairs small, the upper minute, remote. *Flowers* small, solitary, axillary, usually violet; pedicels filiform or none, bracteoles none. *Calyx* small, 5-partite; lobes narrow, imbricate. *Corolla* 2-lipped; tube slender below, dilated into a broad throat; upper lip outside in bud, 2-fid; lower broad, 3-lobed, spreading. *Stamens* 2, upper only perfect, included; anther-cells parallel, distinct, equal; staminodes 2, minute, included within the tube. *Ovary* 2-celled, style short, stigma 2-lamellate. *Fruit* a small globose or oblong capsule, opening loculicidally, the valves placentiferous. *Seeds* many, very small, tuberculate.—Species 12, in Asia, Africa and Australia.

D. junceum, Buch.—Ham. in Benth. *Scroph. Ind.* 31; *F. B. I.* iv, 274; *Prain Beng. Pl.* 766; *Cooke Fl. Bomb. ii*, 292. *Gratiola juncea*, *Roxb. Fl. Ind. i*, 142.

Rather fleshy; stems erect, 6—12 in. high, branched from the base, lower portion swollen and spongy. *Leaves* few, sessile; the lower oblong or obovate, obtuse or subacute, entire upper much smaller, in pairs and remote. *Flowers* subracemose, in opposite distant pairs, sessile or shortly stalked; pedicels (when present) filiform, erect in fruit. *Calyx-lobes* oblong, obtuse. *Corolla* $\frac{3}{8}$ — $\frac{1}{2}$ in. long, pinkish-violet. *Capsules* $\frac{1}{10}$ in. in diam., globose. *Seeds* minute, tuberculate.

In rice-fields and swampy ground, flowering in rainy season. **DISTRIB.:** Throughout India and in Ceylon; Himalaya, in Brit. Garhwal and Kumaon at low elevations; extending to the Malay Islands, China, Japan and Philippines to Australia.

12. TORENIA, Linn.; Fl. Brit. Ind. iv, 275.

Glabrous or pubescent herbs. *Leaves* opposite, entire, crenate or serrate. *Flowers* often showy, axillary or in terminal or pseudo-axillary umbels or racemes, bracteoles none. *Calyx* tubular, 3—5-winged or -folded or -keeled, 2-lipped or 3—5-toothed. *Corolla* 2-lipped, tube cylindric, somewhat curved and dilated upwards; upper lip concave or pinched, notched or 2-fid.; lower larger, spreading, 3-lobed. *Stamens* didynamous, all perfect, 2 upper included, 2 lower adnate to the throat, appendaged or not at the base and connivent under the upper lip, cells often confluent. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* a linear or oblong septicidal capsule, included, valves separating from the placentiferous dissepiment. *Seeds* many, rugose or cancellate.—Species 25, in tropical Asia and Africa, and one in America.

T. cordifolia, Roxb. *Cor. Pl.* ii, 32, t. 161; *Fl. Ind.* iii, 95; Royle *Ill.* 291; *F.B.I.* iv, 276; Collett *Fl. Siml.* 353; Prain *Beng. Pl.* 767; Cooke *Fl. Bomb.* ii, 292.

An erect nearly glabrous annual, 4—10 in. high. *Stems* and branches 4-angled or almost 4-winged. *Leaves* $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, ovate, acute or sub-obtuse, sharply serrate, glabrous, base usually cuneate, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* solitary or fascicled in the axils towards the ends of the branches; pedicels slender, often exceeding the leaves. *Calyx* $\frac{3}{8}$ in. long, 2-lipped, ovoid, cordate or rounded at the base, wings not decurrent on the pedicel, teeth ciliate. *Corolla* $\frac{3}{4}$ in. long, bluish-purple. *Filaments* arching, not toothed. *Capsules* oblong, acute, enclosed in the persistent calyx. *Seeds* minute, truncate at both ends.

Dehra Dun. Flowers Sep. **DISTRIB.**: W. Himalaya from Simla to Kumaon up to 6,000 ft., Behar and hilly parts of Peninsular India, Burma, Java and China.

13. VANDELLIA, Linn.; *Fl. Brit. Ind.* iv, 279.

Herbs, usually annual, glabrous or pubescent. *Leaves* opposite, often toothed, penninerved (except in *V. pyxidaria*). *Flowers* small, axillary or sub-racemose, bracteoles none. *Calyx* subcampanulate; lobes free or connate, not winged. *Corolla* 2-lipped, tube cylindric; upper lip outside, erect, concave, notched or bifid, lower broader, 3-lobed, spreading. *Stamens* didynamous, usually, all perfect, 2 posterior usually included; 2 anterior with arched filaments, appendaged near the base; anthers touching or cohering in pairs under the upper lip, cells divaricate. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* a globose or ovoid long-cylindric septicidally 2-valved capsule, valves separating from the placentiferous septum. *Seeds* many, rugose.—Species about 26, chiefly in Trop. Asia.

Leaves pinnately veined:—

Capsule equalling the calyx or shorter:—

Calyx in flower not divided beyond the middle

1. *V. crustacea*.

Calyx divided to the base or nearly so

2. *V. multiflora*.

Capsule much longer than the calyx:—

Calyx in flower cleft to the middle.

3. *V. nummularifolia*.

Calyx-lobes free to the base or nearly so

4. *V. pedunculata*.

Leaves with 3—5 parallel nerves; calyx divided to the base, shorter than the ovoid orbicular capsule

5. *V. pyxidaria*.

1. V. crustacea, Benth. *Scroph. Ind.* 35; *F. B. I.* iv, 279; Collett *Fl. Siml.* 354; Prain *Beng. Pl.* 768; Cooke *Fl. Bomb.* ii, 295. *Torenia varians*, Roxb. *Fl. Ind.* iii, 96. *Gratiola lucida*, Vahl.; Roxb. *Fl. Ind.* i, 138.

A glabrous or sparsely hairy annual, 4—18 in. high, diffusely branched from the base; stems angular. *Leaves* shortly petioled, $\frac{3}{8}$ — $\frac{3}{4}$ in. long, ovate or lanceolate, sub-acute, margins with shallow teeth or sub-entire. *Flowers* axillary and sub-racemose at the ends of the branches; pedicels $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, slender, stiff. *Calyx* $\frac{3}{8}$ — $\frac{1}{2}$ in. long in flower, elongating in fruit, 5-ribbed, not divided beyond the middle; teeth triangular, acute. *Corolla* $\frac{3}{8}$ — $\frac{1}{2}$ in. long, purplish or white. *Capsule* shorter than the calyx, oblong-ovate, obtuse.

A common weed within the area. **DISTRIB.:** Throughout India and in Ceylon Himalaya up to 4,000 ft., and generally scattered throughout the tropics of the Old World.

2. *V. multiflora*, *G. Don Syst. iv, 549; F.B.I. iv, 280; Prain Beng. Pl. 768.* *Torenia multiflora, Roxb. Fl. Ind. iii, 96.*

A small erect glabrous herb, somewhat succulent. *Stem* 4—6 in. high, with 3-chotomous quadrangular branches. *Leaves* 1—2 in. long; lowest stalked, upper sessile, oblong ovate-oblong or obovate, obtuse, entire sinuate or subserrate. *Flowers* minute, racemed, pedicels exceeding calyx. *Calyx* $\frac{1}{10}$ in. long, divided to the base or nearly so; segments narrowly acuminate, lanceolate. *Capsule* about as long as the calyx, suborbicular with an acute apex.

Guna in C. India (King). **DISTRIB.:** Behar, E. Bengal and S. India; Sarju Valley in Kumaon up to 4,000 ft. and eastwards to Assam.

3. *V. nummularifolia*, *Don Prod. 86; F.B.I. iv. 282; Collett Fl. Siml. 354; Lindernia nummulariæfolia, Wettst. in Engl. and Prantl, Pfl. iv. 3B, 79.*

An erect glabrous herb, simple or branching from the base, branches 2—6 in. long, divaricate, not rooting. *Leaves* sessile or shortly stalked, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, broadly ovate obovate or suborbicular, crenate-serrate, nerves subflabellate. *Pedicels* very slender, or in subumbellate or few-flowered racemes longer than the leaves. *Calyx* $\frac{1}{4}$ in. long, divided half-way or to the base when in fruit, teeth acute. *Corolla* $\frac{3}{4}$ in. long, reddish-purple, lateral lobes of lower lip white. *Capsule* $\frac{1}{2}$ in. long, ellipsoid, acute, longer than the calyx.

Dehra Dun (Duthie). **DISTRIB.:** Himalaya from Kashmir to Sikkim up to 7,000 ft. and on the Khasia Hills; also in Trop. Africa.

4. *V. pedunculata*, *Benth. Scroph. Ind. 37; F. B. I. iv, 282; Prain Beng. Pl. 769; Cooke Fl. Bomb. ii, 295.* *Torenia diffusa, Roxb. Fl. Ind. iii, 95.*

A small diffuse glabrous herb. *Stems* often creeping at the base and rooting from the nodes, sometimes tinged with purple; branches 4—10 in. long, slender. *Leaves* shortly stalked, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovate, obtuse or subacute, obscurely crenate-serrate, usually unequally subcordate at the base. *Flowers* solitary, axillary, pedicels about twice as long as the leaves. *Calyx-segments* almost free to the base, narrowly lanceolate, acuminate. *Corolla* $\frac{3}{8}$ in. long, white, margined with pale-purple and marked with a yellow spot on the lower lip. *Capsule* linear-lanceolate, acute, twice as long as the calyx. *Seeds* ellipsoid.

Abundant within the area in swamps and rice-fields, flowering during the rainy and cold seasons. **DISTRIB.:** Throughout India and in Ceylon, W. Himalaya up to 4,000 ft. and extending to the Malay Peninsula, Borneo, China and Cochin-China.

5. *V. pyxidaria*, *Maxim. Diagn. Pl. Nov. Dec. xix, 413; Prain Beng. Pl. 769. *V. crecta, Benth: F.B.I. iv, 281. Gratiola integrifolia. Roxb. Fl. Ind. i, 137.**

A small erect glabrous annual, 4—8 in. high, branching from the base, branches not rooting. *Leaves* sessile, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, elliptic or oblong, obtuse, entire or obscurely crenate; nerves 3—5 in. long, parallel. *Pedicels* axillary, solitary, slender, usually twice as long as the leaves. *Calyx-segments* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, free to the base, lanceolate or linear, rather obtuse, shorter than the ovoid-orbicular capsule.

Dehra Dun (Gamble), Rohilkhand (T. Thomson), Bundelkhand (Duthie). Flowers during the rainy and cold seasons. **DISTRIB.:** Himalaya from Kashmir to Assam, common in Bengal, also in C. and S. India, but not recorded from Ceylon; extending to Siam, China, Japan, Malaya and Polynesia and westwards to France. This plant closely resembles *Ilysanthes parviflora*, and the nerves of the leaves are parallel as in the latter genus. Roxburgh describes the plant as erect when young, but afterwards straggling.

14. ILYSANTHES, Rafin.; Fl. Brit. Ind. iv, 283.

Annual glabrous slender marsh-plants. *Leaves* opposite, entire or toothed, 1—5-nerved from the base. *Flowers* small axillary or passing into terminal racemes, pedicels often reflexed in fruit, bracteoles none. *Calyx* 5-partite, segments narrow. *Corolla* 2-lipped, tube cylindric; upper lip outside, concave, notched; lower larger, spreading, 3-lobed. *Stamens*, the 2 upper only perfect, sub-included, the lower pair reduced to staminodes, anthers connivent, cells divaricate; staminodes 2, bilobed, one lobe glandular, the other glabrous. *Ovary* 2-celled, stigma 2-lamellate. *Fruit* a septicidal capsule; valves entire, separating from the placenterous septum. Seeds, many, rugose.—Species 35, India, extending to Siam, S. Africa and S. America.

I. parviflora, Benth. in DC. Prod. x, 419; F. B. I. iv, 283; Cooke Fl. Bomb. ii, 296; Prain Beng. Pl. 769. *Gratiola parviflora*, Roxb. Fl. Ind. i, 140.

A small erect glabrous herb. *Stem* about 6 in. high, simple or diffusely branched, 4-sided. *Leaves* sessile or the lowermost very shortly stalked, $\frac{1}{2}$ —1 in. long, oblong or oblong-lanceolate, entire or slightly serrate, 1—5 nerved from the base. *Flowers* axillary and in terminal racemes, filiform. *Calyx* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, deeply divided; segments linear-lanceolate, acute. *Corolla* twice as long as the calyx, blue or white. *Capsule* ovoid-oblong, acute, usually exceeding the calyx.

Common within the area in wet ground, flowering during the rainy season. **DISTRIB.:** Throughout the greater part of India, but not in Ceylon, extending to Siam and Trop. Africa. Very similar in general appearance to *Vandellia pyxidaria*, but the shorter stamens reduced to staminodes and the longer and acute capsules distinguish it from the latter.

15. BONNAYA, Link & Otto; Fl. Brit. Ind. iv, 284.

Annual glabrous herbs. *Leaves* opposite, entire or serrate, obscurely penninerved. *Flowers* solitary, axillary, or often passing into terminal racemes, bracteoles none. *Calyx* 5-partite; segments narrow, partly

imbricate. *Corolla* 2-lipped, tube cylindrical; upper lip outside, erect, concave, 2-lobed; lower larger, spreading, 3-lobed. *Stamens*, the 2 upper only perfect; sub-included, filaments filiform, anthers connivent, cells divaricate; staminodes 2, entire, obtuse, glandular. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* a narrow exserted septicidal capsule; valves entire, separating from the placentiferous septum. *Seeds* many, rugose.—Species 8, in Asia and Trop. Africa.

Leaves deeply and closely serrate

1. *B. brachiata*.

Leaves narrower with shallow distant teeth, the lower leaves often subentire

2. *B. veronicæfolia*.

1. ***B. brachiata***, *Link & Otto Ic. Pl. Sel. i, 25, t. 11; F. B. I. iv, 284; Collett Fl. Siml. 354; Prain Beng. Pl. 770; Cooke Fl. Bomb. ii, 297. Gratiola serrata, Roxb. Fl. Ind. i, 139.*

A small rigid glabrous herb, 3—10 in. high. *Stem* 4-sided, the lowest branches decumbent below. *Leaves* sessile, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, oblong, obtuse or subacute, closely and deeply spinose-serrate, glabrous. *Flowers* shortly pedicelled, forming terminal racemes; pedicels about equalling the calyx, rigid; bracts lanceolate, lowermost often dentate. *Calyx* about $\frac{1}{2}$ in. long, deeply divided; segments narrow, aristate. *Corolla* $\frac{1}{2}$ in. long, pink or white. *Staminodes* short, pubescent. *Capsules* $\frac{1}{2}$ in. long, narrowly cylindrical, diverging, acute, glabrous. *Seeds* minute, usually truncate at both ends.

Abundant within the area, flowering during the rainy season. **DISTRIB.:** Throughout India and in Ceylon; Himalaya up to 5,000 ft., extending to the Malay Peninsula, Java, China and the Philippines.

2. ***B. veronicæfolia***, *Spreng. Syst. Veg. i, 41; F. B. I. iv, 285; Prain Beng. Pl. 770; Cooke Fl. Bomb. ii, 298. Gratiola veronicæfolia, Retz; Roxb. Fl. Ind. i, 138.*

A decumbent or creeping herb. *Stem* 4-sided; branches ascending, often rooting at the nodes. *Leaves* $\frac{1}{2}$ — $1\frac{1}{4}$ in. long, oblong or oblong-lanceolate or obovate, rather distantly serrate or the lower sometimes subentire. *Flowers* in terminal and axillary racemes. *Calyx* deeply divided; segments linear-lanceolate, acute. *Corolla* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, violet streaked with purple. *Capsules* slender, erect or somewhat spreading, about twice as long as the calyx.

Very common all over the area, flowering during the rainy and cold seasons. **DISTRIB.:** Throughout India and in Ceylon, W. Himalaya up to 5,000 ft., extending to Malay Pen. and Islands, Siam, China and the Philippines. A very variable species.

16. GLOSSOSTIGMA, Arn.; Fl. Brit. Ind. iv, 287.

Minute glabrous creeping herbs. *Leaves* opposite or in fascicles, linear or spatulate, entire. *Flowers* minute, axillary, solitary, bracteoles none. *Calyx* campanulate, obtusely 3—4-lobed. *Corolla* shortly tubular; lobes 5, subequal, spreading. *Stamens* 2 (in the single Indian species) or 4, filaments filiform; anther-cells diverging, their tips confluent. *Ovary* perfectly or imperfectly 2-celled, style short; stigma

dilated, spathulate, recurved. *Fruit* a small included loculicidal capsule; valves entire, separating from the columnar placentiferous axis. *Seeds* small, ovoid.—Species 3, all Australian, one of which extends to Asia and Africa, and another occurs in New Zealand.

G. spathulatum, *Arn. in Nov. Act. Nat. Cur. xviii, 355; F. B. I. iv, 288; Prain. Beng. Pl. 772; Cooke Fl. Bomb. ii, 299.* *Limosella diandra*, *Roxb. Fl. Ind. iii, 91.*

A minute tufted herb with creeping stems and rooting at the nodes, the branches intricately interwoven. *Leaves* $\frac{1}{10}$ — $\frac{1}{4}$ in. long, narrowly spathulate, tapering into a flat petiole of variable length. *Pedicels* slender usually shorter than the leaves. *Calyx* about $\frac{1}{2}$ in. long, slightly enlarged in fruit; lobes 3, shallow, broadly ovate. *Corolla* bluish, tube included within the calyx. *Stamens* 2. *Capsule* about as long as the calyx.

Somewhat abundant within the area, on margins of stagnant water as at Saharanpur (Royle), Moradabad (T. Thomson) and also near Jhansi in Merwára (Duthie). *DISTRIB.*: Mt. Abu in Rajputana, Behar, Konkan to S. India and Ceylon. It has been collected also in Trop. Africa (Senegambia) and in Australia. Very similar in habit to *Limosella aquatica* and *Microcarpæa muscosa*. The latter may very possibly be found within the area of this flora if carefully searched for in similar localities. It may be distinguished by its acutely 5-fid. tubular calyx.

17. SCOPARIA, Linn.; Fl. Brit. Ind. iv, 289.

Branched glabrous or pubescent herbs or undershrubs. *Leaves* opposite or whorled, entire or toothed, punctate. *Flowers* small, white or yellow, axillary, solitary or 2-nate, bracteoles none. *Calyx* campanulate, 4-5-partite, imbricate in bud. *Corolla* rotate, 4-fid., throat densely bearded; lobes obtuse, subequal. *Stamens* 4, sub-equal, filaments filiform; anthers sub-sagittate; cells distinct, parallel or diverging. *Ovary* 2-celled; style subclavate, stigma notched or truncate. *Fruit* a small globose or ovoid septicidal capsule; valves membranous, entire; margins inflexed, separating from the placentiferous axis. *Seeds* many, obovoid, angled, scrobiculate.—Species 5 or 6, all American, one of which is sporadic in Asia, Africa and Australia.

S. dulcis, *Linn. Sp. Pl. 116; F. B. I. iv, 289; Prain Beng. Pl. 772, Cooke Fl. Bomb. ii, 310.*

A glabrous leafy undershrub, up to 3 ft. high; branches many, erect or ascending. *Leaves* opposite or ternate, 1-2 in. long, lanceolate or elliptic-lanceolate, or obtuse, shortly petioled, margins serrate. *Flowers* many, in terminal panicles; pedicels $\frac{1}{4}$ — $\frac{1}{2}$ in. long, slender, rigid. *Calyx* 4-partite, segments oblong. *Corolla* white, $\frac{1}{2}$ in. in diam., tube very short. *Capsule* globose, $\frac{1}{2}$ in. in diam.

Often met with as a weed of cultivated ground, more especially in the sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* March—June. *DISTRIB.*: Abundant all over Bengal where, according to

Clarke, it was unknown in Roxburgh's time. The first record of its occurrence in Bengal was, by Voigt in 1845. It has been found recently by Woodrow in a salt swamp near Bombay. The plant is a native of Trop. America, whence it has spread more or less throughout the tropics.

18. VERONICA, Linn.; Fl. Brit. Ind. iv, 291.

Herbs or shrubs, rarely trees. *Leaves* opposite, the cauline or all rarely alternate. *Flowers* usually blue or purple, solitary, axillary or in terminal or axillary racemes, bracts usually conspicuous, bracteoles none. *Calyx* 4—5-partite, the lower segments connate, upper (if present) smaller. *Corolla* rotate or shortly salver-shaped; lobes 4 or 5, spreading, the lateral, or one of them, outside in bud. *Stamens* 2, exserted, adnate to corolla-tube by the sides of the upper lobe; anther-cells confluent at their tips. *Ovary* 2-celled, stigma subcapitate; ovules many or few, rarely only 2 in each cell. *Fruit* a compressed or turgid 2-grooved capsule, dehiscing in various ways. *Seeds* many or few, smooth or rugose, sometimes winged.—Species over 200, mostly in temperate and alpine regions of both hemispheres, less frequent in America.

Leaves oblong or linear-oblong, flowers in axillary racemes.

An erect perennial usually glabrous herb

1. *V. Anagallis*.

Leaves cordate-ovate or orbicular, flowers in terminal racemes. A prostrate pubescent annual

2. *V. agrestis*.

1. *V. Anagallis*, Linn. *Sp. Pl.* 12; Royle *Ill.* 290; *F. B. I.* iv, 293; Collett *Fl. Siml.* 357; Prain *Beng. Pl.* 773; Cooke *Fl. Bomb.* ii, 301. *V. punctata*, Buch.-Ham. in Don *Prod.* 93. *V. Anagallis*, var. *punctata*, *F. B. I. l.c.*; Prain *Beng. Pl. l.c.*

An erect more or less succulent glabrous herb, 3—18 in. high. *Stems* hollow, creeping below and stoloniferous. *Leaves* sessile or the lowest shortly stalked, 2—6 in. long, oblong-lanceolate, or linear-oblong, entire or serrate, base usually cordate. *Flowers* in lax axillary racemes, 3—6 in. long; pedicels filiform, spreading, longer than the linear-lanceolate bracts. *Calyx* about half as long as the pedicels, divided to the base; segments ovate, subacute. *Corolla* $\frac{1}{2}$ — $\frac{1}{4}$ in. across, pale-purple or white. *Capsules* compressed, $\frac{1}{8}$ — $\frac{1}{2}$ in. long, orbicular or orbicular-oblong, emarginate, glabrous.

Abundant in wet places. Flowers in the cold season. **DISTRIB.:** Over the greater part of India, and up to 9,000 ft. on the Himalaya and at much higher elevations in Baltistan. Found also in Europe, N. America, and in nearly all warm and temperate regions of the world.

2. *V. agrestis*, Linn. *Sp. Pl.* 13; Royle *Ill.* 290; *F. B. I.* iv, 294; Collett *Fl. Siml.* 357; Prain *Beng. Pl.* 773.

A prostrate more or less pubescent annual. *Stems* spreading, 6—18 in., long, much-branched. *Leaves* shortly petioled, $\frac{1}{2}$ —1 in. long, broadly ovate-cordate, or orbicular, coarsely crenate-serrate. *Pedicels* axillary solitary, about as long as the leaves, decurved in fruit. *Sepals* $\frac{1}{2}$ in. long, ovate, obtuse, ciliate. *Corolla* shorter or longer than the sepals, blue or white. *Capsule* $\frac{1}{2}$ in. in diam.; lobes globose 4—10-seeded.

A common weed within the area, appearing during the cold season in gardens and cultivated ground. **DISTRIB.:** Punjab Plain and W. Himalaya from Kashmir and Baltistan to Kumaon up to 9,000 ft., also in C. Bengal, extending to Europe, N. Africa, China, Japan and the Loochoo Islands.

19. BUCHNERA, Linn.; Fl. Brit. Ind. iv, 297.

Rigid annual herbs, black when dry. *Leaves*, the lower ones, opposite and broad, upper alternate and narrow. *Flowers* sessile, axillary or in bracteate spikes, 2-bracteolate. *Calyx* tubular, 5-toothed, 10-nerved and sometimes 5-ribbed. *Corolla-tube* straight or nearly so, slender; lobes 5, flat, subequal, spreading, 2 upper inside in bud. *Stamens* didynamous, included; anthers 1-celled, vertical, dorsifixed, bases obtuse, connective sometimes mucronate. *Ovary* 2-celled, style thickened or clavate upwards, stigma entire or notched. *Fruit* an oblong loculicidal capsule; valves coriaceous, entire, septiferous, separating from the placentas. *Seeds* many, obovoid or oblong, reticulated.—Species about 78, in the warmer regions of both hemispheres.

B. hispida, Buch.-Ham. in Don Prod. 91; F.B.I. iv, 298; Collett Fl. Siml. 358; Prain Beng. Pl. 774; Cooke Fl. Bomb. ii, 301.

An erect hispid herb, 6–18 in. high. *Stem* slender, often branched above. *Leaves* sessile or obscurely petioled; the lower crowded, 1–2 in. long, obovate or oblong; the upper usually longer and narrower. *Flowers* distant, sessile in the axils of narrow bracts and forming terminal spikes 6–10 in. long; bracteoles small, subulate. *Calyx* $\frac{1}{2}$ – $\frac{1}{4}$ in. long, tubular, hispid; teeth lanceolate, acute. *Corolla* pale-purple or white; tube, slender, cylindric, longer than the calyx, hairy within. *Capsule* oblong, shorter than the calyx.

Frequent in grassy places on the Siwalik range and throughout the sub-Himalayan tracts eastwards. *Flowers* July-Oct. **DISTRIB.:** W. and C. Himalaya from Kashmir to E. Nepal, up to 9,000 ft., and from Chota Nagpur, C. India and the Konkan to S. India; also in Madagascar and Trop. Africa.

20. STRIGA, Lour.; Fl. Brit. Ind. iv, 298.

Usually scabrid herbs, turning blackish when dry. *Leaves*, the lower, opposite; upper alternate, linear, entire, rarely toothed, sometimes reduced to scales. *Flowers* axillary or the upper in bracteate spikes, bracteoles usually 2. *Calyx* 5-toothed or -fid.; tube with 4 or 5 or 15 strong nerves. *Corolla* 2-lipped; tube slender, abruptly incurved at or above the middle; limb spreading; upper lip inside in bud, usually short, notched or 2-fid., lower 3-lobed. *Stamens* didynamous, included; anthers 1-celled, vertical, dorsifixed, bases obtuse, connective sometimes mucronate. *Ovary* 2-celled, style thickened upwards, stigma simple. *Fruit* an oblong or subglobose capsule; valves entire, septiferous, separating from the placentas. *Seeds* many, reticulated.—Species about 34, in the warmer parts of Asia, Africa and Australia.

Calyx 4—5-ribbed, with one rib running to the apex of each calyx-tooth:—

A reddish-brown root-parasite with tuberous rootstock, leaves scale-like, corolla pink

1. *S. orobanchoides*.

A green non-parasitic plant, rootstock not tuberous, leaves linear, corolla white

2. *S. densiflora*.

Calyx 10—15-ribbed:—

Ribs of calyx usually 10, the secondary ones terminating in the sinus, corolla yellow

3. *S. lutea*.

Ribs of calyx 15, the secondary ones continued up the sides of adjacent calyx-teeth and beyond the sinus, corolla white

4. *S. enphrasioides*.

1. *S. orobanchoides*, Benth. in Hook. Comp. Bot. Mag. i, 361, t. 19; F.B.I. iv, 299; Cooke Fl. Bomb. ii, 302. Buchnera orobanchoides, R. Br.; Royle Ill. 291.

A small glabrous or puberulous herb, 6—10 in. high, usually parasitic; rootstock tuberous. *Stems* stout or slender, simple or branched, *Leaves* scale-like, ovate-oblong, acute, reddish-brown as are the stems, passing gradually into floral bracts. *Flowers* sessile, arranged in erect usually dense spikes; bracts shorter than the calyx, ovate-lanceolate, acute; bracteoles narrower, ciliolate. *Calyx* 5- or 4-ribbed, less than $\frac{1}{4}$ in. long; teeth 5 or 4, shorter than the tube, lanceolate, acuminate and tipped with a bristle. *Corolla* usually pink with a white spot at the base of each lobe; tube about $\frac{1}{2}$ in. long, incurved above the middle, hairy in the throat; limb about $\frac{1}{4}$ in. across. *Capsule* about $\frac{1}{4}$ in. long, oblong-ellipsoid.

Dehra Dun (Royle), Ajmere, parasitical on the roots of *Lepidagathis Hamiltoniana* (Duthie). Flowers in Oct. **DISTRIB.:** Rajputana, on Mt. Abu, Sind, Konkan, Deccan, Gujarat to S. India and Ceylon; also in Arabia, Socotra, Cape de Verde Islands, and in Trop. and S. Africa. Trimen says that in Ceylon the plant is sometimes green, and then the flowers are white.

2. *S. densiflora*, Benth. in Hook. Comp. Bot. Mag. i, 363; F. B. I. iv, 299; Prain Beng. Pl. 775; Cooke Fl. Bomb. ii, 303.

An erect scabrid or strigose herb, 6—18 in. high. *Stem* simple or branched, stout or slender, rootstock not tuberous. *Leaves* sessile, erect, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, linear, acute, passing into floral bracts. *Flowers* in slender spikes, bracts longer than the calyx; bracteoles linear, acute, ciliate. *Calyx* $\frac{1}{8}$ in. long, lengthening in fruit, 5-ribbed; teeth lanceolate-subulate, ciliate. *Corolla* white; tube nearly $\frac{1}{4}$ in. long, incurved above the middle, throat hairy within, limb about $\frac{1}{4}$ in. across, upper lip much shorter than lower. *Capsule* $\frac{1}{8}$ in. long, oblong-obovoid, included within the calyx.

Saharanpur (Royle), banks of Ganges near Benares (Madden). Flowers during the rains and the cold season. **DISTRIB.:** N. Bengal and from Gujarat, Konkan and the Deccan southwards.

3. *S. lutea*, Lour. Fl. Cochinch. 22; F. B. I. iv, 299; Collett Fl. Siml. 385; Prain Beng. Pl. 775; Cooke Fl. Bomb. ii, 303. Buchnera asiatica, Linn; Roxb. Fl. Ind. iii, 31.

A slender erect herb, 6—18 in. high, simple or fastigiately branched, scabrid or villous. *Leaves* sessile, $\frac{1}{2}$ — $1\frac{1}{4}$ in. long, linear, rough. *Flowers* in elongated usually interrupted spikes 2—6 in. long; bracts usually longer than the calyx. *Calyx* 10-ribbed, $\frac{1}{3}$ in. long, narrowly tubular in flower, widening in fruit; teeth 5, subequal. *Corolla* about $\frac{1}{4}$ in. long, usually yellow or sometimes white pink or purple; tube slender, cylindric, incurved at the apex; upper lip slightly emarginate, reflexed, much shorter than lower. *Capsule* shorter than the calyx, oblong-ellipsoid, grooved.

Grassy places in Dchra Dun; also in Rohilkhand, Bundelkhand and in the sub-Himalayan tracts of N. Oudh. *DISTRIB.*: W. Himalaya up to 6,000 ft., Bengal, Punjab, Sind, W. and S. India to Ceylon; extending to the Malay Pen., Siam, Java, China, Arabia, Africa and Mascarene Islands.

4. *S. euphrasioides*, Benth. in Hook. Comp. Bot. Mag. i, 364; F. B. I. iv, 299; Prain Beng. Pl. 775; Cooke Fl. Bomb. ii, 303. *Buchnera euphrasioides*, Vahl; Roxb. Fl. Ind. iii, 32. Vern. Aggia (Bundelkhand).

Very variable in habit, sometimes only 4—6 in. high and with a simple filiform stem, or a much-branched stout herb up to 2 ft. high. *Leaves* sessile, 1—2 in. long, often with 1 or 2 teeth on each margin, scabrous. *Flowers* sessile or nearly so, in long often interrupted spikes or racemes. *Calyx* $\frac{1}{4}$ in. long, campanulate; ribs 15, strong and scabrous; segments linear-subulate, acute, usually reflexed in fruit: each segment with one rib passing along the centre to the apex, the secondary ones not ending in the sinus but continuing to the apex of each segment along the edges which thus become strongly margined. *Corolla* white, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, tube exerted, the much-incurved upper portion hairy within. *Capsule* $\frac{1}{4}$ in. long.

Moradabad (T. Thomson), Bundelkhand (Edgeworth Duthie, Mrs. Bell). Parasitic on and said to be destructive to crops of *juar* (*Andropogon Sorghum*). *Flowers* during the cold season. *DISTRIB.*:—Plains of Punjab and Bengal, Himalaya up to 4,000 ft. in Kumaon; also on the Khasia Hills and in Burma, in W. C. and S. India to Ceylon, extending to Java. Very injurious as a parasite to sugar cane in the Central Provinces.

21. CENTRANTHERA, R. Br., Fl. Brit. iv. 300.

Annual rigid scabrid herbs. *Leaves* opposite or the upper alternate, oblong or linear, obtuse, entire or toothed. *Flowers* axillary or in bracteate spikes or racemes, bracteoles 2. *Calyx* compressed, spathaceous, split on one side, entire or shortly 3—5-lobed. *Corolla-tube* long, incurved and dilated above, limb oblique; lobes 5, broad, subequal, spreading, the two upper inside in bud. *Stamens* didynamous, included; anthers meeting in pairs, cells transverse, bases spurred or mucronate, one cell often empty; stigma tongue-shaped, acute. *Fruit* an ovoid or subglobose loculicidal capsule; valves entire, carrying away the placentas. *Seeds* very many, oblong, cuneate; testa lax, reticulate.—

Species 4, in tropical and sub-tropical Asia, the Malay Archipel. and in Australia.

C. hispida, *R. Br. Prod.* 438; *Royle Ill.* 291; *F. B. I. iv*, 301; *Collett Fl. Siml.* 359; *Prain Beng. Pl.* 776; *Cooke Fl. Bomb. ii*, 308. *C. nepalensis*, *Don Prod.* 88. *Digitalis stricta*, *Roxb. Fl. Ind. iii*, 99.

An erect hispid and somewhat hoary herb, 1—2 ft. high. *Stem* stout simple or more or less branched above. *Leaves* sessile or nearly so, $\frac{1}{2}$ — $1\frac{1}{2}$ -in. long, linear or elliptic-oblong, the lower opposite, the upper alternate, passing into floral bracts, hispid on both surfaces with tubercled hairs. *Flowers* rather large for the size of the plant, arranged in terminal bracteate spikes. *Calyx* $\frac{1}{2}$ in. long, ovate, inflated, narrowed towards the mouth. *Corolla* $\frac{3}{4}$ in. long or more, funnel-shaped, purplish or white, lobes rounded. *Filaments* softly hairy. *Capsule* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, broadly ovoid-oblong, grooved, subrugose.

Grassy places in Dehra Dun and in the sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers June—Oct. **DISTRIB.**: Throughout India and in Ceylon, ascending to 4,000 ft. on the W. Himalaya; also in Burma, Java, China, the Philippines and Australia.

22. SOPUBIA, Buch.-Ham.; Fl. Brit. Ind. iv, 302.

Erect herbs. *Leaves* opposite, or the upper alternate, narrow, often lacinate. *Flowers* in spikes or racemes, bracts leafy, bracteoles 2. *Calyx* campanulate; lobes 5, narrow, valvate. *Corolla* funnel-shaped; tube short, dilated at the throat; lobes 5, broad, spreading, subequal, the 2 upper inside in bud. *Stamens* didynamous, anthers of both sets of stamens meeting in pairs, one cell of each perfect and ovoid, the other empty and stipitate. *Ovary* 2-celled; stigma thickened, tongue-shaped, obtuse. *Fruit* an ovoid or oblong loculicidal capsule; valves entire or 2-fid., separating from the placentiferous septum. *Seeds* numerous, testa somewhat lax.—Species about 27, in Africa, Madagascar, India, China, Malaya and Australia.

S. delphinifolia, *G. Don. Gen. Syst. iv*, 560; *F. B. I. iv*, 302; *Watt E. D.*; *Prain Beng. Pl.* 777; *Cooke Fl. Bomb. ii*, 305. *Gerardia delphinifolia*, *Roxb. Fl. Ind. iii*, 99.

A tall erect much-branched herb, 1—3 ft. high. *Stem* 4-sided, grooved, glabrous or scaberulous, often spotted with purple. *Leaves* pinnatisect, 1— $1\frac{1}{2}$ in. long, the uppermost (bracts) simple, segments filiform. *Flowers* subsessile, axillary, solitary or in few-flowered terminal racemes; bracteoles $\frac{1}{2}$ in. long, filiform, pedicels slender. *Calyx* $\frac{3}{4}$ in. long, tube strongly ribbed; teeth linear-subulate, erect. *Corolla* rose-coloured, 1— $1\frac{1}{2}$ in. long, limb $\frac{3}{4}$ in. across; lobes broad, spreading. *Filaments* hairy. *Capsule* as long as the calyx, oblong-ellipsoid.

Grassy places near Agra (Munro), Bundelkhand (Edgeworth). Flowers in the wet and cold seasons. **DISTRIB.**: Behar, Chota Nagpur, Konkan, Deccan and south to Ceylon. The juice of this plant is sometimes used medicinally.

23. LINDENBERGIA, Lehm. ; Fl. Brit. Ind. iv, 261.

Annual or perennial herbs. *Branches* erect straggling, or ascending, rarely woody below. *Leaves* opposite or the upper alternate, toothed. *Flowers* yellow, axillary, passing into terminal spikes or racemes; bracts leaf-like, bracteoles none. *Calyx* campanulate, 5-fid, lobes leaf-like. *Corolla* 2-lipped, tube cylindric; upper lip short, notched or 2-fid, innermost in bud; lower larger, 3-lobed, spreading, throat and lip with a 2-plicate palate. *Stamens* 4, didynamous, included; anther-cells separate, stipitate, all fertile. *Fruit* a 2-grooved loculicidal capsule; valves entire, separating from the placentiferous dissepiment. *Seeds* many, minute.—Species 14, Indian, Malayan and S. African.

Glabrous or nearly so with stout erect stems 2—3 ft. high, calyx longer than the bracts

1. *L. macrostachya*.

Glandular-pubescent herbs with slender stems, calyx shorter than bracts.

Leaves shortly petioled, flowers sessile

2. *L. polyantha*.

Leaves long-petioled, flowers pedicelled

3. *L. urticæfolia*.

1. *L. macrostachya*, Benth. *Scroph. Ind.* 22 ; *F. B. I. iv*, 262 ; *Collett Fl. Siml.* 351.

A glabrous or slightly pubescent herb. *Stems* 2—3 ft. high, erect and usually stout. *Leaves* 1—3 in. long, ovate or oblong-lanceolate, serrate, petioles less than half the length of blade. *Flowers* $\frac{1}{2}$ in. long, unilateral, usually crowded in erect rigid spikes. *Calyx* longer than the bracts; lobes short, acute. *Capsule* about $\frac{1}{4}$ in. long, pubescent.

Siwalik range and Sub-Himalayan tracts eastwards to Gorakhpur; also in Merwara. *Flowers* April and May. *DISTRIB.*: Western Himalaya up to 4,000 ft., Punjab Plain and Shan Hills, extending to Siam, Tonkin and China. Closely allied to *L. philippinensis*, but less hairy and with much shorter petioles.

2. *L. polyantha*, Royle ex Benth. *Scroph. Ind.* 22 ; *F. B. I. iv*, 262 ; *Prain Beng. Pl.* 760 ; *Cooke Fl. Bomb. ii*, 307.

A densely glandular-villous annual. *Stems* erect or ascending, leafy, 12—20 in. long, branching from the base. *Leaves* very shortly petioled, about $\frac{1}{2}$ in. long, ovate or elliptic, acute, margins crenate-serrate. *Flowers* many, unilateral, arranged in axillary and terminal leafy spikes. *Calyx* $\frac{1}{4}$ in. long, gland-villous; lobes oblong, obtuse. *Corolla* yellow, twice as long as the calyx, hairy outside, upper lip pubescent, mid-lobe of lower lip oblong, rounded at the apex. *Ovary* ovoid, pubescent. *Capsule* $\frac{1}{4}$ in. long, hairy at the apex.

Common within the area, on walls and banks. *DISTRIB.*: Throughout India, ascending to 6,000 ft. on the Himalaya; also in Baluchistan.

3. *L. urticæfolia*, Link and Otto *l.c. Pl. Rar. Hort. Berol. t.* 48 ; *F. B. I. iv*, 262 ; *Collett Fl. Siml.* 352 ; *Prain Beng. Pl.* 760 ; *Cooke Fl. Bomb. ii*, 307. *Stemodia ruderalis*, Vahl ; *Roxb. Fl. Ind. iii*, 94.

An annual, more or less glandular-hairy. *Stems* 4—10 in. high, simple or branched, often tufted, brittle when dry. *Leaves* $\frac{3}{4}$ —2 in. long, broadly ovate, crenate-serrate, usually gland-villous on both sides;

petioles $\frac{1}{4}$ — $\frac{3}{8}$ in. long. *Flowers* unilateral, shortly pedicelled, solitary or in pairs in the axils of large leaves, sometimes forming axillary or terminal leafy racemes. *Calyx* $\frac{1}{4}$ in. long, densely gland.-villous; lobes triangular-oblong, obtuse. *Corolla* yellow, 6 in. long, hairy outside, tube tinged with red or purple, throat hairy, mid-lobe of lower lip narrow. *Ovary* pubescent round the apex. *Capsule* $\frac{1}{2}$ in. long, oblong, hairy above.

Walls and banks, abundant within the area. **DISTRIB.:** Throughout India and up to 6,000 ft. on the Himalaya, extending to Afghanistan. Not found in Ceylon.

LXXX.—OROBANCHACEÆ.

Leafless brown, white or reddish root-parasites containing little or no chlorophyll. *Stem* usually simple, stout or slender, scaly. *Flowers* 2-sexual, irregular, solitary or in spikes or racemes. *Calyx* spathaceous or 2-lipped, with 4 or 5 free or connate segments. *Corolla* hypogynous, curved, usually distinctly 2-lipped, or sometimes with 5 subequal lobes; upper lip often arched, lower 3 fid, throat often with 2 villous folds. *Stamens* didynamous, inserted on the corolla-tube; anthers 1- or 2-celled; cells frequently spurred at the base, opening by slits or apical pores, one cell often imperfect. *Disk* usually obscure. *Ovary* of 2 (rarely 3) carpels, 1 or (rarely) 2-celled; ovules usually many, anatropous, on 2 (rarely 3) pairs of free or confluent parietal placentas which sometimes ultimately reach the centre of the ovary. *Fruit* a capsule, usually 1-celled; valves 2, rarely 3. *Seeds* usually many, testa pitted or reticulated, albumen fleshy, embryo often undivided.—Species about 150, in temperate and tropical regions.

Corolla-lobes broad, subequal:—

Calyx spathaceous, anther-cells unequal	1. ÆGINETIA.
Calyx tubular-campanulate, 5-lobed; anther-cells equal	2. CISTANCHE.
Corolla 2-lipped, upper lip 2-lobed, lower 3-lobed	3. OROBANCHE.

1. ÆGINETIA, Linn.; Fl. Brit. Ind. iv, 320.

Leafless herbs with branched or simple naked or scaly scapes or stems. *Flowers* few, large solitary or corymbose, bracteoles none. *Calyx* spathaceous, split in front nearly to the base. *Corolla* broadly tubular, incurved, obscurely 2-lipped; lobes 5, broad, spreading, the 2 upper connate. *Stamens* didynamous, included; anthers meeting in pairs, each with 1 perfect cell adnate to the filament and not spurred at the base, the other cell absent from the upper pair, the absent cell in the lower pair represented by an empty clavate and deflexed spur. *Ovary* 1-celled; placentas large, 2- or more-lobed, filling the cavity; ovules very many, covering the whole placental surface; style slender; stigma large, peltate. *Fruit* a 2-valved capsule. *Seeds* many, minute, pitted.—Species 3 in Tropical and Sub-tropical Asia.

Scape slender, naked, corolla purple, placentas multifid
 Scape short, stout, bracteate; corolla-tube yellow, mouth
 blue, placentas 2 lamellate

1. *Æ. indica*.

2. *Æ. pedunculata*.

1. *Æ. indica*, *Lin. Sp. Pl.* 632; *Roxb. Fl. Ind.* iii, 30; *Royle Ill.* 292; *F. B. I. iv*, 320; *Prain Beng. Pl.* 778; *Cooke Fl. Bomb.* ii, 311.

Whole plant tinged with purple, turning brown when dry. *Rhizome* small, tuberous, emitting many short branching coral-like roots. *Scapes* erect, slender, solitary or several, 6—12 in. high, with usually a few scales at the base. *Flowers* solitary on the top of each naked scape, nodding. *Calyx* $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, closed in bud, pointed, glabrous. *Corolla* purple; tube 1— $1\frac{1}{2}$ in. long, curved, inflated; limb $\frac{3}{4}$ —1 in. across; lobes small, equal, rounded, margins fimbriate. *Anthers* of lower stamens with thick blunt dorsal spurs. *Placentas* multifid. *Capsule* $\frac{3}{4}$ in. long, ovoid, beaked, enclosed in the persistent calyx and corolla. *Seeds* pale-yellow, testa loose and hyaline.

Dehra Dun, in shady ravines. Flowers during the rainy season. **DISTRIB.:** Throughout the greater part of India from the W. Himalaya in Kumaon up to 3,500 ft., also in Nepal, Assam and on the Khasia Hills and southwards to Travancore and Ceylon, extending to Burma, China, Japan and the Philippines.

2. *Æ. pedunculata*, *Wall. Pl. As. Rar.* iii, 13, t. 219; *F. B. I. iv*, 320; *Prain Beng. Pl.* 778. *Orobanche pedunculata*, *Roxb.*; *Fl. Ind.* iii, 29. *O. acaulis*, *Roxb. Fl. Ind.* iii, 29.

Whole plant red or yellow. *Stem* very short, buried in the soil. *Scape* short, stout, very fleshy, many-flowered; bracts $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovate, obtuse. *Calyx* $1\frac{1}{2}$ — $2\frac{1}{2}$ in. fleshy, red turning to yellowish-white, obtuse, acute or shortly beaked, very mucilaginous. *Corolla-tube* equalling the calyx, yellowish; limb violet, lobes crenate or erose. *Stigma* broadly cordiform, peltate. *Capsule* ovoid. *Seeds* brown.

Sub-Himalayan tracts; Moradabad (T. Thomson), parasitic on roots of the *Khas-khas grass* (*Vetiveria zizanioides*). Flowers during the rainy season. **DISTRIB.:** Throughout the greater part of India from near Murree (W. Himalaya) to Sikkim and Assam, and from Bengal (in jhils) to Travancore and Ceylon (on roots of grasses); also in Upper Burma, Malay Peninsula and Islands and Cochin China.

2. **CISTANCHE**, Hoffm. and Link; *Fl. Brit. Ind.* iv, 324.

Scapigerous herbs, scape or stem simple, scaly. *Flowers* sessile, in dense spikes, yellow violet or purple. *Calyx* broadly tubular-campulate; lobes 5, subequal, obtuse. *Corolla-tube* long, curved, dilated above; limb spreading, oblique; lobes 5, broad subequal. *Stamens* 4, subexserted; anthers subtransverse, often villous; the cells equal, parallel, bases obtuse. *Ovary* 1-celled; placentas 4, equidistant or in pairs, stigma broad. *Capsule* ovoid, laterally compressed, 2-valve to the base. *Seeds* numerous, subglobose, reticulately punctate.—Species 12, Mediterranean region and N. Africa extending to W. and C. Asia.

C. tubulosa, *Wight Ic. t. 1420 bis*; *F. B. I. iv, 324*; *Cooke Fl. Bomb. ii, 313*. *Orobanche calotropidis*, *Edgew. in Hook, Journ. Bot. ii, 285*. *Vern. Bhumphor* (Rajputana).

Whole plant yellowish or sometimes tinged with purple. *Stem* $\frac{1}{2}$ —2 ft. high and as much as 2 in. in diam., not branched, densely covered with acute triangular scales $\frac{1}{2}$ —1 in. long, glabrous or pubescent. *Flowers* many, arranged in dense spikes 6—10 in. long and sometimes 3 in. in diam.; bracts lanceolate, acuminate, longer than the calyx, margins membranous; bracteoles narrower, shorter than the calyx. *Calyx* $\frac{1}{2}$ — $\frac{3}{4}$ in. long; lobes rounded, about $\frac{1}{3}$ as long as the tube; margins membranous, veined. *Corolla* yellow; tube erect, inflated above, 2 or 3 times as long as the calyx, hairy inside at the base; upper half campanulate, bent outwards from the middle; lobes rounded, reflexed. *Filaments* hairy at the base, anthers not or scarcely apiculate. *Style* exerted, curved below the stigma. *Capsule* 1 in. long, beaked.

Ajmer (Duthie). Flowers during the cold season. **DISTRIB.**: Plains of Punjab and Sind, extending to C. Asia and Arabia.

3. OROBANCHE, Linn.; Fl. Brit. Ind. iv, 324.

Scapigerous herbs, scapes or stems simple or branched, stout or slender, scales acute. *Flowers* in dense or lax or interrupted spikes or racemes, bracts scale-like, bracteoles 2 or none. *Calyx* unequally 4-fid, or 2-partite from back to front; segments entire or 2-fid, with rarely a fifth lobe or segment. *Corolla* 2-lipped; tube curved, dilated above, circumscissile at the base; upper lip erect, crenulate notched or 2-fid; lower somewhat spreading, 3-lobed. *Stamens* included; anther-cells equal, parallel, usually mucronate at the base. *Disk* none or glandular. *Ovary* 1-celled; placentas 4, equidistant or in pairs; stigma funnel-shaped or peltate, or more or less 2-lobed. *Fruit* a 2-valved capsule, the valves often cohering with the style. *Seeds* very many, globose or ovoid.—Species about 90, in northern or sub-tropical regions of the Old World.

Flowers without bracteoles, arranged in dense spikes 1. *O. cernua*.
Flowers with 2 bracteoles, arranged in rather lax spikes 2. *O. zgyptiaca*.

1. **O. cernua**, *Læffl. It. Hisp. 152*; *F. B. I. iv, 325*; *Prair Beng. Pl. 778*. *O. indica*, *Wall. Cat. 9636* (not of *Buch.-Ham.*)

Stems 1 or more, stout or slender, 6—12 in. high, pale-brown or bluish; scales ovate, upper acute or acuminate. *Spikes* dense, about half as long as the stem or longer. *Flowers* blue; bracts lanceolate, shorter than the corolla, cleft to the middle; segments lanceolate, cuspidate; bracteoles none. *Corolla* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, curved outwards, glabrous or sometimes puberulous above; lobes crenate, not ciliate, the 2 upper broad; the 3 lower ovate, acuminate. *Filaments* glabrous; anther-cells acuminate, glabrous or slightly hairy. *Style* glabrous; stigmatic-lobes short, thick.

Oudh (Wallich). **DISTRIB.**: W. Himalaya from Nepal to Kashmir. Baltistan and Gilgit up to 12,000 ft.; also in Bengal, C. India and C.

Provinces to S. India, extending to N. Africa and Spain, occurring also in extra-tropical Australia.

2. *O. ægyptiaca*, *Pers. Syn. ii, 181; Royle Ill. 181; Cooke Fl. Bomb. ii, 314; O. indica, Buch.-Ham. in Roxb. Fl. Ind. iii, 27; F. B. I. iv, 326; Watt E. D.; Prain Beng. Pl. 779.*

Stems 4—20 in. high, usually branching from the base. *Scales* few, lanceolate, often slightly hairy. *Flowers* many, sessile or the lowest shortly stalked and forming a rather lax spike; bracts half as long as the corolla-tube, ovate or lanceolate; bracteoles filiform, shorter than the calyx. *Calyx* $\frac{3}{8}$ in. long, 4-toothed, campanulate, pubescent, sub-membranous; teeth about equalling the tube, lanceolate from a broad base, strongly nerved down the middle. *Corolla* $\frac{3}{4}$ — $1\frac{1}{4}$ in. long, hairy outside, upper portion blue or lilac, whitish below; upper lip 2-lobed, lower equally 3-lobed; tube slightly curved above, constricted above the insertion of the stamens. *Filaments* hairy at the base, anthers woolly. *Capsule* oblong, acuminate, glabrous.

Abundant within the area, parasitic on various cultivated plants, often in mustard fields. **DISTRIB.:** More or less throughout the plains of India, extending to Central and W. Asia. Cattle appear to be fond of this plant, and their milk is said to be improved thereby.

LXXXI.—LENTIBULARIACEÆ.

Herbs aquatic or in wet places, often insectivorous. *Leaves* rosulate, capillary-multifid or obsolete when submerged. *Flowers* purple blue or white, irregular, hermaphrodite, arranged on 1—many-flowered simple or branched scapes or peduncles; bracts small or none, bracteoles 2 or none. *Calyx* inferior, 2—5-lobed. *Corolla* 2 lipped, spurred; upper lip usually the smaller, entire or emarginate, lower 3—5-lobed. *Stamens* 2, attached to the base of corolla, alternate with lobe of lower lip; filaments curved, anthers 2-celled; cells diverging, transversely confluent. *Ovary* superior, 1-celled; style short, stigma unequally 2 lobed; ovules usually many, anatropous, attached to a free basal placenta. *Fruit* a globose few- or many-seeded capsule, opening by 2—4 valves or circumscissile or bursting irregularly. *Seeds* minute, without albumen.—Species about 200, found in all parts of the world, except in arid regions.

UTRICULARIA, Linn.; Fl. Brit. Ind. iv, 328.

Herbs floating and rootless, or on wet ground and rocks, often furnished with minute bladder-like insect-traps. *Leaves* rosulate, or when submerged many-partite with capillary segments. *Flowers* on simple or branched scapes; racemes few or many-flowered, pedicels bracteate and often 2-bracteolate. *Calyx* 2-partite; lobes entire or nearly so, often enlarged in fruit. *Corolla* 2-lipped; upper lip entire or emar-

ginate; lower larger, 3—6-lobed; tube with a straight or curved spur. For characters of *stamens*, *ovary*, *fruit* and *seeds* see the family.—Species over 100, in the tropical and temperate regions of both hemispheres.

Inflorescence held up above water by a whorl of floats on the peduncle

1. *U. stellaris*.

Inflorescence without floats on the peduncle:—

Peduncles stout; pedicels reflexed in fruit, bearing usually more than 3 flowers; seeds not or scarcely winged

2. *U. flexuosa*.

Peduncles slender, pedicels erect in fruit, bearing 1—3 flowers; seeds distinctly winged

3. *U. exoleta*.

1. *U. stellaris*, *Linn. f. Suppl.* 86; *Roxb. Fl. Ind.* i, 143; *F. B. I.* iv, 328; *Prair Beng. Pl.* 780; *Cooke Fl. Bomb.* ii, 316.

An aquatic herb. Stolons and leaves floating under the surface of the water. *Stolons* long and usually rather slender, sparingly branched. *Leaves* $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, often in whorls of four, pinnately divided into capillary segments, each primary segment furnished near the base with a small roundish bladder, the mouth of which is truncate. *Racemes* erect, slender, few--12-flowered, rising above the surface of the water; peduncles 1—8 in. long, each suspended by a whorl of spongy floats attached about $\frac{1}{2}$ in. below the lowest flower, each float tipped with a tuft of filiform pinnae; bracts small, ovate, obtuse, bracteoles none; pedicels $\frac{1}{10}$ — $\frac{1}{8}$ in. long, thickened, usually deflexed in fruit. *Calyx* $\frac{1}{10}$ — $\frac{1}{8}$ in. long; segments nearly equal, suborbicular, enlarged in fruit. *Corolla* yellow $\frac{1}{4}$ in. in across; upper lip rounded, lower subquadrate; spur a little shorter than the lower lip, stout, blunt, somewhat curved. *Capsule* globose, $\frac{1}{8}$ in. in diam. *Seeds* minute, discoid; angled; margin slightly winged, inflexed, entire.

Common in ponds and ditches and especially in the Sub-Himalayan tracts. Flowers during the rainy season. **DISTRIB.:** Throughout the greater part of India and in Ceylon, extending to Malaya, Tropical and S. Africa, Madagascar and N. Australia.

2. *U. flexuosa*, *Vahl Enum.* i, 198; *F. B. I.* iv, 329; *Prair Beng. Pl.* 780; *Cooke Fl. Bomb.* ii, 316. *U. fasciculata*, *Roxb. Fl. Ind.* i, 143. *U. confervifolia*, *Don Prod.* 84.

An aquatic herb, submerged all but the inflorescence. *Stolons* stout, much branched and often very long. *Leaves* $1\frac{1}{2}$ —3 in. long, usually in whorls of 4; segments filiform, pectinate, each pinna usually bearing at its base a small subglobose bladder which becomes black by age. *Racemes* erect, 3—8-flowered; peduncles up to 9 in. long, rather stout, naked or with a few small scales, but with no whorl of floats, the whorl of leaves however at the base of the peduncles has often its rhachis more or less inflated and thus acts as a float; bracts small, ovate; pedicels $\frac{1}{4}$ — $\frac{3}{4}$ in. long, deflexed in fruit. *Calyx* $\frac{1}{8}$ — $\frac{1}{4}$ in. long; lobes subequal, ovate, obtuse or subacute, somewhat enlarged in fruit. *Corolla* yellow, $\frac{1}{4}$ — $\frac{1}{2}$ in. across; spur nearly as long as the lower lip, conical, acute. *Capsule* subglobose, $\frac{1}{8}$ in. long. *Seeds* as in *U. stellaris* but rather larger.

Abundant within the area in watery places, flowering in the hot season.

DISTRIB.: Throughout the greater part of India and in Ceylon, extending to Malaya, Tropical Africa and N. Australia.

3. U. exoleta, *R. Br. Prod.* 430; *F. B. I. iv*, 329; *Prair. Beng. Pl.* 781; *Cooke Fl. Bomb. ii*, 316. *U. biflora*, *Roxb. Fl. Ind. i*, 143 (not of *Wall.*) *U. pterosperma*, *Edgew. in Proc. Linn. Soc. i*, 352.

A small aquatic herb, usually floating, but sometimes rooting when stranded on mud. *Stolons* very slender, varying in length; branches slender, flattened. *Leaves* variable, rarely more than $\frac{1}{4}$ in. long, not much dissected, the segments all capillary, but one or more represented by bladders, or the whole leaf transformed into a bladder, bladders obliquely ovoid, the mouth truncate, ciliate. *Racemes* 1-3 flowered; peduncles slender, $1\frac{1}{4}$ -3 in. long, with a minute bract-like scale below the middle; pedicels slender, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, erect in fruit; bracteoles very small, broadly ovate, truncate or rounded. *Calyx* $\frac{1}{16}$ in. long; segments subequal, broadly elliptic, obtuse. *Corolla* yellow with darker streaks, $\frac{1}{8}$ - $\frac{1}{4}$ in. long; spur conical, obtuse, equalling or slightly longer than the lower lip. *Capsule* globose, $\frac{1}{8}$ - $\frac{1}{6}$ in. in diam. *Seeds* orbicular, flat, with a broad more or less crenulate wing.

Saharanpur district (Royle), and probably in many other localities within the area, especially in the Sub-Himalayan tracts, but not common.

DISTRIB.: Throughout India from the N.-W. Himalaya and Assam to Ceylon, extending to S. E. Asia, Malay Pen. and Islands and N. Australia.

U. STRIATULA, *Smith* (syn. *U. orbiculata*, *Wall.*; *F. B. I. iv*, 434) very probably occurs within the area of this flora, and should be looked for in Dehra Dun in damp shady spots. It is abundant on the Himalaya up to 8,000 ft., also in Assam and on the hills of Peninsular India; extending to Ceylon, Malaya, & China and Trop. Africa. It is a very small terrestrial species with violet-coloured flowers, and is found usually on wet rocks. It may at once be distinguished by its orbicular or reniform persistent leaves, its very unequal calyx-segments and the glochidiate seeds.

LXXXII.—GESNERIACEÆ.

Herbs or undershrubs, often epiphytic. *Leaves* opposite, alternate or solitary, undivided, entire or toothed; stipules none. *Flowers* hermaphrodite, nearly always irregular, peduncles axillary, bracteate; bracteoles usually small. *Calyx-lobes* 5, valvate or open in bud, rarely imbricate. *Corolla-tube* long or short; lobes usually 5 and imbricate in bud. *Stamens* attached to the corolla-tube, usually didynamous, sometimes 5, all or only 2 fertile, anthers 2- or 1-celled. *Disk* annular or shortly cylindrical or none, sometimes unilateral. *Ovary* 1- or imperfectly 2-celled, style linear, stigma capitate or 2 lobed; ovules

many, anatropous, on bifid parietal sometimes subconfluent placentas. *Fruit* a 2-valved capsule or a berry. *Seeds* many, minute, fusiform or ovoid, smooth, sometimes tipped with a long hair, albumen scanty or none, embryo straight.—Species about 700, mostly in S. E. Asia, Polynesia and in Trop. America. The Indian representatives of this family all belong to the suborder *Cyrtandreae*, recognized by having the ovary free and superior. The *Eugesnereæ*, which are confined to the New World, are characterized by a more or less inferior ovary.

Capsule linear, exceeding the calyx .

1. DIDYMOCARPUS.

Capsule ellipsoid, included in the calyx

2. RHYNCHOCLOSSUM.

1. DIDYMOCARPUS, Wall.; Fl. Brit. Ind. iv, 345.

Stemless or erect herbs. *Leaves* opposite, alternate or crowded, rarely solitary. *Peduncles* axillary, bearing few or many flowers; pedicels cymose, subumbellate or subracemose in pairs; bracts usually inconspicuous. *Calyx* small, 5-fid or partite, lobes narrow. *Corolla* with a cylindric or ovoid tube, limb oblique or subsymmetric; lobes 5, rounded. *Stamens* included, the 2 anterior perfect with 2—3 staminodes, rarely 4 perfect; anthers cohering in pairs; cells 2, ovate, on confluent. *Disk* cylindric or none. *Ovary* narrow, 1-celled, sessile or stipitate; stigma peltate, emarginate or unilateral; placentas deeply inflexed, at length recurved; ovules many, crowded along the margins. *Fruit* a loculicidally 2-valved or subfollicular capsule; valves not twisted before opening, their edges revolute and concealing the seeds. *Seeds* ellipsoid, small, smooth, minutely reticulate.—Species about 90, in India, Malaya, China, Trop. Africa, Madagascar and Australia.

Stems distinct, leaf solitary.—Plant minute

1. *D. pygmæa*.

Stems none or very short; leaves more than one, usually all radical

2. *D. pedicellata*.

1. *D. pygmæa*, C. B. Clarke in F. B. I. iv, 345; Prain Beng. Pl. 783.

A small delicate pubescent herb. *Stems* filiform, $\frac{1}{3}$ —2 in. long. *Leaf* solitary, sessile or nearly so, membranous, 1—2 in. long, obliquely ovate or lanceolate, obtuse at both ends; margins sinuate, scarcely crenate. *Pedicels* few, about $\frac{1}{4}$ in. long, fascicled in the leaf-axil, bracts minute or none. *Calyx* $\frac{1}{10}$ — $\frac{1}{8}$ in. long, densely pilose with white hairs; lobes linear, slightly enlarged in fruit. *Corolla* $\frac{1}{4}$ -in. long, tubular, shortly 5-lobed. *Stamens* 2, fertile; staminodes 2, linear, $\frac{2}{3}$ the length of the fertile filaments. *Ovary* and style villous. *Capsule* $\frac{1}{2}$ — $\frac{2}{3}$ in. long.

Found originally by Vicary close to a waterfall near Mhowganj in the Rewah district of C. India, and just within the south-east border of the area of this flora. **DISTRIB.:** Chota Nagpur (C. B. Clarke). Nimar district of C. Prov. (Duthie). This interesting little plant has probably been often overlooked in other localities and should be searched for on wet rocks in the vicinity of waterfalls, especially in the districts of Mirzapur and Bundelkhand. In its size and general habit this plant may be compared with *Platystemma violoides* which it greatly

resembles in its filiform stems, each of which bears a solitary leaf. The latter plant inhabits the W. Himalaya at elevations between 6 and 9,000 ft., and flourishes within the spray of dripping rocks.

2. D. pedicellata, *R. Br. in Benn. Fl. Jav. Rar. 118; F. B. I. iv, 345.*
D. macrophylla, Wall. Cat. 784 (in part); Royle Ill. 294, t. 70, f. 1.

Stems none or very short, innovations scabrous-puberulous. *Leaves* usually all radical, 3—6 in. diam., roundly ovate, crenate-serrate, glandular-punctate. *Pedicels* longer than the calyx; bracts about $\frac{1}{4}$ in. often shortly connate. *Calyx* funnel-shaped, about $\frac{1}{2}$ in. long; lobes shallow, rounded. *Corolla* purple, nearly 1 in. long. *Capsule* 1—1 $\frac{1}{4}$ in. long; its stalk slender, longer than the persistent calyx.

Dehra Dun, in damp shady ravines. Flowers in Aug. **DISTRIB.:** Sub-tropical W. Himalaya from Chamba to Kumaon, up to 5,500 ft.

2. RHYNCHOGLOSSUM, Blume; Fl. Brit. Ind. iv, 367.

Herbs, glabrous or minutely pubescent. *Leaves* alternate, elliptic, acuminate, unequal-sided, cordate on one side of the unequal base, subentire or sinuate. *Racemes* long, many-flowered; bracts none, bracteoles minute. *Calyx* campanulate, 5-lobed. *Corolla-tube* cylindrical, contracted at the mouth; limb 2-lipped; upper lip short, bifid; lower longer, 3-lobed. *Stamens* 2, perfect, included; anther connivent, 2-celled; cells ellipsoid, subparallel, slits ultimately confluent at the apex. *Ovary* 1-celled, ovoid, style linear, stigma minutely 2-lobed; placentas much intruded, divided into 2 thick lamellæ bearing many ovules on all sides. *Fruit* an ellipsoid membranous loculicidally 2-valved smooth capsule, included within the calyx. *Seeds* narrowly ellipsoid, smooth, testa minutely reticulate.—Species 2, extending from India to the Philippines.

R. obliquum, *Blume Bijdr. 741, Var. parviflora, C. B. Clarke in D. C. Monogr. v, 162; F. B. I. iv, 367; Prain Beng. Pl. 784; Cooke Fl. Bomb. ii, 324.*

A succulent herb up to 20 in. high, glabrous or nearly so. *Leaves* 2—6 in. long, elliptic-oblong, acuminate, unequal at the base, semicordate at the base on one side, acute on the other; lateral nerves many, parallel, curved, prominent beneath, petioles $\frac{1}{2}$ —2 in. long. *Racemes* about 4 $\frac{1}{2}$ in. long. Flowers solitary or in pairs; bracteoles about $\frac{1}{8}$ in. long, narrow, subulate; pedicels filiform, nodding. *Calyx* $\frac{3}{8}$ in. long, divided about $\frac{1}{2}$ -way down; lobes triangular, acute. *Corolla* blue, tube about as long as the calyx; upper lip about $\frac{1}{8}$ in. long, with 2 triangular acute lobes, lower lip nearly twice as long as the upper and with 3 shallow obtuse lobes. *Capsule* $\frac{1}{8}$ in. long.

Dehra Dun, flowering during the rainy season. **DISTRIB.:** Himalaya from Kumaon to Bhutan up to 5,000 ft., Chota Nagpur and C. India to W. and S. India, also in Ceylon. The type occurs in Tenasserim the Malay Islands and in China.

LXXXIII.—BIGNONIACEÆ.

Trees, shrubs (rarely climbing) or herbs. *Leaves* opposite, rarely alternate, unequally 1—3-pinnate, or sometimes undivided. *Flowers* hermaphrodite, irregular, usually showy, arranged in terminal racemes or panicles, rarely on short lateral branches; bracts and bracteoles inconspicuous. *Calyx* spathaceous or funnel-shaped; lobes 2—5 or more, valvate. *Corolla* 2-lipped, tubular-ventricose; lobes 5, subequal, imbricate in bud. *Stamens* didynamous, rudiment of 5th stamen often present and inserted where the corolla-tube is suddenly swollen, rarely with five perfect stamens; filaments glabrous or hairy at the base; anthers 2-celled, included or rarely shortly exerted; cells elliptic or oblong, parallel or diverging, dehiscing by longitudinal slits. *Disk* usually thick or annular. *Ovary* subsessile, 2-celled; style long, glabrous, stigma of 2 elliptic lobes; ovules usually in many rows, anatropous. *Fruit* a loculicidally or septicidally 2-valved capsule, usually elongated; septum enlarging in fruit, deciduous with the placentas. *Seeds* compressed, discoid, rarely subtrigonous, usually prominently winged, exalbuminous.—Species about 550, mostly tropical and chiefly in S. America; a few are extratropical, including two Himalayan herbaceous species of *Amphicome*.

Perfect stamens 5
 Perfect stamens 4:—
 Leaves simple
 Leaves pinnate:—
 Calyx spathaceous
 Calyx campanulate

1. OROXYLUM.
 2. TECOMELLA.
 3. DOLICHANDRONE.
 4. STEREOSPERMUM.

1. OROXYLUM, Vert.; Fl. Brit. Ind. iv, 377.

A glabrous tree. *Leaves* opposite, large, 2—3-pinnate; leaflets ovate, entire. *Flowers* in long terminal racemes. *Calyx* large, campanulate, coriaceous, truncate or obscurely toothed, persistent. *Corolla* large, campanulate, white or purplish; lobes 5, subequal, round, crisped and toothed. *Stamens* 5, perfect, exerted, four of them equal, the fifth shorter; filaments straight; anthers glabrous, 2-celled; cells oblong, parallel. *Disk* wide. *Fruit* a large linear 2-valved capsule, compressed parallel to the septum, opening septifragally. *Seeds* many, thinly discoid; wing broad, hyaline.—A single species, found in India, Ceylon, Burma, Malaya, China and Cochin-China.

O. indicum. Vent. Dec. Gen. Nov. 8; F. B. I. iv, 378; Watt E. D.; Kanjilal For. Fl. 254; Gamble Man. Ind. Timb. 510; Collett Fl. Siml. 368, Prain Beng. Pl. 787; Cooke Fl. Bomb. ii, 327; Brandis Ind. Trees 496. *Bignonia indica*, Linn.; Roxb. Fl. Ind. iii, 110; Royle Ill. 295. *Calosantes indica*, Blume; Brandis For. Fl. 347. Vern. Ullu, arlu, pharkath, pharri, sanna (Oudh).

A small deciduous soft-wooded tree, up to 40 ft. high, branching near the top; bark light-brown, usually covered with corky lenticels. *Leaves* very large, sometimes attaining 5 ft. in length; rachis stout, cylindrical; leaflets 2—4 pairs, 2½—5 in. long, ovate or elliptic, acuminate,

entire, glabrous, base rounded or cordate, petiolules $\frac{1}{4}$ — $\frac{3}{8}$ in. long. *Flowers* many, in large erect racemes 1—2 ft. long or more, fœtid, pedicels $\frac{1}{2}$ — $1\frac{1}{4}$ in. long. *Calyx* about 1 in. long, oblong-campanulate, obscurely toothed, coriaceous, glabrous. *Corolla* 2—3 in. long, fleshy, tube green, limb lurid-purple, margins crisped. *Filaments* woolly at the base. *Capsule* 1—3 ft. by 2— $3\frac{1}{4}$ in. wide, flat and straight. *Seeds* many, 2—3 in. long, margins broadly winged except at the base.

Sub-Himalayan tracts from the Jumna eastwards, usually in more or less moist places. *Flowers* during June and July, and the fruit ripens in the cold season. *DISTRIB.*: Throughout India except in the western drier area, Himalaya ascending to 4,000 ft. in Kumaon; also in Ceylon and Burma, extending to the Malay Penins. and Archipel., and Cochinchina. The bark and fruit are used as a mordant in dyeing and tanning, and the root-bark is much valued as a native medicine, the extremely light seeds are made use of for lining hats.

2. TECOMELLA, Seem.; Fl. Brit. Ind. iv, 378.

A shrub or small tree with glaucescent foliage; innovations stellately grey-tomentose, otherwise quite glabrous. *Leaves* usually opposite, simple, oblong, obtuse, entire. *Flowers* in terminal racemes. *Calyx* tubular-campanulate, subequally 5-toothed. *Corolla* tubular-ventricose, mouth wide; lobes subequal, rounded, imbricate. *Stamens* exserted; anther-cells divergent, pendulous. *Disk* cupular. *Ovary* oblong, ovules many in each cell. *Capsule* linear-oblong, somewhat compressed, opening loculicidally. *Seeds* discoid, winged, the wing very narrow at its apex, absent at the base.—A single species found in India, Baluchistan and Arabia.

T. undulata, Seem. in *Ann. & Mag. Nat. Hist. Ser. 3, Vol. X, 30*; *Cooke Fl. Bomb. ii, 328*. *Tecoma undulata*, G. Don; *F. B. I. iv, 378*; *Watt E. D.*; *Brandis For. Fl. 352*; *Ind. Trees 492*; *Gamble Man. Ind. Timb. 511*. *Bignonia undulata*, Smith; *Roxb. Fl. Ind. iii, 101*; *Royle Ill. 295*. *B. glauca*, Dcne, in *Jacquem. Voy. Bot. 137, t. 142*. Vern. *Rohra*, *rohera* (Merwára).

Branches drooping. *Leaves* 2—5 in. long, narrowly oblong, margins undulate, petiole 1 in. long. *Flowers* inodorous, in corymbose racemes terminating short lateral branches, pedicels $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Calyx* nearly $\frac{1}{2}$ in. long; lobes hardly $\frac{1}{8}$ in. long, broadly ovate, obtuse, mucronate. *Corolla* $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, orange-yellow, veined. *Filaments* glabrous. *Stigma* of 2 spatulate-oblong plates. *Capsule* about 8 in. long, slightly curved, glabrous, valves thin. *Seeds* (including wing) 1 in. by $\frac{3}{8}$ in.

Jumna and Chambal ravines near Etawah, also in Merwára. *Flowers* Jan.—April. *DISTRIB.*: Punjab, on the Siwalik range west of Jumna, Rajputana, Sind and Gujarat, extending to Baluchistan and Arabia. Very ornamental when in flower. Wood grey or yellowish-brown mottled with lighter streaks, strong and durable. The leaves afford good fodder and the bark is used medicinally.

3. DOLICHANDRONE, Seem.; Fl. Brit. Ind. iv, 378.

Trees, glabrous or tomentose. *Leaves* opposite, 1-pinnat. *Flowers* in terminal racemes or panicles. *Calyx* spathaceous, cleft to the base on one side. *Corolla* tubular, tube long or short; lobes 5, subequal, round, crisped, crenate or incised. *Anther-cells* oblong, parallel. *Disk* annular, cushion-like. *Ovary* sessile; ovules usually many-seriate. *Fruit* a long subterete or compressed capsule, loculicidally 2-valved, imperfectly 4-celled. *Seeds* thinly discoid, with a broad wing on each side.—Species about 20, in India and Ceylon, extending to Malaya, China, Trop. Africa and Australia.

D. falcata, Seem. in Journ. Bot. viii, 381; F. B. I. iv, 380; Watt E. D.; Gamble Man. Ind. Timb. 512; Cooke Fl. Bomb. ii, 329; Brand. Ind. Trees 493. *D. Lawii*, Seem.; F. B. I. iv, 380. *Spathodea falcata*, Wall.; Brandis For. Fl. 350. *Bignonia spathacea*, Roxb. Fl. Ind. iii, 103.

A deciduous tree up to 50 ft. high; innovations grey-pubescent or shortly villous. *Leaves* simply pinnate, 3–6 in. long; leaflets 5–7, pubescent or glabrous, $\frac{1}{2}$ – $1\frac{1}{2}$ in. long, obovate or suborbicular, rarely with a small obtuse point, more or less unequal at the base, the terminal usually larger; main lateral nerves about 4 pairs, prominent beneath, petiolules short or none. *Racemes* terminal, few-fid, pedicels $\frac{1}{2}$ in. long. *Calyx* $\frac{1}{2}$ – $\frac{3}{4}$ in. long, softly grey-pubescent. *Corolla* white, about 1 in. long; tube 1– $1\frac{1}{2}$ in. long, slender, tapering downwards; lobes obovate-oblong, their margins undulate and crisped. *Capsule* 10–18 in. long and about $\frac{3}{4}$ in. wide falcately curved, compressed, glabrous. *Seeds* about 1 in. long by $\frac{1}{4}$ in. wide, rectangular, winged at both ends.

Bundelkhand, on hills above Doni (Duthie) dry hills in C. India (Edgeworth). Flowers in May and June. **DISTRIB.**: Rajputana, W. and S. India. The hard whitish wood is used for building and agricultural purposes. A decoction of the fruit is said to be used in native medicine.

4. STEREOSPERMUM, Cham.; Fl. Brit. Ind. iv, 382.

Trees. *Leaves* large, 1- or 2-pinnate. *Flowers* in large lax terminal panicles. *Calyx* ovoid, closed or open in bud, truncate or shortly and unequally 2–5-lobed or 5-toothed in flower. *Corolla* tubular-campulate; limb spreading, 5-lobed and somewhat 2-lipped; lobes subequal, round, often crisped toothed or lacinate. *Stamens* 4, with a rudimentary 5th; anther-cells linear, diverging. *Disk* cushion-like, fleshy. *Fruit* an elongate terete subcompressed or obscurely 4-angled capsule, loculicidally 2-valved and often spirally twisted, septum at length thick and corky. *Seeds* many, in one or two series, trigonous, with a transverse groove outside and a prominent ridge within which fits into a deep groove of the septum; wings membranous, lying flat on the septum.—Species 12, in Tropical Asia and Africa.

Panicle-branches slender, glabrous; capsule sub-quadrangular, smooth

Panicle-branches short, viscidly hairy; capsule cylindrical, rough

1. *S. chelonoides*.

2. *S. suaveolens*.

1. *S. chelonoides*, DC. *Prod.* ix, 210; *Brandis For. Fl.* 352; *Ind. Trees* 495; *F. B. I.* iv, 382; *Watt E. D.*; *Gamble Man. Ind. Timb.* 514; *Prain Beng. Pl.* 790; *Cooke Fl. Bomb.* ii, 331. *Bignonia chelonoides*, Linn. f.; *Roxb. Fl. Ind.* iii, 106. Vern. *Pader, parral*.

A deciduous tree, 30—60 ft. high, glabrous except the flowers; bark thick, brown, corky outside, branches spreading. *Leaves* simply pinnate, 12—18 in. long; leaflets 3—5 pairs and an odd one, 4—5 in. long by 1—2 in. wide, elliptic, caudate-acuminate, glabrous; base acute or rounded, often unequal-sided, petiolules $\frac{1}{2}$ in. or less. *Flowers* fragrant, in lax drooping panicles with slender articulate glabrous branches. *Calyx* campanulate, $\frac{1}{4}$ in. long, glabrous, usually purple, shortly 3—5-lobed. *Corolla* $\frac{3}{4}$ in. long, yellow, veined and tinged with purple, more or less pubescent outside, bearded within on the lower side; lobes of limb rounded and crisped. *Filaments* villous at the base. *Capsule* 1—2 ft. long by $\frac{1}{2}$ in. wide, subquadrangular and pointed, spirally twisted, often dotted with white specks. *Seeds* 1—1 $\frac{1}{4}$ in. long, splitting easily along the transverse furrow.

Forests of N. Oudh. Flowers April to June, after the leaves have appeared. **DISTRIB.:** Eastwards to Sikkim, Chittagong and Chota Nagpur; also in the moist forests of Bombay, S. India and Ceylon, extending to Burma. The hard grey wood is used for building and for making furniture. The roots, leaves and flowers are employed in native medicine.

2. *S. suaveolens*, DC. *Prod.* ix, 211; *Brandis For. Fl.* 351; *Ind. Trees* 495; *F. B. I.* iv, 382; *Watt E. D.*; *Kanjilal For. Fl. Sch. Circ.* 255; *Gamble Man. Ind. Timb.* 515; *Prain Beng. Pl.* 790; *Cooke Fl. Bomb.* ii, 331. *Bignonia suaveolens*, *Roxb. Fl. Ind.* iii, 104; *Royle Ill.* 295. Vern. *Pádal*.

A deciduous tree up to 60 ft. high, young parts viscous-hairy. *Bark* grey exfoliating in large thick flat scales. *Leaves* 1—2 ft. long, simply pinnate; leaflets 3—4 pairs with an odd one, shortly stalked, 3—6 in. long, broadly elliptic, acute or acuminate, entire or serrulate, rough above, hairy beneath, rounded and unequal at the base, main lateral nerves 6—8 pairs, petiolules about $\frac{1}{10}$ in. long. *Flowers* very fragrant, arranged in large lax 3-chotomously branched viscidly hairy panicles. *Calyx* $\frac{1}{4}$ in. long, shortly 3—5-lobed. *Corolla* dull-purple, funnel-shaped, 1—1 $\frac{1}{2}$ in. long, puberulous outside, bearded within at the throat; limb oblique, 2-lipped; lobes rounded, crenate and crisped, the 3 lower longer than the 2 upper. *Filaments* not villous at the base. *Capsule* 1—2 ft. long by $\frac{3}{4}$ in. wide, straight, cylindrical, somewhat ribbed, grey or purplish, rough with white raised specks. *Seeds* 1 $\frac{1}{4}$ in. long, with a long membranous wing at each end.

Common within the *sál* areas of the Dchra Dun and Saharanpur forests and in the Sub-Himalayan tracts eastwards. Flowers during May and June, and the fruit ripens in the cold season. **DISTRIB.:** Punjab Plain, becoming scarce west of the Jhelum; outer Himalayan ranges from Kashmir to Sikkim, up to 4,000 ft.; found also in the drier parts of Bengal, and in Central, W. and S. India, extending to Burma. The

wood is valued for planks and beams; it polishes well, and is much used as fuel and for making charcoal. The bark and flowers are said to be employed medicinally. Regarding the sylvicultural value of this tree see Gamble l.c.

This family is remarkable for the large number of handsome-flowered trees and shrubs which it contains. The following, belonging to genera not indigenous in India are some of the more important species cultivated within the area of the upper Gangetic Plain:—

MILLINGTONIA HORTENSIS, Linn. f.; Brandis For. Fl. 347; Ind. Tree 496; F. B. I. iv, 377; Watt E. D.; Kanjilal For. Fl. 256; Gamble Man. Ind. Timb. 509; Prain Beng. Pl. 788; Cooke Fl. Bomb. ii, 334. *Bignonia suberosa*, Roxb.; Fl. Ind. iii, 111.—Vern. *Akás-nim*, *chambeli* (Indian Cork tree).—A tall erect fast-growing tree with corky bark and soft yellowish wood. Leaves bi- or tri-pinnate, 2—3 ft. long. Flowers white, very fragrant, arranged in large panicles which are terminal on the pendent branches. This tree, supposed to be indigenous in Burma and the Malay Archipelago, is cultivated in gardens and as a roadside tree within the area of this flora and in many other parts of India. As an avenue-tree it cannot be altogether recommended; for, owing to the brittleness of its branches, it is liable to be much damaged during severe storms. It flowers at the beginning of the cold season, but produces no seed in this part of India.

PANDOREA JASMINOIDEA, K. Schum.; Cooke Fl. Bomb. ii, 335. *Tecoma jasminoides*, Lindl.—A climbing shrub with pale bluish flowers. It is a native of Australia and is frequently cultivated in the gardens of Upper India.

PYROSTEGIA IGNEA Presl.; Cooke Fl. Bomb. ii, 335. *Bignonia venusta*, Ker. Gawl.—A large climbing shrub with 3-foliolate leaves and large handsome orange-red flowers arranged in terminal racemes. A native of Brazil.

CAMPSIS RADICANS, Seem.; Cooke Fl. Bomb. ii, 335. *Tecoma radicans*, Lindl.—A scandent shrub climbing like ivy, and with red flowers. Indigenous in N. America.

STENOLOBIUM STANS, Seem.; Cooke Fl. Bomb. ii, 335. *Tecoma stans*, Juss.; Gamble Man. Ind. Timb. 511; Prain Beng. Pl. 788.—A hardy shrub or small tree with handsome foliage and large yellow flowers. It is a native of S. America, and in some parts of India has become almost naturalized.

HETEROPHRAGMA ADENOPHYLLUM, Seem.; F. B. I. iv, 381; Watt E. D.; Gamble Man. Ind. Timb. 514; Brand. Ind. Trees 494; Prain Beng. Pl. 789; Cooke Fl. Bomb. ii, 336.—A handsome tree with large pinnate leaves. Flowers brownish-yellow, densely tomentose. Capsule 1—3 ft. long, twisted. A native of E. Bengal, Burma and the Andaman Islands. Often planted in the gardens of Upper India. The wood is valued for cabinet work.

KICELIA PINNATA, DC., Gamble Man. Ind. Timb. 517; Cooke Fl. Bomb. ii, 336; Brandis Ind. Trees 492.—An ornamental tree introduced from

Trop. Africa, and now largely grown in Indian gardens. The rough pinnate leaves are clustered towards the ends of the branches, and the large handsome maroon-coloured flowers are arranged on long pendent racemes and open during the hot season. The hard gourd-like fruits, 2—3 ft. long, ripen during the cold season. It is a quick-growing tree and the wood is hard.

LXXXIV.—PEDALIACEÆ.

Herbs, rarely undershrubs. *Leaves* opposite or the upper alternate, entire toothed or lobed. *Flowers* irregular, hermaphrodite, usually axillary and solitary (rarely fascicled or in racemes), pedicels short bracts none or minute. *Calyx* 4—5-partite. *Corolla* tubular-ventricose; limb obscurely 2-lipped; lobes 5, imbricate. *Stamens* didynamous, rarely 2. *Ovary* 2-celled, rarely 1-celled, style filiform, stigma shortly 2-lobed; ovules many or few, superposed. *Fruit* hard and indehiscent, or a 2-(rarely 3—4) valved capsule. *Seeds* (in the Indian species) wingless, albumen none.—Species about 45, in the warmer parts of both hemispheres, especially in desert regions and on sea-coasts.

SESAMUM, Linn.; Fl. Brit. Ind. iv, 386.

Erect to prostrate herbs. *Leaves* opposite below, upper alternate, entire toothed, lobed or divided. *Flowers* axillary, solitary or few and fascicled, shortly pedicelled, purplish or pink, often marked with yellow. *Calyx* small, 5-partite. *Corolla* tubular-ventricose, base subgibbous; limb 2-lipped; lobes 5, those of the upper lip usually smaller. *Stamens* didynamous, included; anthers sagittate, the cells subparallel, distinct. *Ovary* 2-celled, becoming 4-celled by the intrusion of a false, dissepiment; ovules many, 1-seriate in each chamber; style filiform, stigma 2-lobed. *Capsule* oblong or ovoid, loculicidally 2-valved, 4-chambered, usually 4-angled. *Seeds* many, obliquely oblong, subcompressed, foveolate.—Species about 10, in India and in Trop. and S. Africa.

S. indicum, Linn. *Sp. Pl.* 634; DC. *L'Orig. Pl. Cult.* 337; Duthie and Fuller *Field and Gard. Crops* ii, 35, t 42; F. B. I. iv, 387; Watt *E. D.*; Comm. *Prod. Ind.* 981; Prain *Beng. Pl.* 792; Cooke *Fl. Bomb.* ii, 338. *S. orientale*, Linn.; Roxb. *Fl. Ind.* iii, 100.—Vern. *Til, tili, tila* (Sansc.) Gingelly or Sesame.

An erect pubescent or puberulous annual, 1—2 ft. high, branching from the base. *Leaves* oblong or ovate, 3—5 in. long, the lower ones lobed or often pedatisect, lobes serrate; upper leaves narrowly oblong, entire, glabrous above, puberulous beneath. *Pedicels* $\frac{1}{2}$ in. long, solitary or 2—3-nate. *Flowers* with a strong unpleasant odour. *Calyx-segments* $\frac{1}{2}$ in. long, lanceolate, acute, hairy. *Corolla* $1\frac{1}{4}$ in. long, hairy outside, pinkish-purple and often marked with yellow. *Capsule* about 1 in. long, erect, hispid, beak short, valves separating half-way down. *Seeds* black or white, glabrous.

Extensively cultivated within the area during the rainy season, but chiefly as a mixed crop. Sometimes met with as a naturalized weed. In other parts of India it is usually grown as a pure crop. There are two well-marked varieties, black-seeded and white-seeded; the former yields the best oil and is therefore more abundantly grown. The oil is largely used in India for culinary purposes, as well as for burning in lamps, and it is also employed in anointing the body and in the manufacture of soap and perfumes. The seeds of the white-seeded variety are often eaten, chiefly in the form of sweetmeats. The oil and seeds are very largely exported to Europe, for particulars of which trade see Watt's "Commercial Products of India," p. 987. There is considerable doubt as to the native country of this plant. Decandolle regarded it as having come originally from the Malay Archipelago, whilst other authors consider it be of Indian or of African origin.

MARTYNIA DIANDRA *Glox.*; *F. B. I. iv*, 386; *Watt E. D.*; *Prair. Beng. Pl.* 791; *Cooke Fl. Bomb. ii*, 339.—Vern. *Bichu*. (Tiger-claw or Devil's claw). A tall coarse herb. *Leaves* large, opposite, cordate, glutinous. *Flowers* diandrous, rose-coloured. *Fruit* large, woody, beaked by two strong curved spines. Common within the area and in other parts of India on roadsides and in waste places, flowering during the rainy season. The plant is a native of Mexico.

LXXXV.—ACANTHACEÆ.

Herbs or shrubs, rarely trees. *Leaves* opposite, usually entire, exstipulate. *Flowers* nearly always irregular, in cymes racemes or spikes, rarely solitary; bracts large or small or none; bracteoles usually 2, sometimes more and forming an epicalyx. *Calyx* 5- or 4-partite or (in *Thunbergia*) minute and multifid. *Corolla* 2-lipped or subequally 5-lobed, lobes imbricate or twisted in bud. *Stamens* 4 or 2, inserted on the corolla-tube; anthers 2- or 1-celled, the cells sometimes remote. *Disk* often conspicuous. *Ovary* superior, 2-celled; style simple, filiform or swollen below; stigma usually 2-lobed, the lobes often unequal; ovules 1 or more in each cell, in one or two series, anatropous. *Fruit* a loculicidal capsule, the valves often elastically recurved and the septum splitting. *Seeds* usually hard, attached (except in a few genera) to recurved subacute supports (retinacula), ovoid or compressed, smooth rugose or rarely hispid, usually exalbuminous.—Species upwards of 2,000, in tropical and warm temperate regions.

Climbers; seeds not supported on hard retinacula; ovules 2 in each cell, collateral

1. THUNBERGIA.

Erect or prostrate plants, not climbing:—

Seeds not supported on retinacula; ovules many, superposed in 2 rows in each cell:—

Calyx 4-partite, stamens 2.

Bracts rigid, peduncle of spike covered with alternate scales

2. TUBIFLORA.

- Bracts herbaceous, spike sessile, or if stalked the peduncle without scales
- Calyx 5-partite, stamens 4
- Seeds supported on retinacula:—
- Upper lip of corolla subobsolete; lower lip large, expanded, 3-lobed; ovules 2 in each cell
- Corolla 2-lipped or with 5 subequal lobes:—
- Corolla lobes twisted to the left in bud:—
- Ovules more than 2 in each cell, capsule normally 6—or more—seeded:—
- Corolla distinctly 2-lipped:—
- Inflorescence spinose
- Inflorescence not spinose
- Corolla subequally 5-lobed:—
- Bracteoles large; capsule clavate, with a solid base
- Bracteoles small, narrow or none, capsule seed-bearing throughout:—
- Flowers in sessile clusters which are arranged on the branches of a trichotomous or 1-sided panicle.
- Flowers sessile, in terminal or pseudo-axillary heads or spikes
- Ovules 2 in each cell, capsule with 4 or fewer seeds:—
- Placentas separating elastically from the base of the capsule; stamens 4; bracteoles very large
- Placentas remaining attached to the base of the ripe capsule:—
- Anthers minutely mucronate or spurred at the base; stamens four
- Anthers blunt at the base:—
- Cor-tube slender, linear; stamens two.
- Cor-tube widened from near the base; stamens four
- Cor-lobes imbricate in bud:—
- Ovules 3—8 in each cell, capsule normally 6—or more—seeded:—
- Capsule compressed at right angles to the septum; seeds ovoid, hardly compressed:—
- Flowers in panicles often 1-lateral racemes, without axillary barren branches (cladodes)
- Flowers in spikes in the midst of cladodes
- Capsule subterete, seeds much compressed
- Ovules 2 or rarely 1 in each cell:—
- Corolla-lobes 5, subequal:—
- Calyx 4-part., the two opposite outer segments much longer than the inner; perfect stamens 2
- Calyx 5-part., segments subequal; stamens 4, all perfect
- Corolla distinctly 2-lipped:—
- Stamens 4
- Stamens 2:—
- Placentas remaining attached to the valves of the capsule:—
- Anther-cells parallel, subequal; bracts large, imbricate; cor-tube long, narrow
3. NELSONIA.
4. STAUROGYNE.
5. BLEPHARIS.
6. ASTERACANTHA.
7. HYGROPHILA.
8. RUELLIA.
9. ÆCHMANTHERA.
10. HEMIGRAPHIS.
11. PETALIDIUM.
12. DISCHORISTE.
13. DÆDALACANTHUS.
14. STROBILANTHES.
15. ANDROGRAPHIS.
16. HAPLANTHUS.
17. PHLOGACANTHUS.
18. BARLERIA.
19. ASYSTASIA.
20. EPIDACATHIS.
21. ECBOLIUM.

Anther-cells placed one higher up than the other:—	
Anther-cells (at least the lower) with a white basal spur-like appendage (apiculate in <i>J. Adhatoda</i>)	22. JUSTICIA.
Anther-cells muticous	23. PERISTROPHE.
Placentas separating elastically from the base of the capsule:—	
Flowers in 1-lateral spikes	24. RUNGIA.
Flowers crowded in axillary cymes towards the end of the branches	25. DICLIPTERA.

1. THUNBERGIA, Linn. f.; Fl. Brit. Ind. iv, 390.

Climbers. *Leaves* opposite, often cordate hastate or angular. *Flowers* axillary, solitary or in pairs or racemose, bracts at the base of the pedicels leaf-like; bracteoles large, the margins cohering, at least when young. *Calyx* small, annular, teeth 10—16 or obscure. *Corolla* conspicuous; tube swollen, curved; limb oblique, with rounded lobes, twisted to the left in bud. *Stamens* didynamous, attached to the base of the corolla-tube; anthers 2-celled; cells parallel, oblique, spurred or not at the base; pollen globose, obscurely banded. *Disk* annular or cushion-like. *Ovary* with 2 collateral ovules in each cell, style long, stigma funnel-shaped, 2-lobed or entire, or style 2-fid and with capitate stigmas. *Fruit* a capsule, globose below, suddenly narrowed to a barren sword-shaped beak. *Seeds* 2 in each cell, ovoid or dorsally compressed, the glabrous base plane or hollowed, funicle minute or conic.—Species about 90, in tropical regions of the Old World.

T. fragrans, Roxb. *Cor. Pl. i, 47, t. 67*; *Fl. Ind. iii, 33*; *F. B. I. iv, 390*; *Prain Beng. Pl. 795*; *Cooke Fl. Bomb. 342*.

Stem long and slender with swollen nodes, retrorsely hairy or glabrous. *Leaves* 2—3 in. long, oblong or deltoid-ovate, acute or obtuse, rounded cordate or hastate at the base, entire or with a few basal angular apiculate lobes, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* solitary or in pairs in the axils, pedicels 1—2 in. long; bracteoles $\frac{1}{2}$ — $\frac{3}{4}$ in., broadly falcate-oblong, subacute. *Calyx* $\frac{1}{8}$ — $\frac{1}{6}$ in., pubescent, deeply divided into 12—15 linear-lanceolate acute segments, nearly glabrous in fruit. *Corolla* inodorous, pure white, $1\frac{1}{2}$ in. long, pubescent outside; tube about as long as the segments, constricted below the limb; segments 5, spreading, obovate, truncate, coarsely toothed. *Anthers* not spurred. *Capsule* (including beak) about 1 in. long, grey-puberulous. *Seeds* 4 or less, $\frac{1}{8}$ in. in diam., hemispheric, excavated on the plane face, rugose.

Probably indigenous in the Sub-Himalayan tracts from the Jumna eastwards. Cultivated in gardens. Flowers in Oct. and Nov. **DISTRIB.:** Throughout India chiefly in the hilly districts; also in Ceylon, Burma, and the Malay Peninsula, extending to Timor, the Philippines and N. Australia. The specimens from N. India are referred to *T. fragrans*, var. *lævis*, *F. B. I. l.c.*, which differs from the type in having 2 pedicels in each axil, and it is also a much less hairy plant. The

specific name applies to the plant as a whole, and not to the flowers which are inodorous.

THUNBERGIA ALATA, *Boj.*; *F. B. I. iv*, 391; *Prain Beng. Pl.* 795; *Cooke Fl. Bomb. ii*, 343.—A slender climber. *Leaves* softly villous, ovate, cordate, subentire; petioles usually winged. *Flowers* yellow or whitish, with a brown or claret-coloured eye. Much cultivated in gardens, and becoming naturalized as an escape in many parts of the area. It is a native of Trop. Africa and Natal.

THUNBERGIA GRANDIFLORA, *Roxb.*; *Fl. Ind. iii*, 34; *F. B. I. iv*, 392; *Gamble Man. Ind. Timb.* 518; *Prain Beng. Pl.* 796. *Cooke Fl. Bomb. ii*, 343; *Brandis Ind. Trees* 497.—An extensive climber with large cordate-ovate or sometimes angular leaves and blue flowers. Often cultivated in gardens, and sometimes met with in a semi-wild state within the area. It is a native of E. Bengal whence it extends to S. China.

2. TUBIFLORA, J. F. Gmel.

UNDER ELYTRARIA IN FL. BRIT. IND. IV, 394.

Herbs, stemless or nearly so. *Leaves* alternate, crowded, sub-radical. *Flowers* in close rigid simple or divided spikes. *Scapes* covered by spirally imbricate bracts; bracteoles smaller than the bracts. *Calyx* 4-partite; segments unequal, the largest sometimes 2-fid. *Corolla* white or bluish, 2-lipped, tube linear; lobes 5, oblong, imbricate in bud. *Stamens* 2, perfect, attached to the throat of the corolla; anthers elliptic, acute; cells parallel, with or without a minute spur at the base. *Disk* small. *Style* short, stigma shortly 2-lobed; ovules 6—10 in each cell, superposed. *Fruit* an ellipsoid acute capsule. *Seeds* minute, ovoid, reticulated, minutely papillose, attached by a small hilum, without a retinaculum.—Species 3 or 4, American, one of which is widely spread in Trop. Africa and Asia.

T. acaulis, *O. Kuntze Revis. Gen. i*, 500; *Cooke Fl. Bomb. ii*, 345. *Elytraria crenata*, *Vahl*; *Royle Ill.* 298; *F. B. I. iv*, 394. *Justicia acaulis*, *Linn. f.*; *Roxb.*; *Fl. Ind. i*, 119.

Stem none or up to 2 in. long, woolly. *Leaves* 3—8 in. long, obovate or oblanceolate, obtuse or apiculate, tapering into a hairy petiole, more or less crenate, nerves beneath pubescent. *Scapes* several, usually longer than the leaves, clothed with small rigid elliptic acuminate bract-like scales. *Spikes* hard, $\frac{1}{2}$ —4 in. long, simple or branched; bracts $\frac{1}{2}$ in. long, ovate, acuminate or spine tipped, hairy outside and with ciliate margins. *Calyx* $\frac{1}{2}$ in. long; segments pennicillate at the apex and with scarious ciliate margins, three of them narrowly lanceolate, the 4th broader and sometimes 2-fid. *Corolla* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, pale-blue or white. *Anthers* without a basal spur. *Capsule* $\frac{1}{4}$ — $\frac{1}{2}$ in. long.

Moradabad (T. Thomson), ravine-tracts in the vicinity of Delhi and Agra (Royle, Munro), Bundelkhand (Edgeworth, Duthie), Merwara (Duthie). Flowers after the rainy season. **DISTRIB.**: Southwards through the drier parts of Peninsular India and in Ceylon, extending to Trop. and S. Africa and to Trop. and N. America.

3. NELSONIA, R. Br. ; Fl. Brit. Ind. iv, 394.

A diffuse softly villous herb. *Leaves* opposite, subequal. *Flowers* in ovate or cylindrical spikes; bracts herbaceous, ovate, glandular-villous, closely imbricate, alternate or spirally scattered, bracteoles none. *Calyx* small, 4-partite; segments unequal, lanceolate, the larger often bifid. *Corolla* very small, purplish-rose or white, tube slender, limb 2-lipped; lobes 5, obtuse, spreading. *Stamens* 2, attached above the middle of the corolla-tube; anthers 2-celled, subincluded; cells elliptic, distinct, more or less divergent, glabrous or ciliate, mucicous or minutely spurred. *Ovary* with 8—10 ovules in each cell, stigma shortly 2-lobed. *Fruit* an ovoid pointed capsule, bearing the seeds below the middle. *Seeds* small, ellipsoid or sub-globose, smooth, not supported on retinacula.—A single species, occurring in S. E. Asia, Africa, and Australia; also in America where it has probably been introduced.

N. campestris, R. Br. *Prod.* 481; *F.B.I.* iv, 394; *Prain Beng. Pl.* 797; *Cooke Fl. Bomb. ii*, 345. *Justicia lamifolia*, *Koen.*; *Roxb. Fl. Ind. i*, 134.

Stems short, branches trailing. Young parts more or less densely clothed with white hairs. *Leaves* elliptic-oblong, entire, the lower 4—8 in. long and with long petioles; upper subsessile, $\frac{1}{2}$ —2 in., clothed with grey woolly pubescence. *Flowering spikes* $\frac{1}{2}$ —2 in. long, ovate or cylindrical; bracts herbaceous, $\frac{1}{8}$ — $\frac{1}{4}$ in. long, ovate, subobtuse, softly pubescent, bracteoles represented by 2 opposite tufts of hairs situated below the calyx. *Calyx* $\frac{1}{2}$ in. long, strongly nerved. *Corolla* $\frac{1}{4}$ in. long, purplish. *Capsule* ovoid-conic, 8—12-seeded, glabrous. *Seeds* broadly ellipsoid, yellowish with brown granulations.

Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand, N. Oadh and Gorakhpur; also in Bundelkhand. **DISTRIB.:** Throughout India, except in the desert tracts, up to 4,000 ft. on the Himalaya and in Ceylon; extending to S. E. Asia, Australia, Africa and America.

4. STAUROGYNE, Wall.

UNDER EBERMAIERA IN FL. BRIT. IND. IV, 395.

Herbs or small undershrubs. *Leaves* opposite, rarely alternate. *Flowers* in terminal or pseudo-axillary simple or compound dense or lax racemes or spikes, bracts usually leaf-like; bracteoles 2, near the base of the calyx, smaller than the bracts. *Calyx* deeply 5-partite; segments oblong or linear, subequal or one larger than the others. *Corolla* 2-lipped, tube long or short, cylindrical or somewhat funnel-shaped; lobes 5, short, spreading. *Stamens* didynamous, usually included, filaments usually hairy; anthers with 2 ovoid mucicous distant cells. *Disk* inconspicuous. *Style* linear, glabrous, with 2 lobes, the lower one often again 2-lobed; ovules numerous. *Fruit* a small oblong capsule, seed-bearing throughout. *Seeds* 15—30 in each cell, small, globose or cuboid, glandular or nearly smooth when mature, retinacula none, hilum hollowed.—Species about 40, in S. E. Asia, Malaya, Australia and Brazil.

S. glutinosa, *O. Kuntze Rev. Gen. i, 497*; *Ebermaiera glutinosa*, *Wall; F. B. I. iv, 396*; *Prain Beng. Pl. 798*. *E. glauca*, *T. Anders. in Journ. Linn. Soc. ix, 450 (not of Nees)*.

Stems many, 12—18 in long, trailing, pubescent. *Leaves* all opposite, shortly stalked, about $1\frac{1}{2}$ in. long, elliptic, subobtuse, entire, tapering to the base, minutely pubescent or glabrous. *Heads* pseudo-axillary, on short branches, 2—8-fld., subglobose; bracts $\frac{1}{4}$ in. long, narrowly obovate-oblong, viscid. *Calyx-segments* viscidly pubescent, one slightly longer than the others. *Corolla* $\frac{1}{2}$ in. long, bluish with dark veins, pubescent outside. *Stigma* with one lobe oblong, the other bifid.

Abundant within the area, often met with in rice-fields and on swampy ground. *DISTRIB.*: Punjab Plain, Rajputana, and C. India to N. and C. Bengal, also in Sylhet.

5. BLEPHARIS, Juss.; Fl. Brit. Ind. iv, 478.

Herbs or undershrubs, often rigid or prickly. *Leaves* opposite or 4 in a whorl, subentire or toothed and sometimes prickly. *Spikes* terminal or on suppressed lateral branches, strobilate, 4-ranked or capitate and few or 1-flowered; lower bracteoles leaf-like, upper linear. *Calyx* deeply 4-partite; segments unequal, in opposite pairs, one of the larger pair emarginate or 2-lobed, the 2 inner segments much shorter and narrower. *Corolla* 2-lipped, tube rigid, upper lip subobsolete; lower spreading, 3-lobed, purple blue or white. *Stamens* didynamous; filaments thick, rigid, connective of the lower stamens produced; anthers with one large cell densely bearded on the margin, the other cell small and obsolete. *Disk* annular, inconspicuous. *Ovary* glabrous, with 2 ovules in each cell, style linear, stigma shortly 2-fid. *Fruit* an oblong or ellipsoid capsule, 2- or 4-seeded. *Seeds* compressed, suborbicular, echinate or ciliate.—*Species* about 50, mostly African, 5 in India.

Flowers in short heads, solitary or 2 or 3 together.—

Herbs:—

Leaves petioled, up to $2\frac{1}{4}$ in. long, thin acute

1. *B. boerhaviæfolia*.

Leaves subsessile, $\frac{1}{4}$ —1 in. long, fleshy, obtuse

2. *B. molluginifolia*.

Flowers in strobiliform spikes.—A small shrub with a very short stem

3. *B. sindica*.

1. B. boerhaviæfolia, *Pers. Syn. ii, 180*; *Royle III, 298*; *F. B. I. iv, 478*; *Prain Beng. Pl. 799*; *Cooke Fl. Bomb. ii, 349*. *Acanthus maderaspatanus*, *Linn.*; *Roxb. Fl. Ind. iii, 33*.

A prostrate roughly pubescent herb. *Stems* much-branched, wiry, rooting at the nodes. *Leaves* petioled, thin, 4 in a whorl, unequal, 1— $2\frac{1}{2}$ in. long, elliptic or obovate, acute and finely apiculate, appressedly hairy above, lower surface paler and with hairs only on the nerves; margins entire or with a few distant teeth, ciliate. *Flowers* axillary, solitary or 2 or 3 together; bracteoles 8, in opposite pairs, becoming larger upwards; outermost pair $\frac{1}{2}$ in. long, second $\frac{1}{2}$ in., third $\frac{1}{4}$ — $\frac{1}{2}$ in., all 3 pairs cuneiform below, broadly spathulate and rounded at the apex, strongly 3-nerved, furnished on the upper margin with stiff retrose bristles; the fourth or innermost pair of bracteoles longer than the others, linear with a flat rounded apex; all four pairs of bracteoles

white with green veins. *Calyx-segments* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, lanceolate, acute, pubescent and ciliate, the largest one 3-nerved, the opposite one 2-fid and 2-nerved, the 2 lateral ones with a single nerve running down the centre. *Corolla* $\frac{1}{2}$ — $\frac{2}{3}$ in. long, blue or pinkish-purple spotted with yellow on the lower lip. *Capsule* $\frac{1}{4}$ — $\frac{1}{3}$ in. long, usually 2-seeded. *Seeds* obtusely echinate.

Not uncommon within the area, but mostly in dry or rocky ground; Moradabad (T. Thomson), Saharanpur district (Royle), Siwalik range (Falconer), Agra (Munro), Bundelkhand (Edgeworth), Ajmer (Lowrie), Merwara (Duthie). Flowers during the cold season. **DISTRIB.:** From Mt. Abu and Chota Nagpur to S. India and Ceylon, also in Burma and extending to Trop. and S. Africa.

2. *B. molluginifolia*, *Pers. Syn. ii, 180; Royle Ill. 298; F. B. I. iv, 479; Prain Beng. Pl. 799; Cooke Fl. Bomb. ii, 350.*

Stems slender, prostrate, wiry, more or less hispid. *Leaves* $\frac{1}{3}$ —1 in. long, sessile or nearly so in a whorl of four, unequal, fleshy, oblong or obovate, obtuse, mucronate, hairy or minutely scabrous, pale beneath. Heads usually 1-flowered; bracteoles 10, in opposite pairs, enlarging in size upwards, varying in length from $\frac{1}{10}$ to $\frac{3}{8}$ in., the 4 outer pairs very similar to those of the preceding species, the 5th or innermost pair oblong or oblong-spathulate, tipped with a spinulose mucro about $\frac{1}{10}$ in. in length with sometimes one or two shorter ones alongside. *Calyx-segments* linear-lanceolate, acute, margins membranous, nervation as in the preceding species. *Corolla* blue, $\frac{3}{8}$ in. long. *Capsule* included, $\frac{1}{4}$ in. long, ellipsoid, 2-seeded. *Seeds* shaggy.

Abundant within the area, especially in the drier south-western and western portions. **DISTRIB.:** Chota Nagpur and southwards through C. W. and S. India to Ceylon, extending to Trop. and S. Africa.

3. *B. sindica*, *T. Anders. in Journ. Linn. Soc. ix, 500; F. B. I. iv, 479; Cooke Fl. Bomb. ii, 350.*

A small shrub, somewhat spinose-bristly. *Stem* usually very short or none; branches slender, clothed with short grey pubescence. *Leaves* sessile in whorls of four, unequal, 1—2 $\frac{1}{2}$ in. long, linear, acute, finely apiculate, roughly hairy, margins often with a few spine-like teeth near the base. *Spikes* strobilate, hairy, 1—3 in. long, in the forks of the branches, solitary in the upper forks and usually numerous in the lowest one; peduncle stout, woody; bracts in four rows, $\frac{1}{2}$ —1 in. long, the lowest the smallest, ovate, abruptly acuminate and spinous-pointed at the apex, hairy on the both sides, armed towards the apex with slender usually recurved spines, nerves 5 bracteoles 2, shorter than the bracts, lanceolate, acute, hairy and ciliate, reticulate-veined. *Calyx* softly hairy on both sides; largest segment $\frac{1}{2}$ in. long, ovate, bluntly acuminate, the apex truncate and densely ciliate; nerves 7, the 3 central ones parallel, each ending in a bristly tooth; the opposite calyx-segment $\frac{3}{8}$ in. long, similar in shape, the 3 parallel nerves not produced; lateral segments $\frac{1}{4}$ in. long, ovate, acute, 1-nerved. *Corolla* about $\frac{1}{2}$ in. long, mid-lobe of lower lip quadrate, twice as large as the rounded lateral ones; tube $\frac{1}{8}$ in. long, constricted below the limb.

Capsule $\frac{1}{2}$ in. long, ellipsoid, compressed, shining, 2-seeded. *Seeds* $\frac{1}{8}$ in. long, densely clothed with long stout hairs.

Ajmer (Duthie). Flowers during the end of the rainy season. **DISTRIB.:** Punjab, Sind and Gujarat. Reduced by Clarke in "Fl. Trop. Africa" to the African *B. linearifolia*, Pers., but, as Dr. Cooke points out, the corolla is very different.

6. ASTERACANTHA, Nees.

UNDER HYGROPHILA IN FL. BRIT. IND. IV, 408.

A stout herb, growing in wet ground. *Stems* many, fasciated, spinous at the nodes. *Leaves* narrow, lanceolate, arranged in whorls of 6, the 2 outer leaves of each whorl larger. *Flowers* in sessile axillary whorls, surrounded by rigid spines, bracts leaf-like, bracteoles linear-lanceolate. *Calyx* deeply 4-partite, the upper segment broader. *Corolla* distinctly 2-lipped, upper lip 2-lobed; lower 3-lobed, with 2 crest-like folds on the palate. *Stamens* didynamous; anthers 2-celled, equal; the cells parallel, glabrous, mucous. *Ovary* with 4 ovules in each cell, style hairy; stigma simple, acuminate. *Fruit* a compressed linear-oblong capsule. *Seeds* 4—8, clothed with white hygroscopic hairs, retinacula hard.—A single species, found in India, Ceylon and in Trop. and S. Africa.

A. longifolia, Nees in Wall. Pl. As. Rar. iii, 90; Royle Ill. 298; Lindau in Engl. and Prantl. Pflanzenf. iv, 3 B, 297; Cooke Fl. Bomb. ii, 352. *Hygrophila spinosa*, T. Anders.; F. B. I. iv, 408; Watt E. D.; Collett, Fl. Siml. 371; Prain Beng. Pl. 802. *Ruellia longifolia*, Roxb. Fl. Ind. iii, 50.

Stems erect, 2—5 ft. high, more or less hispid with long hairs especially at the base of each node. *Leaves* subsessile, the 2 outer of each whorl up to 7 in. long, oblong-lanceolate or oblanceolate, sparsely hispid on both sides with long white hairs, each of the 6 leaves with a long sharp nearly straight yellow spine in its axil. *Flowers* in a whorl of 8 (four pairs) at each node; bracts about 1 in. long, lanceolate, ciliate; bracteoles smaller, linear-lanceolate. *Calyx-segments* $\frac{3}{8}$ — $\frac{3}{4}$ in. long, linear-lanceolate, hairy outside and with hyaline ciliate margins, the upper broader and rather longer than the other three. *Corolla* 1—1 $\frac{1}{2}$ in. long, pale bluish-purple or white; tube $\frac{3}{8}$ in. long, abruptly dilated above, lips subequal. *Capsule* $\frac{1}{2}$ in. long, linear-oblong, pointed.

Common over the greater portion of the area, in ditches and swampy ground. **DISTRIB.:** Throughout India and in Ceylon, also at Singapore and extending to Trop. and S. Africa. The whole plant, including the root and seeds, is valued by natives for certain medicinal properties.

7. HYGROPHILA, R. Br.; Fl. Brit. Ind. iv, 406.

Herbs, usually found in wet places. *Leaves* opposite, lanceolate or obovate, entire. *Flowers* bluish-purple, sessile, in terminal heads or axillary whorls; bracts elliptic or lanceolate; bracteoles linear or lanceolate, shorter than the calyx. *Calyx* tubular, 5-fid, rarely 4-partite, lobes linear or lanceolate. *Corolla* 2-lipped, nearly glabrous, tube dilated

above, lobes twisted to the left in bud. *Stamens* didynamous, the posterior pair sometimes smaller or rudimentary, filaments glabrous, anthers oblong; cells equal, diverging or connate at the base. *Ovary* oblong, tip hairy; style slender, hairy; stigma simple, linear; ovules few or many in each cell. *Fruit* a linear or narrowly oblong capsule, bearing the seeds from near the base. *Seeds* usually many, ovoid, compressed, hygroscopically hairy; retinacula hard, curved, acute.—Species about 30, in tropical and subtropical regions of both hemispheres.

Flowers in terminal spikes.—Procumbent herbs:—

Fertile stamens 2, upper pair reduced to teeth, leaves usually glabrous, seeds 20 or more.

1. *H. polysperma*.

Fertile stamens 4, leaves hairy, seeds 8—10.

2. *H. Serpyllum*.

Flowers in axillary whorls, stamens 4, seeds 20 or more.—

An erect herb

3. *H. angustifolia*.

1. *H. polysperma*, T. Anders. in Journ. Linn. Soc. ix, 456; F. B. I. iv, 406; Collett Fl. Siml. 371; Prain Beng. Pl. 801; Cooke Fl. Bomb. ii, 353. *Justicia polysperma*, Roxb. Fl. Ind. i, 119.

A small much-branched procumbent herb, branching and rooting near the base. *Leaves* subsessile, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, narrowly oblong to ovate, sub-obtuse at the apex and tapering to the base, entire or almost so, usually glabrous. *Flowers* in dense terminal oblong spikes 1—4 in. long; bracts $\frac{1}{4}$ — $\frac{1}{2}$ in., elliptic-oblong, obtuse, hairy on both sides, mid-nerve prominent; bracteoles $\frac{1}{4}$ in., linear. *Calyx* $\frac{1}{4}$ in. long, pubescent; teeth linear, with scarious ciliate margins. *Corolla* $\frac{1}{2}$ in. long, pale-blue or white, pubescent. *Fertile stamens* 2, the upper reduced to teeth. *Capsule* $\frac{3}{8}$ in. long, narrowly oblong, glabrous. *Seeds* 20—30.

Very common in most parts of the area in wet places, flowering during the rains. **DISTRIB.:** Throughout India, ascending to 4,000 ft. on the Himalaya; extending to Afghanistan, Malacca and Tonkin.

2. *H. Serpyllum*, T. Anders. in Journ. Linn. Soc. ix, 456; F. B. I. iv, 406; Prain Beng. Pl. 801; Cooke Fl. Bomb. ii, 354.

Rootstock woody. *Stems* procumbent, 4—15 in. long, glabrous or slightly hairy. *Leaves* $\frac{3}{8}$ — $1\frac{1}{4}$ in. long, elliptic or suborbicular, entire, more or less hairy on both sides, petioles of the basal leaves up to 1 in. long. *Flowers* in dense or rather lax spikes; bracts $\frac{1}{4}$ in. long, elliptic, sub-acute, hairy; bracteoles $\frac{1}{4}$ in. long, oblong or oblong-lanceolate. *Calyx* $\frac{1}{4}$ — $\frac{1}{2}$ in. long; lobes linear, densely ciliate. *Corolla* $\frac{1}{2}$ in. long; upper lip shorter than lower, with 2 short obtuse lobes; lower bullate, shortly 3-lobed. *Fertile stamens* 4, anthers of the 2 lower larger. *Capsule* $\frac{1}{4}$ in. long, pointed glabrous, 8—10 seeded.

Bundelkhand and Malwa (Edgeworth), recorded also from Guna in C. India (King) and from Saugor (Jerdon). Flowers during the cold season. **DISTRIB.:** From Behar and C. Provinces to W. and S. India.

3. *H. angustifolia*, R. Br. Prod. 479; Cooke Fl. Bomb. ii, 354. *H. salicifolia*, Nees; F. B. I. iv, 407, Watt E. D.; Prain Beng. Pl. 804. *Ruellia salicifolia*, Vahl; Roxb. Fl. Ind. iii, 50.

A much-branched erect herb, 1—3 ft. high. *Stems* bluntly 4-angular, nearly glabrous. *Leaves* sessile or shortly petioled, glabrous, $\frac{3}{4}$ —3 in.

long; lower obovate or oblong, upper lanceolate. *Flowers* in dense rather distant axillary whorls; bracts $\frac{1}{2}$ in. long, ovate or oblong, sub-obtuse, hairy; bracteoles about half as long as the calyx, lanceolate, acute, hairy. *Calyx* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, divided $\frac{1}{2}$ way down in flower; teeth linear from a broad base, acute, hairy; margins hispid, ciliate. *Corolla* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, pale-purple, hairy outside; tube abruptly swollen above, hairy inside at the base of the stamens. *Stamens* 4, all fertile. *Style* pubescent. *Capsule* longer than calyx, narrow, subquadrangular, 20—28-seeded.

Common in wet ground in most parts of the area. *DISTRIB.*: Throughout the greater part of India and in Ceylon, extending to China and Japan. The leaves are sometimes eaten by natives as a pot-herb.

8. RUELLIA, Linn.; Fl. Brit. Ind. iv, 411.

Herbs or undershrubs. *Leaves* opposite, entire. *Flowers* sessile or subsessile, solitary or in clusters or racemes; bracts none; bracteoles large, usually exceeding the calyx. *Calyx* 5-partite or 5-fid; lobes subequal, narrow, acute. *Corolla* more or less oblique, tube ventricose; lobes subequal, rounded, twisted to the left in bud, spreading in flower. *Stamens* didynamous; filaments glabrous or hairy at the base; anthers subequal, 2-celled; cells oblong, mucicous, glabrous. *Ovary* glabrous; ovules 3—10 in each cell; style linear, hairy, unequally bifid. *Fruit* a clavate cylindrical or ellipsoid capsule, seed-bearing above the solid base. *Seeds* large, thin, discoid, margined, hygroscopically hairy; retinacula large, hooked, strong.—Species about 200, in all warm regions. The above generic description refers only to the section *Dipteracanthus*, to which all the Indian species belong.

Stems prostrate or climbing, woody; leaves ovate or elliptic, acute, glabrous or slightly hairy; flowers greyish-purple; capsule pubescent

1. *R. prostrata*.

Stems erect, woody; leaves ovate, obtuse, rather densely pubescent on both surfaces; flowers greyish-purple, capsule glabrous below the tip

2. *R. patula*.

Stems annual, erect from a woody rootstock; leaves narrowly elliptic, subobtuse, villous on both surfaces; flowers white; capsule glabrous

3. *R. suffruticosa*.

1. ***R. prostrata***, Lamk. *Encycl. vi*, 349, VAR. ***dejecta***, Clarke in *F. B. I. iv*, 412; Watt *E. D.*; Prain *Beng. Pl.* 803; Cooke *Fl. Bomb. ii*, 355. *R. ringens* Roxb. *Fl. Ind. iii*, 44.

A small diffuse undershrub. *Stems* 6—18 in. long, prostrate or climbing, amongst bushes, much branched, internodes long, the nodes more or less hairy and often ringed with purple. *Leaves* $\frac{1}{4}$ —3 in. long, ovate or elliptic, acute at both ends, entire, glabrous or slightly hairy, petioles, $\frac{1}{4}$ — $\frac{3}{4}$ in. long. *Flowers* subsessile, solitary or few together; bracteoles similar to the leaves but smaller. *Calyx* $\frac{1}{3}$ in. long, divided to below the middle; segments linear-subulate, acute, hairy. *Corolla* pale greyish-purple, $1\frac{1}{4}$ in. long, caducous, pubescent outside; tube narrowly cylindrical below, funnel-shaped above; lobes subequal, obovate-oblong, rounded. *Capsule* $\frac{1}{4}$ in. long, clavate, pointed, pube-

scent. *Seeds* 16—20, subglabrous but with a dense fringe of hygroscopic hairs on the margin.

Abundant within the area, especially in bushy places. Flowers during several months of the year. *DISTRIB.*: Throughout India from the Punjab and Assam to Ceylon, extending to E. Africa. The plant is used by natives as a remedy for diseases of the ear.

2. *R. patula*, Jacq. *Misc. Bot.* ii, 358; Roxb. *Fl. Ind.* iii, 45; F. B. I. iv, 412; Cooke *Fl. Bomb.* ii, 656.

A small hoary-pubescent shrub. *Stems* erect or long and straggling, much-branched, densely and closely pubescent. *Leaves* $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, ovate or elliptic, obtuse and sometimes apiculate, rounded at the base or abruptly narrowed, closely pubescent on both surfaces, petioles $\frac{1}{4}$ — $\frac{3}{4}$ in. long. *Flowers* subsessile, solitary or 2—3 together in the axils; bracteoles leaflike, less than $\frac{1}{2}$ in. long (including the short flat stalk), elliptic, obtuse, densely pubescent and ciliate. *Calyx* 5-partite, $\frac{1}{4}$ in. long, densely pubescent; segments linear-lanceolate, very acute. *Corolla* pale greyish-purple, 1— $1\frac{1}{2}$ in. long, hairy outside; tube narrowly cylindrical below, funnel-shaped above; lobes $\frac{1}{4}$ in. long, elliptic or suborbicular. *Ovary* glabrous except the tip, style hairy. *Capsule* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, clavate, glabrous. *Seeds* suborbicular, nearly glabrous, but with a dense fringe of hair on the margin.

Common in uncultivated ground, chiefly in the drier western portion of the area, as in Bundelkhand and Merwara and in the ravine tracts skirting the districts of Delhi, Agra and Etawah. Flowers during the hot and rainy seasons. *DISTRIB.*: Punjab Plain, Rajputana, Sind and southwards through the drier portions of W. and S. India to Ceylon, extending to Arabia, Tropical Africa and Ava.

3. *R. suffruticosa*, Roxb. *Fl. Ind.* iii, 53; F. B. I. iv, 413; Watt *E. D.*; Prain *Beng. Pl.* 803. *Dipteracanthus* Sibua, *Nees in Wall. Pl. As. Rar.* iii, 81.

An erect pubescent undershrub, 1—2 ft. high. *Roots* stout, often with fusiform swellings. *Stems* herbaceous, annually produced from a short creeping woody rhizome. *Leaves* petioled, lanceolate elliptic or oblanceolate, the lower ones usually smaller and often suborbicular, obtuse or subacute, entire, villous with white hairs on both surfaces especially on the nerves and veins beneath, margins ciliate. *Flowers* solitary, terminal, subsessile; bracteoles resembling the leaves but smaller and narrower, $\frac{3}{4}$ in. long, stalked. *Calyx-segments* $\frac{1}{4}$ in. long, linear, puberulous or nearly glabrous. *Corolla* white, $1\frac{1}{2}$ —2 in. long, tube slender, limb subregular. *Capsule* $1\frac{1}{2}$ in. long, oblong, glabrous, often tinged with purple. *Seeds* few.

Saharapur district (Royle), Moradabad (T. Thomson), also in the fire-exposed tracts of Pilibhit, N. Oudh and Gorakhpur (Duthie). Flowers April to July. Roxburgh states that the flowers open at sunset and drop off on the following morning. *DISTRIB.*: N. and W. Bengal and in Chota Nagpur, also in Upper Burma (Collett). The roots of this plant are said to be used by the Santals for producing fermentation

in the grain from which they manufacture their beer. Similar tuberous roots occur in the closely allied *R. cernua*, as well as in *R. tuberosa*, a native of America and now naturalized in C. Bengal. See also under *Echolium Linneanum*.

9. ÆCHMANTHERA, Nees; Fl. Brit. Ind. iv, 428.

Small villous shrubs. *Leaves* broadly elliptic, acute, crenate, often viscid. *Flowers* pale-violet or purplish, in sessile close or distant clusters arranged on the branches of a 3-chorous or 1-sided panicle; bracts linear, as long as the calyx; bracteoles, similar, smaller. *Calyx* 5-partite; segments linear, subequal. *Corolla* nearly straight; tube cylindric at the base, suddenly widened near the middle, palate with 2 hairy lines within; lobes 5, subequal, rounded, twisted to the left in bud. *Stamens* didynamous, included, longer filaments hairy; anthers ovate or oblong, 2-celled, cells blunt, connective sometimes produced. *Ovary* densely hairy at the apex; style sparsely hairy, thickened upwards, stigma large, simple, linear-lanceolate, ovules 4-6 in each cell. *Fruit* a narrowly oblong capsule, seed-bearing from the base. *Seeds* 6-8 (sometimes 12), discoid and densely hairy, or thicker and glabrous; retinacula strong, hooked.—Species 2, both Indian.

A. tomentosa, Nees in Wall. *Pl. As. Rar.* iii, 87; *F. B. I.* iv, 428; *Kanjilal For. Fl.* 257; *Gamble Man. Ind. Timb.* 518.

A small erect shrub, 1-3 ft. high, clothed with grey or whitish (not snowy white) hairs. *Leaves* petioled, 2-4 in. long, elliptic or lanceolate, acute, slightly crenate, base rounded; upper surface coarsely pubescent, lower densely grey-tomentose. *Flowers* arranged in small 3-8-flowered clusters which are sessile along the spreading branches of a large terminal panicle; bracts $\frac{1}{2}$ in. or more long, linear, glandular-hairy, bracteoles similar but smaller. *Calyx* $\frac{1}{3}$ - $\frac{1}{2}$ in. long, segments linear, glandular-hairy. *Corolla* pale-blue, 1 in. long, lobes spreading, about $\frac{1}{2}$ in. across. *Anthers* with the connective very slightly excurrent. *Capsule* about as long as the calyx, linear, usually 8-seeded.

Summit of Siwalik range. Flowers during the cold season. **DISTRIB.:** W. Himalaya, up to 5,000 ft. in Kumaon, also in Nepal.

VAR. Wallichii, *F. B. I.* iv, 428; *Watt E. D.*, *Kanjilal l.c.*; *Gamble l.c.*; *Prain Beng. Pl.* 804. *Æ. gossypina*, Nees; *Royle Ill.* 298. Vern. *Bharara*.—Stems and leaves densely clothed with snow-white wool. Anthers with the connective distinctly excurrent.—Dehra Dun and Siwalik range. Flowers in the late autumn, and abundantly every 4 and 5 years after the manner of some species of *Strobilanthes*. **DISTRIB.:** W. Himalayan, Simla to Kumaon up to 5,000 ft., also in N. Bengal and Chittagong. Madden says that bees are particularly fond of the flowers of this plant. It usually grows gregariously, and is therefore a conspicuous feature during the periods of profuse flowering. The thick white wool which covers the stems and the under surfaces of the leaves is much used by the natives for making a kind of cloth. The wool when young is often tinged with lilac.

10. HEMIGRAPHIS, Nees, Fl. Brit. Ind. iv, 422.

Herbs or shrubs. *Leaves* opposite, toothed or subentire. *Flowers* blue or yellow, sessile, in heads or spikes, rarely solitary; heads terminal or pseudo-axillary on shortened branchlets, rarely in panicles or solitary; bracts large, imbricate, each 1-flowered; bracteoles small, narrow or none. *Calyx* 5-partite nearly to the base; segments subequal, lanceolate or linear. *Corolla* elongate, tube cylindric below, funnel-shaped or ventricose above; lobes 5, sub-equal, rounded, twisted to the left in bud. *Stamens* didynamous, included or nearly so; anthers oblong, 2-celled, mucous, sometimes triangular, bases acute. *Ovary* with 3—many ovules in each cell, style long, stigma unequally 2-lobed. *Fruit* a linear or linear-oblong capsule, seed-bearing almost from the base. *Seeds* 6 to 20, compressed, discoid, brown with a white margin.—Species about 30, Indian and Malayan, & three in Africa.

Corolla-limb ventricose, longer filaments hairy below:—

Bristly, corolla purplish

1. *H. dura*.

Softly hairy, corolla pale blue

2. *H. hirta*.

Corolla-tube narrowly funnel-shaped throughout, longer filaments densely bearded in their upper half

3. *H. latebrosa*,
var. *rupestris*.

1. *H. dura*, *T. Anders. in Journ. Linn. Soc. ix, 461 (excl. syn. Ruellia crispata)*; *F. B. I. iv, 422*; *Cooke Fl. Bomb. ii, 357*.

A procumbent or diffuse herb, hispid or almost prickly. *Stems* 1—2 ft. high, clothed with stiff white deflexed bristles. *Leaves* hispid, 1—1½ in. long, spathulate-oblong, obtuse, subcrenate, tapering below into a short petiole. *Heads* many-flowered, densely clothed with white and yellowish-brown hair; bracts ¾—1 in. long, oblong or spathulate, subacute, densely hairy. *Calyx* ½ in. long; segments linear, acute, densely hairy and ciliate with jointed hairs. *Corolla* ¾ in. long, blue; tube slender, lower cylindric portion about as long as the upper ventricose part; lobes obovate, rounded. *Filaments* (the longer ones) laxly hairy below. *Ovary* glabrous, style hairy. *Capsule* ½ in. long, glabrous, 6—8-seeded.

Bundelkhand (Duthie). Flowers in the cold season. *DISTRIB.*: C. India in black soil (Edgeworth), Sind, Gujarat, Konkan and C. Provinces to S. India.

2. *H. hirta*, *T. Anders. in Journ. Linn. Soc. ix, 462*; *F. B. I. iv, 422*; *Prain Beng. Pl. 805*. *Ruellia hirta*, *Vahl*; *Roxb. Fl. Ind. iii, 46*.

A softly pubescent herb. *Stems* 6—18 in. long, creeping, 4-sided. *Leaves* ½—1 in. long, ovate or oblong, crenate. *Heads* 2—6 flowered or the flowers occasionally solitary; bracts ½ in., elliptic, pubescent, bracteoles none. *Calyx* ½ in. long, green; segments (in fruit) spathulate. *Corolla* pale-blue, ½ in. long, soon falling, glabrous except for the 2 lines of hairs on the palate, the swollen upper portion nearly as long as the cylindric base; lobes subequal, obliquely oval. *Filaments* (the longer ones) laxly hairy below. *Style* hairy. *Capsule* ½ in. long, linear, about 12-seeded, glabrous.

Abundant in most parts of the area. Flowers in early part of the hot season. **DISTRIB.:** Behar and in C. and W. Bengal; W. Himalaya, up to 5,000 ft. in Kumaon.

3. H. latebrosa, Nees in DC. *Prod.* xi, 723, var. **rupestris**, C. B. Clarke in *F. B. I.* iv, 423; Prain *Beng. Pl.* 805; Cooke *Fl. Bomb.* ii, 358.

A diffuse rather rigid viscidly pubescent herb. *Stems* slender, obtusely 4-angled, clothed with soft white hairs. *Leaves* petioled, 1–3 in. long, ovate, acuminate, crenate-serrate, tapering towards the base, petioles $\frac{1}{2}$ – $1\frac{1}{2}$ in. long, leaves of the flowering branches much smaller. *Flowers* in rather dense heads; bracts ovate or elliptic, acute, hairy and with ciliate margins, the outer ones largest. *Calyx* $\frac{1}{2}$ in. long, linear, acute, whitish with green tips, hairy and with ciliate margins, one segment larger than the others. *Corolla* about $\frac{1}{2}$ in. long, narrowly funnel-shaped and nearly straight; tube yellowish, limb blue; lobes obovate, obtuse. *Filaments* (the longer ones) densely woolly above. *Capsule* $\frac{1}{2}$ in. long, puberulous, 6-seeded. *Seeds* hairy.

Dehra Dun and Siwalik range, Bundelkhand (Duthie), in shady places. **DISTRIB.:** W. Himalaya up to 5,000 ft.; also in Behar, Rajputana, C. Provinces, Bombay and S. India.

11. PETALIDIUM, Nees; Fl. Brit. Ind. iv, 416.

Undershrubs, minutely pubescent. *Leaves* ovate or narrowly oblong, entire or toothed. *Flowers* solitary, sessile or nearly so, usually crowded on short lateral branches; bracts narrow; small or none; bracteoles large, ovate, reticulate-veined, at length scarious. *Calyx* unequally 5-fid or 5-partite, segments narrowly lanceolate. *Corolla* straight or curved, dilated upwards or funnel-shaped at the top; lobes 5, rounded, twisted to the left in bud, spreading in flower. *Stamens* didynamous; anthers subsimilar, 2-celled; cells parallel, spurred at the base. *Ovary* with 2 ovules in each cell, style linear, stigma unequally 2-lobed. *Fruit* a clavate capsule, compressed parallel to the septum. *Seeds* 2 or 4, discoid, hygroscopically hairy; placentas separating elastically from the base of the capsule, carrying the seeds with them; retinacula hard, curved.—Species 18, one in India, the rest in Africa and the Mascarene Islands.

P. barlerioides, Nees in Wall. *Pl. As. Rar.* iii, 82; Royle *III.* 298; *F. B. I.* iv, 416; Kanjilal *For. Fl.* 261; Gamble *Man. Ind. Timb.* 518; Collett *Fl. Siml.* 371; Prain *Beng. Pl.* 805; Cooke *Fl. Bomb.* ii, 359. *Ruellia bracteata*, Roxb. *Fl. Ind.* iii, 47.

An undershrub, 4–5 ft. or more, minutely hairy. *Stems* several, straight, woody, subterete, glabrous. *Leaves* on the main stems 2–4 in. long, broadly ovate, acuminate, crenate-serrate, glabrous except on the nerves and veins beneath; main lateral nerves 6–8 pairs, prominent beneath, petioles about $\frac{1}{2}$ in. long; leaves on the shortened flowering branches much smaller. *Bracts* none, bracteoles leaf-like, $\frac{3}{4}$ in. long, ovate, acuminate strongly nerved and veined, scarious when old, margins ciliolate, pedicels $\frac{1}{4}$ – $\frac{1}{2}$ in. long. *Calyx* glandular-hairy,

about $\frac{1}{8}$ in. long. *Corolla* $1\frac{1}{2}$ in. long, yellowish-white, hairy outside, the palate clothed within with long deflexed fulvous hairs, tube dilated upwards; lobes obovate, obtuse, the margins crenate. *Filaments* hairy at the base, anthers slightly pubescent. *Ovary* glabrous, style hairy. *Capsule* $\frac{1}{2}$ in. long, compressed, glabrous. *Seeds* usually 2, clothed with soft hairs along the margins.

Dehra Dun and Siwalik range and eastwards through the Sub-Himalayan tracts of N. Oudh, also in Bundelkhand and Merwára. Flowers March—May. *DISTRIB.*: W. Himalaya up to 3,000 ft.; also in Chota Nagpur, Rajputana, and in C. & W. India and in the Bombay Presidency.

12. DYSCHORISTE, Nees.

UNDER CALOPHANES IN FL. BRIT. IND. IV, 410.

Perennial herbs. *Leaves* opposite, petioled. *Flowers* in axillary clusters or short cymes; bracteoles, small, narrow. *Calyx* tubular; lobes 5, subequal, lanceolate or subulate. *Corolla* tubular, obscurely 2-lipped; lobes 5, obtuse, twisted to the left in bud, spreading in flower. *Stamens* didynamous, perfect, filaments glabrous or hairy, anthers similar, 2-celled; cells oblong, parallel, minutely mucronate or spurred at the base; pollen globose, ribbed. *Ovary* glabrous, ovules 2 in each cell; style linear, hairy; stigma linear, the upper lobe minute or obsolete. *Fruit* an oblong capsule, narrowed below into a short solid base. *Seeds* 4, orbicular, much compressed, hygroscopically hairy when moistened; retinacula strong, curved.—Species 60, in S. E. Asia, Tropical Africa and America.

D. depressa, Nees in Wall. *Pl. As. Rar. iii*, 81; *Cooke Fl. Bomb. ii*, 361. *Calophanes Nagchana*, Nees; *F. B. I. iv*, 410; *Prair Beng. Pl.* 806. *Vern. Nagchana*.

A perennial herb or suffruticose. *Stems* many, glabrous or hoary, sub-quadrangular, branches usually prostrate and rooting at the nodes. *Leaves* $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, broadly elliptic or obovate, obtuse, entire, tapering into the petiole, glabrous or nearly so. *Flowers* subsessile, in axillary clusters, bracts none; bracteoles $\frac{1}{6}$ in. long, linear. *Calyx* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, divided more than $\frac{1}{2}$ way down in flower, hairy; segments lanceolate-subulate, the margins membranous towards the base. *Corolla* pale violet-pink, rather shorter than the calyx; lobes spreading, oblong, rounded or truncate. *Stamens* with the filaments connate in pairs at the base, anther-cells shortly mucronate. *Capsule* $\frac{3}{8}$ in. long, glabrous.

Kheri district of N. Oudh (Duthie), also in Bundelkhand (Mrs. Bell). Flowers March and April. *DISTRIB.*: Bengal and in W. and S. India to Ceylon extending to Tropical Africa.

13. DÆDALACANTHUS, T. And.; Fl. Brit. Ind. iv, 417.

Perennial herbs or shrubs. *Leaves* opposite, petioled, entire or obscurely toothed, lineolate from embedded raphides. *Flowers* blue or

rose-coloured, in linear distant or close spikes or in heads; bracts usually large; bracteoles linear-lanceolate, shorter than the calyx. *Calyx* 5-lobed; lobes narrow, often scarious. *Corolla* slender; tube long, narrow, widened near the top or (in a few species) from the middle; lobes obovate, twisted to the left in bud, spreading in flower. *Stamens* 2, glabrous, anthers narrowly oblong, 2-celled, mucous, exerted or subincluded. *Ovary* glabrous, 4-ovuled; style long, sparsely hairy; stigma simple, linear. *Fruit* a clavate capsule with a cylindric solid base. *Seeds* normally 4, compressed, discoid, hygroscopically hairy, retinacula acute.—Species 18, in India and Malaya.

Spikes forming a close terminal panicle; bracts elliptic, subobtuse or shortly acuminate, not ciliate

1. *D. nervosus*.

Spikes usually solitary; bracts ovate, much acuminate, ciliate

2. *D. purpurascens*.

1. ***D. nervosus***, *T. Anders. in Journ. Linn. Soc. ix, 487; Royle Ill. 298; F. B. I. iv, 418; Watt E. D.; Kanjilal For. Fl. 261; Gamble Man. Ind. Timb. 518; Collett Fl. Siml. 371; Prain Beng. Pl. 807.*

A stout herb, 2—6 ft. high, with 4-angled scabrous stems. *Leaves* 6—8 in. long, ovate, acuminate, entire or crenulate, lineolate, glabrous but scabrous on the nerves beneath, base attenuate, petiole $\frac{1}{2}$ — $1\frac{1}{2}$ in. long. *Flowers* in short uninterrupted bracteate spikes forming close terminal panicles; peduncles $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, often acutely 4-angled, glabrous or obscurely pubescent; bracts more or less white with green nerves, about $\frac{1}{2}$ in. long, ovate or elliptic, subobtuse or shortly acuminate, puberulous, the margins not ciliate; bracteoles shorter than the calyx, narrowly lanceolate. *Calyx* $\frac{1}{4}$ in. long, lobed half-way down, whitish, minutely but densely pubescent, lobes lanceolate. *Corolla* deep-blue, $1\frac{1}{4}$ in. long, glabrous; tube elongate, dilated near the top; limb oblique, $\frac{3}{4}$ in. across; lobes subequal, rounded. *Anthers* exerted. *Capsule* oblong, $\frac{1}{2}$ in. long.

Dehra Dun and in the Sub-Himalayan tracts of Pilibhit, N. Oudh and Gorakhpur, frequent in *sal* forests. Flowers during February and March. **DISTRIB.:** Subtropical Himalaya from the Punjab to Bhutan, extending to 4,000 ft. in Kumaon; also in N. Bengal, Chota Nagpur and the Sundribuns. Often cultivated in gardens for its handsome dark-blue flowers.

2. ***D. purpurascens***, *T. Anders. in Journ. Linn. Soc. ix, 488; F. B. I. iv, 420; Watt E. D.; Kanjilal For. Fl. 261; Gamble Man. Ind. Timb. 518; Prain Beng. Pl. 807; Cooke Fl. Bomb. ii, 364. Eranthemum pulchellum, Roxb. Fl. Ind. i, 111.*

A stoutish herb. *Stems* 2—4 ft. high, leafy. *Leaves* up to 8 or 9 in. long, ovate, acuminate, closely lineolate on both surfaces, glabrate or sometimes pubescent on the nerves, lamina of lower leaves more or less decurrent into the petiole, upper with a rounded or cordate base and shortly stalked; main lateral nerves 7—9 pairs, prominent beneath. *Flowers* in dense usually solitary spikes which are 1—3 in. long; bracts glandular-pubescent, about 1 in. long, ovate-lanceolate, long-acuminate, pale-green or becoming whitish when old; nerves strong, dark-green.

connected with fine reticulations, margins ciliate; bracteoles smaller, linear-lanceolate, scarious and glandular-pubescent. *Calyx* $\frac{1}{4}$ — $\frac{1}{2}$ in., lobed about half-way down, scarious and minutely pubescent on both sides; lobes narrowly lanceolate, acute. *Corolla* bluish-purple or lilac, $1\frac{1}{4}$ in. long, hairy outside, tube slightly funnel-shaped; lobes $\frac{1}{2}$ in. long, obovate, rounded or truncate. *Stamens* slightly exserted. *Capsule* $\frac{1}{2}$ — $\frac{2}{3}$ in. long, glabrous.

Gorakhpur (Brandis), Bundelkhand (Duthie and Mrs. Bell). **DISTRIB.:** From Assam and Behar throughout the hilly parts of Northern, W. and S. India and in Ceylon. A handsome plant when in flower and often grown in gardens.

14. STROBILANTHES, Blume; Fl. Brit. Ind. iv, 429.

Shrubs or herbs. *Leaves* opposite, often unequal, toothed or subentire, often containing raphides. *Flowers* purple or white, rarely yellow, capitate or in strobilate or interrupted spikes or panicles, sessile or pedicelled; bracts and bracteoles large or small or none, persistent or caducous. *Calyx* deeply subequally 5-partite, rarely 2-lipped, segments narrow. *Corolla* straight or curved, tube ventricose above; lobes 5, ovate or rounded, subequal, twisted to the left in bud. *Stamens* usually didynamous; anthers oblong, 2-celled, muticous. *Disk* small, or prominent as a stalk to the ovary. *Ovary* with 2 ovules in each cell; style linear, stigma of one long linear branch, the other obsolete. *Fruit* a 4- or 2-seeded capsule; placentas sometimes separating from the base, carrying the seeds with them. *Seeds* much compressed, glabrous or hairy; retinacula strong, curved.—Species about 200, mostly Asiatic, a few in Madagascar.

Flowers in spikes:—

Leaves sessile, auricled; spikes strobilate, elongate, bracts persistent

1. *S. auriculatus*.

Leaves petioled, spikes short, arranged in irregular panicles, bracts caducous

2. *S. angustifrons*.

Flowers in peduncled heads, leaves petioled, bracts caducous

3. *S. penstemonoides*.

1. ***S. auriculatus***, Nees in Wall. *Pl. As. Rar.* iii, 86 t. 195; *F. B. I.* iv, 453; *Watt E. D.*; *Gamble Man. Ind. Timb.* 519; *Prair Beng. Pl.* 808.

A shrub, 2—6 ft. high; branches spreading and often zigzag, 4-angled, glabrous or more or less hairy at their extremities. *Leaves* sessile elliptic-lanceolate or ovate-oblong, those of the same pair often very unequal 3—10 in. long acuminate, serrulate, pubescent on both surfaces, base auricled. *Spikes* 3—5 in. long, mostly terminal and solitary, linear-oblong, densely velvety-pubescent; bracts $\frac{1}{4}$ — $\frac{1}{2}$ in. long and usually broader, obovate, obtuse, softly tomentose, glandular-pubescent, apex often recurved in fruit, bracteoles none. *Calyx-segments* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, linear, obtuse, closely velvety-hairy. *Corolla* 1 in. long, curved, pale-blue, slightly hairy, lower cylindric portion $\frac{1}{2}$ in. long, limb somewhat 2-lipped. *Capsule* $\frac{1}{2}$ in. long, 4-seeded, glabrous.

The type is said to have been found by Edgeworth on the Malwa plateau, and it no doubt occurs in other localities within the southern

boundary of this flora. **DISTRIB.:** C. India up to 4,000 ft., Chota Nagpur and C. Provinces, extending to Ava.

VAR. Edgeworthiana, *F. B. I. Lc.*; *Prair Bengal. Pl.* 808; *S. Edgeworthiana, Nees.* *S. auriculatus, Auct.*; *Royle Ill.* 298; *Kanjilal For. Fl.* 258. *Bracts* clothed with spreading white cilia $\frac{1}{4}$ in. long. *Sepals* white-ciliate at the tips.—Fairly common in Dehra Dun and on the Siwalik range, especially in *sāl* forests. *Flowers* Nov.—March.—**DISTRIB.:** Extends along the base of the Himalaya as far east as Sikkim and up to 4,000 ft.; also in Chota Nagpur, Tenasserim and Upper Burma.

2. S. angustifrons, *C. B. Clarke in F. B. I. iv,* 466; *Kanjilal For. Fl.* 259.

A small suberect shrub, 2—3 ft. high; branches terete, glabrous, innovations white-tomentose. *Leaves* 3—4 in. long, elliptic, acuminate at both ends, serrulate, glabrescent, pale beneath, main lateral nerves of 6 pairs, petioles $\frac{1}{2}$ in. or more, upper leaves never cordate. *Spikes* lateral and terminal, forming short irregular panicles; bracts oblong, acuminate, caducous; the lower leaf-like, lanceolate; the uppermost (? bracteoles) linear, shorter than the calyx, minutely pubescent. *Calyx—segments* linear, $\frac{1}{3}$ — $\frac{1}{2}$ in. long, pubescent. *Corolla* purple, about 1 in. long, nearly glabrous, mouth curved. *Capsule* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, 4-seeded. *Seeds* orbicular, less than $\frac{1}{8}$ in. diam., hairy.

Common in Dehra Dun and on the Siwalik Range. *Flowers* Jan. to Mar. **DISTRIB.:** Outer hills of the Punjab Himalaya up to 6,000 ft. This species differs from *S. alatus* by the attenuated (never cordate) base of the uppermost leaves, the more slender corolla and the smaller seeds.

3. S. penstemonoides, *T. Anders. in Journ. Linn. Soc. ix,* 477 (*in part*); *F. B. I. iv,* 460; *Kanjilal For. Fl.* 258; *Gamble Man. Ind. Timb.* 519.

A much-branched glabrous shrub, 3—8 ft. in circumference. *Leaves* 5—8 in. long, elliptic, acuminate at both ends, closely serrate, lineolate and glabrous on both surfaces, main lateral nerves 7 pairs, petioles about $\frac{1}{2}$ in. long. *Peduncles* solitary or in pairs, mostly 3-headed, 1—3 in. long, often glandular-hairy. *Heads* $\frac{1}{2}$ —1 in. long, glandular when young; bracts white, suborbicular, concave, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, glabrous, caducous, bracteoles none. *Calyx* $\frac{1}{4}$ in. long, often enlarging in fruit, deeply divided, segments linear. *Corolla* $1\frac{1}{2}$ in. long, more or less curved, narrow portion of tube sometimes minutely pubescent. *Capsule* $\frac{1}{3}$ in. long, oblong clavate, 4-seeded, glandular-pubescent. *Seeds* silky.

Dehra Dun, on the banks of the Renaddi (Kanjilal). *Flowers* in the rains. **DISTRIB.:** Subtropical Himalaya from Nepal to Bhutan, up to 6,000 ft.

15. ANDROGRAPHIS, Wall.; Fl. Brit. Ind. iv, 501.

Erect or procumbent annuals, or small shrubs. *Leaves* entire. *Flowers* in lax panicles or in dense subcapitate axillary and terminal racemes,

often unilateral; bracts small, bracteoles minute or none. *Calyx* 5-partite, segments narrow. *Corolla* small, tubular, 2-lipped, pubescent, lobes imbricate in bud. *Stamens* 2, filaments ciliate or setulose; anthers exerted, 2-celled; cells oblong, parallel, subequal, mucous, bearded at the base. *Ovary* sparsely hairy, style slender, stigma shortly 2-lobed; ovules 3—6 in each cell. *Fruit* an oblong-linear or elliptic capsule, compressed at right angles to the septum. *Seeds* 6—12, hard, subquadrate or oblong, rugosely pitted, glabrous, retinacula lanceolate.—Species about 17, confined to India and Ceylon.

Leaves glabrous, flowers in lax paniced racemes, capsule

glabrous

1. *A. paniculata*.

Leaves hairy, flowers in axillary racemes, capsule hairy

2. *A. echioides*.

1. *A. paniculata*, *Nees in Wall. Pl. As. Rar. iii, 116; Royle Ill. 298; F. B. I. iv, 501, Watt E. D.; Prain Beng. Pl. 809; Cooke Fl. Bomb. ii, 374. Justicia paniculata, Burm.; Roxb. Fl. Ind. i, 117. Vern. Kuluf-nath, kiryat.*

An erect annual, 1—3 ft. high, branches sharply 4-angled or almost winged. *Leaves* 2—3 in. long, lanceolate, acute, tapering to the base, paler, beneath, main lateral nerves 4—6 pairs, petioles none or up to $\frac{1}{4}$ in. long. *Flowers* small, solitary, arranged in lax spreading axillary and terminal racemes or panicles, the whole forming a large paniculate inflorescence; pedicels distinct, gland-pubescent; bracts $\frac{1}{10}$ in. long, lanceolate, bracteoles smaller or none. *Calyx* $\frac{1}{2}$ in. long; segments equal, linear-lanceolate, gland-pubescent. *Corolla* pink, $\frac{3}{8}$ in. long, hairy outside, tube $\frac{1}{2}$ in. long, dilated below the limb. *Filaments* hairy upwards, anthers bearded at the base. *Capsule* $\frac{3}{4}$ in. long, tapering at each end. *Seeds* several, subquadrate, rugose, glabrous.

In the districts of Shahjehanpur (Duthie) and Agra (Munro), also at Lucknow and in Bundelkhand (Edgeworth), often cultivated in gardens. Flowers Oct. to Dec. **DISTRIB.:** Throughout the W. Peninsula and in Ceylon. This plant is much valued by the natives of India as a febrifuge. The juice of the leaves forms the chief ingredient of a much used native medicine known as *alui*.

2. *A. echioides*, *Nees in Wall. Pl. As. Rar. iii, 117; Royle Ill. 298; F. B. I. iv, 505; Prain Beng. Pl. 809; Cooke Fl. Bomb. ii, 374. Justicia echioides, Linn.; Roxb. Fl. Ind. i, 118.*

An erect annual, 6—18 in. high. *Stem* 4-angled, grooved, clothed with spreading hairs, sometimes branched. *Leaves* 1—3 in. long, sessile, oblong or subelliptic, obtuse, sparsely hairy, base cuneate, margins ciliate, main lateral nerves 4—6 pairs. *Flowers* unilateral, in axillary spreading or recurved racemes shorter than the leaves, rachis gland-hairy; bracts $\frac{1}{2}$ in. long, lanceolate, bracteoles much smaller. *Calyx* $\frac{1}{2}$ — $\frac{1}{4}$ in.; segments narrowly linear, acute, ciliate, elongating in fruit. *Corolla* about $\frac{1}{2}$ in. long, densely hairy outside, pink or white, the lower lip spotted with purple. *Filaments* slightly hairy, anthers bearded. *Capsule* $\frac{1}{2}$ — $\frac{1}{4}$ in. long, elliptic-lanceolate, hairy. *Seeds* $\frac{1}{10}$ in. long, rugose, glabrous.

Dehra Dun and Siwalik Range, but chiefly in the western and southern portions of the area. Flowers Aug.—Dec. **DISTRIB.:** Throughout the drier parts of Trop. India from the Punjab Plain and Chota Nagpur to S. India and Ceylon.

16. HAPLANTHUS, Nees.; Fl. Brit. Ind. iv, 506.

Erect herbs. *Leaves* entire. *Flowers* axillary, in false whorls, surrounded by numerous spine-like barren branches (cladodes) which latter are terminated by 2 or 3 minute acicular teeth (reduced leaves); bracts and bracteoles small. *Calyx* 5-partite; segments linear-lanceolate, subequal. *Corolla* small, tubular; limb 2-lipped, upper lip 2-fid, lower obtusely 3-lobed. *Stamens* 2, shorter than the corolla, inserted below the throat, filaments flattened; anthers 2-celled, connivent and subcoherent; cells ovate, more or less unequal, mucous connective bearded on the back. *Ovary* 6—16-ovulate, style acute or obliquely truncate at the apex. *Fruit* a linear-oblong capsule, compressed at right angles to the septum. *Seeds* from the base of the capsule, oblong-ellipsoid, hardly compressed, appearing densely hairy when moistened.—Species 3, confined to India.

Bracteoles longer than calyx, cladodes more than 1 in.
long, capsule glabrous

1. *H. verticillaris.*

Bracteoles shorter than calyx, cladodes less than 1 in.
long, capsule hairy

2. *H. tentaculatus.*

1. *H. verticillaris,* Nees in DC. *Prod. xi*, 513; *F. B. I. iv*, 506
Cooke Fl. Bomb. ii, 375. *Justicia verticillata*, Roxb. *Fl. Ind. i*, 135.

A herb, 1½—2½ ft. high. *Stem* glabrous at the base, more or less pubescent upwards. *Leaves* 2½—4 in. long, ovate, acuminate acute or sub-obtuse, hairy on the upper surface and on the nerves beneath, abruptly cuneate at the base; main nerves 8—10 pairs, prominent beneath, petioles 1—2 in. long. *Cladodes* (axillary spines) 1—1½ in. long, stout, 4-angled, enlarging in fruit, usually with 2 sharp spines at the apex, more or less glandular-pubescent and with spreading bristles towards the base. *Flowers* sessile amongst the verticils of cladodes; bracteoles longer than the calyx, subulate, finely pointed. *Calyx* ½ in. long, segments lanceolate, pointed, gland.-pubescent. *Corolla* ¾ in. long, minutely hairy outside, limb lilac with darker lines. *Capsule* about ½ in. long, narrowly oblong, acute, glabrous. *Seeds* ⅛—⅙ in. long.

Bundelkhand (Duthie), Ajmer (Lowrie). Flowers Dec. and Jan. **DISTRIB.:** From Mt. Abu in Rajputana and southwards to W. and S. India, also in Assam (Griffith).

2. *H. tentaculatus,* Nees in DC. *Prod. xi*, 513; *F. B. I. iv*, 507;
Cooke Fl. Bomb. ii, 376.

A slender gland.-pubescent herb. *Stems* 4-angular above. *Leaves* 2—4 in. long, ovate, acuminate, decurrent into the petioles; main nerves 8—10 pairs, petioles often obscure. *Cladodes* slender, ¼—¾ in. long, densely clothed with short hairs intermixed with longer ones, the apex furnished with 2 or 3 flattened villous teeth (reduced leaves). *Flowers* sessile amongst the cladodes; bracteoles subulate, shorter

than the calyx. *Calyx* $\frac{1}{2}$ in. long; segments linear-subulate, hairy. *Corolla* about $\frac{1}{2}$ in. long, blue lilac or white. *Capsule* $\frac{1}{2}$ in. long, oblong, pointed, hairy. *Seeds* smaller than those of *H. verticillaris*.

Found by Edgeworth in C. India at Mandu in the Dhár State, and just within the southern boundary of this flora. *DISTRIB.*: Gujarat, Deccan and Konkan.

17. PHLOGACANTHUS, Nees; Fl. Brit. Ind. iv, 510.

Shrubs or tall herbs. *Leaves* entire or obscurely crenate. *Flowers* in terminal thyrses or narrow panicles, rarely in axillary racemes or cymes; bracts small, bracteoles none. *Calyx* 5-partite, segments very narrow. *Corolla* tubular, curved upwards; tube narrowly funnel-shaped, limb more or less 2-lipped; lobes ovate or oblong, connivent, spreading or recurved, imbricate in bud. *Stamens* 2, with sometimes 2 small rudiments added; anthers 2-celled, oblong, mucous, glabrous. *Ovary* with 5—8 ovules in each cell, glabrous, style filiform, stigma subsimple. *Fruit* an elongated many-seeded capsule, somewhat 4-angled. *Seeds* from the base of the capsule, lenticular, ovate in outline, glabrous or densely puberulous.—Species about 12, Himalayan, also in Burma and Malaya.

P. thyrsiflorus, Nees in Wall. *Pl. As. Rar.* iii, 99; Royle *Ill.* 298; *F. B. I.* iv, 512; Watt *E. D.*; Kanjilal *For. Fl.* 260; Gamble *Man. Ind. Timb.* 523; Brand. *Ind. Trees* 501. *Justicia thyrsiflora*, Roxb. *Fl. Ind.* i, 114.

An evergreen shrub, upto 8 ft. high, with smooth grey bark; shoots swollen at the nodes, often tinged with dull purple, 4-angled. *Leaves* drooping, 6—8 in. long, elliptic-lanceolate, obtuse, subentire, dark green and glossy above, paler beneath and densely punctulate, petioles $\frac{1}{4}$ to 1 in. long. *Flowers* pedicelled, crowded in verticils of four, forming terminal elongate thyrsoid panicles up to 12 in. long; bracts subulate, conspicuous in bud, $\frac{1}{2}$ — $\frac{1}{4}$ in. long, arranged in threes, the 2 inner ones persistent; the outer larger, caducous. *Calyx-segments* $\frac{1}{2}$ — $\frac{1}{4}$ in. long, bristle-like, hairy. *Corolla* orange-coloured or brick-red, villous, tube laterally compressed; upper lip suberect, deeply emarginate; lower spreading, of 3 ovate acute lobes. *Anthers* dark-brown pollen white. *Capsule* $1\frac{1}{2}$ in. long, linear-clavate, glabrous. *Seeds* 12—14, densely hairy.

Common in moist shady places in the forests of Dehra Dun and Saharanpur, also on the Siwalik Range and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* Mar. and Apr. *DISTRIB.*: Subtrop. Himalaya up to 4,000 ft. from the Ravi to Bhutan, also in Assam, Chota Nagpur and extending to Upper and Lower Burma.

18. BARLERIA, Linn.; Fl. Brit. Ind. iv, 482.

Small shrubs or undershrubs, spinous or unarmed. *Leaves* opposite, entire. *Flowers* showy, sessile, solitary or in dense, or rather lax spikes or racemes, bracts and bracteoles large, small or none. *Calyx* deeply

4-partite; segments in opposite pairs, outer pair much larger. *Corolla* funnel-shaped, tube elongate; lobes 5, subequal, ovate or elliptic, imbricate in bud. *Stamens* 2, fertile, with oblong 2-celled anthers; 2 small rudimentary stamens sometimes containing a little pollen are also usually present, with often a rudimentary 5th stamen. *Disk* large, often as a toothed cup half enclosing the ovary. *Ovary* with 2 ovules in each cell, style long, stigma bifid or subentire. *Fruit* an ovoid or oblong capsule, 2- or 4-seeded below the middle. *Seeds* compressed, ovate, clothed with wavy silky closely appressed hairs.—Species about 120; mostly in Trop. Asia and Africa, a few in Trop. America.

Prickly shrubs or undershrubs:—

Outer calyx-segments ending in a spine, capsule 2-seeded

1. *B. Prionitis.*

Outer calyx-segments mucronate, not spine-tipped; capsule 4-seeded

2. *B. acanthoides.*

Unarmed shrubs or undershrubs:—

Outer calyx-segments subspinescently toothed on the margin, capsule 4-seeded

3. *B. cristata.*

Outer calyx-segments strigose with denticulate and ciliate margins, capsule 4-seeded

4. *B. strigosa.*

1. *B. Prionitis*, *Linn. Sp. Pl.* 636; *F. B. I. iv*, 482; *Watt E. D.*; *Gamble Man. Ind. Timb.* 522; *Prair Beng. Pl.* 812; *Cooke Fl. Bomb. ii*, 379. *Barleria Hystrix*, *Linn.*; *Royle Ill.* 298.

A bush, 2—5 ft. high, usually very prickly. *Stems* and branches terete or obscurely 4-angled, glabrous, bark white. *Leaves* petioled, about 4 in. long, elliptic, acuminate and tipped with a bristle, lineolate, glabrous or more or less pubescent beneath, tapering at the base, lower leaves distinctly petioled, main lateral nerves about 5 pairs, interpetio- lar spines $\frac{1}{4}$ — $\frac{3}{4}$ in. long. *Flowers* in terminal spikes, the lower ones often distant; bracts leaf-like, about $\frac{5}{8}$ in. long, oblong or oblong-lanceolate, acute and ending in a bristle, glabrous; bracteoles $\frac{1}{2}$ in. long, narrower and almost spine-tipped. *Calyx* divided nearly to the base; 2 outer segments about $\frac{1}{2}$ in. long, oblong-lanceolate, spine-tipped; the 2 inner shorter, linear-lanceolate, mucronate. *Corolla* orange-yellow or cream-coloured, somewhat 2-lipped, $1\frac{1}{4}$ — $1\frac{3}{4}$ in. long, sparingly hairy outside; upper lip with 4 nearly equal rounded lobes, lower lip rather shorter, tube about as long as the upper lip. *Capsule* $\frac{3}{4}$ —1 in. long, with a tapering solid beak, 2-seeded. *Seeds* $\frac{1}{2}$ in. in diam.

Common within the area, and often used as a hedge-plant. *Flowers* Oct.—Jan. *DISTRIB.*: Throughout the hotter parts of India, also in Ceylon, Burma and the Malay Peninsula, extending to Trop. and S. Africa. The juice of the leaves and the roots are used medicinally by the natives in some parts of India.

2. *B. acanthoides*, *Vahl. Symb. i*, 47; *F. B. I. iv*, 484; *Cooke Fl. Bomb. ii*, 381.

A small prickly much-branched undershrub; branches terete, hoary-pubescent. *Leaves* sessile or shortly petioled, hairy, dark-green, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, oblong or obovate, obtuse, mucronate, tapering to the base, main lateral nerves 5 pairs. *Inflorescence* of dense unilateral racemes or reduced to a solitary flower; bracts $\frac{1}{2}$ — $\frac{3}{4}$ in. long, spine-pointed,

sometimes spinous, pinnatifid or reduced to pinnatifid spines. *Calyx-segments* glabrate, strongly nerved and soon becoming scarious; outer pair $\frac{5}{8}$ in. long; broadly ovate, acute, mucronate; inner pair smaller, lanceolate. *Corolla* white, hairy outside, $2\frac{1}{2}$ — $3\frac{1}{2}$ in. long; tube cylindrical, dilated just below the limb; lobes ovate, $\frac{1}{3}$ in. long. *Capsule* ellipsoid, glabrous, 4-seeded. *Seeds* $\frac{1}{2}$ in. long, silky-hairy.

Dry hills in Merwára (Duthie) (Oct. to Jan.). **DISTRIB.:** Punjab, Rajputana, Sind; extending to Baluchistan, Abyssinia, Nubia and Egypt.

3. *B. cristata*, Linn. *Sp. Pl.* 636; Roxb. *Fl. Ind.* iii, 37; Royle III. 298; F. B. I. iv, 488; Watt E. D.; Kanjilal For. Fl. 262; Gamble Man. Ind. Timb. 522; Collett Fl. Siml. 374; Prain Beng. Pl. 812; Cooke Fl. Bomb. ii, 382. *B. dichotoma* and *B. ciliata*, Roxb. l.c. 38.

A small erect or diffuse undershrub, the branches clothed with appressed yellowish hairs, the nodes densely hairy. *Leaves* $2\frac{1}{2}$ —4 in. long, elliptic-oblong, acute, tapering towards the base, hairy on both surfaces, lineolate above, petioles $\frac{1}{8}$ — $\frac{1}{2}$ in. long. *Flowers* in axillary and terminal ovate spikes; bracteoles conspicuous, about $\frac{1}{2}$ in., linear, acute, membranous and prominently veined; margins ciliate, sometimes with distant teeth. *Calyx* hairy below; segments $\frac{3}{4}$ —1 in. long, whitish, prominently veined and reticulate, the 2 outer segments lanceolate, acuminate, mucronate, marginal teeth bristle-tipped; inner segments $\frac{1}{2}$ in. long, linear-lanceolate, acute. *Corolla* blue purple or white, 1— $1\frac{1}{2}$ in. long, hairy outside, tube funnel-shaped in the upper half; lobes $\frac{3}{4}$ in. obovate-oblong. *Capsule* $\frac{3}{4}$ in. long, ellipsoid, 4-seeded. *Seeds* orbicular, covered with silky hairs.

Found chiefly in the northern portion of the area from Dehra Dun eastwards along the Sub-Himalayan tracts of Rohilkhand and W. Oudh and in the district of Gorakhpur. It has been reported also from Bundelkhand (Edgeworth) and Merwára (Duthie). Owing to its ornamental appearance it is largely grown in gardens. In the plains it flowers mostly during the cold season. **DISTRIB.:** Himalaya upto 6,000 ft. in Garhwal and Kumaon, also in Bengal, Khasia and Burma and in the hilly parts of W., C. and S. India. It is cultivated in gardens in various parts of India and in other countries. Various parts of this plant are used medicinally, and by some natives the seeds are regarded as an antidote for snake-bites. Roxburgh's *B. dichotoma* has white flowers. It is cultivated in gardens, and is sometimes found planted near Hindu temples. It is mentioned by Prain and Cooke as a variety of *B. cristata*. There is no record of its having been met with in a wild state within the area of this flora.

4. *B. strigosa*, Willd. *Sp. Pl.* iii, 379; F. B. I. iv, 489; Watt E. D.; Kanjilal For. Fl. 262; Gamble Man. Ind. Timb. 522; Prain Beng. Pl. 812; Cooke Fl. Bomb. ii, 384 (under var. *terminalis*); Brandis Ind. Trees 498. *B. cœrulea*, Roxb.; Fl. Ind. iii, 39.

An unarmed shrub, 3—4 ft. high. *Stems* more or less strigose with fulvous hairs. *Leaves* 4—6 in. long, ovate or elliptic, acute or acuminate the base long-decurrent on the petiole, lineolate and sparingly fulvous strigose on the upper surface, densely strigose on

the nerves and veins beneath and with bulbous-based hairs intermixed, margins ciliate main lateral nerves 6—8 pairs. *Flowers* in dense fulvous-hairy unilateral spikes, often crowded at the tops of the branches; bracteoles about $\frac{1}{2}$ in. long, lanceolate, hairy on the back and with ciliate margins. *Calyx* densely strigose; outer segments subequal, $\frac{3}{4}$ —1 in. long, elliptic-lanceolate, sub-acute, margins denticulate and ciliate; inner smaller, linear, acute, densely clothed with white appressed silky hairs. *Corolla* $1\frac{1}{2}$ —2 in. long, blue; tube pale-blue, upper part funnel-shaped; lobes obovate-oblong, obtuse. *Capsule* $\frac{3}{4}$ in. long, acute at the top, 4-seeded, glabrous. *Seeds* silky-hairy.

Plentiful in Dehra Dun, on the Siwalik Range and in the Sub-Himalayan tracts eastwards. Flowers during the cold season. **DISTRIB.:** Bengal, Assam and Sikkim, extending to Burma; also in the Bombay Pres. and S. India. Cultivated in gardens. The root is used by the Santals as a remedy for coughs.

19. ASYSTASIA, Blume; Fl. Brit. Ind. iv, 492.

Herbs or undershrubs. *Leaves* entire. *Flowers* in lax or dense usually 1-sided simple or compound spikes or racemes; bracts and bracteoles linear, usually shorter than the calyx. *Calyx* deeply 5-partite; segments equal, linear or linear-lanceolate. *Corolla-tube* inflated above; lobes 5, subequal, imbricate in bud. *Stamens* didynamous, all perfect; anthers oblong, cells parallel, approximate, minutely spurred at the base or submuticous. *Ovary* with 2 ovules in each cell; style linear, very hairy, stigma minutely bifid or subcapitate. *Fruit* an elliptic-clavate capsule, its base contracted and solid. *Seeds* 4, compressed suborbicular or irregularly angled, rugose or tuberculate, glabrous.—Species about 34, in tropical regions of the Old World.

A. macrocarpa, Nees in Wall. Pl. As. Rar. iii, 89; F. B. I. iv, 495
Prain Beng. Pl. 813.

A diffuse rambling hairy undershrub. *Stems* 1—4 ft., obtusely 4-gonous. *Leaves* about $4\frac{1}{2}$ in long, petioled, oblong or lanceolate, narrowed at both ends, hairy on both sides, margins subrepand, main lateral nerves 8 pairs, petioles $\frac{1}{3}$ in. long. *Racemes* usually condensed and 1-sided; sometimes 3—4 in. long, erect, somewhat lax and with the lower flowers opposite, lower pedicels upto $\frac{1}{2}$ in. long, bracts $\frac{1}{3}$ in. long. *Calyx-segments* $\frac{1}{4}$ in. long, linear-lanceolate, pubescent. *Corolla* $1\frac{1}{4}$ in. long, dull-pink, pubescent, cylindrical base of tube much shorter than the ventricose portion. *Anther-cells* distinctly spurred at the base. *Capsule* $1\frac{1}{3}$ in. long, pubescent, its solid base $\frac{2}{3}$ in. long. *Seeds* $\frac{1}{4}$ in. in diam., tubercled and rugose.

Dehra Dun (Gamble). **DISTRIB.:** W. Himalaya upto 4,000 ft. in Kumaon, also in N. Bengal.

20. LEPIDAGATHIS, Willd.; Fl. Brit. Ind. iv, 515.

Herbs or undershrubs, often pubescent. *Leaves* entire or crenate-serrate. *Flowers* sessile, usually capitate, sometimes opposite or soli-

tary; heads terminal or axillary, almost always dense, often 1-sided, sometimes fascicled; bracts usually conspicuous, bracteoles smaller. *Calyx* deeply 5-lobed; segments unequal, the 2 anterior often more or less connate, the calyx becoming almost 4-partite. *Corolla* usually small, 2-lipped; tube slender below, suddenly swollen at or above the middle; upper lip erecto-patent, usually notched or 2-fid, lower lip with 3 spreading usually spotted lobes. *Stamens* didynamous, included; anthers all 2-celled; cells oblong, mucicous, frequently bearded, one of them often attached higher up than the other. *Disk* annular. *Ovary* with 2 ovules (rarely 1) in each cell, style recurved, stigma capitate, shortly 2-lobed or entire. *Fruit* a compressed ovoid-oblong lanceolate capsule. *Seeds* 2 or 4, compressed, ovate-oblong or orbicular, hairy.—Species about 80, in the warmer regions of the world, but in America two only are known.

Capsule 2-seeded, bursting irregularly, seeds clothed with long hairs:—

Calyx-lobes spinescent

1. *L. Hamiltoniana*.

Calyx-lobes not spinescent

2. *L. trinervis*.

Capsule 4-seeded, distinctly 2-valved, seeds clothed with short hairs:—

An erect undershrub, bracts and calyx-segments glandular-hairy

3. *L. cuspidata*.

Diffuse or prostrate herbs, rarely sub-erect:—

Bracts striate

4. *L. purpuricaulis*.

Bracts not striate

5. *L. hyalina*.

1. *L. Hamiltoniana*, *Wall. Pl. As. Rar. iii, 96; F. B. I. iv, 516; Watt E. D. (under *L. cristata* var. *rupestris*); Prain Beng. Pl. 815.*

A perennial herb. *Stems* elongate, flagelliform, leafy upwards. *Leaves* 5—6 in. long, linear or narrowly oblong, subfalcate, nearly glabrous, margins scabrous. *Spikes* in globular heads, arising from the base of the stems; bracts upto $\frac{1}{2}$ in. long, lanceolate, acuminate, spinescent, margins ciliate with long white spreading hairs. *Calyx-segments* membranous, tough, lanceolate, acuminate, spinescent, not thickened upwards, the lower one broader and bifid. *Corolla* strigose outside with white hairs, spotted with brown inside. *Capsule* 2-seeded, conical, scarious on the back, thin and irregularly rupturing. *Seeds* ovate, covered with long hairs.

Found usually in dry situations as in the Jumna ravines near Etawah and Agra; also in Bundelkhand, Ajmer and in the Gonda district of N. Oudh. Flowers during the cold season. **DISTRIB.:** Behar, Chota Nagpur and southwards to Chanda in the C. Provinces.

2. *L. trinervis*, *Nees in Wall. Pl. As. Rar. iii, 96; F. B. I. iv, 517; Prain Beng. Pl. 815; Cooke Fl. Bomb. ii, 393.*—Vern. *Pattar-phor* (Merwára).

A diffuse perennial herb, woody below; branches many, 5—10 in. long, slender, 4-angled. *Leaves* sessile, 1—1 $\frac{1}{4}$ in. long, linear, subacute, entire, nearly glabrous, 3-nerved from a tapering base, margins scabrous. *Flowers* in axillary ovoid spikes $\frac{1}{2}$ — $\frac{3}{4}$ in. long, usually 2 or more spikes closely packed together and forming what appears to be a single head; bracts under $\frac{1}{2}$ in. long, ovate or obovate, tipped with a

long recurved spine; bracteoles as long as the bracts, oblong-lanceolate, aristate, softly membranous. *Calyx* membranous, $\frac{3}{8}$ in. long; 3 outer segments nearly equal in length, lanceolate, acute, not spine-pointed, nearly glabrous outside, very hairy within; the 2 inner lateral segments shorter and narrower, hairy on both sides. *Corolla* white with yellow brown or purple spots, $\frac{1}{4}$ — $\frac{1}{3}$ in. long. *Capsule* 2-seeded, $\frac{1}{4}$ in. long, ovoid-lanceolate, subacute, thin and bursting irregularly. *Seeds* covered with long hairs.

Frequent in Merwára in dry rocky or sandy ground. Flowers in the cold season. **DISTRIB.:** N.-W. Himalaya? (Herb. Falconer), Chota Nagpur and at the base of the Sikkim Hills, extending to Central, W. and S. India.

3. *L. cuspidata*, *Nees in Wall. Pl. As. Rar. iii, 97; F. B. I. iv, 519; Cooke Fl. Bomb. ii, 396.*

An erect undershrub. *Stems* 1—3 ft. high; branches 4-angled, often gland-pubescent upwards. *Leaves* of main stem 3—4 $\frac{1}{2}$ in. long, oblong-lanceolate, acute or acuminate, usually mucronate, glabrous or nearly so, tapering at the base and decurrent into the petiole; leaves of the branches sessile and much smaller, elliptic-lanceolate, spinous pointed, softly hairy. *Spikes* terminal or terminating short axillary branches, varying in length according as the flowers are densely or loosely arranged, and if the latter, the flowers are distinctly in opposite pairs; bracts about $\frac{1}{2}$ in. long, elliptic or obovate, acute, spine-tipped, 3—5-nerved, gland-hairy; bracteoles smaller, 1—3-nerved. *Calyx* about $\frac{1}{2}$ in. long, glandular-hairy; outer segments longer, broader than the inner, spine-tipped; the 2 inner lateral segments linear acute. *Corolla* white streaked with purple; upper lip ovate, acute; lower lip with rounded lobes, palate glabrous. *Capsule* 4-seeded, $\frac{1}{2}$ in. long, ovoid-lanceolate, acute, glabrous. *Seeds* clothed with short hairs, especially along the margins.

Dehra Dun and Siwalik Range, Hardwar (Wallich), and along the Sub-Himalayan tracts eastwards to Gonda and the Nepal Terai. Flowers March—May. **DISTRIB.:** W. Himalaya upto 5,000 ft. in Kumaon, extending to C. and W. India.

4. *L. purpuricaulis*, *Nees in Wall. Pl. As. Rar. iii, 96; F. B. I. iv, 519, Prain Beng. Pl. 815.*

A suberect or diffuse perennial herb. *Stems* 8—24 in. long, glabrous or hairy, 4-angled, often tinged with purple. *Leaves* 1—5 in. long, lanceolate, glabrous or sparingly hairy, often in unequal pairs, the larger attenuate at each end, the smaller subovate. *Spikes* $\frac{1}{2}$ —1 $\frac{1}{2}$ in. long, dense, axillary, sessile, solitary or clustered, oblong; bracts $\frac{1}{2}$ in. long, lanceolate, or ovate lanceolate, mucronate, striate, glandular hairy; bracteoles $\frac{1}{4}$ in. long, linear-falcate. *Calyx* glandular-pubescent, with one broad lanceolate segment $\frac{1}{4}$ — $\frac{1}{2}$ in. long, the 2 outer lateral ones linear-lanceolate; $\frac{1}{4}$ in. long, the 2 inner ones linear. *Corolla* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, white with brownish spots on the palate. *Capsule* $\frac{1}{2}$ in. long, 4-seeded.

Dehra Dun (Gamble), Hardwar (Wallich). **DISTRIB.:** Sub-tropical W. Himalaya, up to 4,000 ft. in Kumaon, Chota Nagpur, extending to the Prome Hills in Burma.

5. *L. hyalina*, Nees in Wall. Pl. As. Rar. iii, 95; F. B. I. iv, 521; Prain Beng. Pl. 815. *Ruellia dependens*, Roxb. Fl. Ind. iii, 49.

A suberect perennial herb, 1–2 ft. high, or the stems often somewhat prostrate. *Leaves* about 3 in. long, minutely glandular-hairy, scabrous on the nerves beneath; lower ovate; upper narrower, pendent, petioles $\frac{1}{2}$ in. long. *Spikes* oblong, dense, axillary and terminal, often clustered, softly hairy; bracts nearly $\frac{1}{2}$ in. long, lanceolate, acuminate, mucronate; bracteoles $\frac{1}{3}$ in. long, narrower. *Calyx* $\frac{1}{3}$ in. long, linear-lanceolate, mucronate, outer segments longest. *Corolla* $\frac{1}{4}$ in. long, white with brown spots on the palate. *Capsule* $\frac{1}{2}$ in. long, 4-seeded.

Abundant within the area and especially in the Sub-Himalayan tracts. **DISTRIB.:** Outer Himalayan ranges from the Punjab eastwards, upto 4,000 in Kumaon; also in Bengal, N. Assam and Burma, extending to China.

VAR. *mollis*, F. B. I. iv, 521; Prain Beng. Pl. 816.—Leaves all ovate, hairy on both surfaces.—Sub-Himalayan tracts, common.—**DISTRIB.:** N. Bengal.

VAR. *ustulata*, F. B. I. iv, 521. *L. ustulata*, Nees.—A small suberect plant up to 6 in. high. *Leaves* thick, $\frac{1}{2}$ –1 in. long, ovoid or broadly ovate, acute or subobtus, almost glabrous above, more or less pubescent on the prominent nerves beneath. *Spikes* $\frac{1}{2}$ –1 in. long, bracts rather larger than in the type. Common in the Sub-Himalayan tracts from Bijnor to Gorakhpur (Duthie); also in Bundelkhand. **DISTRIB.:** W. Himalaya from Kashmir to Kumaon ascending to 4,000 ft.—Considerably less hairy than the type or than any other of its varieties and of very different habit. The Gorakhpur specimens are more erect, and the bracts are deeply tinged with purple. The roots are very stout and sometimes almost tuberous, a condition which has been observed in many other perennial plants of the fire-exposed tracts of country.

21. **ECBOLIUM**, Kurz.; Fl. Brit. Ind. iv, 544.

Glabrous or hairy shrubs. *Leaves* entire. *Flowers* in dense terminal spikes; bracts large, imbricate; bracteoles small, linear or lanceolate. *Calyx* 5-partite, segments linear. *Corolla* 2-lipped; tube (in the Indian species) long, linear; upper lip entire or 2-fid, 3-lobed. *Stamens* 2, staminodes none; anthers 2-celled; cells parallel, subequal, not spurred at the base. *Ovary* glabrous or hairy, ovules 2 in each cell, style filiform, stigma shortly 2-fid. *Fruit* an ovoid compressed capsule, with a solid stalk, usually 2-seeded, placentas not rising elastically from the base of the valves. *Seeds* (in the Indian species) large, ovoid or orbicular, compressed, tubercular-scabrous, not hairy.—Species 12, one in India, the rest in Africa, Madagascar and Arabia.

This genus is distinguished from *Justicia* by having the anther-cells at about the same level; and its alliance with that genus is through *J. Adhatoda*, in which the anther-cells are not spurred.

E. Linneanum, Kurz. VAR. **dentata**, C. B. Clarke in *F. B. I.* iv, 545; *Prain Beng. Pl.* 816. *Justicia Ecbolium*, Linn.; *Roxb. Fl. Ind.* i, 114.

A small glabrescent undershrub. *Stems* swollen above the nodes. *Leaves* up to 6 in. long, ovate or lanceolate, acute or subobtusate, tapering at the base into a short petiole, dark-green above, paler beneath. *Spikes* dense, 2—6 in. long; bracts about $\frac{3}{4}$ in. long, obovate-rhomboid, acute or subacuminate, pubescent or puberulous, pale-green; margin more or less toothed, ciliate. *Calyx-segments* $\frac{1}{2}$ in. long, linear-lanceolate, acute. *Corolla* bluish-green, hairy outside. *Capsule* $\frac{2}{3}$ —1 in. long, puberulous; seed-bearing portion broad, acute at the apex; stalk $\frac{1}{4}$ — $\frac{1}{3}$ in. long, solid.

Gorakhpur district, in the fire-exposed tracts (Duthie). Flowers in March and April. **DISTRIB.**: E. Bengal and Assam, extending to Trop. Africa and Madagascar. The Gorakhpur specimens, owing to local conditions are considerably dwarfed, and the main roots are developed into hard fusiform tubers similar to those of *Ruellia suffruticosa* and of other perennial plants inhabiting fire-exposed ground.

22. JUSTICIA, Linn.; Fl. Brit. Ind. iv, 524.

Herbs or shrubs. *Leaves* opposite, entire. *Flowers* sessile or nearly so, in spikes or panicles, rarely solitary; bracts usually small; bracteoles narrow, obsolete or none. *Calyx* 5- or 4-partite, segment narrow. *Corolla* 2-lipped, tube equalling or shorter than the limb, upper lip 2-lobed or subentire; lower 3-lobed, lobes imbricate in bud. *Stamens* 2, attached to the upper part of the corolla-tube; anthers 2-celled, one cell usually higher up than the other, the lower with a white spur-like appendage at the base (except in *J. Adhatoda*). *Ovary* with 2 ovules in each cell, style filiform, stigma shortly bifid. *Fruit* an ovoid or ellipsoid capsule, seed-bearing from the base or narrowed into a solid stalk and 4-seeded at the apex. *Seeds* ovoid, more or less compressed, tuberculate scaly or glochidiate, not hygroscopically hairy. Species about 300, in all warm regions.

Lower cells of anthers without a basal spur .

1. *J. Adhatoda*.

Lower cells of anthers distinctly spurred at the base:—

Calyx 5-partite, corolla $\frac{1}{2}$ in. long or more.—Undershrubs:—

Stems decumbent, flowers white with pink spots

2. *J. Betonica*, var. *ramosissima*.

Stems erect, softly hairy, leaves hairy beneath, flowers salmon-coloured .

J. Betonica, var. *villosa*.

Calyx 4-partite, corolla $\frac{1}{2}$ in. long or less.—Prostrate herbs:—

Leaves linear or linear-lanceolate, sessile or nearly so, bracteoles and sepals linear-oblong, obtuse, glabrous

3. *J. quinqueangularis*.

Leaves elliptic, oblong or ovate, petioled:—

Bracteoles and sepals linear-oblong, obtuse, glabrous

J. quinqueangularis,
var. *peploides*.

Bracteoles and sepals lanceolate, acute or acuminate:—

Sepals minutely scabrous near the tips otherwise glabrous

4. *J. diffusa*.

Sepals hairy, the margins scarious and densely ciliate

5. *J. simplex*.

1. *J. Adhatoda*, *Linn. Sp. Pl. 15*; *Roxb. Fl. Ind. i, 126*. *Adhatoda Vasica*, *Nees*; *Royle Ill. 298*; *F. B. I. iv, 540*; *Watt E. D.*; *Comm. Prod. Ind. p. 5*; *Kanjilal For. Fl. 261*, *Gamble Man. Ind. Timb. 523*; *Collett Fl. Siml. 317*; *Prair Bengal. Pl. 819*; *Cooke Fl. Bomb. ii, 414*—*Vern. Arusa, bānsa, bakas, etc.*

A dense evergreen often gregarious shrub, 4—8 ft. high. *Stem* with yellowish bark, terete, glabrous; branches many, ascending. *Leaves* 5—8 in. long, elliptic-lanceolate, acuminate, tapering to the base, minutely puberulous, dark-green above when young, pale beneath, main lateral nerves 8—12 pairs, veins reticulate, petioles $\frac{1}{2}$ —1 in. long. *Flowers* in short dense axillary peduncled spikes 1—3 in. long, arranged towards the ends of the branches; peduncles stout, shorter than the leaves; bracts up to $\frac{2}{3}$ in. long, elliptic, subacute, glabrous or nearly so, 5—7-nerved, closely reticulate; bracteoles $\frac{1}{2}$ in. long, 1-nerved, margins ciliate. *Calyx* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, often slightly pubescent; segments equal, oblong-lanceolate, acute, 3-nerved. *Corolla* white with pink or purple stripes in the throat, $1\frac{1}{4}$ in. long, hairy outside; tube $\frac{1}{2}$ in. long, upper half much inflated laterally; upper lip curved, ovate-oblong, notched; lower lip as long as the upper; lobes oblong, rounded. *Filaments* hairy at the base, the lower anther-cells apiculate (not spurred) at the base. *Ovary* and lower portion of style hairy. *Capsule* $\frac{1}{4}$ in. or more in length, clavate, pubescent. *Seeds* suborbicular, tubercular verrucose.

Abundant in all parts of the area, especially in Dchra Dun and throughout the Sub-Himalayan tracts eastwards. It is often cultivated near villages, and sometimes in the form of hedges. Flowers chiefly after the rainy season. **DISTRIB.**: Throughout India and in Ceylon, ascending to 4,500 ft. on the Himalaya; it is found also in Burma and in the Malay Peninsula and Archipelago. All parts of the plant have a bitter taste and possess pronounced medicinal properties, and this may account for the fact of its not being eaten by goats. The charcoal prepared from the wood is used for making gunpowder, and in Bengal the wood is sometimes manufactured into beads. The leaves yield a yellow dye; they are also much used in some parts of India as a manure, with the idea of ridding the ground of noxious insects; but, apart from this, the leaves containing as they do, a large amount of potassium nitrate must add considerably to the fertility of the soil. The absence of a spur at the base of the lower anther-cells connects this species with the genus *Ecbolium*.

2. J. Betonica, Linn. *Sp. Pl.* 15, VAR. **ramosissima**, F. B. I. iv, 525; *Prain Beng. Pl.* 817; *Cooke Fl. Bomb.* ii, 407. *J. ramosissima*, Roxb. *Fl. Ind.* i, 129. *Adhatoda ramosissima*, Nees.

A diffusely branched undershrub; branches more or less decumbent and often rooting at the lower nodes, cylindric, often tinged with purple above the nodes, slightly pubescent when young. *Leaves* 2—4 in. long, ovate or lanceolate, subobtusely, entire or slightly toothed, glabrous pale-green, petioles up to $\frac{1}{4}$ in. long. *Spikes* 1—5 in. long, usually terminal, simple or branched; bracts white veined with green, about $\frac{1}{2}$ in. long, lanceolate, acute, glabrous; bracteoles narrower, unequal at the base, glabrous except the ciliolate margins. *Calyx* deeply 5-partite, $\frac{1}{8}$ in. long, pubescent; segments linear-lanceolate, acute. *Corolla* dull-white, veined and spotted with pink. *Filaments* hairy at the base, lower cells of anthers acutely spurred. *Capsule* $\frac{3}{8}$ in. long, widely clavate at the top and protuberant above the seeds. *Seeds* 4, nearly spherical, intensely rugose.

Widely distributed within the area. **DISTRIB.:** Throughout the warmer parts of India. This differs from the type by its more bushy habit, and its spreading decumbent branches often strike root at the nodes; also the bracts are narrower and less conspicuously white.

VAR. villosa, F. B. I. iv, 525; *Prain Beng. Pl.* 817.—An erect shrub with softly hairy stems. *Leaves* densely hairy beneath. *Flowers* salmon-coloured.—Found in the southern portion of the area. **DISTRIB.:** Common in Chota Nagpur and in Central India.

3. J. quinqueangularis, Koen. ex Roxb. *Hort. Beng.* 80; *Fl. Ind.* i, 133; F. B. I. iv, 536; *Prain Beng. Pl.* 818; *Cooke Fl. Bomb.* ii, 411.

A slender glabrous somewhat prostrate herb. *Stems* often reaching 2 in., angular, geniculate and with distant internodes. *Leaves* shortly stalked, 1—3 in. long, linear or linear-lanceolate, obscurely lineolate, glabrous. *Spikes* 1—5 in. long, terminal, slender, glabrous; bracts $\frac{1}{2}$ in. long, linear, obtuse, glabrous, the margins as also of the bracteoles and calyx-segments scarious; bracteoles similar to the bracts, but narrower. *Calyx* as long as the bracts, 4-partite; segments linear, obtuse. *Corolla* rose-coloured, $\frac{1}{4}$ — $\frac{3}{8}$ in. long, glabrous or slightly hairy outside; upper lip $\frac{1}{2}$ in. long, notched; lower lip rather longer, suborbicular, shortly 3-lobed. *Filaments* glabrous. *Ovary* glabrous. *Capsule* $\frac{1}{2}$ in. long, oblong, pointed, tapering to the base, glabrous. *Seeds* 4, reticulately rugose.

Abundant throughout the Upper Gangetic Plain. **DISTRIB.:** From the plains of the Punjab and Bengal southwards to C. and S. India.

VAR. peploides, F. B. I. iv, 537; *Prain Beng. Pl.* 818; *Cooke Fl. Bomb.* ii, 411.—A prostrate herb, usually more branched than the type. *Leaves* oblong or elliptic-oblong, petioles up to $\frac{3}{8}$ in. long. *Spikes* shorter and broader. Common within the area. **DISTRIB.:** Plains of Punjab and Bengal and southwards to C. and W. India, extending to Afghanistan.

4. **J. diffusa**, Willd. *Sp. Pl.* i, 87; *F. B. I.* iv, 538; *Prain Beng. Pl.* 818; *Cooke Fl. Bomb.* ii, 410. *J. procumbens*, Linn. (*in part*); *Roxb. Fl. Ind.* i, 132.

A diffuse much-branched herb. *Stems* somewhat 4-angled, 1—2 ft. high, slightly woody below. *Leaves* 1—2 in. long, ovate or elliptic-lanceolate, acute or acuminate, lineolate on both sides, glabrous or nearly so, base acute, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* in slender axillary and terminal spikes 1—6 in. long; bracts linear-lanceolate or linear, shorter than the calyx, ovate, acuminate, margins scarious, tips minutely scabrous; bracteoles similar to the bracts, but narrower. *Calyx* $\frac{1}{2}$ in. long, 4-partite nearly to the base; segments unequal, lanceolate, acute, minutely scabrous upwards. *Corolla* $\frac{1}{2}$ in. long, pink or pale-purple, slightly hairy outside. *Filaments* hairy at the base. *Ovary* glabrous, style hairy below. *Capsule* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, oblong, shortly pointed, glabrous. *Seeds* obscurely rugose.

Abundant within the area. **DISTRIB.:** Plains of the Punjab, Sind and Bengal extending to S. India and Ceylon, also in Burma and Siam.

5. **J. simplex**, D. Don. *Prod.* 118; *F. B. I.* iv, 539; *Collett Fl. Siml.* 375; *Prain Beng. Pl.* 818; *Cooke Fl. Bomb.* ii, 411.

A slender erect or prostrate herb. *Stems* 6—20 in.; branches 4-angular, more or less hairy. *Leaves* petioled, 1—2 in. long, ovate or elliptic-oblong, obtuse, glabrous or hairy, strongly lineolate. *Flowers* in dense axillary and terminal spikes 1—4 in. long; bracts about as long as the calyx, elliptic, subacute, hairy; margins scarious, ciliate with jointed hairs; bracteoles similar, but narrower. *Calyx* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, deeply partite; segments unequal in length, linear, subacute; margins scarious, densely ciliate. *Corolla* pale-purple, $\frac{1}{2}$ — $\frac{3}{4}$ in., hairy outside, tube equalling the limb. *Filaments* hairy at their insertion. *Ovary* at the apex and base of style hairy. *Capsule* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, oblong, obtuse, hairy at the top. *Seeds* rugose.

Common within the area of this flora. *Flowers* during the cold season. **DISTRIB.:** W. Himalaya from Kashmir to Kumaon up to 7,000 ft. also from the Punjab plain, Sind and Bengal to Central and W. India, extending to Abyssinia, the Malay Archipelago and the Loochoo Inlands.

J. GENDARUSSA, *Burm.*; *Roxb. Fl. Ind.* i, 128; *F. B. I.* iv, 532; *Watt E. D.*; *Prain Beng. Pl.* 818; *Cooke Fl. Bomb.* ii, 412.—Vern. *Jagat madan*.—A small erect evergreen shrub, tinged with purple and strongly scented. *Leaves* lanceolate, glabrous. *Flowers* in interrupted spikes. *Corolla* white or pink with purple spots. Common in gardens within the area and in other parts of India and in Ceylon. It is often met with as an escape. Probably introduced from China.

23. PERISTROPHE, Nees; *Fl. Brit. Ind.* iv, 554.

Erect spreading herbs. *Leaves* entire. *Flowers* purple or rose-coloured, in axillary or terminal clusters, often panicled by the reduction of the floral leaves; bracts 1—4 together, linear or ovate, usually

longer than the calyx. *Calyx* 5-partite; segments equal, linear-lanceolate. *Corolla* 2-lipped, tube slender, upper lip subentire, lower shortly 3-lobed. *Stamens* 2, filaments pubescent below; anthers 2-celled; cells linear, rarely ovoid, mucicous, one higher up than the other. *Ovary* with 2 ovules in each cell, style filiform, stigma shortly bifid. *Fruit* an ellipsoid stipitate capsule, usually 4-seeded, pubescent; placentas not separating elastically. *Seeds* ovoid, compressed, minutely glandular-papillose.—Species about 20, in the warmer regions of the world.

P. bicalyculata, Nees in Wall. *Pl. As. Rar.* iii, 113; *F. B. I.* iv, 554; *Watt E. D.*; *Cooke Fl. Bomb.* ii, 415; *Justicia bicalyculata*, Vahl; *Roxb. Fl. Ind.* i, 126.

An unattractive-looking herb, 3—4 ft. high. *Branches* 6-angled, hairy, the angles more or less scabrous. *Leaves* 2—3 in. long, ovate, acuminate, strongly lineolate, sparsely hairy above, densely so on the nerves and veins beneath, base rounded, main lateral nerves 4—6 pairs, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* in 3-chotomous cymes forming large lax divaricate hairy panicles; bracts 2, unequal, opposite, $\frac{1}{4}$ — $\frac{3}{8}$ in. long, linear, acute, mucronate; margins membranous, white; bracteoles 4, smaller. *Calyx* $\frac{1}{8}$ — $\frac{1}{6}$ in. long, segments with ciliate margins. *Corolla* pink, $\frac{1}{3}$ — $\frac{1}{2}$ in. long, hairy outside; upper lip entire, obtuse; lower rather longer, with 3 acute lobes. *Filaments* hairy. *Capsule* $\frac{1}{2}$ in. long, pointed, narrowed below into a stalk. *Seeds* papillose, slightly rugose.

A very common plant within the area. **DISTRIB.:** Throughout the warmer parts of India, but not in Ceylon; outer Himalayan ranges up to 6,000 ft. in Kumaon; also in Afghanistan and Trop. Africa. The plant is regarded by natives as a remedy for snake-bites.

24. RUNGIA, Nees; *Fl. Brit. Ind.* iv, 545.

Erect or diffuse herbs or shrubs. *Leaves* entire. *Flowers* in dense terminal or axillary 1-sided spikes; bracts in 2 or 4 rows, two of the rows often flowerless, the flowering bracts often with scarious margins, bracteoles narrower than the bracts. *Calyx* small, 5-partite; segments linear-lanceolate. *Corolla* small, 2-lipped; upper lip acute or emarginate; lower longer, 3-lobed. *Stamens* 2; anthers 2-celled, parallel or often superposed; lower cell, mucicous or with a white basal appendage. *Ovary* with 2 ovules in each cell, style filiform, stigma bifid. *Fruit* an ovoid or oblong shortly stalked capsule, placentas and retinacula elastically separating from the base of the capsule after dehiscence. *Seeds* normally 4, compressed, orbicular, glabrous, minutely tuberculate, often concentrically rugose—Species about 30, in the warmer parts of the Old World.

Bracts uniform; corolla white or violet with purple spots,
upper lip emarginate

1. *R. repens*.

Bracts dimorphic; corolla white with blue lines, not spotted,
upper lip entire

2. *R. parviflora* var.
pectinata.

1. **R. repens**, *Nees in Wall. Pl. As. Rar. iii, 110; F. B. I. iv, 549; Watt E. D.; Prain Beng. Pl. 821; Cooke Fl. Bomb. ii, 401.* *Justicia repens, Roxb. Fl. Ind, i, 132.*

Stems decumbent and rooting near the base, slender and erect above, glabrous or slightly hairy. *Leaves* nearly sessile, 1—2 in. long, oblong, lanceolate, acute, lineolate on both surfaces, sparsely hairy; base tapering, or sometimes rounded and unequal-sided. *Flowers* in erect terminal pubescent spikes 1—2½ in. long; bracts ¼ in. long, broadly elliptic, cuspidate; margins scarious, ciliate; bracteoles smaller, linear-lanceolate, acute, puberulous, margins scarious. *Calyx* ½ in. long deeply divided; segments lanceolate-subulate, pubescent. *Corolla* ¼—½ in. long, white or violet with purple spots in the throat, hairy outside, upper lip emarginate. Cells of lower anthers with a white appendage at the base. *Capsule* about ½ in. long, pubescent, scarious on the faces, edges hard. *Seeds* concentrically rugose.

Abundant within the area. **DISTRIB.:** Throughout the warmer parts of India, and in Ceylon. The plant is often used medicinally.

2. **R. parviflora**, *Nees in Wall. Pl. As. Rar. iii, 110, var. pectinata, C. B. Clarke in F. B. I. iv, 550; Watt E. D.; Prain Beng. Pl. 821; Cooke Fl. Bomb. ii, 400.* *Justicia pectinata, Linn; Roxb. Fl. Ind. i, 133.*

A much-branched procumbent annual. *Leaves* ½-about 2½ in. long, elliptic or oblong-lanceolate, acute or subobtuse, glabrous or sparsely hairy, lineolate, base acute, petioles ¼—½ in. long. *Flowering spikes* ¼—1 in. long, often 2 or 3 together at the ends of the branches; bracts dimorphic, the barren ones ¼ in. long, in two rows, lanceolate, cuspidate, pubescent, margins scarious; fertile bracts ½ in. in diam, orbicular, hairy on both surfaces, margins broadly scarious, usually 2-fid at the apex; bracteoles smaller than the bracts, elliptic-oblong, subacute, concave, 2-fid, the margins scarious and ciliate. *Calyx* ½ in. long, linear-lanceolate. *Corolla* white, with blue lines, ½ in. long, hairy outside; upper lip acuminate, not emarginate. *Anthers* superposed, the lower ones white-tailed. *Capsule* ¼ in. long, ovoid, acute, compressed, hairy at the apex and with scarious faces. *Seeds* minutely echinulate.

A common weed within the area. **DISTRIB.:** Throughout the warmer parts of India and in Ceylon, ascending to 4,000 ft. on the Kumaon Himalaya. The roots, leaves and the juice of this plant are used in native medicines.

25. DICLIPTERA, Juss.; Fl. Brit. Ind. iv, 550.

Diffuse or suberect herbs. *Leaves* ovate or elliptic, acute, entire or obscurely undulate. *Flowers* in axillary and terminal clusters or in paniced cymes, one or more enclosed within a pair of opposite bracts, the flowers sessile within the bracts and often reduced to a calyx and bracteoles; bracts exceeding the calyx; bracteoles linear or linear-lanceolate, about equalling the calyx. *Calyx* 5-partite; segments equal, linear-lanceolate, more or less pubescent. *Corolla* red often spotted with purple, tube slender, limb deeply 2-lipped; upper lip entire or

emarginate; lower 3-lobed, recurved. *Stamens* 2, anthers 2-celled; cells ovoid, usually superposed, mucicous. *Ovary* with 2 ovules in each cell, style filiform, stigma shortly bifid. *Fruit* a clavate capsule, narrowed below into a solid stalk, placentas separating elastically from the base of the capsule after dehiscence. *Seeds* ovoid or suborbicular, compressed, verrucose echinulate or papillose.—Species about 60, in tropical and subtropical regions of both hemispheres.

Leaves ovate, acuminate; flowers mostly in axillary clusters, bracts glabrous except the ciliate margins; corolla less than $\frac{1}{4}$ in. long.

1. *D. micranthes.*

Leaves elliptic, acute; flowers in terminal and axillary clusters, bracts pubescent and with ciliate margins; corolla $\frac{3}{4}$ in. long:—

Bracts cuneate-elliptic or obovate, apiculate, not acuminate

2. *D. Roxburghiana.*

Bracts linear or linear-oblong, with nearly parallel margins, acuminate-cuspidate

D. Roxburghiana, var. *bupleuroides.*

1. *D. micranthes.* *Nees in Wall. Pl. As. Rar. iii, 112; F. B. I. iv, 553; Prain Beng. Pl. 822; Cooke Fl. Bomb. ii, 402.*

An erect usually glabrous herb, 6—18 in. high, branches angular. *Leaves* glabrous or slightly hairy, $1\frac{1}{2}$ — $3\frac{1}{2}$ in. long, ovate or elliptic, acuminate, lineolate, petioles $\frac{1}{2}$ — $1\frac{1}{2}$ in. long. *Flowers* in small sessile axillary clusters; bracts herbaceous, unequal, reaching $\frac{1}{2}$ in. long, oblong or obovate, cuspidate; margins scarious, densely ciliate towards the base, each pair of bracts enclosing usually 3 flowers; bracteoles $\frac{1}{2}$ in. long, linear-lanceolate, hairy. *Calyx* $\frac{1}{8}$ — $\frac{1}{4}$ in. long; segments lanceolate-subulate, acute. *Corolla* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, hairy outside, upper lip longer than lower. *Capsule* $\frac{1}{2}$ in. long, compressed, ellipsoid, subacute, hairy at the apex. *Seeds* very small, echinulate.

Found chiefly in the drier western districts of the area. *Flowers* Oct. to Dec. *DISTRIB.*: Behar, Chota Nagpur and C. India to the Konkan; also in Trop. Africa and the Comoro Islands.

2. *D. Roxburghiana.* *Nees in Wall. Pl. As. Rar. iii, 111; F. B. I. iv, 553; Watt E. D.; Prain Beng. Pl. 822.*

A herb, 1—3 ft. high. *Stems* nearly glabrous. *Leaves* up to $2\frac{1}{2}$ in. long, elliptic, acute, obscurely pubescent or glabrate, petioles about $\frac{1}{4}$ in. long. *Flowers* in terminal and axillary, usually sessile clusters; bracts nearly $\frac{1}{2}$ in. long, cuneate-elliptic or obovate, not acuminate, pubescent and with ciliate margins. *Corolla* $\frac{3}{4}$ in. long. *Capsule* $\frac{3}{4}$ in. long, clavate, narrowed into a solid stalk, puberulous or glabrate. *Seeds* distinctly verrucose.

Frequent in most parts of the area. *DISTRIB.*: Plains of Punjab and Bengal, extending to Assam and Bhutan.

VAR. bupleuroides. *F. B. I. iv, 554; Watt E. D.; Prain Beng. Pl. 822.* *D. bupleuroides.* *Nees; Collett Fl. Siml. 377.*—A much more hairy plant than the type. It differs also in the bracts which are linear or linear-oblong and acuminate, and the margins are nearly parallel. Watt describes the capsules as much smaller and flattened at right angles to the septum.—Dehra Dun and eastwards along the Sub-

Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.:** Himalaya from Kashmir to N. Assam and Chittagong, up to 7,000 ft.; also on the hills of Rajputana and C. India, extending to Afghanistan.

RHINACANTHUS COMMUNIS, *Nees*; *Royle Ill.* 298; *F. B. I. iv*, 541; *Watt E. D.*; *Prain Beng. Pl.* 819; *Cooke Fl. Bomb. ii*, 415. *Justicia nasuta*, *Linn.*; *Roxb. Fl. Ind. i*, 120.—Vern. *Jui-pana*.—An undershrub with oblong or ovate leaves and white flowers arranged in large panicles.—Cultivated within the area of this flora and throughout India. It appears to be wild in the Deccan and also in Ceylon where, according to Trimen, it is not cultivated. It occurs also in Java and in Trop. Africa as an introduced plant. The fresh root and leaves are used by natives as a remedy for certain skin-diseases, and more particularly for what is commonly known as *Dhobi's itch*.

GRAPTOPHYLLUM HORTENSE, *Nees*; *F. B. I. iv*, 545; *Cooke Fl. Bomb. ii*, 416. *Justicia picta*, *Linn.*; *Roxb. Fl. Ind. i*, 117. A glabrous shrub with lanceolate leaves which are often blotched with white, and the flowers are large and crimson.—Cultivated in gardens throughout the hotter parts of India and in most tropical countries. Probably wild in the Malay Archipelago.

LXXXVI.—VERBENACEÆ.

Herbs, shrubs or trees. *Leaves* opposite or whorled, simple or digitate, very rarely pinnate; stipules none. *Inflorescence* cymose racemose or spicate; cymes often compound or paniculate, bracts usually small; flowers often showy, 2-sexual or polygamous, usually irregular. *Calyx* inferior, gamosepalous, persistent, 5—4 (rarely 6—8)-toothed. *Corolla-tube* cylindric or dilated upwards; limb 2-lipped or subequal, 5—4 (rarely many)-lobed. *Stamens* didynamous (rarely 2 or very rarely 5 or 6), inserted on corolla-tube. *Disk* usually inconspicuous. *Ovary* superior, 2—4-celled, very rarely 8-celled or almost 1-celled, entire or 4-lobed, style terminal, stigma usually entire; ovules variously attached, 2 or solitary in each cell. *Fruit* a drupe, rarely capsular, 2—4- or 1-celled, cells 1-seeded. *Seeds* erect or pendulous, albumen (in the Indian genera) none.—Species about 700, chiefly in the tropical regions of both hemispheres.

Flowers in dense spikes, opening centripetally:—

Fruit with two 1-seeded pyrenes, calyx small:—

Fruit indehiscent, succulent. Usually scabrous climbing shrubs

1. LANTANA.

Fruit dry, the pyrenes easily separating.—A much-branched prostrate perennial herb

2. LIPPIA.

Fruit of four 1-seeded pyrenes, calyx tubular.—Herbs

3. VERBENA.

Inflorescence cymose, flowers opening centrifugally:—

Fruit indehiscent, of one or four pyrenes:—

Corolla regular; stamens isomerous, equal; leaves simple:—

Calyx not enlarging in fruit, corolla purple or red, drupe with four 1-seeded pyrenes

4. CALLICARPA.

- Calyx accrescent in fruit, corolla white, drupe with one 4-celled pyrene 5. TECTONA.
- Corolla 2-lipped, stamens didynamous, leaves simple or digitate:—
- Drupe with one 4-celled pyrene:—
- Leaves simple, entire or toothed:—
- Flowers large, up to 1 in. long 6. GMELINA.
- Flowers small 7. PREMNA.
- Leaves digitate 8. VITEX.
- Drupe with four 1-seeded pyrenes, leaves simple:—
- Calyx campanulate, limb truncate, or 5-toothed or almost 5-partite 9. CLERODENDRON.
- Calyx rotate, widely patent, entire or obscurely 5-lobed 10. HOLMSKIOLDIA.
- Fruit breaking up into four valves with one pyrene attached to each valve.—Trees or shrubs with simple leaves 11. CARYOPTERIS.

1. LANTANA, Linn.; Fl. Brit. Ind. iv, 562.

Rambling or scandent shrubs, pubescent or scabrous; branches 4-angled, sometimes prickly. *Leaves* opposite, petioled, simple, crenate, often rugose. *Flowers* in peduncled capitate ovoid or cylindrical spikes; bracts conspicuous, longer than the calyx, bracteoles none. *Calyx* small, membranous, truncate or obscurely 4–5-toothed. *Corolla-tube* slender, cylindrical; lobes 4–5, spreading. *Stamens* didynamous, included, anthers broadly oblong. *Ovary* 2-celled; with 1 ovule in each cell, style short, stigma oblique, subcapitate. *Fruit* a more or less fleshy drupe, containing 2 bony 1-celled pyrenes.—Species about 50, in tropical and subtropical regions, mostly American.

L. indica, Roxb. Hort. Beng. 46; Fl. Ind. iii, 89; Brandis For. Fl. 369; Ind. Trees 502; F. B. I. w, 562; Kanjilal For. Fl. 269; Gamble Man. Ind. Timb. 524; Collett Fl. Siml. 379; Prain Beng. Pl. 824; Cooke Fl. Bomb. ii, 418; L. dubia, Wall.; Royle Ill. 300, t. 73, fig. 2. L. collina Dcne. in Jacquem. Voy. Bot. 136, t. 141. L. alba, Schauer; Brandis For. Fl. 369.—Vern. *Ghaneri*, *pápar-dani* (Ajmer).

A shrub, 3–8 ft. high; branches roughly hairy, long and straggling, 4 angular, sometimes prickly, yellowish brown. *Leaves* $1\frac{1}{2}$ – $2\frac{1}{2}$ in. long, opposite or in whorls of 3, ovate, acute or subobtuse, crenate-serrate, rugose and finely pubescent on upper surface, softly white-pubescent or subvillous beneath, narrowed or somewhat rounded at the base, petioles $\frac{1}{4}$ – $\frac{3}{8}$ in. long. *Flowers* inodorous, sessile, arranged in axillary peduncled heads or spikes $\frac{1}{2}$ – $\frac{3}{4}$ in. long and elongating in fruit; peduncles 1 – $3\frac{1}{4}$ in., usually in opposite axils, 4-angled, thickening upwards; bracts up to $\frac{3}{8}$ in. long, ovate, acuminate, softly hairy on both sides. *Calyx* $\frac{1}{16}$ in. long, truncate, membranous, densely hairy. *Corolla* with a pale purplish limb $\frac{1}{4}$ in. across, hairy outside; tube $\frac{1}{4}$ in. long, yellowish; lobes 4, rounded. *Filaments* very short. *Ovary* glabrous. *Drupe* purple when ripe, enclosed in the thin transparent calyx.

Plentiful within the area of this flora, in waste places. *Flowers* during the greater part of the year. *DISTRIB.*: Throughout the warmer portion of India and in Ceylon, ascending to 3,500 ft. in Kumaon;

also in Upper Burma, Afghanistan, Baluchistan and in Trop. Africa. The leaves are regarded by the natives as a cure for snake-bite.

L. Camara, Linn ; F. B. I. iv, 562 ; Watt E. D. ; Kanjilal For Fl. 269 ; Gamble, Man. Ind. Timb. 524 ; Prain Beng. Pl. 824 ; Cooke Fl. Bomb. ii, 419. *L. aculeata*, Linn. ; Roxb. Hort., Beng. 46.—A large climbing shrub with prickly branches and orange-coloured flowers. It is a native of Trop. America, whence it has spread and become naturalized in many parts of the Old World. It appears to have been introduced into Ceylon about the year 1824, and from there to have spread throughout Peninsular India and northwards as far as Dchra Dun. As an undergrowth in forests, although beneficial to some extent as affording shelter to young trees, it has nevertheless proved itself to be a very troublesome weed in deciduous forests, and very difficult to eradicate.

L. trifolia, Linn. ; F. B. I. iv, 563 ; Prain Beng. Pl. 824.—A small unarmed shrub with usually ternate leaves. This is also a native of Trop. America, and has been recorded as a naturalized plant by Royle and others from N. W. India to Ceylon, as well as in E. Bengal. It closely resembles *L. indica*.

L. crenulata, Otto and Dietr. ; F. B. I. iv, 563.—A shrub with ovate lanceolate finely crenulated leaves, their upper surfaces very scabrid ; bracts narrowly oblong or subspathulate, scabridly hairy ; corolla yellow to orange. Recorded by both Royle and Falconer as occurring in N. W. India, and by Thomson as cultivated at Moradabad. It has also been found in S. India. It is no doubt an introduction, but from what country is uncertain.

2. LIPPIA, Linn. ; Fl. Brit. Ind. iv, 563.

Calyx distinctly lobed or toothed, *Fruit* small dry, separating into two 1-seeded pyrenes ; otherwise as in *Lantana*.—Species about 60, chiefly in Trop. America, of which two extend to India.

L. nodiflora, Rich. in Michx. Fl. Bor. Amer. ii, 15 ; F. B. I. iv, 563 ; Watt E. D. ; Collett Fl. Siml. 378 ; Prain Beng. Pl. 825 ; Cooke Fl. Bomb. ii, 420. *Verbena nodiflora*, Linn. ; Roxb. Hort. Beng. 4. *Zapauia nodiflora* Lamk. ; Royle Ill. 299.

A widely creeping much branched perennial herb, branches usually rooting at the nodes, subquadrangular, clothed with minute appressed white hairs attached by their middle, or sometimes almost glabrous. *Leaves* sessile, $\frac{3}{4}$ —1 in. long, spathulate, cuneate and entire at the base, sharply serrate at the rounded apex, minutely strigose on both surfaces. *Flowers* sessile, arranged in dense globose peduncled axillary heads, elongating after flowering into oblong spikes ; peduncles 1—3 in. usually from the axil of one only of each pair of leaves ; bracts $\frac{1}{10}$ in. long, broadly elliptic or obovate, mucronate, glabrous, base cuneate. *Calyx* $\frac{1}{2}$ in. long, membranous, compressed, 2-lobed, hairy outside, closely covering the fruit, the 2 acuminate lobes projecting above in. *Corolla* white or pale-pink $\frac{1}{10}$ — $\frac{1}{8}$ in. long, falling off as a

calyptra as the fruit ripens; upper lip bifid, lower 3-lobed. *Fruit* less than $\frac{1}{2}$ in. in diam., dry, separating into two 1-seeded plano-convex glabrous pyrenes.

A very common plant within the upper Gangetic Plain and found usually in moist places. **DISTRIB.:** Throughout the greater part of India and in Ceylon, and in all tropical and warm-temperate regions including the Mediterranean region. In North India the plant is used medicinally, being considered cooling.

L. citriodora, II. B. and K. (*Aloysia citriodora*, Ort.) is the well-known 'Lemon-scented verbena' and a native of South America. It is largely grown in the gardens of North India.

3. VERBENA, Linn.; Fl. Brit. Ind. iv, 565.

Herbs or undershrubs, usually pubescent. *Leaves* opposite or ternately whorled, toothed or pinnatifid. *Flowers* small, in terminal simple or corymbose spikes, bracts small, bractcoles none. *Calyx-tube* ribbed; lobes 5, short. *Corolla-tube* straight or curved; limb oblique somewhat 2-lipped; lobes 5, oblong, obtuse or retuse. *Stamens* didynamous, included; anthers ovate, 2-celled, cells subparallel. *Ovary* more or less 4-lobed and sometimes 4-celled even when in flower, style short, stigma obscurely 2-lobed; ovules 4, attached laterally near the base of each cell. *Fruit* dry, included in the calyx, separating into 4 oblong pyrenes.—Species about 80, in temperate and tropical regions, mostly American.

V. officinalis, Linn. *Sp. Pl.* 20; *Roxb. Hort. Beng.* 4; *Royle Ill.* 299; *F. B. I. iv*, 565; *Watt E. D.*; *Collett Fl. Siml.* 379; *Prair Beng. Pl.* 826; *Cooke Fl. Bomb. ii*, 437.—Vervain.

An erect more or less pubescent perennial herb. *Stems* 1—3 ft. high decumbent at the base, branched 4-sided puberulous. *Leaves* 2—4 in. long, variously lobed, narrowed to the base; lower ones stalked, pinnatifid or coarsely toothed, more or less pubescent and usually hoary on the nerves beneath; upper sessile, usually 3-partite. *Flowers* $\frac{1}{4}$ in. long, sessile in dense bracteate heads which elongate as the fruit ripens into slender spikes up to 10 in. long; bracts ovate, acute. *Calyx* twice as long as the bracts and half as long as the corolla-tube, minutely 5-toothed, glandular-hairy. *Corolla* blue or lilac, hairy; limb spreading, about $\frac{1}{3}$ in. in diam., lobes subquadrate, throat hairy. *Fruit* dry, pyrenes ribbed.

On waste ground and also as a weed in gardens, mostly along the northern portion of the area. **DISTRIB.:** Plains of Punjab and Bengal, and up to 7,000 ft. on the Himalaya from Kashmir eastwards; also in all temperate and subtropical regions, but not wild in America. The leaves and root are used medicinally by the people of the Punjab. The many varieties of the cultivated garden *verbena*, so extensively grown in Europe as well as in India, are hybrids and are supposed to be chiefly related to *V. chamædrifolia*, a species indigenous in S. America.

4. CALLICARPA, Linn.; Fl. Brit. Ind. iv, 566.

Shrubs or trees; young branches stellately hairy. *Leaves* opposite, rarely ternately whorled, toothed or subentire. *Flowers* in axillary cymes which are shorter than the leaves; bracts linear, inconspicuous. *Calyx* very small, campanulate; limb minutely 4-lobed, not enlarged in fruit. *Corolla* small, tubular, subsymmetric, purple or red; lobes 4, subquadrate, spreading. *Stamens* 4, equal; anthers exerted, 2-celled, glandular. *Ovary* imperfectly 2-celled, style linear; stigma dilated, obscurely bifid, ovules 2 in each cell. *Fruit* a small globose drupe; pyrenes 4, or fewer by suppression, 1-seeded.—Species 30, widely distributed in the tropical and subtropical regions of both hemispheres.

Leaves entire, finely tomentose beneath; drupes purple, becoming black when ripe.—A small tree

1. *C. ARBOREA.*

Leaves closely crenate, stellately tomentose beneath, drupes white.—A shrub

2. *C. MACROPHYLLA.*

1. *C. arborea*, Roxb. Hort. Beng. 10; Fl. Ind. i, 390; Brandis For. Fl. 368; Ind. Trees 511; F. B. I. iv, 567; Watt E. D.; Gamble Man. Ind. Timb. 525; Prain Beng. Pl. 827.—Vern. *Ghiwala* (Kumaon).

A small tree, up to 40 ft. high; trunk stout, with grey soft bark. *Leaves* coriaceous, 6–8 in. long, ovate to narrowly oblong, acute, usually quite entire, base cuneate; upper surface glabrate when mature, densely clothed beneath with persistent tomentum covering numerous glands; petioles 1–2 in. long. *Peduncles* as long as the petioles, closely tomentose. *Calyx* $\frac{1}{10}$ in. long, subtruncate, stellately pubescent. *Corolla* $\frac{1}{2}$ in. long, pale-purple. *Drupes* $\frac{1}{10}$ in. in diam., purple, turning black when ripe.

Sub-Himalayan tracts of North Oudh, where it rarely grows higher than 20 ft. Flowers April–June. **DISTRIB.:** Lower hills of Kumaon up to 4,000 ft. above sea-level and eastwards to Sikkim, Assam and the Khasia Hills; also in Bengal, extending to Burma and Sumatra. The light-coloured wood is hard and close-grained and takes a good polish. The aromatic bitter bark is used in skin-diseases.

2. *C. macrophylla*, Vahl Symb. iii, 13, t. 53; Roxb. Fl. Ind. i, 393; Royle Ill. 299; Brandis For. Fl. 368; Ind. Trees, 512; F. B. I. iv, 568; Watt E. D.; Kanjilal For. Fl. 263; Gamble Man. Ind. Timb. 525; Collett Fl. Siml. 380; Prain Beng. Pl. 828; *C. incana*, Roxb. Fl. Ind. i, 393.—Vern. *Daya*.

An erect shrub, 4–8 ft. high; branches virgate, usually shaggy as well as the tomentose tips. *Leaves* 5–9 in. long, ovate or ovate-lanceolate, acuminate, base cuneate or rounded; upper surface wrinkled, glabrate when mature, white-tomentose beneath with compound stellate hairs; main lateral nerves 12–16 pairs; petiole $\frac{1}{4}$ – $\frac{1}{2}$ in. long. *Flowers* hardly $\frac{1}{2}$ in. long, crowded in axillary peduncled globose cymes 1–3 in. across; peduncles shorter than the petioles. *Calyx* less than $\frac{1}{10}$ in. long, stellate-hairy; lobes minute, triangular. *Corolla* rose-coloured; lobes subequal, spreading. *Drupes* white.

Dehra Dun, in swampy places, and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. Flowers chiefly

during the rainy season. **DISTRIB.:** Bengal plain; W. Himalaya from Kashmir eastwards, ascending to 6,000 ft.; also in Assam and Pegu. The leaves applied hot are said to relieve rheumatism.

5. TECTONA, Linn. f.; Fl. Brit. Ind. iv, 570.

Trees, stellately tomentose. *Leaves* large, opposite or whorled, petioled, entire. *Flowers* many, in 2-chotomous cymes forming large terminal panicles; bracts small, narrow. *Calyx* campanulate, shortly 5-6-lobed, enlarged in fruit. *Corolla* white, tube short, limb with 5 or 6 nearly equal spreading imbricate lobes. *Stamens* 5 or 6, adnate to the base of the corolla, equal, exserted, anthers ovate or oblong. *Ovary* 4-celled, with 1 ovule in each cell, style linear, stigma shortly bifid. *Fruit* a drupe, enclosed in the enlarged 4-celled bladder-like calyx, endocarp bony.—Species 3, two of which are Indian, and the third is a native of the Philippine Islands.

T. grandis, Linn. f. *Suppl.* 151; Roxb. *Fl. Ind. i*, 600; Royle *Ill.* 299; Brand. *For. Fl.* 354, t. 44; *Ind. Trees* 505; F. B. I. *iv*, 570; Watt *E. D.*; *Comm. Prod. Ind.*; Kanjilal *For. Fl.* 269; Gamble *Man. Ind. Timb.* 526; Prain *Beng. Pl.* 828; Cooke *Fl. Bomb. ii*, 424.—Vern. *Ságun*, *Saigun*, *Sáj*.—The Teak-tree.

A large deciduous tree, 80-120 ft. high; branchlets 4-angular, stellately tomentose. *Leaves* about 12 in. long (or much larger in seedling specimens), elliptic or obovate, acute or acuminate, entire, usually cuneate at the base; upper surface rough, but glabrous, the lower densely clothed with grey or yellowish tomentum, main lateral nerves 8-10 pairs. *Flowers* many, on short pedicels and arranged in large terminal much-branched tomentose cymose panicles 1-3 ft. long; bracts at the forks lanceolate, those beneath the calyx narrower. *Calyx* (in flower) $\frac{1}{2}$ in. long, broadly campanulate, stellately tomentose; lobes $\frac{1}{6}$ in. long, subequal, spreading; the whole calyx ultimately enlarging to 1 in. or more and forming a membranous bladder-like covering to the fruit. *Corolla* white, glabrous, limb $\frac{1}{2}$ in. across; lobes subequal, spreading. *Fruit* subglobose, $\frac{1}{2}$ in. in diam., somewhat 4-lobed; pericarp soft, densely clothed with felted stellate hairs.

6. GMELINA, Linn.; Fl. Brit. Ind. iv, 581.

Trees or shrubs, sometimes spinous; young shoots usually tomentose. *Leaves* opposite, entire toothed or lobed. *Flowers* large, yellow or brownish, arranged in paniced usually tomentose cymes; bracts usually narrow, rarely leaf-like, bractcoles none. *Calyx* campanulate, shortly 5 or 4-toothed or subentire, persistent and unaltered in fruit. *Corolla* 2-lipped; tube slender below, swollen upwards, limb 5 or 4-lobed. *Stamens* didynamous, sub-exserted; anthers with oblong more or less separate cells. *Ovary* 4-celled, with 1 ovule in each cell, style slender, stigma shortly bifid. *Fruit* a succulent drupe; endocarp bony, undivided, 4 or 2-celled.—Species about 8, in India, China, Malaya and Australia.

G. arborea, Roxb. *Hort. Beng.* 46; *Fl. Ind.* iii, 84; *Royle Ill.* 299; *Brandis For. Fl.* 364; *Ind. Trees* 509; *F. B. I.* iv, 581; *Watt E. D.*; *Kanjilal For. Fl.* 264; *Gamble Man. Ind. Timb.* 537; *Prain Beng. Pl.* 829; *Cooke Fl. Bomb.* ii, 424.—Vern. *Ganhár, gumhár, gambhár khamára, sewan* (Rajputana).

An unarmed deciduous tree, up to 60 ft. high; bark somewhat corky, greyish outside and yellow within; young parts covered with white mealy pubescence. *Leaves* 4—8 in. long, broadly ovate, acuminate, entire; upper surface glabrous when mature, lower persistently clothed with fulvous stellate hairs, base cordate or truncate and shortly cuneate; petioles 2—3 in. long, cylindric, puberulous, glandular at the top. *Flowers* in small, usually 3-flowered cymes which are arranged along the branches of a densely fulvous-tomentose panicle about 12 in. in length; buds clavate, angled; bracts $\frac{1}{2}$ in. long, linear-lanceolate. *Calyx* broadly campanulate, $\frac{1}{2}$ in. long, densely fulvous-tomentose; teeth small, triangular, acute. *Corolla* 5-lobed, $1\frac{1}{2}$ in. long, brownish-yellow, very hairy outside; upper lip $\frac{3}{8}$ — $\frac{1}{2}$ in. long, deeply divided into 2 oblong obtuse lobes; lower lip about twice as long, 3-lobed, the middle lobe much longer than the lateral ones and with a crenulate margin. *Drupe* $\frac{3}{4}$ —1 in. long, ovoid or pyriform, smooth, orange-yellow when ripe.

Not uncommon within the area in moist sal forests, from Dehra Dun eastwards along the Sub-Himalayan tracts; also in Merwára and Bundelkhand. Often grown in gardens. Flowers usually in April and before the new leaves appear. *DISTRIB.*: Outer Himalayan ranges from the Punjab eastwards, up to 3,000 ft., Aravalli Hills, Bengal and southwards to the Deccan, S. India and Ceylon; also in Burma, extending to the Malay Islands and the Philippines. The wood, which greatly resembles that of teak, is much valued, for it is easily worked and lasts well under water. Various parts of the tree are used medicinally, and the fruit is much eaten by various kinds of deer.

G. asiatica, L. *Roxb. Fl. Ind.* iii, 87; *Brandis For. Fl.* 365; *Ind. Trees* 509; *F. B. I.* iv, 582; *Watt E. D.*; *Gamble Man. Ind. Timb.* 537; *Prain Beng. Pl.* 829; *Cooke Fl. Bomb.* ii, 425.—A spinous shrub with bright yellow flowers. It is cultivated in gardens within the area, and is found wild in S. India, Ceylon and the Malay Archipelago. The plant is useful for making fences. The root is used medicinally and also the leaves which are said to render water mucilaginous.

7. PREMNA, Linn.; *Fl. Brit. Ind.* iv, 571.

Trees or shrubs, sometimes scandent. *Leaves* opposite, entire or toothed. *Flowers* small, greenish or white, often polygamous, pubescent, arranged in paniced or corymbose cymes; bracts small, narrow. *Calyx* small, cup-shaped; limb truncate or minutely 2—5-toothed, or 2-lipped. *Corolla* small, tube short, throat hairy inside, limb 2-lipped 5-lobed or subequally 4 lobed. *Stamens* didynamous; anthers ovate or rounded, the cells parallel or divergent. *Ovary* 2- or 4-celled, 4-ovuled, style linear, stigma shortly bifid. *Fruit* a small globose or oblong-obovoid

drupe; endocarp hard, undivided, normally 4- or by abortion 1—3-celled. *Seeds* 1—4, oblong.—Species 40 or more, in the warmer regions of the Old World.

- Leaves usually quite entire and with a cuneate base, corymbs large, calyx 5-toothed.—A medium-sized tree . . . 1. *P. mucronata*.
 Leaves more or less toothed when mature; corymbs small, usually compact:—
 Leaves petioled, sparingly toothed, calyx 4-toothed.—A shrub or small tree . . . 2. *P. barbata*.
 Leaves sessile, coarsely toothed, calyx 5-toothed.—A small almost stemless undershrub . . . 3. *P. herbacea*.

1. *P. mucronata*, Roxb. *Fl. Ind.* iii, 80; Royle *Ill.* 299; Brandis *For. Fl.* 366; *Ind. Trees* 511. *P. latifolia*, var. *mucronata*, F. B. I. iv, 578. Watt *E. D.*; Kanjilal *For. Fl.* 264; Gamble *Man. Ind. Timb.* 537; Prain *Beng. Pl.* 831. Vern. *Bakar, basota*.

A small or medium-sized deciduous tree; branchlets and young leaves pubescent or velvety. *Leaves* membranous, drying black, 3—6 in. long broadly ovate, sharply acuminate, usually quite entire, base cuneate; upper surface glabrous when mature, the lower hairy especially on the midrib, petioles $\frac{1}{2}$ — $\frac{3}{4}$ in. long. *Corymbs* broad, usually terminating short leafy branchlets, rusty pubescent. *Calyx* 5-toothed, clothed with spreading hairs. *Corolla* greenish-white, $\frac{1}{4}$ in. long, pubescent within. *Drupe* globose, verrucose.

Dehra Dun and Siwalik range and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, often found on the outskirts of sal forests, recorded also from Bundelkhand. *Flowers* April—June. *DISTRIB.*: Outer Himalayan ranges to Bhutan, up to 3,000 ft., also in N. Bengal and on the Khasia Hills. The wood is hard and yields good fuel, and it is sometimes used for lighting fires by friction. The juice of the bark is said to be used medicinally. Gamble (in his *Manual* p. 537) refers to a moderate-sized thorny tree which he found at Kasumri on the Saharanpur Siwaliks as having thin greyish-white smooth bark, and with the leaves drying green (not black), but otherwise resembling *P. mucronata*.

2. *P. barbata*, Wall. *Cat.* 1768; Brand. *For. Fl.* 367; *Ind. Trees* 511; F. B. I. iv, 579; Kanjilal *For. Fl.* 264; Gamble *Man. Ind. Timb.* 535; Prain *Beng. Pl.* 831.—Vern. *Lamenar, lamnar, baharchu* (Dehra Dun).

A shrub or small tree with dark-grey bark. *Leaves* 3—7 in. long, oblong or ovate, acuminate, obtuse or subcordate in fruit, usually distinctly toothed, sometimes with only a few teeth towards the apex, puberulous on both surfaces when young, nearly glabrous on upper surface when mature; main lateral nerves 6 pairs; veins reticulate, dark, conspicuous; petiole 1 in. long or more. *Corymbs* rather dense, 1—2½ in. in diam., villous, glabrescent in fruit; bracts small, linear, deciduous. *Calyx* $\frac{1}{2}$ in. long, subequally 4-toothed, glabrous or puberulous; teeth oblong, obtuse, enlarged and ribbed in fruit. *Corolla* $\frac{1}{4}$ — $\frac{1}{3}$ in. long, throat hairy within. *Drupe* $\frac{1}{2}$ in. in diam., globose or subovoid, glabrous, subverrucose.

Sub-Himalayan tracts from Dehra Dun eastwards. **DISTRIB.:** Outer Himalayan ranges from the Chenab eastwards to Bhutan up to 5,000 ft.; also in Assam, Bengal, the Central Prov. and Upper Burma.

3. P. herbacea, Roxb. *Hort. Beng.* 46; *Fl. Ind.* iii, 80; *Brandis For. Fl.* 368; *Ind. Trees* 511; *F. B. I.* iv, 581; *Watt E. D.*; *Kanjilal, For. Fl.* 264; *Gamble Man. Ind. Timb.* 535; *Prain Beng. Pl.* 831. *P. pygmæa*, *Wall*; *Royle Ill.* 299.

A small almost stemless undershrub. Flowering branches 1—4 in. long, springing up annually after the jungle fires. *Leaves* 1—5 in. long, in rosettes of 2 or 3 pairs, lying flat on the ground, sessile, obovate, obtuse, cuncate at the base, margins coarsely serrate, nerves pubescent; upper surface (when mature) minutely gland-dotted, the lower clothed with very small deciduous hairs. *Flowers* in peduncled cymes arranged in terminal somewhat dense pubescent corymbs $1\frac{1}{2}$ in. in diam. *Calyx* $\frac{1}{10}$ in. long, subequally 5-toothed, closely pubescent: lobes ovate, obtuse. *Corolla* pale-yellow or greenish, $\frac{1}{2}$ in. long, throat hairy inside, limb obscurely 2-lipped, lobes 4. *Drupe* $\frac{1}{4}$ in. in diam., globose, black when ripe.

Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Feb.—May. **DISTRIB.:** Subtrop. Himalaya from Kashmir to Bhutan, usually in open grassy places; also in Bengal and in the Sikkim Terai, extending to the southern portion of the W. Peninsula. A good example of a plant belonging to a genus mostly represented by trees or shrubs, and which has become permanently dwarfed by continuous exposure to periodical fires.

8. VITEX, Linn.; *Fl. Brit. Ind.* iv, 583.

Trees or shrubs; young shoots hairy or tomentose. *Leaves* opposite, digitately 3—5-foliolate (often simple in *V. trifolia*). *Flowers* in peduncled or sessile cymes forming terminal and axillary or wholly axillary panicles or corymbs; bracts small, longer or shorter than the calyx. *Calyx* campanulate, truncate or shortly 5-rarely 3-toothed. *Corolla* small, 2-lipped, tube short, limb 5-lobed, central lobe of lower lip usually largest. *Stamens* didynamous, usually exserted; anther-cells at first parallel and pendulous, afterwards divaricate, often twisted so that their bases become suberect. *Ovary* 2—4-celled, with 1 ovule in each cell, style filiform, stigma shortly bifid. *Fruit* a globose or obovoid drupe supported by the somewhat enlarged calyx; endocarp bony, 4- or by suppression 3—1-celled. *Seeds* obovate or oblong.—Species 100, in all tropical and warm temperate regions.

1. V. Negundo, *Linn. Sp. Pl.* 638; *Roxb. Fl. Ind.* iii, 70; *Royle Ill.* 299; *Brandis For. Fl.* 369; *Ind. Trees* 503; *F. B. I.* iv, 583; *Watt E. D.*; *Kanjilal For. Fl.* 265; *Gamble Man. Ind. Timb.* 539; *Collett Fl. Siml.* 380; *Prain Beng. Pl.* 833; *Cooke Fl. Bomb.* ii, 428.—*Vern. Shiwari, mewri, nishinda* (Dehra Dun), *malla* (Saharanpur) *shamaku* (Bijnor).

A shrub or small tree, with a thin grey bark; branchlets 4-angled, densely white-tomentose. *Leaves* 3—5-foliolate; leaflets stalked, 2—2½ in.

long, lanceolate, acute, entire or rarely crenate, subglabrous above, white-tomentose beneath, petiolule of terminal leaflet $\frac{3}{8}$ — $\frac{1}{2}$ in. long; lateral smaller and with much shorter petiolules, common petiole 1— $1\frac{1}{2}$ in. long. *Flowers* in peduncled cymes forming large terminal often compound pyramidal panicles; branches 4-angled, closely white-tomentose bracts $\frac{1}{8}$ — $\frac{1}{10}$ in. long, lanceolate, caducous. *Calyx* $\frac{1}{4}$ in. long, white-tomentose; teeth small, triangular. *Corolla* $\frac{3}{8}$ in. long, lavender to blue, tomentose outside, hairy at the insertion of stamens; upper lip deeply 2-lobed; lobes obtuse, mid-lobe broadly obovate, crenulate; the two lateral ones shorter, oblong, obtuse. *Drupe* about $\frac{1}{4}$ in. in diam., black when ripe.

Abundant within the area of this flora in waste ground and on the banks of streams, also much planted to form hedges. Flowers during the greater part of the year, but chiefly between March and April. *DISTRIB.*: Throughout India and in Ceylon. N. W. Himalaya up to 5,000 ft. and westwards to Peshawar and Afghanistan, extending to Trop. Africa and Madagascar, and to China and the Philippines. The plant is much recommended for the regeneration and reclamation of forest-land, especially in those areas which are liable to injury by floods. The branches are largely used for wattle-work and in the manufacture of baskets, and the leaves laid over stored grain are said to keep off insects. The roots, leaves and fruits are used in native medicine, and the ashes are largely employed as an alkali in dyeing. The plant appears to be not much eaten by cattle.

V. trifolia, Linn., a species closely allied to the preceding, and with a somewhat similar distribution in India, is known only as a cultivated plant within this area. It may be distinguished by its simple or 3-foliolate leaves, by its sessile always entire obtuse leaflets and also by its rather larger flowers and fruit. Outside India it is found in Burma and in the Malay Archipelago, and from China, Japan and the Philippines to N. Australia.

9. CLERODENDRON, Linn.; Fl. Brit. Ind. iv, 589.

Trees or shrubs, sometimes sarmentose. *Leaves* opposite, rarely 3-4-nate, simple entire or lobed. *Flowers* in axillary cymes or terminal panicles, often leafy below, bracts conspicuous or small. *Calyx* campanulate; limb truncate 5-toothed or almost 5-partite, persistent, often accrescent, sometimes coloured. *Corolla-tube* slender, usually long, limb more or less oblique; lobes 5, spreading. *Stamens* didynamous, much exerted; anthers ovate or oblong, the cells parallel. *Ovary* imperfectly 4-celled, with 1 ovule in each cell, style filiform, stigma shortly bifid. *Fruit* a globose usually succulent drupe, 4-grooved and separating into 4 pyrenes of which 1—3 are sometimes suppressed.—Species about 100, chiefly in the warm regions of the Old World, a few in Trop. America.

Corolla irregularly salver-shaped, $\frac{1}{2}$ in. long or less:—

Calyx not or only slightly enlarged in fruit:—

Calyx-lobes long, ovate-acuminate; leaves opposite,
less than 3 in. long

I. C. Phlomidis

Calyx-lobes very short, broadly triangular; leaves often in whorls of 3, reaching more than 6 in. long
 Calyx much enlarged in fruit and turning red.
 Corolla narrowly funnel-shaped, 3—4 in. long or longer

2. *C. serratum*.
3. *C. infortunatum*.
4. *C. Siphonanthus*.

1. *C. Phlomidis*, Linn. f. *Suppl.* 292; *Cooke Fl. Bomb.* ii, 431. *C. phlomoides*, Linn. f.; *Roxb. Fl. Ind.* iii, 57; *Royle Ill.* 299; *Brandis For. Fl.* 363; *Ind. Trees* 507; *F. B. I.* iv, 590; *Watt F. D.*; *Gamble Man. Ind. Timb.* 543; *Prair Beng. Pl.* 835.—Vern. *Urui*.

A large shrub, or small tree, up to 30 ft. high; young parts pubescent. *Leaves* $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, ovate or subrhomboid, obtuse or acute, coarsely crenate-dentate or entire, undulate, glabrous above, more or less puberulous beneath, base truncate or subcordate, petioles $\frac{1}{4}$ — $\frac{3}{4}$ in., pubescent. *Flowers* medium-sized, in small 2-chorous axillary cymes forming a rounded terminal panicle; pedicels slender; bracts leaf-like, obovate or lanceolate, acute. *Calyx* about $\frac{3}{8}$ in. long, divided about $\frac{1}{2}$ way down, glabrous or puberulous, slightly enlarged in fruit; lobes ovate, acutely acuminate, veined. *Corolla* white or pink; tube $\frac{3}{4}$ in. long, sparingly pubescent outside; lobes under $\frac{1}{4}$ in. long, elliptic, obtuse, veined. *Drupe* $\frac{1}{4}$ in. long, broadly obovoid, black when ripe.

Common in the drier parts of the area, and often found in hedges, also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers during the greater part of the year. **DISTRIB.**: Throughout the drier parts of India from the Punjab and Bengal to S. India and Ceylon, also in Baluchistan. The roots are used in native medicine.

2. *C. serratum*, *Spreng. Syst. veg.* ii, 758; *Don Prod.* 103; *Brandis For. Fl.* 364; *Ind. Trees* 508; *F. B. I.* iv, 592; *Watt E. D.*; *Kanjilal For. Fl.* 266; *Gamble Man. Ind. Timb.* 543; *Prair Beng. Pl.* 835; *Cooke Fl. Bomb.* ii, 432. *Volkameria serrata*, Linn.; *Roxb. Fl. Ind.* iii, 62.—Vern. *Barangi* (N. Oudh), *ban-bakri* (Jaunsar).

A shrub 3—8 ft. high, or sometimes occurring as a perennial herb, nearly glabrous. *Stems* bluntly 4-angular, often burnt down during the periodical jungle fires. *Leaves* sessile or nearly so, opposite or sometimes ternate, passing upwards into bracts, usually about 5—6 in. long, sometimes much longer, narrowly obovate-oblong or sub-elliptic, acute or acuminate, usually coarsely and sharply serrate, glabrous when mature or more or less pubescent beneath, base cuneate. *Flowers* many, conspicuous, arranged in dichotomous cymes, the whole forming a lax more or less pubescent subpyramidal panicle 6—10 in. long; bracts sub-persistent, obovate to lanceolate, pubescent, often coloured. *Calyx* $\frac{1}{2}$ in. long, cup-shaped, hardly enlarged in fruit; lobes minute, broadly triangular, ciliolate. *Corolla* blue purple or white, 2-lipped, glabrous outside; lower lip large, often directed upwards by reason of the twisting of the pedicels, usually purple; tube $\frac{3}{8}$ in. long, cylindrical, the 2 upper and 2 lateral lobes $\frac{1}{2}$ in. long, spreading. *Filaments* curved, very hairy at their bases. *Drupe* about $\frac{1}{4}$ in. long broadly obovoid, rather succulent, dark-purple when ripe.

Common in the Sub-Himalayan tracts from Dehra Dun eastwards. **Flowers** April—Aug. **DISTRIB.**: Outer Himalayan ranges up to 5,000 ft.,

and on the Khasia Hills, and thence throughout Cent. and S. India to Ceylon and the Malay Peninsula. The root, leaves and seeds are used in native medicine; the young leaves and the flowers are eaten as a vegetable, and the Santals are said to make use of the root for bringing about the fermentation of their rice-beer.

3. *C. infortunatum*, *Linn. Sp. Pl.* 637; *Royle Ill.* 299; *Brand. For. Fl.* 363; *Ind. Trees* 507; *F. B. I.* iv, 594; *Watt F. D.*; *Kanjilal For. Fl.* 267; *Gamble Man. Ind. Timb.* 543; *Prain Beng. Pl.* 835; *Cooke Fl. Bomb.* ii, 432. *Volkameria infortunata*, *Roxb. Fl. Ind.* iii, 59.—Vern. *Bhant, karu* (Dehra Dun).

A shrub up to 12 ft. high, often gregarious; branchlets bluntly 4-angular, clothed with yellowish-white pubescence. *Leaves* 4—10 in. long, ovate, acuminate, entire or denticulate, sparingly hairy on both sides, base cordate or rounded; petioles $1\frac{1}{2}$ —4 in., cylindrical, hairy. *Flowers* on rather long, pedicels, arranged in peduncled cymes and forming a large terminal panicle; bracts leaf-like, deciduous. *Calyx* $\frac{1}{2}$ in. long (in flower), 5-partite, silky-pubescent, much enlarged in fruit; segments broadly lanceolate, very acute. *Corolla* densely hairy outside, white tinged with pink; tube $\frac{3}{4}$ in. long, slender; lobes $\frac{3}{8}$ — $\frac{1}{2}$ in. long, oblong, obtuse. *Filaments* glabrous. *Drupe* seated on the enlarged pink calyx, $\frac{1}{2}$ in. in diam., subglobose, black when ripe.

Abundant throughout the Sub-Himalayan tracts from the Jumna eastwards, also in Merwara and Bundelkhand; often as an undergrowth in sal forests, and in open places near villages. *Flowers* Dec.—April. **DISTRIB.:** Outer Himalayan ranges from Garhwal eastwards, and from Bengal southwards to Ceylon, and from Burma, to the Malay Peninsula and Islands. The plant is said to be useful in the reclamation of land. The leaves, juice and bark are used in native medicine. Edgeworth mentions that the stems are used in the Umballa district for producing fire by friction.

4. *C. Siphonanthus*, *R. Br. in Ait. Hort. Kew, ed. 2, iv,* 65; *Royle Ill.* 299; *Brand. For. Fl.* 364; *Ind. Trees* 508; *F. B. I.* iv, 595; *Watt E. D.*; *Kanjilal For. Fl.* 267; *Gamble Man. Ind. Timb.* 543; *Prain Beng. Pl.* 836; *Cooke Fl. Bomb.* ii, 433. *C. verticillatum*, *Don Prod.* 102. *Siphonanthus indica*, *Linn.*; *Roxb. Fl. Ind.* iii, 67. Vern. *Barangi, chingári* (Dehra Dun).

A glabrous shrub, 4—8 ft. high; branches virgate. *Leaves* sessile, about 6 in. long, narrowly lanceolate, shortly acuminate, tapering to the base, entire or sinuate. *Flowers* white, in a large terminal lax panicle of cymes; bracts about $\frac{1}{2}$ in. long, linear or linear-lanceolate, pedicels $\frac{1}{2}$ — $1\frac{1}{2}$ in. long. *Calyx* $\frac{1}{2}$ in. long, 5-partite; segments oblong, acute. *Corolla* white, glabrous; tube 3—4 in. long, curved; lobes $\frac{3}{8}$ in. long, obovate-oblong. *Drupes* bluish-green, seated on the enlarged persistent red calyx.

Common in open grassy places in Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* in the hot season and sometimes again in Oct. **DISTRIB.:** Himalaya up to 4,000 ft.

in Kumaon and eastwards to Bengal, Sikkim and Assam, also in Burma, the Malay Peninsula and Sumatra; extensively cultivated in both hemispheres. At once recognized by its oleander-like leaves, the very long corolla-tube and by its bluish-green drupes supported by the red persistent calyx. The root and the juice of this plant are used medicinally.

10. HOLMSKIOLDIA, Retz.; Fl. Brit. Ind. iv, 596.

Straggling or climbing shrubs. *Leaves* opposite. *Flowers* in short cymes, axillary or collected towards the ends of the branches, bracts small, bracteoles none. *Calyx* widely obconic, subtruncate, membranous, red. *Corolla* cylindric, curved, limb oblique; lobes 5, short. *Stamens* didynamous; anthers ovate, exerted, cells parallel. *Ovary* obtuse or obscurely depressed, becoming ultimately 4-celled; ovules 1 in each cell, laterally attached, style terminal, stigma shortly bifid. *Fruit* an obovoid drupe, included in the accrescent calyx, divaricately 4-lobed about half-way down, pyrenes 1-4.—Species 4; Himalaya, Africa and Madagascar.

H. sanguinea, Retz. *Obs. vi*, 31; *Dcne. in Jacquem. Vog. Bot. t.* 140; *Brand. For. Fl.* 370; *Ind. Trees* 506; *F. B. l. iv*, 596; *Watt E. D.*; *Kanji-lal For. Fl.* 267; *Gamble Man. Ind. Timb.* 544; *Collett Fl. Siml.* 380; *Prain Beng. Pl.* 836. *Hastingia coccinea*, *Smith*; *Roxb. Fl. Ind. iii*, 65. *Hastingia scandens*, *Roxb. l.c.* 66. Vern. *Rilhoul* (Dehra Dun).

A nearly glabrous straggling shrub, 10-30 ft. high. *Leaves* stalked, about 3 in. long, ovate, acuminate, toothed or entire, cordate at the base; petioles about $\frac{1}{2}$ in. long. *Flowers* crowded in axillary stalked cymes. *Calyx* scarlet tinged with orange, much enlarged in fruit, tube very short; limb spreading, about 1 in. in diam. when in fruit, membranous, circular, entire. *Corolla* coloured like the calyx, $\frac{3}{4}$ -1 in. long; tube nearly cylindric, curved; limb short, obscurely 2-lipped, lobes unequal, lowest the longest. *Drupe* $\frac{1}{4}$ - $\frac{1}{2}$ in., nearly dry.

Dehra Dun in shady ravines, and eastwards in the Sub-Himalayan tracts. *Flowers* Oct.—Dec. *DISTRIB.*: Subtropical Himalaya from the Sutlej to Bhutan up to 5,000 ft., extending to Chota Nagpur, Assam and Burma. Often grown in gardens.

11. CARYOPTERIS, Bunge; Fl. Brit. Ind. iv, 597.

Erect or rambling shrubs. *Leaves* opposite, acuminate, toothed or subentire, minutely punctate with yellow glistening glands. *Flowers* in small dense many-flowered cymes, axillary or passing into a terminal thyrses, bracts small, bracteoles none. *Calyx* 5-partite; segments triangular or lanceolate, somewhat accrescent. *Corolla* 2-lipped; tube short, cylindric, limb spreading, middle lobe of lower lip the longest, crisped or fimbriate. *Stamens* didynamous, anthers exerted; cells divaricate confluent. *Ovary* imperfectly 4-celled, ovules 1 in each cell, style

filiform, stigma shortly 2-fid. *Fruit* a small globose capsule, separating into 4 concave valves with incurved margins retaining the seeds.—Species 5, Himalaya, extending to Japan.

C. Wallichiana, Schauer in DC. *Prod.* xi, 625; Brandis *For. Fl.* 370; *Ind. Trees* 512; F. B. I. iv, 597; Watt E. D.; Kanjilal *For. Fl.* 268; Gamble, *Man. Ind. Timb* 544; Collett *Fl. Siml.* 381; Prain *Beng. Pl.* 836. Vern. *Karui* (Dehra Dun).

An erect or spreading shrub; bark grey, papery; branchlets 4-sided, young shoots grey-pubescent or subtomentose. *Leaves* shortly stalked, about 4 in. long, elliptic or lanceolate, acuminate, toothed or subentire, canescent. *Cymes* arranged mostly in terminal thyrses 3–5 in. long grey-pubescent and glandular. *Flowers* fragrant. *Calyx* campanulate, $\frac{1}{2}$ in. long, enlarging in fruit, pubescent; segments lanceolate, erect in fruit, 1–3 ribbed. *Corolla* $\frac{1}{2}$ in. long, pubescent and glandular, tube $\frac{1}{3}$ in.; limb $\frac{3}{4}$ in. in diam.; midlobe of lower lip $\frac{1}{4}$ – $\frac{1}{3}$ in. long, blue, the other lobes smaller and white. *Capsule* globose, $\frac{1}{8}$ in. in diam., closely pubescent, dark-blue when ripe.

Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* April and May. *DISTRIB.*: Punjab and outer Himalayan ranges eastwards from the Indus to Bhutan, up to 5,000 ft., also in N. Bengal. The wood has a fragrant scent like that of cherry.

The following, belonging to genera not indigenous within the area of this flora, are frequently cultivated in gardens:—

Stachytarpheta indica, Vahl; F. B. I. iv, 564; Prain *Beng. Pl.* 826; Cooke *Fl. Bomb.* ii, 421.—A nearly glabrous herb, 1–2 ft. high. *Leaves* elliptic, serrate. *Flowers* dark-blue, in long slender terminal spikes.—A native of S. America, but cultivated in most tropical and subtropical countries, and often occurring as a naturalized weed.

Duranta Plumieri, Jacq.; Gamble *Man. Ind. Timb.* 524; Cooke *Fl. Bomb.* ii, 437.—An erect shrub with spinose branches. *Leaves* oblong lanceolate, acuminate. *Flowers* blue or white, in terminal racemes. *Berries* orange-coloured. A native of S. America and the W. Indies. It is much cultivated in Indian gardens.

Petrea volubilis, Linn.; Cooke *Fl. Bomb.* ii, 437.—A large woody climber with very scabrous ovate or lanceolate leaves. *Flowers* in copious racemes. *Calyx* large, persistent, blue. *Corolla* violet-coloured, caducous. A native of Trop. America. A very handsome climber when in flower.

Congea tomentosa, Roxb. var. *azurea*, F. B. I. iv, 604; Cooke *Fl. Bomb.* ii, 437.—A robust climbing shrub with densely tomentose branches. *Leaves* elliptic, acute. *Bracts* lilac, oblong. *Calyx* toothed $\frac{1}{2}$ way down. *Corolla* white. This plant is found wild in Manipur, Burma and in Siam and is often cultivated in the gardens of N. India.

LXXXVII.—LABIATÆ.

Herbs, rarely shrubs, usually gland-dotted. Stems usually 4-ang. *Leaves* opposite or whorled, stipules none. *Flowers* 2-sexual, irreg solitary 2-nate or fascicled and axillary, or in centrifugal spicate c which by their union in pairs form false whorls. *Calyx* inferior, sistent, more or less irregular, 4—5-cleft or distinctly 2-lipped. Co hypogynous, gamopetalous, limb 4—5-lobed or 2-lipped, lobes imbr in bud. *Stamens* inserted in the corolla-tube, didynamous or or perfect, anthers with connate discrete or confluent cells dehiscing l tudinally. *Disk* prominent. *Ovary* superior, of two 2-celled car style simple, inserted between the lobes, stigma usually 2-fid, some, unequally; ovules 1 in each lobe, erect, anatropous. *Fruit* of 4 dr rarely fleshy 1-seeded nutlets at the base of the calyx, sometimes more suppressed. *Seeds* small, albumen scanty or none.—Species 3,000, chiefly in warm dry temperate regions.

Ovary 4-partite; areola of nutlets small, basilar or placed somewhat ob to the outer side:—

Stamens 4, all perfect and declinate, anther-cells at length confluent:—

Attachment of nutlets basilar:—

Lower lip of corolla declinate, flat or slightly concave, generally ne but hardly longer than the 3—4-lobed upper lip:—

Calyx deflexed in fruit; upper lobe widest, large, ovate, recurva margins decurrent on the tube:—

Corolla-tube short, lower lip flat, stigma 2-fid

1. OCIMUM.

Corolla-tube usually long, lower lip concave, stigma entire

2. ORTHOSIPHUM

Calyx suberect or declinate in fruit, upper lobe broader than the others, margins not decurrent on the tube:—

Whorls crowded in terminal and axillary, globose or ovoid heads with imbricate bracts, calyx sub-erect

3. ACROCEPHALUM

Whorls forming long terminal spicate racemes; bracts white, conspicuous, calyx usually declinate

4. GENIOSPORUM

Lower lip of corolla deflexed, concave or boat-shaped, much longer than the upper lip: =

Calyx equally 5-toothed or somewhat 2-lipped, with a 3-toothed upper and a 2-toothed lower lip, or with the upper lobe large rounded and reflexed, the others narrow and subulate

5. PLECTRANTHUM

Calyx very oblique, suberect, 2-lipped; upper lip large, entire inflexed and closing the mouth: lower lip truncate, obscurely toothed

6. ANISOCHILUM

Attachment of nutlets slightly oblique to the outer side, the nutlets also dorsally attached to the lobes of the disk and leaving a large areola on separation; calyx-lobes subequal, 13—15-nerved; corolla 2-lipped, lobes all flat and spreading, stamens included in the tube

7. LAVANDULA.

Stamens erect spreading or ascending:—

Stamens 4, all perfect:—

Corolla-lobes 4, flat, sub-equal and similar; stamens subequal, anther-cells confluent:—

- Calyx 5-toothed, teeth equal, stamens exerted, filaments usually bearded:—
- Lower lobe of corolla flat, spreading; whorls in glomerate or in solitary interrupted spikes:— 8. POGOSTEMON.
- Lower lobe of corolla like the others; whorls in slender dense continuous spikes 9. DYSOPHYLLA.
- Calyx 5-partite; segments plumose in flower, pappose in fruit; whorls in slender cylindric spikes; stamens of female flowers included, filaments naked 10. COLEBROOKIA.
- Corolla 2-lipped, stamens didynamous:—
- Anterior pair of stamens the longer:—
- Calyx 13-nerved, anthers 2-celled:—
- Calyx equally 5-toothed 11. MICROMERIA.
- Calyx distinctly 2-lipped 12. CALAMINTHA.
- Calyx 5—10-nerved:—
- Upper lip of corolla short, nearly flat; anthers of upper stamens 2-celled, of lower 1-celled, the cells transverse and parallel 13. ANISOMELES.
- Upper lip of corolla hooded:—
- Upper lip of corolla not woolly; calyx 2-lipped, with a broad plate at the back, the mouth closed after flowering 14. SCUTELLARIA.
- Upper lip of corolla woolly; calyx 5—10-toothed, its mouth remaining open after flowering:—
- Calyx 5-toothed, leaves more or less lobed or cut:—
- Anther-cells connivent, calyx teeth spine-scent 15. LEONURUS.
- Anther-cells divergent:—
- A shrub, flowers white tinged with pink 16. ROYLEA.
- An erect robust, herb, leaves mostly radical, flowers yellow, nutlets bearded at the apex 17. EREMOSTACHYS.
- Calyx 6—10-toothed, anther-cells divergent:—
- Lower lip of corolla longer than the upper lip 18. LEUCAS.
- Lower lip of corolla shorter than the upper lip 19. LEONOTIS.
- Posterior pair of stamens the longer; calyx 5-toothed, 15-nerved, stamens not exerted 20. NEPETA.
- Perfect stamens 2:—
- Lower (anterior) pair of stamens perfect, filaments short; anther-cells linear, separated by an elongated connective which is jointed with the filaments; upper arm of connective ascending and bearing one fertile anther-cell, lower arm horizontal or deflexed and bearing a fertile or an empty cell or naked, nutlets triquetrous 21. SALVIA.
- Upper (posticous) pair of stamens perfect, anther-cells not separated by an elongated connective, nutlets subglobose 22. MOSLA.
- Ovary 4-lobed, nutlets with a large oblique or lateral areola on the inner side; stamens 4, perfect, erect, exerted from the notch or fissure of the upper lip.
- Corolla deeply slit behind and apparently 1-lipped, the two small upper lobes along with the small lateral pair springing from the contracted base of the very large lower lobe 23. TEUCRIUM.

Corolla distinctly 2-lipped; upper lip short, 2-lobed, notched; lateral pair of lobes very small, springing from the sides of the very large lower lobe

24. AJUGA.

1. **OCIMUM**, Linn.; Fl. Brit. Ind. iv, 607.

Strongly scented herbs shrubs or undershrubs. *Flowers* small, in 6—10-flowered whorls, spicate or racemose, pedicels with recurved tips; bracts minute, caducous. *Calyx* 2-lipped, ovoid or campanulate, deflexed, enlarged and strongly veined in fruit; upper lip broad, flat, decurrent; lower with 4 mucronate teeth. *Corolla* 2-lipped; tube short, not annulate within; upper lip subequally 4-fid; lower hardly longer than the upper, declinate, entire. *Stamens* didynamous, declinate, exserted; filaments free or the lower pair connate below, naked or the upper toothed or hairy below, anther-cells confluent. *Disk* entire or 3—4-lobed. *Ovary* 4-partite, style-lobes subulate or flattened. *Nutlets* dry, smooth or subrugose, mucilaginous when moistened, basal scar small.—Species about 60, in tropical and warm temperate regions of both hemispheres.

Pedicels as long as or longer than the calyx, the 2 lower cal-teeth exceeding the upper lip

1. *O. sanctum*.

Pedicels shorter than the calyx:—

Bracts sessile, longer than calyx, the 2 lower cal-teeth minute

2. *O. gratissimum*.

Bracts stalked, shorter than calyx, the 2 lower cal-teeth longer than the upper lip:—

Corolla $\frac{1}{4}$ — $\frac{1}{2}$ in. long

3. *O. canum*.

Corolla $\frac{2}{3}$ — $\frac{1}{2}$ in. long

4. *O. Basilicum*.

1. ***O. sanctum***, Linn. Mant. i, 85; Roxb. Fl. Ind. iii, 14; F. B. I. iv 609; Watt E. D.; Duthie F. & G. Crops, N. W. Prov. iii, 50; Kanjilal For. Fl. 272; Prain Beng. Pl. 843; Cooke Fl. Bomb. ii, 440.—Vern. *Tulsi*, *krishna tulsi*. Holy Basil.

A much-branched herb, 1—2 ft. high, sometimes woody at the base; stems and branches clothed with soft spreading hairs. *Leaves* 1—2 in. long, oblong or elliptic-oblong, obtuse or acute, entire or subserrate, hairy on both surfaces and minutely dotted, petioles $\frac{1}{2}$ —1 in. long. *Racemes* slender, 6—8 in. long; bracts not exceeding the calyx, broadly ovate or cordate-ovate, acuminate, ciliate; pedicels slender, as long as or longer than the calyx. *Calyx* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, elongating in fruit; upper lip much reflexed, broadly obovate, apiculate; lower lip exceeding the upper, the two central teeth with long slender awns which curve upwards beyond the upper; the two lateral teeth with short straight awns. *Corolla* $\frac{1}{2}$ in. long, purplish-pink, upper lip hairy on the back. *Filaments* of upper pair of stamens with a small bearded appendage at the base. *Nutlets* broadly ellipsoid, smooth, yellow dotted with black.

Much cultivated within the area by Hindus, and often occurring as if wild. This is one of their most sacred plants and is to be found in every Hindu garden and around their temples.—DISTRIB.: Throughout India and in Ceylon, and up to 6,000 ft. on the Himalaya, extending also from W. Asia and Arabia to the Malay Islands and Australia.

Native country uncertain. Beads for rosaries are made from the woody stems, and all parts of the plant are used medicinally.

2. *O. gratissimum*, *Linn. Sp. Pl.* 1197; *Roxb. Fl. Ind.* iii, 17; *F. B. I.* iv., 608; *Watt E. D.*; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb.* ii, 441.—Vern. *Rám tulsi*. Shrubby Basil.

A much branched shrub, 4—6 ft. high, young branches pubescent. *Leaves* 2½—5 in. long, elliptic-lanceolate, acute, coarsely crenate or serrate, pubescent and gland-dotted on both sides, base cuneate; petioles 1—2½ in., slender, pubescent. *Racemes* rather short, simple or branched, rachis softly pubescent; bracts sessile, longer than the calyx, broadly ovate, acuminate, ciliate; pedicels softly hairy, shorter than the calyx. *Calyx* ½ in. long, elongating in fruit, pubescent and glandular; upper lip longer than lower one, rounded and curved upwards in fruit; lower lip strongly nerved, shortly toothed, the two central subulate ones a little longer than the broadly lanceolate lateral ones. *Corolla* ½ in. long, greenish-yellow, hairy outside; upper lip ½ in. broad, teeth rounded; lower lip longer and narrower. *Filaments* of upper pair of stamens with a bearded appendage at the base. *Nutlets* subglobose, brown, rugose.

Cultivated within the area and apparently wild in Merwára.—**DISTRIB.:** Throughout India, in Ceylon and Java; found also in Trop. Africa, but its native country is not known for certain. The leaves and seeds are used medicinally.

3. *O. canum*, *Sims in Bot. Mag.* 2452; *Royle Ill.* 301; *F. B. I.* iv, 607; *Watt E. D.*; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb.* ii, 440. *O. album*, *Roxb. Fl. Ind.* iii, 15 (not of *Linn.*).—Vern. *Bharhari* (Beng.), *Rám tulsi* (Bombay). *Hoary tulsi*.

An erect much-branched herb, 6—24 in. high, young parts pubescent. *Leaves* ½—1½ in. long, elliptic-lanceolate, entire or with shallow teeth, gland-dotted; petiole ¼—1 in. long, slender, hairy. *Spikes* 3—8 in. long; whorls rather close, 6-fid; bracts stalked, elliptic-lanceolate, ciliate; pedicels shorter than the calyx. *Calyx* ½ in. long, pubescent; upper lip rounded, flat, reticulately veined, mucronate, ciliate; lower lip with the two central awned teeth longer than the two lateral ones and exceeding the upper lip. *Corolla* white, ⅔—¾ in. long, upper lip broadly oblong, 4-toothed at the subtruncate apex, shorter and broader than the oblong obtuse lower lip. *Filaments* very long, the 2 upper ones toothed at the base. *Nutlets* ellipsoid, black.

Cultivated in Bundelkhand and probably elsewhere within the area.—**DISTRIB.:** Plains and lower hills of India, also in Ceylon, Java and in Trop. Africa, where by some authors it is believed to be indigenous. The leaves are used medicinally.

4. *O. Basilicum*. *Linn. Sp. Pl.* 597; *Roxb. Fl. Ind.* iii, 17; *Royle Ill.* 301; *F. B. I.* iv, 608; *Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii,* 50; *Watt E. D.*; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb.* ii, 442. *O. pilosum*, and *O. caryophyllatum*, *Roxb. Fl. Ind.* iii, 16.—Vern. *Káli tulsi*, *babui tulsi*. Sweet Basil.

An erect branching herb, 2—3 ft. high, glabrous or more or less hispidly pubescent. *Stems* and branches green or sometimes purplish. *Leaves* 1—2 in. or more long, ovate, acute, entire or more or less toothed or lobed; base cuneate, entire, petiole $\frac{1}{2}$ —1 in. long. *Whorls* densely racemose, the terminal raceme usually much longer than the lateral ones; bracts stalked, shorter than the calyx, ovate, acute. *Calyx* $\frac{1}{2}$ in. long, enlarging in fruit, very shortly pedicelled; lower lip with the 2 central teeth longer than the rounded upper lip. *Corolla* $\frac{1}{2}$ — $\frac{1}{2}$ in. long, white pink or purplish, glabrous or variously pubescent. *Stamens* slightly exserted, upper filaments toothed at the base. *Nutlets* about $\frac{1}{2}$ in. long, ellipsoid, black and pitted.

Sweet Basil is much grown in native gardens within this area, and is sometimes met with as if wild.—*DISTRIB.*: Dr. Aitchison considered it to be truly indigenous on the lower hills of the Punjab. It is cultivated throughout the greater part of India and in Ceylon, also in Burma and generally within the tropics of the E. Hemisphere and in Polynesia. *O. Basilicum* is a more robust plant than *O. canum* and has much larger flowers and seeds. There are numerous varieties, differing from one another as to the degree of hairiness and in the colour of their stems and flowers. The form usually regarded as typical has quite smooth green leaves and white flowers. The plant is strongly aromatic and is much used by the natives as a flavouring ingredient. The seeds swell up in water and form a jelly which is employed medicinally.

2. ORTHOSIPHON, Benth.; Fl. Brit. Ind. iv, 612.

Undershrubs or shrubs. *Flowers* racemose in 6-or fewer-flowered whorls, bracts small. *Calyx* ovoid campanulate or tubular, deflexed in fruit; upper tooth broad, membranous, margins decurrent on the tube; lateral and lower teeth distinct or shortly connate, usually subulate. *Corolla* 2-lipped, tube often slender, straight or incurved, upper lip 3—4-fid; lower entire, concave. *Stamens* didynamous, declinate; filaments free, toothless at the base, anther-cells confluent. *Disk* usually gibbous. *Ovary* 4-partite, style with a minute capitate or clavate entire or notched stigma. *Nutlets* dry, ovoid or globose, smooth or nearly so, basal scar small. Species about 60, in the warmer regions of the Old World.

Corolla-tube about as long as the calyx

1. *O. pallidus*.

Corolla-tube twice as long as the calyx

2. *O. rubicundus*.

1. *O. pallidus*, Royle Mss. ex Benth. in Hook, Bot. Misc. iii, 370; F. B. I. iv, 613; Prain Beng. Pl. 844; Cooke Fl. Bomb. ii, 442.

A low diffuse undershrub, 6—12 in. high; branches many from a woody root-stock, 4-angular, finely pubescent or subglabrous. *Leaves* petioled, not scented, $\frac{1}{2}$ —1 $\frac{1}{2}$ in. long, ovate, obtuse or acute, coarsely serrate or crenate, glabrous or sparingly hairy; base cuneate, entire, petiole $\frac{1}{4}$ — $\frac{3}{4}$ in. long. *Racemes* rather short; whorls distant, 6-flowered; bracts minute, hairy; pedicels about as long as the calyx in flower, hairy. *Calyx* $\frac{1}{2}$ in. long, enlarging to twice as long in fruit.

hairy below; upper lip with 3 obtuse lobes; lower lip membranous, strongly parallel-nerved, the 2 central teeth narrowly lanceolate and ending in a long up-curved awn exceeding the upper lip; lateral teeth broadly lanceolate and with short straight awns. *Corolla* white or lilac, $\frac{1}{4}$ in. long, tube about as long as the calyx; upper lip shorter than the rounded and concave lower lip. *Nutlets* subglobose, smooth, pale-brown.

Sub-Himalayan tracts of N. Oudh (Duthie), Banks of the Jumna (Royle), Lucknow (T. Anderson), Bundelkhand (Duthie). Flowers in July. **DISTRIB.:** Throughout the greater part of India from Kashmir and the Punjab to W. Behar and southwards to Travancore; extending to Gilgit, Baluchistan, Aden and Arabia.

2. *O. rubicundus*, Benth. in Wall. Pl. As. Rar. ii, 14; F. B. I. iv, 614; Prain Beng. Pl. 844. *O. virgatus*, Benth. l.c. *Ocimum tuberosum*, Roxb. Fl. Ind. iii, 18. *Plectranthus rubicundus*, Don Prod. 116.

An erect perennial herb with a woody often tuberous rootstock. *Stems* slender, 1–2 ft. high, 4-angled, pubescent or glabrate. *Leaves* usually sessile, 2–4 in. long, ovate or ovate-lanceolate, coarsely crenate or serrate, base cuneate. *Flowers* in rather distant whorls, bracts minute. *Calyx* hairy, lower lip with 4 subulate teeth. *Corolla* white or pink, $\frac{1}{2}$ – $\frac{3}{4}$ in. long, its tube twice as long as the calyx. *Nutlets* suborbicular, compressed, punctulate.

Not uncommon in the Sub-Himalayan tracts from Dehra Dun and the Siwalik range eastwards. Flowers April–June. **DISTRIB.:** W. Himalaya from Kashmir to Nepal ascending to 5,000 ft., and from W. Bengal to the Nilgiri Hills, extending to Upper Burma and China. Specimens obtained by Duthie's collectors in the Bahraich District of N. Oudh are furnished with large fusiform root-tubers similar to those of *Ruellia suffruticosa* and of other undershrubs which become modified by the action of periodical fires. This is probably Roxburgh's *Ocimum tuberosum*. Bentham's *Orthosiphon virgatus* has taller stems much narrower leaves and shorter racemes; the whorls also are more remote and fewer-flowered, the calyx is coloured and the corolla is smaller. This form was found by Wallich at Gorakhpur; it occurs also in Dehra Dun (Duthie) and up to 3,000 ft. in Kumaon (S. and W.), and was collected by Collett in Upper Burma.

3. ACROCEPHALUS, Benth.; Fl. Brit. Ind. iv, 611.

Annual or perennial herbs. *Leaves* small, opposite or whorled, petioled. *Flowers* very small, sessile; whorls in terminal or axillary globose or ovoid dense heads with imbricate bracts. *Calyx* 2-lipped, ovoid, tubular in fruit, base gibbous; upper lip flat, usually entire, lower-entire or 4-toothed, throat naked. *Corolla* small, somewhat 2-lipped upper lip subequally 4-lobed; lower entire scarcely longer than the upper. *Stamens* didynamous, declinate; filaments free, included, toothless. *Disk* small, gibbous. *Ovary* 4-partite, style shortly 2-fid. *Nutlets* dry, smooth, basal scar small.—Species about 40, in Trop. and Subtrop. Asia, also in Trop. Africa and in Madagascar.

A. capitatus, Benth. in Wall. *Pl. As. Rar. ii*, 18; Royle *Ill.* 301; *F. B. I. iv*, 611; Collett *Fl. Siml.* 384; Prain *Beng. Pl.* 844; Cooke *Fl. Bomb. ii*, 443.

An annual, 6—12 in. high. *Stems* simple or branching from the base, bluntly 4-angled, glabrous or nearly so. *Leaves* glabrous, $\frac{1}{2}$ — $1\frac{1}{4}$ in. long, ovate or lanceolate, subacute, coarsely serrate, tapering at the base and often decurrent into an obscure petiole. *Heads* $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., globose or ovoid, often with 2 spreading leaves at the base, peduncles 4-angled. *Whorls* close; bracts shorter than the fruiting calyx, broadly obovate, shortly acuminate, base cuneate. *Calyx* (in flower) $\frac{1}{10}$ in. long, elongating in fruit, hairy outside; upper lip oblong, entire, rounded at the apex; lower lip shorter, 4-toothed. *Corolla* $\frac{1}{8}$ in. long, pale-purple. *Nutlets* oblong-ellipsoid, compressed, dark-brown when ripe.

Dehra Dun (Gamble and Duthie), Moradabad (T. Thomson). Flowers July to October. **DISTRIB.:** Throughout India, chiefly in the hilly districts, Himalaya up to 5,000 ft. from Kashmir to Bhutan, extending to Burma, Java and Borneo.

4. GENIOSPORUM, Wall.; Fl. Brit. Ind. iv, 609.

Herbs. *Flowers* small or minute; whorls many-flowered, in long lax racemes or spikes, bracts often coloured. *Calyx* ovoid in flower, tubular in fruit, suberect or declinate, 5-toothed: upper tooth broadest, not decurrent; lateral free or connate with the upper; lowest pair short, free or connate. *Corolla* 2-lipped, tube short, upper lip 4-fid; lower declinate, entire. *Stamens* didynamous, declinate, filaments free, toothless. *Disk* swollen, gibbous. *Ovary* 4-partite, style-arms short, flattened. *Nutlets* dry, ovoid or oblong, smooth or punctulate. Species about 12, in Tropical Asia and Africa and in Madagascar.

G. strobiliferum, Wall. *Pl. As. Rar. ii*, 18; *F. B. I. iv*, 610. *Plectranthus coloratus*, Don *Prod.* 116.

An erect puberulous herb. *Stem* 2—3 ft. high, obtusely angled. *Leaves* 2—5 in. long, lanceolate, coarsely serrate, base acute or rounded, petioles $\frac{1}{4}$ — $\frac{3}{4}$ in. long. *Flowers* $\frac{1}{2}$ in. long, arranged in spikes 2—5 in. long; bracts leaf-like, white, deciduous, exceeding the pedicelled flowers. *Calyx* pubescent, with 2 black glands on the lower lip, ovoid in flower, erect and tubular in fruit, throat glabrous. *Corolla* white with purple veins, lower lip narrow. *Stamens* exserted. *Nutlets* ellipsoid, black hispid towards the apex.

Dehra Dun (Gamble and Duthie). Flowers July to Oct. **DISTRIB.:** In dry forests from Kumaon to Bhutan up to 5,000 ft., also on the Khasia Mts.

5. PLECTRANTHUS, L'Herit.; Fl. Brit. Ind. iv, 616.

Herbs or undershrubs. *Flowers* usually small, in lax (rarely close) paniced or racemose 6—8-flowered cymes. *Calyx* usually 2-lipped;

lobes 5, subequal or the upper widest, enlarged in fruit. *Corolla* 2-lipped; tube exserted, long or short, straight or decurved, throat equal or obliquely swollen; upper lip usually short, broad, 4-fid, recurved; lower much longer, entire, boat-shaped, stipitate or narrowed at the base. *Stamens* didynamous, declinate; filaments simple, free, anther-cells usually confluent. *Disk* usually enlarged in front. *Ovary* 4-partite, style subequally 2-fid. *Nutlets* orbicular ovoid or oblong, smooth granulate or punctate, basal scar small.—Species about 90, in Trop. and Subtrop. Asia, Africa, Australia and Polynesia.

Fruiting calyx decurved, corolla blue

1. *P. Coetsa*.

Fruiting calyx erect; corolla white spotted with pink

2. *P. ternifolius*.

1. *P. Coetsa*, *Buch.-Ham. ex D. Don Prod. 117; F. B. I. iv, 619; Collett Fl. Siml. 385; Cooke Fl. Bomb. ii, 447.*

A tall erect much-branched strong-smelling perennial herb, 3–6 ft. high. *Stems* stout, 4-angled, pubescent, often tinged with red. *Leaves* $1\frac{1}{2}$ –4 in. long, ovate or ovate-lanceolate, acute, crenate or serrate, softly pubescent above, white-tomentose beneath, base tapering into the more or less winged petiole, nerves and veins prominent beneath; petioles $\frac{1}{4}$ – $\frac{1}{2}$ in. long, stout, woolly. *Flowers* in many short cymes which are arranged in long axillary and terminal pubescent paniced racemes; pedicels slender, deflexed, hairy. *Calyx* clothed with stiff grey hairs, in flower $\frac{1}{2}$ – $\frac{1}{10}$ in. long and campanulate, decurved in fruit and tubular; tube curved, 10-ribbed; teeth subequal, acute. *Corolla* $\frac{1}{3}$ – $\frac{1}{2}$ in. long, lavender-blue, hairy outside, tube abruptly decurved; upper lip obscurely lobed; lower longer, boat-shaped. *Nutlets* broadly ellipsoid or suborbicular smooth, yellow.

Dehra Dun, in the Nakraunda swamp (Kanjilal). **DISTRIB.:** Subtrop. and Temp. Himalaya from the Punjab to Mishmi, up to 8,000 ft.; also on the Khasia Hills and in Burma, extending to Afghanistan, the Konkan, Deccan, S. India and Ceylon.

2. *P. ternifolius*, *D. Don Prod. 117; F. B. I. iv, 621; Kanjilal For. Fl. 272; Collett Fl. Siml. 386; Prain Beng. Pl. 846; Brandis Ind. Trees 516. Elsholtzia Thompsoni, Hook. f. in F. B. I. iv, 643.*

A bush-like herb, 3–6 ft. high; branches erect, densely white-tomentose. *Leaves* opposite and ternately whorled, sessile or nearly so, thick rugose, 2–6 in. long, lanceolate, acuminate, serrate, base acute; upper surface hairy, lower white-tomentose. *Cymes* shortly stalked, crowded in erect cylindric villous racemes forming terminal panicles, lower bracts leaf-like. *Calyx* tomentose; tube campanulate when in flower elongate tubular and erect in fruit; teeth subequal, acute. *Corolla* white with pink spots at the base of the upper lip; tube inflated, longer than the calyx, limb very short. *Nutlets* trigonous, acuminate.

Dehra Dun, at Karwapani (Kanjilal); N. Oudh, at Gadughat (R. Thompson), Kheri forests (Hearle). **DISTRIB.:** Outer Himalayan ranges from Kashmir eastwards, up to 5,000 ft.; also in Bengal, the Khasia Hills, Manipur, Upper Burma and Tonkin.

6. ANISOCHILUS, Wall.; Fl. Brit. Ind. iv, 627.

Herbs or undershrubs. *Flowers* small, in dense oblong 4-angled or cylindrical spikes bracts caducous. *Calyx* suberect, inflated below the middle, 2-lipped or 5-toothed, rarely 1-lipped; upper lip entire and deflexed, or short and minutely 3-lobed; lower lip short, truncate obscurely toothed or none. *Corolla* 2-lipped; tube slender, decurved, throat inflated; upper lip short, entire or 3-4-fid; lower elongate, concave. *Stamens* didynamous, declinate, filaments free. *Disk* lobed. *Ovary* 4-partite, style 2-fid at the apex. *Nutlets* dry, ovoid, smooth, basal scar small.—Species about 15, all confined to India except one in Trop. Africa.

A. carnosus, Wall. *Pl. As. Rar. ii*, 18; *Royle Ill.* 301; *F. B. I. iv*, 627; *Watt E. D.*; *Prain Beng. Pl.* 847; *Cooke Fl. Bomb. ii*, 450. *A. eriocephalus*, *Benth.*; *F. B. I. l.c.* *Plectranthus strobiliferus*, *Roxb. Fl. Ind. iii*, 23. Vern. *Panjiri*.

An erect annual, 1—2 ft. high. *Stem* stout, bluntly 4-angled, glabrous or sparsely pubescent, often tinged with red. *Leaves* rather fleshy, 1—2½ in. long, broadly ovate, obtuse, crenate, rounded or subcordate at the base, usually hairy beneath, petioles ½—1½ in. long. *Spikes* ½—1½ in. long, 4-gonous in flower and becoming cylindrical in fruit, peduncles slender; bracts ⅓ in. long, ovate, acuminate, ciliate, glandular. *Calyx* pubescent, ½ in. long, enlarging in fruit; upper lip ovate-lanceolate, acute, ciliolate, bending over the lower lip and closing the mouth of the calyx when in fruit; lower lip truncate, its membranous ciliate tip reflexed and appressed against the tube. *Corolla* pale-purple, ⅔ in. long, hairy outside; upper lip short, erect, with shallow lobes. *Nutlets* suborbicular, compressed, polished and brown when ripe.

Upper Gangetic Plain (Wallich), Banks of Jumna from Delhi to Allahabad (Royle), Bundelkhand (Edgeworth). *Flowers* Sep. and Oct. **DISTRIB.**: W. Himalaya, up to 8,000 ft. in Garhwal and Kumaon, and southwards through C. and S. India to Ceylon, extending to Ava.

7. LAVANDULA, Linn.; Fl. Brit. Ind. iv, 630.

Herbs or shrubs. *Leaves* incised or entire. *Flowers* in 2—10-flowered whorls forming simple or branched spikes, bracts persistent. *Calyx* erect, ovoid, tubular, shortly and equally 5-toothed, 13—15-nerved. *Corolla* blue or purple, rarely white, oblique, 2-lipped; upper lip 2-fid, lower 3-partite, the lobes all spreading. *Stamens* didynamous, declinate, included, filaments free, anther-cells confluent. *Disk* equally 4-lobed. *Ovary* 4-partite, style shortly 2-fid, the lobes flattened. *Fruit* of 4 dry smooth nutlets, basal scar somewhat oblique.—Species 30, chiefly Mediterranean.

L. Burmanni, *Benth. Lab. Gen. & Sp.* 151; *Royle Ill.* 300; *F. B. I. iv*, 631; *Prain Beng. Pl.* 848; *Cooke Fl. Bomb. ii*, 452.

A slender erect herb. *Stems* 2—3 ft. high, simple or branched, 4-angled, pubescent. *Leaves* sessile or nearly so, 2—4 in. long and as broad as long, pinnatipartite or deeply pinnatisect; lobes linear entire or cut or

toothed, obtuse or subacute, glabrous or pubescent above, pale and pubescent beneath. *Spikes* simple or more or less branched, or sometimes subumbellate, bracts pubescent, $\frac{1}{4}$ — $\frac{1}{3}$ in. long, broadly ovate and strongly nerved at the base, the apex ending in a long capillary awn. *Calyx* (in fruit) grey-pubescent, $\frac{1}{3}$ in. long, tube somewhat curved; teeth lanceolate, acute and with pennicillate tips. *Corolla* blue or white, nearly $\frac{1}{2}$ in. long, hairy outside; tube $\frac{1}{2}$ in. long, slender below; upper lip $\frac{1}{8}$ in. long; middle lobe of lower lip twice as long as the 2 lateral ones. *Nutlets* oblong-ellipsoid, mucilaginous when moistened.

Central India at Indore (Jacquemont). This is the only known record of this plant as occurring within the area of this flora. There is, however, every reason to suppose that it is not restricted to a single locality. Flowers Oct. and Nov. **DISTRIB.:** Chota Nagpur, and in Western, Cent. and S. India.

8. POGOSTEMON, Desf.; Fl. Brit. Ind. iv, 631.

Herbs or undershrubs. *Leaves* opposite, rarely ternate. *Flowers* small, in simple or paniced spikes or contracted racemes formed of many dense-flowered subcapitate cymes (whorls). *Calyx* subequally 5-toothed. *Corolla* somewhat 2-lipped, 4-lobed; upper lip 3-lobed, the middle lobe often longer and narrower than the lateral; lower lip flat, spreading, narrow, entire. *Stamens* 4, subequal, exserted, straight or declinate, filaments usually bearded, anther-cells confluent. *Disk* subentire, equal. *Ovary* 4-partite, style shortly 2-fid. *Nutlets* dry, smooth, ovoid or oblong, basal scar small.—Species about 30, in India and Malaya to Japan.

P. plectranthoides, Desf. in *Mém. Mus. Par. ii*, 155, t. 6; *F. B. I. iv*, 632; *Kanjilal For. Fl.* 272; *Collett Fl. Siml.* 387; *Prair Beng. Pl.* 849, *Cooke Fl. Bomb. ii*, 454; *Brandis Ind. Trees* 516. *Mentha fruticosa*, *Roxb. Fl. Ind. iii*, 6.

A large gregarious aromatic bush; young parts grey-tomentose; branches terete or subquadrangular, often tinged with dark-purple, pith large. *Leaves* 2—5 in. long, ovate, acute, doubly serrate, rounded or cuneate at the base, petioles $\frac{1}{2}$ — $1\frac{1}{4}$ in. long. *Flowers* in dense villous bracteate whorls crowded in numerous stout cylindric spikes 1—4 in. long, the whole forming an erect terminal panicle; bracts leaf-like, up to $\frac{1}{3}$ in. long, ovate, acute, softly hairy and glandular, enclosing a fascicle of sessile flowers; bracteoles mostly linear-lanceolate, often tinged with purple. *Calyx* $\frac{1}{4}$ — $\frac{1}{3}$ in. long, glandular-pubescent; teeth triangular-lanceolate, ciliate, usually tinged with purple at the apex. *Corolla* $\frac{1}{3}$ in. long, white tinged with pink; tube $\frac{1}{3}$ in. long, slender, curved; upper lip $\frac{1}{3}$ in. long; middle lobe longer and narrower than the 2 obtuse lateral ones; lower lip shorter than the upper, ovate-oblong, obtuse, entire. *Filaments* bearded with long lilac moniliform hairs. *Nutlets* minute, broadly ellipsoid, shining, dark-brown, when ripe.

Abundant within the area, especially in the Sub-Himalayan tracts from Dehra Dun to Gorakhpur, also in Bundelkhand. **DISTRIB.:** W. Hima-

laya up to 5,000 ft., Punjab plain, Bengal, the Circars and in the Bombay Pres., also in Upper Burma. The ashes prepared from the stems are used in some places as manure for young rice plants. The scent of the leaves resembles that of black-currants. The true *patchouly* plant, from which the well-known scent is derived is, according to Prain, *P. Cablin*, Benth. (*P. suavis*, Ten. and *P. Patchouli* var. *suavis*, Hook. f. in. F. B. I. iv, 634). It is known only in cultivation, and it very seldom produces flowers. *P. Patchouli* of the F. B. I. is *P. Heyneanus*, Benth. and is recognized in commerce as "*Indian patchouli*."

9. DYSOPHYLLA, Blume; Fl. Brit. Ind. iv, 637.

Herbs. *Leaves* opposite or whorled. *Flowers* minute, in dense long spikes composed of numerous close-set many-flowered cymes. *Calyx* ovoid, 5-toothed, teeth subequal, throat naked within. *Corolla* small, tube exerted or included, limb equally 4-fid; upper lobe entire or 2-fid, lower somewhat spreading. *Stamens* 4, exerted, straight or subdeclinate; filaments very long, bearded; anther-cells confluent. *Disk* equal, subentire. *Style* 2-fid, lobes subulate. *Nutlets* ovoid or oblong, smooth or granulate.—Species about 15, in Tropical Asia and in Australia.

D. crassicaulis, Benth. in Wall. Pl. As. Rar. i, 30; F. B. I. iv, 640; Collett Fl. Siml. 387; Prain Beng. Pl. 851. VAR. **pumila**, F. B. I. iv, l.c.; Prain l.c.; *D. pumila*, Benth. l.c. *Mentha verticillata*, Don Prod. 114.

A dwarf annual. *Stems* few, erect, 3—4 in. high, usually subglabrous. *Leaves* sessile, flat, usually in whorls of 4, about $\frac{1}{2}$ in. long, narrowly oblong or oblanceolate, obtuse, distantly and rather coarsely toothed. *Spikes* terminal, $\frac{1}{2}$ —1 in. long, dense, cylindric, sometimes interrupted below, rachis hairy; bracts exceeding the calyx, oblanceolate, obtuse, the lowest often leaf-like. *Calyx* hairy, teeth erect or conniving in fruit; lobes triangular, enlarging in fruit. *Corolla* purplish, tube exerted. *Filaments* bearded with bluish moniliform hairs. *Nutlets* very small, orbicular, compressed, pale, shining.

Dehra Dun, in swampy ground at Kaluwala, elevation about 1,500 ft. (Gamble). Flowers in Dec. DISTRIB.: Northern Bengal. The type is abundant on the Himalaya from Kashmir to Sikkim; also in E. Bengal, Assam, Sylhet and on the Khasia Hills. The variety differs by its dwarf habit, much shorter spikes and the more hairy calyx.

10. COLEBROOKIA, Smith; Fl. Brit. Ind. iv, 642.

A densely hoary or woolly shrub. *Leaves* opposite or ternate, petioled, rugose, oblong-lanceolate, crenulate or serrulate. *Flowers* small, functionally, dioecious, arranged in paniced spikes, bracteoles connate. *Calyx-tube* very short; teeth long, subulate, elongating in fruit, capillary and plumose. *Corolla* small, tube very short; lobes 4, subequal. *Stamens* 4, equal, distant, exerted in the male flowers, included in the female flowers; filaments naked, anthers orbicular, cells confluent. *Disk* uniform. *Ovary* 4-partite, style 2-fid, protruded in the female

flowers. *Nutlets* 1—4, obovoid, dry, with hairy tips, basal scar small.—A single species, confined to India and Burma.

C. oppositifolia, Sm. *Exot. Bot.* ii, 111, t. 115; Roxb. *Fl. Ind.* iii, 26; *F. B. I.* iv, 642; Watt *E. D.*; *Kanjilal For. Fl.* 270; *Gamble Man. Ind. Timb.* 547; *Collett Fl. Siml.* 388; *Prain Beng. Pl.* 851; *Cooke Fl. Bomb.* ii, 458; *Brandis Ind. Trees* 515. *C. ternifolia*, Roxb.; *Fl. Ind.* iii, 25.—Vern. *Pansra*, *binda* (Dehra Dun).

An erect tomentose much-branched shrub, 4—10 ft. high; branches stout subquadrangular, grooved, usually in whorls of three. *Leaves* rugose, softly hairy on both surfaces, crowded towards the ends of the branches, opposite or in verticils of three; 4—6 in. long, oblong-lanceolate, acute, crenulate or serrulate, base acute, both surfaces softly hairy, petioles $\frac{3}{8}$ —1 in. long. *Spikes* axillary or in panicles towards the ends of the branches, often 3-nately arranged, erect, cylindrical, slender when in flower, becoming much stouter in fruit; bracts solitary, $\frac{1}{16}$ in. long, linear, pubescent; bracteoles many, $\frac{1}{12}$ in. long, connate at the base. *Calyx* 5-partite $\frac{1}{10}$ — $\frac{1}{8}$ in. long; teeth subulate, plumose with white hairs, elongate in fruit and often with purple tips. *Corolla* $\frac{3}{4}$ in. long, white. *Nutlets* usually solitary, $\frac{3}{8}$ in. long, oblong-obovoid, hairy at the tip.

Dehra Dun and Siwalik range, in ravines and by water-courses extending along the Sub-Himalayan tracts and eastwards to Gorakhpur. Flowers in Jan. and Feb. **DISTRIB.:** Himalaya up to 4,000 ft. from the Indus to Bhutan, and more or less throughout the hilly parts of Cent., W. and S. India, extending to Tenasserim, Upper Burma and China. The wood is used for making gunpowder-charcoal, and the leaves are applied to wounds and bruises.

11. MICROMERIA, Benth.; Fl. Brit. Ind. iv, 649.

Herbs or undershrubs. *Leaves* usually small, entire or toothed. *Flowers* small; whorls few- or many-flowered, in axillary or terminal spikes, rarely paniced. *Calyx* 13-nerved, 5-toothed or 2-lipped. *Corolla* 2-lipped, tube straight; upper lip entire or emarginate, flattish; lower spreading, 3-fid. *Stamens* didynamous, the lower pair longer, ascending, incurved and with diverging apices; anther-cells distinct, parallel, at length diverging, connective usually thickened. *Ovary* 4-lobed; style 2-lobed, the lobes equal or the upper very short; the lower recurved, flattened. *Nutlets* 4, dry, ovoid or oblong, basal scar small.—Species about 60, found in nearly all parts of the world, but not in Australia.

M. capitellata, Benth. in DC. *Prod.* xii, 218; *F. B. I.* iv, 649; Watt *E. D.*; *Prain Beng. Pl.* 852; *Cooke Fl. Bomb.* ii, 459.

A slender herb, 1—2 ft. high, very aromatic, rootstock woody. *Stems* erect, 4-angled, pubescent, often tinged with purple. *Leaves* shortly stalked, $\frac{1}{2}$ —1 in. long, ovate or oblong, subobtruse, hairy and gland-dotted on both surfaces; margins crenate or entire, ciliate, petioles $\frac{1}{8}$ — $\frac{1}{4}$ in. long. *Flowers* in distant subglobose whorls; cymes of lower whorls peduncled, the upper sessile, the whole forming a long slender

spike-like raceme; floral leaves smaller upwards; bracts small, linear-lanceolate, hairy. *Calyx* $\frac{1}{10}$ in. long (in flower), hairy and glandular, divided $\frac{1}{2}$ of the way down into erect lanceolate ciliate teeth. *Corolla* $\frac{1}{2}$ in. long, hairy outside; upper lip pale-violet, oblong and slightly emarginate; lower twice the length of the upper, dark-violet. *Nutlets* ellipsoid, smooth, brown when ripe.

Dehra Dun (Duthie). **DISTRIB.:** Chota Nagpur, Deccan and on the Nilgiri Hills.

12. CALAMINTHA, Mœnch.; Fl. Brit. Ind. iv, 650.

Herbs or shrubs. *Leaves* entire or toothed. *Flowers* small, whorls dense and axillary or loose and paniced or in spikes. *Calyx* 13-nerved, 2-lipped, upper lip 3-toothed, lower 2-fid and with narrower teeth, throat naked or villous. *Corolla* 2-lipped, tube straight, throat villous; upper lip erect, flattish; lower spreading, 3-lobed. *Stamens* didynamous (the upper pair rarely imperfect); lower pair longer, ascending under the upper lip; anther-cells distinct, parallel or diverging. *Ovary* 4-lobed; style 2-fid, the lobes equal, or the lower larger. *Nutlets* 4, minute, subglobose, dry, smooth.—Species 40, chiefly in temperate regions of the N. Hemisphere.

C. umbrosa, *Fisch. and Mey. Ind. Sem. Hort. Petrop. vi, 6; F. R. I. iv, 650; Collett Fl. Siml. 393; Prain Beng. Pl. 853.* *Clinopodium repens*, *Roxb. Fl. Ind. iii, 13.*

A small slender procumbent or decumbent laxly hairy herb. *Leaves* $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, ovate, serrate. *Flowers* in small globose lax or densely flowered whorls; bracts small, not forming an involucre. *Calyx* $\frac{1}{4}$ in. long; teeth of upper lip triangular, those of the lower longer and subulate. *Corolla* purple, hairy. *Nutlets* very small.

Dehra Dun, rather common. **DISTRIB.:** Temperate Himalaya from Kashmir to Bhutan, up to 12,000 ft., Khasia Mts. up to 4,000, and in the hilly portions of Peninsular India from the Konkan and southwards to Ceylon; extending to Afghanistan, the Caucasus range, China, Japan and Java. This species is closely allied to *C. Clinopodium* (Wild Basil), differing by its more slender and procumbent or decumbent habit; the bracts and calyx are much shorter, and the upper lip of the latter is more recurved.

13. ANISOMELES, R. Br.; Fl. Brit. Ind. iv, 672.

Tall erect branching coarse and more or less tomentose herbs. *Flowers* purplish, in axillary whorls, or in lax-flowered branching paniced cymes. *Calyx* ovoid or tubular, straight, limb equally 5-toothed. *Corolla* 2-lipped; tube short, annulate within; upper lip short, erect, entire; lower broad, spreading, 3-lobed; midlobe large, 2-fid. *Stamens* didynamous, exserted, the lower pair longer; anthers of upper pair 2-celled, those of the lower pair 1-celled, the cells transverse and parallel. *Disk* equal. *Ovary* 4-partite; style 2-fid, the lobes

equal, subulate. *Nutlets* ovoid, obtuse, dry, basal scar small.—Species about 8, from Trop. and Subtrop. Asia to N. Australia.

A. ovata, *R. Br. in Ait. Hort. Kew. ed. 2, ii, 264*; *Royle Ill. 301*; *F. B. I. iv, 672*; *Watt E. D.*; *Collett Fl. Siml. 402*; *Prain Beng. Pl. 853*; *Cooke Fl. Bomb. ii, 461*. *A. ovata*, VAR. *mollissima* *Prain l.c.* *Ajuga disticha*, *Heyne*; *Roxb. Fl. Ind. iii, 2*.

A suffruticose herb, 3—6 ft. high, sparingly hairy to densely pubescent or almost woolly. *Stems* acutely 4-angled. *Leaves* $1\frac{1}{2}$ —3 in. long, ovate, acute, crenate-serrate, thickly herbaceous, softly pubescent on both sides, base truncate rounded or rarely cuncate, the margins entire; petioles $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, densely hairy. *Whorls* axillary, many-flowered, more or less interrupted below, crowded above, the whole forming a dense spicate inflorescence; bracts $\frac{1}{3}$ — $\frac{1}{2}$ in. long, linear, clothed with long stiff hairs. *Calyx* subsessile, $\frac{1}{4}$ in. long, enlarging in fruit, hirsute; teeth about as long as the tube, lanceolate, acute, ciliate. *Corolla* $\frac{5}{8}$ in. long; upper lip pale-purple, $\frac{1}{4}$ in. long, oblong, rounded; lower lip deep blue, much longer, the midlobe deeply 2-fid. *Filaments* bearded. *Nutlets* $\frac{1}{10}$ in. long, smooth shining and black when ripe.

Very common within the area. Flowers after the rainy season. **DISTRIB.**: Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya, extending to the Malay Peninsula and Islands to China and the Philippines. The form with densely woolly pubescence (*A. mollissima*, Wall.) and regarded by Prain as deserving varietal rank is abundant within our area. The whole plant has a strong scent resembling camphor.

14. SCUTELLARIA, Linn; Fl. Brit. Ind. iv, 667.

Herbs or undershrubs. *Inflorescence* various. *Calyx* campanulate, 2-lipped, lips closing after flowering; upper lip deciduous, furnished on the back with a large deciduous shield or pouch (the posterior calyx-lobe), lower lip persistent. *Corolla* 2-lipped; tube long, usually sharply recurved beyond the calyx and then ascending, dilated at the throat, not annulate within; upper lip erect, galeate, entire or notched; lower broad, 3-lobed. *Stamens* didynamous; the lower pair longer, ascending under the galeate upper lip; anthers conniving, ciliate; those of the upper stamens 2-celled, of the lower 1-celled. *Disk* elongate. *Ovary* 4-parite, oblique; style 2-fid, the upper lobe very short. *Nutlets* 4, very minute, smooth, granulate or hispidulous.—Species about 90, in northern temperate regions, and on mountains in the tropics, abundant on the Andes.

S. repens, *Buch.-Ham. ex D. Don Prod. 110*; *F. B. I. iv, 669*; *Collett Fl. Siml. 400*.

A diffuse pubescent or tomentose herb with long rather stout 4-angled curved brittle stems; branches crowded, ascending. *Leaves* stalked, $\frac{1}{4}$ — $1\frac{1}{2}$ in. long, ovate, acute, the lower ones usually crenate-serrate, upper entire; base acute or truncate, rarely subcordate, petioles

$\frac{1}{4}$ —1 in. long. *Flowers* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, arranged in curved glandular-hairy racemes 6—10 in. long; bracts $\frac{1}{4}$ —1 in. long, ovate, longer than the pedicel and calyx, but hardly leaf-like. *Corolla* dull-yellow with usually a tinge of purple, sharply recurved. *Nutlets* subgranulate.

In the Sub-Himalayan tract of the Gonda district in N. Oudh. **DISTRIB.:** Himalaya from Kashmir to Sikkim up to 6,000 ft., usually amongst loose stones, extending to Ava.

15. LEONURUS, Linn.; Fl. Brit. Ind. iv, 677.

Erect stout leafy herbs. *Leaves* lobed, *Flowers* small, in dense-flowered distant axillary whorls. *Calyx* 5-nerved, turbinate; teeth 5, spreading, spinescent. *Corolla* 2-lipped, tube naked or annulate within; upper lip entire, erect; lower 3-fid, midlobe obcordate. *Stamens* didynamous, the lower pair the longest, filaments ascending, anthers conniving, cells transverse. *Disk* uniform. *Ovary* 4-partite, style 2-fid; lobes equal, obtuse or subulate. *Fruit* of 4 triquetrous smooth dry nutlets, truncate at the apex, basal scar small.—Species 10, in Europe, Asia, Africa and America.

L. sibiricus, Linn. *Sp. Pl.* 584; *F. B. I. iv*, 678; *Prain Beng. Pl.* 854; *Cooke Fl. Bomb. ii*, 463.

An annual, 2—6 ft. high, glabrous or more or less pubescent. *Stems* bluntly 4-angled, sulcate. *Leaves* $1\frac{1}{2}$ —4 in. long, palmatipartite; segments linear, incised, glabrous or nearly so on the upper surface, pale beneath and more or less pubescent on the prominent nerves, petioles up to 2 in. long. *Floral leaves* of upper whorls usually entire; bracts $\frac{1}{2}$ in. long, spinescent. *Calyx* $\frac{1}{4}$ — $\frac{1}{3}$ in. long, glabrous or slightly pubescent; teeth triangular, spine-tipped. *Corolla* red, up to $\frac{1}{2}$ in. long; tube as long as the limb, annulate within; upper lip hooded, hairy; lower equalling the upper, the 2 lateral lobes rounded. *Nutlets* $\frac{1}{16}$ in. long.

Widely dispersed within the area, but often as a naturalized plant. *Flowers* after the rainy season. **DISTRIB.:** Plains of India from Bengal and Sylhet to Kurg, but doubtfully indigenous. The plant has spread to Africa and America from trop. Asia.

16. ROYLEA, Wall.; Fl. Brit. Ind. iv, 679.

A tall hoary shrub or undershrub. *Leaves* shortly petioled, deeply crenate-toothed or lobed. *Whorls* axillary, 6—10-flowered; bracteoles small, subulate. *Calyx-tube* cylindrical, 10-nerved; lobes 5, large, obovate-oblong, obtuse, rigid, reticulate-veined. *Corolla* white or pinkish; tube included, cylindrical, annulate within; upper lip erect, hooded, entire; lower spreading, 3-fid; midlobe longest, entire. *Stamens* didynamous, lower pair longer; anthers conniving, the cells diverging. *Style-lobes* subequal, subulate. *Nutlets* ovoid-oblong, obtuse, smooth.—A single species, restricted to the Western Himalaya ascending to 5,000 ft. from the base of the outer ranges.

R. calycina, Briquet in Engl. and Prantl. *Pflanzenf.* iv, 3 a, 260. *R. elegans*, Wall.; *F. B. I.* iv, 679; *Kanjilal For. Fl.* 271; *Gamble Man. Ind. Timb.* 548; *Collett Fl. Siml.* 404; *Brundis Ind. Trees* 515. *Phlomis calycina*, Roxb. *Fl. Ind.* iii, 11. *Ballota cinerea*, Don *Prod.* 111.—Vern. *Kaur* (Punjab), *karanoi* (Jaunsar), *titpati* (Garhwal).

An erect much-branched shrub with grey bark, 3–5-ft. high; branches slender, terete, pale-brown, finely tomentose. *Leaves* 1–1½ in. long, ovate, acute, deeply crenate or lobed, finely tomentose beneath, base cuneate, petioles ½–¾ in. long. *Flowers* ½ in. long. *Calyx* (in flower) nearly as long as the corolla; lobes erect, oblong, obtuse, much enlarged in fruit. *Corolla* ½ in. long, white or pinkish, hairy, upper lip hooded. *Nutlets* ½ in. long.

Dehra Dun. **DISTRIB.:** W. Himalaya from Kashmir to Nepal up to 5,000 ft.; abundant on hill-sides and often gregarious. Stewart states that the plant is used medicinally for its bitter tonic properties.

17. EREMOSTACHYS, Bunge.; Fl. Brit. Ind. iv, 694.

Erect herbs, usually not much branched. Radical leaves broad, toothed or incised; cauline few, smaller. *Whorls* densely many-flowered, axillary or in a terminal spike. *Calyx* subcampanulate, dilated upwards into a broad membranous limb; teeth 5, equal, setaceous. *Corolla* 2-lipped, tube included; upper lip erect, hooded, bearded within; lower spreading, 3-lobed, midlobe largest. *Stamens* didynamous, ascending, the lower pair longer, filaments of upper pair fimbriate or appendaged at the base; anthers conniving, cells divaricate. *Disk* equal. *Style-lobes* equal, or the upper one shorter. *Nutlets* obovoid, triquetrous, truncate, their summit densely hairy.—Species 27, in W. Asia.

E. superba, Royle ex Benth. in Hook. *Bot. Misc* iii, 381; *Ill.* 303, t. 74; *F. B. I.* iv, 695.

A robust softly hairy herb, about 2 ft. high. *Stem* annual, from a large tuberous rootstock, erect, unbranched. *Radical leaves* petioled, 8–12 in. long, ovate in outline, pinnatisect, segments lobulate; lobules broad, obtuse; cauline leaves few, small, pinnatifid. *Whorls* many-flowered, crowded on a stout woolly spike 6–10 in. long; *floral leaves* erect, ovate, acute, concave, enclosing the flowers, deciduous. *Calyx* woolly, ¾ in. long; mouth truncate, shortly and broadly 5-lobed. *Corolla* yellow tube included; upper lip galeate, ½ in. long, villous.

Siwalik range near the Mohand Pass (Royle, etc.). **DISTRIB.:** Punjab, near Peshawar (Vicary). An extremely local and very handsome plant. When cultivated in the Saharanpur garden, it used often to make its appearance as an escape on sheltered parts of the lawns.

18. LEUCAS, R. Br.; Fl. Brit. Ind. iv, 680.

Herbs or undershrubs, usually woolly or villous. *Flowers* usually white, in axillary mostly distant whorls. *Calyx* 10-nerved, striate; mouth equal or oblique, equally or unequally 6–10-toothed. *Corolla*

2-lipped; tube included, annulate or naked within; upper lip erect, concave, externally villous; lower spreading, 3-fid, midlobe very large. *Stamens* didynamous, the lower pair longer, filaments ascending; anthers conniving, the cells divaricate, at length confluent. *Disk* entire or lobed, equal or glandular in front. *Ovary* 4-partite; style subulate at the apex, the posterior lobe obsolete. *Nutlets* 4, ovoid, triquetrous, obtuse, dry, basal scar small.—Species about 100, chiefly in Asia and Africa.

Calyx-mouth oblique:—

Mouth of calyx split above, much produced below

1. *L. urticaefolia*.

Mouth of calyx projecting forward above:—

Calyx-teeth very short:—

Mouth of calyx glabrous within, whorls both axillary and terminal:—

Perennial, hispidly hairy; bracts few, subulate, mouth of calyx wide

2. *L. hyssopifolia*.

Annual, mouth of calyx contracted:—

Calyx smooth below; bracts long, linear, filiform

3. *L. aspera*.

Calyx smooth throughout; bracts few, short

4. *L. linifolia*.

Mouth of calyx hairy within; whorls terminal, very large, subglobose; bracts many, large, awned

5. *L. Cephalotes*.

Calyx-teeth long and slender

6. *L. nutans*.

Calyx-mouth straight or nearly so:—

Whorls many-flowered, flowers almost sessile, leaves and calyx more or less pubescent:—

Hairs on the stem and branches erect or spreading, not deflexed

7. *L. lanata*.

Hairs on the stem and branches deflexed

8. *L. mollissima*.

Whorls 1—2-flowered, flowers pedicelled, leaves and calyx subglabrous

9. *L. procumbens*.

1. *L. urticaefolia*, *R. Br. Prod.* 504; *Royle Ill.* 301; *F. B. I. iv*, 680; *Prain Beng. Pl.* 855; *Cooke Fl. Bomb. ii*, 464. *Phlomis urticaefolia*, *Vahl*; *Roxb. Fl. Ind. iii*, 11.

A tomentose or hairy annual, 6—18 in. high. *Stems* bluntly 4-angled, finely pubescent. *Leaves* rather thin, $1\frac{1}{2}$ —3 in. long, ovate, acute, coarsely serrate, acute or rounded at the base, petioles $\frac{1}{2}$ —1 in. long. *Flowers* in dense distant globose whorls up to 1 in. in diam.; bracts shortly stalked, $\frac{3}{8}$ in. long, narrowly lanceolate, aristate, ciliate, distinctly veined. *Calyx* $\frac{1}{3}$ — $\frac{1}{2}$ in., cylindric, pubescent or villous; mouth very oblique, about 10-toothed; upper lip very small, with minute spinescent teeth; lower lip much prolonged, truncate, membranous and reticulate-veined, the 3 lowest teeth the largest. *Corolla* white; tube $\frac{1}{2}$ in. long, not annulate within, upper lip villous outside, midlobe of lower lip 2-fid. *Nutlets* $\frac{1}{2}$ in. long, obovoid-oblong, 3-gonous, glandular on the obliquely truncate apex, brown when ripe.

Merwára, Bundelkhand and in the districts of Agra and Delhi, extending eastwards to Patna (Madden). *DISTRIB.*: Punjab Plain, W. Behar, Sind, Gujarat, Deccan and southwards to the Nilgiris, extending to Baluchistan, Arabia and Abyssinia.

2. *L. hyssopifolia*, *Benth. in Wall. Pl. As. Rar. i*, 60; *F. B. I. iv*, 690; *Collett Fl. Siml.* 405; *Prain Beng. Pl.* 855.

An erect hispidly hairy much-branched perennial herb, 4—8 in. high, hairs on stems usually spreading, rootstock woody. *Leaves* sessile, spreading or ascending, 1—2 in. long, linear, obtuse, often rigid; margins entire, recurved. *Flowers* $\frac{3}{4}$ in. long, in small axillary and terminal whorls $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam.; bracts few, slender, subulate. *Calyx* $\frac{1}{4}$ in. long, obconic, glabrous; mouth very oblique, wide, truncate, glabrous within; teeth minute, erect.

Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh to Gorakhpur. Flowers in Oct. **DISTRIB.:** Subtropical Himalaya from Jamu to Sikkim, up to 3,000 ft., also in Chota Nagpur.

3. *L. aspera*, Spreng. *Syst. ii*, 745; *F. B. I. iv*, 690; *Watt E. D.*; *Prair Beng. Pl.* 855; *Cooke Fl. Bomb. ii*, 465; *Phlomis esculenta*, *Roxb. Fl. Ind. iii*, 10.

An annual, 6—18 in. high, very variable. *Stem* stout erect, diffusely branched from below, hispid or scabrid, branches 4-angled. *Leaves* subsessile or with distinct petioles, linear or oblong, obtuse, entire or crenate, more or less pubescent, base tapering, petioles $\frac{1}{10}$ — $\frac{1}{4}$ in. long. *Flowers* sessile or nearly so, in terminal and axillary whorls up to 1 in. in diam.; bracts nearly as long as the calyx, linear, acute and tipped with a bristle, margins ciliate. *Calyx* $\frac{1}{3}$ — $\frac{1}{2}$ in. long; tube curved, constricted above the nutlets, lower portion usually glabrous, upper half ribbed and hispid or scabrid; mouth small, very oblique, not villous; upper lip produced forward; teeth small, triangular, bristle-tipped, ciliate, the upper one the largest. *Corolla* $\frac{2}{3}$ in. long; tube $\frac{1}{3}$ in., enlarged and hairy above, annulate within; upper lip $\frac{1}{3}$ in. long, densely white-woolly; lower lip longer than upper; midlobe obovate, larger than the acute lateral ones. *Nutlets* $\frac{1}{10}$ in. long, oblong with a subtruncate apex, smooth, brown.

Common within the area. Flowers Feb. to April. **DISTRIB.:** Punjab Plain, Behar and more or less throughout India, extending to Mauritius, Java and the Philippine Islands.

4. *L. linifolia*, Spreng. *Syst. ii*, 743; *F. B. I. iv*, 690; *Watt E. D.*; *Prair Beng. Pl.* 856; *Cooke Fl. Bomb. ii*, 465. *Phlomis zeylanica*, *Roxb. Fl. Ind. iii*, 9.

An erect pubescent or tomentose annual, 1—2½ ft. high. *Stem* usually stout and much branched below, branches 4-angled. *Leaves* sessile or shortly stalked, 1½—4 in. long, linear-lanceolate, obtuse, entire or remotely serrate, clothed with appressed hairs or subglabrous, base tapering. *Flowers* shortly stalked, arranged in axillary and terminal whorls $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., usually towards the ends of the branches; bracts shorter than the calyx, seraccous, finely pubescent. *Calyx* $\frac{1}{4}$ — $\frac{1}{3}$ in., glabrous or slightly pubescent; mouth very oblique, glabrous within; upper tooth large, much produced forwards, very acute; the other teeth minute, distant, erect. *Corolla* white, less than $\frac{1}{2}$ in. long; tube $\frac{1}{4}$ in., annulate within; upper lip $\frac{1}{4}$ in. long, white-woolly, lower lip $\frac{1}{4}$ in. long. *Nutlets* $\frac{1}{3}$ in., oblong, rounded at the apex, brown when ripe.

Dehra Dun, in cultivated ground. **DISTRIB.:** Plains of India from Assam and Bengal, southwards to the Konkan, Deccan and Travancore, extending to Mauritius and the Malay Islands. Roxburgh mentions that this plant is used by the Brahmins to decorate their idols.

5. L. Cephalotes, *Spreng. Syst. ii, 743; F. B. I. iv, 689; Watt E. D.; Collett Fl. Siml. 405; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 466; Phlomis Cephalotes, Kæn. ex Roxb.; Fl. Ind. iii, 10.*—Vern. *Dhurpi sag.*

A pubescent or scaberulous annual, 1—3 ft. high, stems and branches obtusely angled, clothed with spreading hairs. *Leaves* $1\frac{1}{2}$ —4 in. long, ovate or ovate-lanceolate, subacute, crenate-serrate, membranous, pubescent, tapering to the base, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. *Flowers* sessile, in large dense globose terminal whorls 1—2 in. in diam., floral leaves similar to the cauline; bracts $\frac{1}{2}$ — $\frac{5}{8}$ in. imbricate, leaf-like, acute and awned, green, thin, reticulately veined, ciliate. *Calyx* tubular, slightly curved, $\frac{3}{8}$ — $\frac{3}{4}$ in. long, lower half glabrous, upper half pubescent outside and within, mouth oblique; teeth minute, subequal narrowly triangular-subulate. *Corolla* $\frac{3}{4}$ in. long, tube annulate within; upper lip $\frac{1}{8}$ in. long, white-woolly; lower lip longer, its midlobe truncate. *Nutlets* $\frac{1}{8}$ in. long, obovoid-oblong, smooth, brown.

A common weed in cultivated ground over the greater portion of the area. **DISTRIB.:** Himalaya from Kashmir to Bhutan up to 6,000 ft., and southwards throughout India, but not in Ceylon. It is found in Afghanistan.

6. L. nutans, *Spreng. Syst. ii, 743; F. B. I. iv, 688; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 466.*

A small straggling diffusely branched annual, 2—12 in. high; stems and branches 4-angled, laxly hairy. *Leaves* sessile or shortly stalked, 1—2 in. long, oblong or oblong-lanceolate, obtuse, subserrate. *Flowers* sessile or nearly so, in terminal and axillary many-flowered whorls about $\frac{3}{4}$ in. in diam.; bracts $\frac{7}{8}$ — $1\frac{1}{2}$ in., leaf-like, slender, lanceolate, acute and bristle-tipped, veined, ciliate. *Calyx* (in fruit) $\frac{3}{8}$ in. long, falcately decurved, strongly ribbed, hispid, tube hairy within, mouth oblique, the internal villi shorter than the teeth; teeth 10, the uppermost one the largest, the rest subequal and about $\frac{1}{10}$ in. long, lanceolate, spine-tipped, ciliate. *Corolla* white, over $\frac{1}{2}$ in. long; tube slender, annulate within near the base; upper lip white-woolly, $\frac{1}{2}$ in. long; lower $\frac{1}{4}$ in.; midlobe obovate, rounded. *Nutlets* $\frac{1}{8}$ in. long, narrowly oblong-ellipsoid, smooth, brown.

Dehra Dun and in the Saharanpur District, also in the Jumna ravines of the Agra district. **DISTRIB.:** Punjab Plain, Parasnath in Bengal, Sind, and southwards to the Deccan and S. India, and also in Burma.

7. L. lanata, *Benth. in Wall. Pl. As. Rar. i, 61; F. B. I. iv, 681; Collett Fl. Siml. 405; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 468.*

A softly woolly or subsilky perennial herb, 2—3 ft. high; rootstock stout, woody; stem and branches bluntly 4-angled, clothed with erect hairs. *Leaves* thick, sessile or shortly petioled, 1—3 in. long, ovate, obtuse or acute, crenate or subserrate, rugose softly tomentose or silky, rounded

or cuneate at the base. *Flowers* sessile, in many-flowered axillary whorls; bracts shorter than the calyx, setaceous, densely hairy and ciliate. *Calyx* $\frac{1}{2}$ in. long, very silky outside, upper half of tube villous inside, mouth truncate; teeth minute, triangular-subulate. *Corolla* white, exceeding $\frac{1}{2}$ in.; tube as long as the calyx, annulate above the middle; upper lip densely silky on both sides, midlobe of lower lip obovate, 2-fid. *Nutlets* oblong-obovoid, apex obliquely truncate.

Dehra Dun at Kansrao (Wallich), Gonda district of N. Oudh. (Duthie), Bundelkhand (Edgeworth). *DISTRIB.*: W. Himalaya from Kashmir to Kumaon, up to 8,000 ft. and from the Konkan and Kanara to the Nilgiris, extending to Upper Burma and S. China.

8. *L. mollissima*, *Wall. Pl. As. Rar. i, 62; Royle Ill. 301; F. B. I. iv, 682, Watt E. D.; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 469.*

A straggling much-branched hoary-tomentose herb. *Stems* 3—4 ft. long, 4-angled; branches slender, clothed with appressed deflexed hairs. *Leaves* sessile or nearly so, $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, ovate or ovate-lanceolate usually acute, serrate; upper surface sparsely clothed with appressed hairs, densely white-tomentose beneath. *Flowers* subsessile, arranged in distant many-flowered whorls; bracts shorter than the calyx, linear, hairy. *Calyx* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, silky-villous outside, the upper half densely silky inside; teeth very short, triangular-subulate. *Corolla* white or purplish, $\frac{1}{2}$ in. long, tube annulate above the middle; upper lip densely silky on both sides; midlobe of lower lip obovate, 2-fid. *Nutlets* $\frac{1}{8}$ in. long, oblong-obovoid, obtusely truncate at the apex.

Dehra Dun, N. Oudh, Bundelkhand, often found climbing amongst bushes. *DISTRIB.*: Subtropical Himalaya in Nepal and Kumaon, Bengal, Orissa, Khasia Mts. up to 4,000 ft., C. India, Konkan, Kanara, S. India and in Ceylon, extending to China.

VAR. scaberula, *F. B. I. l.c.; Watt E. D.; Prain Beng. Pl. l.c.*—More glabrous; *calyx* hispid.—Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. *DISTRIB.*: Chota Nagpur, C. India and Khasia Mts.

9. *L. procumbens*, *Desf. in Mem. Mus. Par. xi, 7, t. 3, f. 2; Royle Ill. 301; F. B. I. iv, 683; Prain Beng. Pl. 857; Cooke Fl. Bomb. ii, 470; Phlomis biflora, Roxb. Fl. Ind. iii, 12 (in part).*

A procumbent perennial herb, root-stock woody; stems and branches slender, 2—3 ft. long, 4-angled, more or less pubescent on the angles. *Leaves* stalked $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, elliptic-ovate or lanceolate, acute, serrate, membranous, subglabrous, base usually acute, petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Whorls* axillary, lax, 1—3-flowered, pedicels filiform, up to $\frac{1}{2}$ in.; bracts minute, ciliate. *Calyx* $\frac{3}{8}$ — $\frac{1}{2}$ in. long, nearly glabrous, reticulate-veined, tapering to the base; teeth 10, subequal, lanceolate, acute, usually less than $\frac{1}{8}$ in. long, ciliate. *Corolla* white, $\frac{5}{8}$ in. long, tube annulate within, midlobe of lower lip emarginate. *Nutlets* $\frac{1}{2}$ in. long, obovoid, truncate at the apex.

Bundelkhand (Duthie). *DISTRIB.*: Cent. and E. Bengal, Nimar district of Cent. Prov., Belgaum, Kanara and Mysore.

Leucas sp. A small erect more or less hispid perennial herb with a woody root-stock. Stems rather slender, sparingly hispid with short appressed ascending hairs. Leaves suberect, $\frac{1}{2}$ —1 in. long, linear or elliptic-oblong, obtuse, narrowed at the base into a very short petiole; margins entire, revolute; upper surface strigose with short white hairs, glabrous and minutely gland-dotted between the prominent hispid midrib and nerves. Whorls small, confined to the upper axils, few-flowered; bracts slender, linear-subulate, shorter than the calyx, hispidly ciliate. Calyx $\frac{1}{4}$ in. long, obconic, tube almost glabrous except on the hispid ribs; mouth wide, slightly oblique, margin shortly ciliate; teeth distant, very minute, subequal. Corolla-tube about $\frac{1}{4}$ in. long, not annulate within, midlobe of lower lip $\frac{1}{4}$ in. long. Filaments sparsely pilose.—Near Indalpur in the Shahjehanpur district of Rohilkhand (Duthie No. 4316). Vern. *Chota guma*.—Resembles *L. hyssofolia* in general habit, but the hairs on the stems are ascending (not spreading); the very rigid leaves are more erect, the whorls which are confined to the upper axils are smaller and fewer-flowered, and the mouth of the calyx is only slightly oblique. The above-mentioned characters indicate a possible alliance with *L. diffusa*, but the habit is very different. I have given provisionally the name of *L. linearifolia* to the specimens in the Kew herbarium, as the material is hardly sufficient for a complete description.

19. LEONOTIS, R. Br.; Fl. Brit. Ind. iv, 691.

Herbs or shrubs. Flowers rather large, scarlet or yellow, arranged in axillary densely many-flowered whorls; bracts many, slender. Calyx 10-nerved, tube often incurved; mouth oblique, with 8—10 rigid teeth, upper tooth largest. Corolla 2-lipped; upper lip long, concave, with a villous crown; lower very small, 3-lobed, the midlobe largest. Stamens didynamous; lower pair longer, ascending, anthers connivent, cells divaricate. Disk equal. Ovary 4-partite; style subulate, the upper lobe very short. Nuts 4, oblong or ovoid, triquetrous, obtuse or truncate, dry, glabrous, basal scar small.—Species 12, mostly African, one of which occurs also in India and America.

L. nepetaefolia, R. Br. in Ait. Hort. Kew. ed. 2, iii, 409; Royle Ill. 301; F. B. I. iv, 691; Watt E. D.; Prain Beng. Pl. 857; Cooke Fl. Bomb. ii, 471. *Phlomis nepctifolia*, Roxb. Fl. Ind. iii, 8.—Vern. *Bara guma*.

A tall erect annual, 4—6 ft. high. Stem stout, puberulous, bluntly 4-angled, deeply sulcate, the faces concave. Leaves membranous, $2\frac{1}{2}$ —6 in. long ovate, acute, coarsely crenate-serrate, puberulous on both sides, base cuneate; petioles 1—4 in. long, winged above. Whorls axillary, dense, globose, many-flowered, $1\frac{1}{2}$ — $2\frac{1}{2}$ in. in diam.; floral leaves lanceolate, deflexed; bracts up to $\frac{5}{8}$ in. long, deflexed, linear, hairy, spine-pointed. Calyx $\frac{3}{4}$ in. long, ribbed, puberulous below, upper part densely villous and clothed with long white bristly hairs, tube incurved, mouth oblique, throat glabrous; teeth unequal, spine-tipped, the upper one up to $\frac{1}{4}$ in. long, ovate, acute, the rest smaller and triangular. Corolla orange-scarlet; tube $\frac{1}{2}$ in. long, glabrous

below, upper part hairy, inside with 3 parallel rings of white hairs; upper lip $\frac{1}{2}$ in. long, densely woolly, lower $\frac{1}{8}$ — $\frac{1}{4}$ in. long. *Nutlets* $\frac{1}{8}$ in. long, obliquely truncate.

Cultivated and naturalized in most parts of the area, but chiefly in the vicinity of villages. Flowers in Oct. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon, widely spread also in S. E. Asia. Trop. America and in Africa, in which latter country, it is believed by some to be indigenous. It is a very striking-looking plant when in flower.

20. NEPETA, Linn.; Fl. Brit. Ind. iv, 656.

Erect or prostrate herbs. *Leaves* opposite. *Flowers* blue white or yellow, arranged in axillary or terminal whorls. *Calyx* tubular, 15-nerved, equally 5-toothed or subbilabiate with the 2 lower teeth narrower than the upper. *Corolla* 2-lipped, tube not annulate within, throat inflated; upper lip straight notched or 2-fid; lower 3-fid, midlobe largest. *Stamens* didynamous, ascending under the upper lip or exserted, upper pair longer, anther-cells diverging. *Disk* uniform or enlarged in front. *Ovary* 4-partite, style shortly 2-fid; lobes subequal, subulate. *Nutlets* 4, ovoid or compressed, dry, smooth.—Species about 120, in Temp. Europe and Asia and in N. and S. Africa.

Whorls dense, many-flowered, lower ones distinctly stalked 1. *N. ruderalis*.

Whorls few-flowered, forming lax often drooping panicles with very slender filiform branches 2. *N. graciliflora*.

1. *N. ruderalis*, *Buch.-Ham. Mss. ex. Hook. F. B. I. iv*, 661; *Watt E. D.*; *Collett Fl. Siml.* 398; *Prain Beng. Pl.* 857; *Cooke Fl. Bomb.* 472. *Glechoma erecta*, *Roxb. Fl. Ind. iii*, 7.

A pubescent annual, 6—18 in. high, branching from the base; branches erect or ascending, obtusely 4-angled and grooved. *Leaves* stalked green or hoary, $\frac{1}{2}$ — $2\frac{1}{2}$ in. long, broadly ovate or suborbicular, crenate, base cordate or truncate, petioles $\frac{1}{4}$ — $1\frac{1}{4}$ in. long. *Flowers* stalked, unilaterally arranged in dense many-flowered peduncled 2-branched cymes 1 in. or more in length; bracts $\frac{1}{2}$ — $\frac{1}{4}$ in. long, linear-lanceolate, acute, ciliate. *Calyx* (in flower) $\frac{1}{2}$ in. long, villous and glandular-hairy; upper lip $\frac{1}{10}$ in. long, with 3 triangular aristate teeth; lower lip shorter, with 2 subulate teeth. *Corolla* exserted, bluish-purple, $\frac{1}{4}$ in. long, hairy outside; upper lip oblong, 2-fid, lobes obtuse; lower lip shorter, its midlobe broad emarginate and crenulate, much longer than the 2 rounded lateral ones. *Nutlets* minute, oblong-ellipsoid, brown spotted with white, mucilaginous when moistened.

Siwalik range, Dehra Dun and eastwards along the Sub-Himalayan tracts, also in the Agra district and in Merwára. **DISTRIB.:** Plains of Punjab and Bengal, ascending to 5,000 ft. on the Himalaya, also in Central India, and the Konkan, extending to Afghanistan. The plant is used medicinally. It has a scent like that of Balm and a pungent bitterish taste.

2. *N. graciliflora*, Benth. in Wall. Pl. As. Rar. i, 65; F. B. I. iv, 663; Collett Fl. Siml. 399.

A pubescent or nearly glabrous annual. Stems many, slender, 1--3 ft. high, erect or ascending. Leaves long-petioled, 1--1 $\frac{3}{4}$ in. long, ovate, or ovate-cordate, acute, coarsely crenate or serrate. Whorls few-flowered, the lower ones distinctly stalked, forming loose often drooping panicles with very slender branches; peduncles and pedicels capillary, bracts setaceous. Flowers $\frac{1}{2}$ in. long. Calyx $\frac{1}{6}$ in. long; upper teeth triangular-lanceolate, awned; lower shorter, setaceous. Corolla $\frac{1}{4}$ in. long, pale-lilac or rose. Nutlets minute, oblong, granulate.

Common on steep rocks on both sides of the Siwalik range. Flowers in Nov. DISTRIB.: Subtrop. Himalaya from the Punjab to Garhwal and Kumaon, up to 5,000 ft.

21. SALVIA, Linn.; Fl. Brit. Ind. iv, 653.

Herbs or shrubs. Flowers small, or large and showy; whorls usually racemed or in spikes; bracts small or large and often coloured. Calyx tubular or campanulate, 2-lipped, throat naked; upper lip entire or 3-toothed, lower 2-fid. Corolla 2-lipped, tube naked or with a ring of hairs inside; upper lip erect, entire; lower 3-lobed, lateral lobes spreading. Stamens 2 (the lower pair) perfect; filaments short, articulate with the slender connective, sometimes produced beyond the joint, anthers dimidiate; connective linear, transverse, the upper arm ascending and bearing a linear fertile cell; the lower arm straight or deflexed, bearing a fertile or an empty cell, or naked, the 2 upper (posterior) stamens represented by small staminodes or obsolete. Disk usually enlarged in front. Ovary 4-partite; style shortly bifid, lobes equal or the anterior longer. Nutlets 4, ovoid, triangular, dry, smooth, basal scar small.—Species about 450, chiefly in temperate and tropical regions of the world.

An erect annual, leaves 1--3 in. long, upper lip of calyx entire

1. *S. plebeia*.

A straggling undershrub, leaves not exceeding 1 in., upper lip of calyx 3-toothed

2. *S. ægyptiaca*.

1. *S. plebeia*, R. Br. Prod. 501; Royle Ill. 301; F. B. I. iv, 655; Watt E. D.; Prain Beng. Pl. 859; Cooke Fl. Bomb. ii, 474. *S. brachiata* Roxb. Fl. Ind. i, 145.

An erect roughly pubescent annual, 6--18 in. high. Stems stout, fastigiate branched, obtusely 4-angled and grooved, hoary-pubescent. Leaves 1--3 in. long, oblong-lanceolate, obtuse or subacute, crenate-glabrous or slightly hairy, base usually acute and often decurrent, petioles 1--2 in. long. Flowers in panicles usually compact glandular-pubescent spicate racemes; floral leaves stalked, $\frac{1}{16}$ in. long, ovate, subacute, bracts smaller and narrower. Calyx pedicelled, hairy, $\frac{1}{10}$ — $\frac{1}{8}$ in. long, enlarging in fruit; upper lip entire, shorter than the lower, reflexed. Corolla lilac or white, $\frac{1}{4}$ in. long, tube annulate within, midlobe of lower lip much larger than the lateral ones. Nutlets minute, ovoid, brown when ripe.

A common weed in all parts of the area. Flowers Sep. to April. **DISTRIB.:** Throughout India in the plains and up to 5,000 ft. on the Himalaya, but not in Ceylon; it extends also to China, the Malay Peninsula and Islands and to Australia. The seeds are used medicinally for their mucilaginous properties.

2. S. ægyptiaca, Linn. *Sp. Pl.* 23; *F. B. I.* iv, 656; *Watt E. D.*, *Cooke Fl. Bomb.* ii, 474.

A low much-branched straggling undershrub; branches spreading, rigid, 4-angled, hairy or more or less scabrid. *Leaves* shortly stalked, varying in length up to 1 in., linear-lanceolate, acute, crenate, much-wrinkled, hairy, nerves and veins prominent beneath. *Whorls* distant, 2-4-flowered, arranged in long racemes; floral leaves small, ovate-lanceolate. *Calyx* glandular-hairy, $\frac{1}{2}$ — $\frac{3}{4}$ in. (when in flower), enlarging in fruit and nodding, upper lip 3-toothed. *Corolla* $\frac{1}{2}$ in. long, tubular-annulate within; upper lip oblong or subquadrate, slightly notched. *Nutlets* $\frac{1}{2}$ in. long, oblong-ellipsoid, nearly black.

Within the dry western borders of the area in the neighbourhood of Delhi (Jacquemont, etc.). **DISTRIB.:** Plains of Punjab and Sind and westwards to Afghanistan; also in W. Asia, N. Africa and the Cape Verde Islands.

VAR. pumila, *F. B. I.* iv, 656; *Watt E. D.*; *Cooke Fl. Bomb.* iv, 474; *S. pumila*, *Benth.*; *Decne in Jacquem. Voy. Bot.* 128, t. 133.

More scabrid and villous than the type. *Leaves* very rigid and rugose. *Calyx* longer, villous with long hairs.—In the drier western portions of the area from Delhi to Bundelkhand and Merwara. Flowers Nov.—Jan. **DISTRIB.:** Punjab plain and Salt range up to 2,500 ft., Sind, Gujarat and Deccan; also in Afghanistan and Baluchistan.

S. coccinea, Juss. A slender herb up to 3 ft. high with handsome scarlet flowers. It is often grown in the gardens of N. India, and is a native of C. and S. America.

S. officinalis, Linn. (Common Sage) is a native of S. Europe. It is sometimes cultivated in gardens within the area.

22. MOSLA, Buch.-Ham.; *Fl. Brit. Ind.* iv, 646.

Annual fragrant herbs. *Leaves* opposite. *Flowers* very minute; whorls 2-flowered, arranged in terminal and axillary secund racemes; bracts very small, or the lower leaf-like. *Calyx* campanulate, 5-toothed, enlarged in fruit, subequal or 2-lipped, base gibbous; upper lip truncate or 3-toothed, lower of 2 longer teeth, throat closed with hairs. *Corolla-tube* naked or with a ring of hairs; lips short upper notched, lower 3-fid. *Stamens* 2, posticous, short, erect, distant; anther-cells 2, divaricate, staminodes 2. *Disk* a large posticous gland. *Nutlets* globose, smooth or reticulate.—Species 7 or 8, in India, Burma and China.

M. ocymoides, *Buch.-Ham. ex. Benth. in Wall. Pl. As. Rar.* i, 66. *M. dianthera*, *Maxim.*; *F. B. I.* iv, 647. *Hedeoma nepalensis*, *Benth.*;

Decne. in Jacquem. Voy. Bot. 133, t. 138. Lycopus dianthera, Buch-Ham.; Roxb. Fl. Ind. i, 144.

A slender erect sparsely pubescent herb, 1–3 ft. high. *Leaves* stalked, 1–1½ in. long, ovate, acute, serrate, petioles $\frac{1}{3}$ – $\frac{1}{2}$ in. long. *Racemes* terminating the branches, slender, lax-flowered. *Calyx* (in fruit) $\frac{1}{2}$ in. long, hemispherical. *Corolla* white or purplish, $\frac{1}{4}$ in. long, tube short. *Nutlets* reticulate.

Dehra Dun, on the Nagsidh Hill at about 2,000 ft. (Gamble) **DISTRIB.:** Himalaya from Kashmir to Bhutan up to 6,000 ft., and on the Khasia Mts., extending to Burma and China.

23. TEUCRIUM, Linn.; Fl. Brit. Ind. iv, 700.

Herbs or shrubs. *Leaves* entire serrate or lobed, floral leaves often bract-like. *Whorls* 2–6-flowered, arranged in axillary or terminal spikes racemes or heads. *Calyx* 10-nerved; teeth 5, equal or the uppermost larger. *Corolla* apparently 1-lipped, tube not annulate within, limb slit behind, the 2 upper and the lateral lobes cuneate or very short or obsolete, lower-lobe very large. *Stamens* didynamous; the lower pair longer, exerted; anthers reniform; the cells short, at length confluent. *Disk* equal. *Ovary* 4-lobed; style 2-fid, its lobes subequal. *Nutlets* 4, obovoid, rugosely reticulate; scar oblique or lateral, often extending more than half-way up the nutlet.—Species about 100, mostly in the warm temperate regions of the world.

T. stoloniferum, *Roxb. Hort. Beng. 44; Fl. Ind. iii, 3; F. B. I. iv, 700. Prain Beng. Pl. 860.*

An erect perennial herb, 1–2 ft. high, glabrous or puberulous. *Stem* stoloniferous, often woody below. *Leaves* 1–3 in. long, ovate or ovate-oblong subacute, deeply crenate or subserrate; base truncate or cuneate, rarely cordate. *Racemes* slender, simple or paniced; bracts lanceolate, pedicels in fruit usually longer than the shortly campanulate calyx. *Calyx* $\frac{1}{2}$ in. long, glandular-pubescent; lower teeth short, obtuse. *Corolla* pink, tube included, limb very small. *Nutlets* enclosed in the globose calyx-tube, nearly smooth.

In the Kheri district of N. Oudh (Duthie). Flowers in May. **DISTRIB.:** Bengal plain, Chittagong, Sikkim, Himalaya up to 5,000 ft., also on the Khasia Hills; extending to Burma, Java and China.

24. AJUGA, Linn.; Fl. Brit. Ind. iv, 702.

Annual or perennial herbs, often decumbent or stoloniferous. *Leaves* usually coarsely toothed. *Flowers* sessile; whorls 2- or more-flowered, axillary or in terminal leafy spikes. *Calyx* 10- or more-nerved; teeth 5, subequal. *Corolla* 2-lipped, marcescent, tube often annulate within, throat slightly dilated; upper lip very short, 2-fid; lower spreading; the midlobe usually largest, emarginate or 2-lobed. *Stamens* didynamous, the lower pair longer, ascending, exerted or included, anthers 2-celled; cells diverging or divaricate, at length confluent. *Disk* uniform

or swollen behind. *Ovary* shortly 4-lobed; style 2-fid, the lobes nearly equal. *Nutlets* 4, obovoid, rugosely reticulate; scar lateral, extending beyond the middle of the nutlet. Species 30, in temperate and sub-trop. regions of the Old World.

Corolla-tube straight, base not inflated
Corolla-tube geniculate above the swollen base

1. *A. bracteosa*.
2. *A. macrosperma*.

1. **A. bracteosa**, Wall. ex Benth. in Wall. Pl. As. Rar. i, 59; F. B. I. iv, 702; Collett Fl. Siml. 406.

A perennial herb, softly hairy or glabrate, stolons none; branches many, 4—12 in. long, usually stout, erect or ascending, simple or branching, leafy. *Leaves* 1—4 in. long, ovate-oblongate or subspathulate, obtuse, sinuate-toothed, the lower ones petioled. *Whorls* axillary, often crowded in spikes. *Flowers* $\frac{1}{4}$ — $\frac{1}{3}$ in. long; bracts leaf-like, longer than the whorls, ovate or cuneate-obovate, entire or toothed. *Calyx* $\frac{1}{8}$ in. long, villous; teeth half as long as the tube, ovate-lanceolate, acute. *Corolla* pale-blue or lilac, pubescent; tube exerted nearly as long as the calyx; upper lip erect, lateral lobes of lower lip oblong, midlobe varying in length. *Stamens* exerted. *Nutlets* $\frac{1}{10}$ in. long, deeply rugose.

Dehra Dun and on the Siwalik range, and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.:** W. Himalaya from Kashmir to Nepal up to 7,000 ft., and on the Punjab plain along the base of the hills from Peshawar; extending to Afghanistan, China, Japan and Abyssinia.

2. **A. macrosperma**, Wall. ex Benth. in Wall. Pl. As. Rar. i, 58; F. B. I. iv, 704; Prain Beng. Pl. 860. *A. repens*, Roxb. Fl. Ind. iii, 3.

A decumbent or prostrate herb, glabrous or somewhat pubescent. *Stems* or branches $\frac{1}{2}$ —3 ft., often stout, spreading and branching and sometimes rooting from the nodes, glabrous or densely hairy. *Leaves* stalked, 2—6 in. long, variable in breadth, ovate-oblong or obovate, obtuse, sinuate-crenate, rarely lobed or cut, narrowed into the often very long petiole. *Whorls* continuous or interrupted; lower bracts leaf-like; upper ovate, shorter than the calyx. *Calyx-teeth* very short, obtuse. *Corolla* blue, usually glabrous; tube twice as long as the calyx, inflated at the base, geniculate above the swelling; limb small, upper lip erect, lobes of lower lip subequal or the midlobe broader. *Stamens* exerted. *Nutlets* $\frac{1}{20}$ — $\frac{1}{12}$ in., rugosely pitted.

Dehra Dun and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. *Flowers* in March and April. **DISTRIB.:** Subtrop. and Temp. Himalaya from Kumaon to Bhutan, up to 8,000 ft., Khasia Mts. and Chittagong, extending to Burma and China.

The following cultivated species belonging to genera which are not indigenous within the area of this flora should be mentioned:—

COLEUS AMBOINICUS, Lour.; Cooke Fl. Bomb. ii, 449. *C. aromaticus*, Benth.; F. B. I. iv, 625; Watt E. D.; Prain Beng. Pl. 846. **Plectranthus**

aromaticus, *Roxb. Fl. Ind. iii, 22.* Vern. *Pathor-chur*.—A fragrant perennial herb, 1—3 ft. high. *Stems* fleshy. *Leaves* stalked, broadly ovate, cordate, crenate, villous or tomentose. *Corolla* pale-purple, but the flowers are usually not developed. The plant is frequently grown in native gardens. Roxburgh mentions that the leaves are often eaten with bread and butter, or are used as a flavouring ingredient in country beer. They may also be employed as a substitute for borage, and the plant is sometimes known as “Indian borage.” It is a native of the Moluccas.—*Coleus barbatus*, *Benth.*, a species allied to the above, is common on the outer ranges of the Himalaya up to 8,000 ft., usually in wet ground. It is found also on Parasnath in Chota Nagpur, and in the hilly parts of the W. Peninsula to Ceylon, extending to Trop. E. Africa. It may possibly occur wild within the northern boundary of the area of this flora.

PERILLA OCYMOIDES, *Linn. ; F. B. I. iv, 646 ; Watt E. D. ; Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii, 45 ; Collett Fl. Siml. 390 ; Prain Beng. Pl. 851.* *Mentha perilloides*, *Willd. ; Roxb. Fl. Ind. iii, 7.* Vern. *Bhanjira*.—An erect aromatic herb, 2—4 ft. high, with ovate or rounded crenate or coarsely serrate leaves. *Whorls* 2-fid, forming long axillary and terminal secund racemes. *Calyx* 2-lipped, 5-toothed, gibbous at the base, enlarging in fruit. *Corolla* white, limb 5-fid. *Nutlets* globose, reticulate.—The plant is wild and cultivated on the outer ranges of the Himalaya from Kashmir to Bhutan up to 10,000 ft. and extends to Burma, China and Japan. It is grown near villages in Dehra Dun and eastwards along the Sub-Himalayan tracts and in Chittagong. The oil yielded by the seeds is much valued for culinary purposes, as well as for burning.

MENTHA. A large genus of aromatic plants found chiefly in northern temperate regions. They include several kinds of mint, which are known to the natives of India by the general name of *podina*, and are largely grown in their gardens as pot-herbs. *M. sylvestris*, L. is the horse-mint. It is common on the Western Himalaya up to 12,000 ft. The variety *incana* with more slender and much interrupted spikes, and with a smaller calyx and white corolla, occurs in Dehra Dun in a semi-wild state and is probably an escape from cultivation. Other species occasionally met with in native gardens within the area are spear-mint (*M. viridis*), marsh-mint (*M. arvensis*), and pepper-mint (*M. piperita*). They are all more or less in use for culinary or medicinal purposes.

MERIANDRA BENGALENSIS, *Benth. ; F. B. I. iv, 652 ; Watt E. D. ; Prain Beng. Pl. 858 ; Cooke Fl. Bomb. ii, 475,* *Salvia bengalensis*, *Roxb. Fl. Ind. i, 145.*—A large straggling shrub with white flowers. It is cultivated in native gardens within the area of this flora and throughout the greater part of India, and is often known under the name of “Bengal Sage.” The leaves have a strong camphor-like scent and are used medicinally and also for preserving cloth from the attacks of insects.

LXXXVIII.—PLANTAGINACEÆ.

Scapigerous annual or perennial herbs. *Leaves* usually radical. *Scapes* axillary. *Flowers* small, spicate, often dimorphic. *Sepals* 4, imbricate in bud, persistent. *Corolla* hypogynous, salver-shaped, scarious; lobes 4, short, imbricate in bud. *Stamens* 4, inserted on the corolla-tube; filaments capillary, inflexed in bud, persistent; anthers large, pendulous, versatile. *Ovary* superior, 1—4-celled; style filiform, with 2 lines of stigmatic hairs, ovules 1—8 in each cell. *Fruit* a 1—4-celled capsule, dehiscing circumscissilely, membranous, 1-or-more-seeded. *Seeds* usually peltate; testa thin, mucilaginous, albumen fleshy; embryo cylindric, transverse, radicle inferior.—Species over 200, chiefly in temperate and subtropical regions.—The above description does not include the two anomalous monotypic genera *Littorella* and *Bougueria*.

PLANTAGO, Linn.; Fl. Brit. Ind. iv, 705. Characters of the Family.

Flowering spikes slender, 2—6 in. long; cells of capsule

4—8 seeded

1. *P. major*.

Flowering spikes ovoid, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long; cells of capsule

1—2 seeded

2. *P. amplexicaulis*.

1. ***P. major***, Linn. *Sp. Pl.* 112; *F. B. I.* iv, 705; *Watt E. D.*; *Collett Fl. Siml.* 407; *Cooke Fl. Bomb.* ii, 477. *P. asiatica*, Linn.; *Wall. in Roxb. Fl. Ind. ed. Carey and Wall.* i, 423.

A perennial herb, glabrous or nearly so. *Root-stock* stout, erect, truncate. *Leaves* petioled, all radical, alternate, 2—5 in. long, oblong or oblong-ovate, obtuse or subacute, entire or sinuate-toothed, 3—7 ribbed, base tapering and decurrent into the long sheathing petiole. *Flowers* usually crowded in long slender cylindric spikes, 3—6 in. long or more; bracts equalling or shorter than the calyx, concave, ovate-oblong, obtuse, margins scarious. *Calyx* $\frac{1}{2}$ in. long, glabrous; sepals oblong, obtuse or subacute, obtusely keeled on the back, margins broadly scarious. *Corolla* $\frac{1}{2}$ in. long, glabrous; lobes lanceolate, acute, reflexed. *Anthers* purple. *Capsule* 2-celled, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovate, glabrous, splitting transversely near the base, cells 4—8 seeded. *Seeds* minute, angled, dull-black, rugulose.

Dehra Dun and Siwalik range. Flowers in July. **DISTRIB.:** Temperate and alpine Himalaya from Kashmir to Bhutan and up to 12,000 ft. in Baltistan; Konkan, Deccan, Nilgiris and Ceylon; also in Assam the Khasia Hills, Burma and the Malay Peninsula, extending to Afghanistan and westwards to the Atlantic. In many of the above-mentioned localities the plant has probably been introduced. The leaves are applied to bruises in the Punjab, and the seeds are used medicinally as a substitute for *ispaghul* (*P. ovata*).

2. ***P. amplexicaulis***, *Cav. Ic.* ii, 22; *F. B. I.* iv, 706; *Watt E. D.*; *Cooke Fl. Bomb.* ii, 477. *P. Bauphula*, *Edgew. in Hook. Journ. Bot.* ii, 285.

Annual or perennial, sparsely hairy or glabrate, stemless or with a short often branching stem. *Leaves* radical, alternate, 3—6 in. long, narrowly lanceolate, acuminate, entire or sparingly toothed, tapering to the

sheathing base. *Scapes* many, axillary, usually exceeding the leaves, terete, glabrous. *Spikes* ovoid, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long; bracts $\frac{1}{2}$ in. long, cucullate, broadly ovate-oblong, obtuse, glabrous, membranous except the green midrib. *Calyx* as long as or slightly exceeding the bracts; sepals ovate-oblong, subacute, membranous with green midrib, or the inner entirely membranous. *Corolla* glabrous, tube $\frac{1}{8}$ in. long; lobes as long as the tube, ovate, acute, concave. *Capsule* $\frac{1}{8}$ in. long, ovoid, subobtuse, cells 1—2 seeded. *Seeds* $\frac{1}{8}$ in. long, boat-shaped, nearly black.—Malwa (Edgeworth). **DISTRIB.**: Punjab Plain westward from the Sutlej; also in Sind, extending westwards to Egypt and Greece. The seeds are sometimes used as a substitute for those of *P. ovata*.

P. ovata, Forsk *Fl. Ægypt. Arab.* 31; Duthie *Field and Gard. Crops, N. W. Prov. and Oudh, part iii, 53, t. 92*; F. B. I. *iv, 707*; Watt *E. D.*; Cooke *Fl. Bomb. ii, 478*. *P. Ispaghula*, Roxb. *Fl. Ind. i, 404*; Royle *Ill. 312*. Vern. *Ispaghul, isafgol*.—A softly hairy annual, stemless or nearly so. *Leaves* linear or filiform, finely acuminate. *Spikes* $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, ovoid or cylindric. *Sepals* elliptic, obtuse. *Corolla-lobes* rounded, apiculate, *Capsule* 2 seeded. *Seeds* light-brown. This plant is cultivated in some of the western districts of the area for the sake of the seeds, which yield, when boiled, a large amount of tasteless mucilage. This latter is much used by the natives as a remedy for diarrhoea and dysentery. The plant grows wild in the Punjab Plain and on low hills from the Sutlej westwards, extending to Persia, Spain and the Canary Islands.

FLORA
OF
THE UPPER GANGETIC PLAIN,

AND OF THE
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY
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NORTHERN INDIA.

VOL. III
PART. I.

NYCTAGINACEÆ TO CERATOPHYLLACEÆ.

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FLORA OF THE UPPER GANGETIC PLAIN AND OF THE ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

LXXXIX.—NYCTAGINACEÆ.

Herbs, shrubs or trees. *Leaves* usually opposite, entire, exstipulate. *Flowers* 2-(rarely 1-) sexual, regular, sometimes dimorphous; inflorescence various; bracts often forming an involucre, free or connate. *Perianth* small, monophyllous, usually petaloid, the tube persistent, enveloping the fruit; limb 3—5-lobed, persistent or deciduous, lobes plicate in bud. *Stamens* 1—30, hypogynous, sometimes unilateral; filaments usually unequal, inflexed in bud; anthers included or exerted, dorsifixed, didymous. *Ovary* free, 1-celled; style filiform, involute in bud, stigma simple or multifid; ovule solitary, basal, erect. *Fruit* membranous, indehiscent, enclosed in the hardened perianth-tube. *Seed* erect, testa adherent, albumen soft or floury, embryo curved or straight and with folded cotyledons, radicle inferior.—Species about 220, chiefly in Trop. America.

BOERHAAVIA, Linn.; Fl. Brit. Ind. iv, 708.

Erect or diffuse herbs, often with divaricate branches. *Leaves* opposite, often unequally paired. *Flowers* small, arranged in panicles umbels or heads, pedicels jointed; bracteoles minute, often deciduous, rarely whorled and involucre. *Perianth-tube* long or short, ovoid below; limb funnel-shaped, 5-lobed. *Stamens* 1—5, exerted. *Ovary* oblique, stipitate, stigma peltate. *Fruit* small, 5-ribbed or -angled, viscidly glandular. *Embryo* hooked; cotyledons broad and thin, the outer the larger, enclosing soft scanty albumen.—Species about 30, in tropical and sub-tropical regions of both hemispheres.

Fruit glandular on the ribs, not at the crown :—

Leaves of each pair very unequal, entire or subundulate; flowers subcapitate, pink or purple .

1. *B. diffusa*.

Leaves of each pair nearly equal, repand-sinuate; flowers in umbels, long-pedicelled, pink

2. *B. repanda*.

Fruit with large semiglobose glands round the crown; flowers in whorls, usually white; leaves obtuse

3. *B. verticillata*.

1. *B. diffusa*, Linn. *Sp. Pl.* 3; *Royle Ill.* 312; *Watt E. D.*; *Cooke Fl. Bomb.* ii, 480. *B. repens*, Linn.; *F. B. I.* iv, 709; *Collett Fl. Siml.* 410, fig. 131; *Prain Beng. Pl.* 862. *B. repens*, vars. *diffusa* and *procumbens*, *F. B. I. l. c.* and *Prain l. c.* *B. procumbens*, *Roxb. Fl. Ind.* i, 146.

A diffusely branched herb; root stout, fusiform, rootstock woody. *Stems* 2—3 ft. long, slender, prostrate or ascending, swollen at the nodes, minutely hairy and sometimes viscid or subglabrous, often tinged with purple. *Leaves* rather thick, arranged in unequal pairs at each node, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, ovate oblong or suborbicular, green and glabrous above, usually white beneath; base rounded or subcordate, margins subundulate, often pink; petioles about as long as the blade. *Flowers* minute, subcapitate, 4—10 together in small bracteolate umbels forming slender long-stalked axillary and terminal panicles; bracteoles, lanceolate, acute. *Perianth* $\frac{1}{8}$ in. long; tube glandular-hairy; limb red, funnel-shaped, with 5 narrow vertical bands outside. *Stamens* 2 or 3, slightly exserted. *Fruit* $\frac{1}{8}$ in. long, clavate, rounded, viscidly glandular on the 5 broad blunt ribs.

An abundant weed within the area of this flora, and very variable in habit and pubescence according to soil and situation. **DISTRIB.:** Throughout India, ascending to 7,000 ft. in the warm valleys of the Himalaya; also in Ceylon and the Malay Peninsula; extending to China, Africa, America and the Islands of the Pacific. The root is used medicinally and the leaves are eaten as a pot-herb. The viscid perianth-tube containing the fruit is easily detached and thus becomes widely distributed by animals.

2. *B. repanda*, Willd. Sp. Pl. i, 22; Royle Ill. 312; F. B. I. iv, 709; Prain Beng. Pl. 863; Cooke Fl. Bomb. ii, 480.

A diffuse subscaudent herb, glabrous or pubescent; branches 3—6 ft. long, cylindrical, glabrous or nearly so. *Leaves* in nearly equal pairs, 1—3 in. long, triangular-ovate, acute or acuminate, repand-sinuate, glabrous above, pubescent beneath, base cordate or truncate; petioles slender, $\frac{1}{4}$ — $1\frac{1}{2}$ in. long. *Umbels* 3—8-fid, on long slender peduncles; pedicels filiform, $\frac{1}{4}$ —1 in. long; bracteoles lanceolate, acute. *Perianth* pink, about $\frac{3}{8}$ in. long, lobes notched. *Stamens* 4 or 5, much exserted. *Fruit* $\frac{1}{4}$ in. long, clavate, obscurely ribbed, rough with glandular projections.

Plentiful within the area, and often found climbing amongst bushes. **DISTRIB.:** Throughout the W. Peninsula; also in Ceylon, Baluchistan and Burma, extending to China and Australia.

3. *B. verticillata*, Poir. Encycl. Méthod. v. 56; F. B. I. iv, 710; Cooke Fl. Bomb. ii, 480. Vern. Satha (Merwára).

A decumbent or climbing annual or perennial herb; branches long, pale, terete, glabrous. *Leaves* thick, $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, often broader than long, broadly ovate or suborbicular, obtuse, mucronate, usually glabrous, margins sinuate, base usually cordate, petioles $\frac{1}{4}$ — $\frac{3}{4}$ in. *Flowers* in long-peduncled racemes, arranged in distant few-flowered whorls on a slender rhachis; bracteoles small, ovate-oblong, acute, deciduous, pedicels slender. *Perianth* usually white, $\frac{1}{2}$ in. long, lower portion constricted above the ovule, limb funnel-shaped, lobes 2-fid. *Stamens* slightly exserted. *Fruit* $\frac{1}{8}$ in. long, clavate, with large semi-globose glands round the crown.

Merwára in Rajputana (Duthie). **DISTRIB.:** Punjab, Sind and in the drier parts of the W. Peninsula; also in Afghanistan and Bluchistan, extending westwards to Syria and Trop. Africa.

The following plants belonging to genera introduced from South America, are much grown in the gardens of North India:—

MIRABILIS JALAPA, L. (Marvel of Peru)—A tall much-branched perennial herb, bearing a profusion of yellow white crimson or variegated flowers. It is cultivated in all parts of India, and is sometimes met with as an escape. The structure of the flowers is very similar to that of *Boerhaavia*. The leaves and flowers are used in native medicine under the name of *gul-abbas*.

BOUGAINVILLEA SPECTABILIS, Willd. A robust thorny extensively climbing shrub with softly pubescent branches and leaves. It bears masses of flowers during the hot season, and at that time becomes a very beautiful and conspicuous object by reason of its large and brilliant purple-coloured bracts. A very handsome variety known as *B. lateritia*, with crimson or brick-red bracts, was introduced into India about 30 years ago, and from the two original plants, now at Saharanpur, the gardens in other parts of India have been supplied.

B. GLABRA, Choisy is also largely cultivated in gardens. It is less robust as a climber, and almost devoid of thorns; the branches and leaves are glabrous and the bracts are magenta-coloured. It flowers more or less throughout the year.

XC.—AMARANTACEÆ.

Herbs, rarely undershrubs, erect or with climbing branches. *Leaves* opposite or alternate, exstipulate. *Flowers* small, usually 2-sexual, (rarely dicecious or polygamous), arranged in terminal simple or paniced spikes cymes or clusters, the outer flowers of a cluster sometimes deformed; bracts hyaline or scarious, never leaf-like bracteoles 2, scarious. *Perianth* dry, persistent, usually of 5 free or slightly connate hyaline or scarious segments, imbricate in bud. *Stamens* 1—5, opposite the perianth-segments; filaments usually connate below or united with intervening membranous staminodes in a hypogynous cup; anthers 1-or-2-celled. *Ovary* 1-celled; style sometimes simple or obsolete and with a capitellate or small stigma, or 2—3-fid with acute stigmas, or styles 2—3, erect or recurved and stigmatic on the lower face; ovules 1 or more, amphitropous, erect or suspended from free basal funicles. *Fruit* a membranous utricle, rarely a circumscissile or irregularly bursting capsule, very rarely a berry enclosed in or supported by the persistent perianth. *Seed* inverted or erect, orbicular ovate or reniform, compressed, testa crustaceous; embryo horseshoe-shaped or annular, surrounding the floury albumen.—Species about 500, inhabiting tropical and sub-tropical regions. The family is closely allied to the *Chenopodiaceæ*, differing chiefly in habit.

Leaves alternate; staminodes none:—

Ovary 2-many-ovuled:—

A shrub with scarlet berries

Herbs with circumscissile capsules

Ovary 1-ovuled; ovule erect:—

Flowers 2-sexual, in spikes; fruit a crustaceous nut

Flowers monoecious or polygamous: fruit an indehiscent or circumscissile utricle

Leaves alternate or fascicled or with opposite and alternate leaves mixed; stamens with interposed staminodes

Leaves all opposite (not fascicled); stamens with or without interposed staminodes:—

Anthers 2-celled:—

Flowers all perfect, in spikes:—

Stamens 2; staminodes none

Stamens 5, with interposed staminodes

Flowers fascicled, each fascicle containing one perfect flower and several sterile ones the perianth-segments of which become converted into spreading hooked bristles; staminodes none

Anthers 1-celled

1. DEERINGIA.

2. CELOSIA.

3. DIGERA.

4. AMARANTUS.

5. ÆRUA.

6. NOTIOSÆRVA.

7. ACHYRANTHES.

8. PUPALIA.

9. ALTERNATHERA.

1. DEERINGIA, R. Br.; Fl. Brit. Ind. iv, 714.

Rambling or climbing undershrubs. *Leaves* alternate, petioled. *Flowers* small, in simple or paniced spikes, 2-sexual or polygamo-dioecious; bracts and bracteoles scarious. *Perianth-segments* 5, sepaline, free and equal or nearly so, membranous or herbaceous, spreading in fruit. *Stamens* 4 or 5, connate below in a hypogynous cup; anthers broadly oblong, 2-celled. *Ovary* ovoid or subglobose, sessile or stipitate; styles 2 or 4, subulate, connate below, uniformly papillose throughout, or small sessile and capitellate; ovules few or many, on long funicles. *Fruit* a small globose berry seated on the persistent spreading perianth. *Seeds* few or many, reniform, compressed; testa black, shining, aril none; embryo annular, surrounding the floury albumen; cotyledons linear, radicle descending. Species 5—6, in Asia, Australia and the Pacific Islands, and one in Madagascar.

D. celosioides, R. Br. *Prod.* 413; *Roxb. Fl. Ind. i*, 682; *Royle Ill.* 320; *F. B. I. iv*, 714; *Kanjilal For. Fl. ed. 2*, 323; *Gamble Man.* 550; *Collett Fl. Siml.* 412; *Prair. Beng. Pl.* 866; *Brand. Ind. Trees* 518. *Cladostachys frutescens*, *Don Prod.* 76 (*excl. syn.*) Vern. *Latman* (Hind.), *chundri* (Dehra Dun).

A climbing shrub with long slender arching striate branches; bark thin, rough, dark-grey. *Leaves* 2—4 in. long, ovate or broadly lanceolate, acuminate, entire; base rounded or acute, rarely cordate, petiole $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* small, pale yellowish-green, shortly pedicelled, arranged in simple or branching racemes 4—10 in. long and forming terminal panicles, bracts acute. *Styles* usually 3. Berry globose, $\frac{3}{8}$ — $\frac{1}{4}$ in. in diam., supported by the persistent spreading perianth-segments, scarlet when ripe. *Seeds* usually 3.

Found in hedges and on the outskirts of forests in Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during Sep. and Oct., and in the cold season the panicles

of scarlet berries render it a conspicuous object. **DISTRIB.** : Subtrop. Himalaya from the Sutlej to Bhutan, up to 5,000 ft.; also in Chota Nagpur, Assam, the Khasia Hills, Bengal and Upper Burma; extending to the Malay Islands, China and Australia. Kanjilal states that the juice of the fruit can be used as a substitute for red ink.

2. CELOSIA, Linn.; Fl. Brit. Ind. iv, 714.

Usually annual herbs, the stems often woody below. *Leaves* alternate, usually petioled. *Flowers* 2-sexual, in dense terminal and axillary spikes, sessile or shortly pedicelled, white or coloured; bracts and bracteoles scarious, shining. *Perianth-segments* 5, connate below, scarious, erect in fruit. *Stamens* 5, filaments united below in a membranous cup; anthers 2-celled; staminodes none. *Ovary* 1-celled, containing 2 or more ovules attached to long funicles; styles short or long or none, sometimes elongating in fruit; stigmas simple or 2—3, subulate. *Fruit* a circumscissile capsule, membranous or sometimes corky or coriaceous. *Seeds* 2 or more, erect, lenticular; testa crustaceous, black and often shining; embryo annular, surrounding the floury albumen; cotyledons linear, radicle descending or ascending. Species about 35, in Trop. Asia, Africa and America.

C. argentea, Linn. *Sp. Pl.* 205; Roxb. *Fl. Ind.* i, 678; Royle *Ill.* 320; *F. B. I.* iv, 714; Watt. *E. D.*; Collett *Fl. Siml.* 412; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 485. *C. margaritacea*, Linn.; Don *Prod.* 76.—Vern. *Safed murga-ka-phul*.

An erect glabrous annual, 1—3 ft. high. *Stem* stout or slender, simple or branching. *Leaves* 1—4 in. long, linear or narrowly lanceolate, rarely ovate, tapering into a short petiole or sessile. *Flowers* pink when young, becoming white and glistening, closely imbricate and forming blunt or acuminate cylindric terminal spikes 1—6 in. long and sometimes branching at the apex; bracteoles shorter than the perianth, linear-lanceolate. *Perianth* $\frac{1}{2}$ in. or more; segments linear-lanceolate, acute. *Capsule* $\frac{1}{2}$ — $\frac{3}{8}$ in. long, ellipsoid. *Seeds* 4—8, compressed, subreniform, $\frac{1}{8}$ in. in diam.

Abundant within the area, especially on cultivated ground. *Flowers* during the end of rainy season. **DISTRIB.** : Throughout India, cultivated or as an escape, ascending to 5,000 ft. on the Himalaya; also in Ceylon, and as an introduction in most tropical countries. Its native country is not known for certain. The plant is used as a pot-herb in times of scarcity and the seeds are employed medicinally.

C. CRISTATA, Linn.; Roxb. *Fl. Ind.* i, 679; Don *Prod.* 76; Royle *Ill.* 320; *F. B. I.* iv, 715; Watt *E. D.*; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 486. *C. cernua*, Roxb. *l.c.* 680. Vern. *Murgha-ka-phul* (Cockscomb).

Closely allied to the proceeding, but usually a taller plant and with broader leaves and much smaller flowers. It is cultivated in gardens as an ornamental plant throughout India and up to 5,000 ft. on the Himalaya. It has pink crimson or yellow flowers borne on the usually

fasciated and crest-like divisions of the spikes. It is often found as an escape, but never truly wild.

3. DIGERA, Forsk.; Fl. Brit. Ind. iv, 717.

An annual herb; branches angular. *Leaves* alternate, entire, petioled. *Flowers* in axillary peduncled spikes, ternate, the 2 outer reduced to crested scales, the central one perfect. *Perianth* sub-membranous, calycine; segments 5, slightly connate below, oblong, erect, the 2 outer larger. *Stamens* 5, hypogynous; filaments free, filiform; anthers 2-celled; staminodes none. *Ovary* 1-celled, oblong, compressed, truncate; style filiform; stigmas 2, recurved; ovule solitary, erect. *Fruit* a subglobose crustaceous nut, included in the perianth. *Seed* subglobose, erect; testa thin, crustaceous, brown, adhering to the albumen, embryo annular, cotyledons linear, radicle descending. A single species, occurring in India and Ceylon, and extending to Afghanistan, Baluchistan, Arabia and N. Africa.

D. arvensis, Forsk. *Fl. Ægypt-Arab.* 65; *Royle Ill.* 320; *F. B. I.* iv, 717; *Watt E. D.*; *Prain Beng. Pl.* 868; *Cooke Fl. Bomb.* ii, 487. *Achyranthes alternifolia*, Roxb. *Fl. Ind.* i, 674.

A slender annual weed of cultivation, or sometimes becoming perennial and with spreading prostrate branches. *Leaves* glabrous, very variable, $\frac{1}{2}$ —3 in. long, ovate or elliptic, acute or rounded at the apex, base rounded or cuneate, margins often tinged with red; petioles slender, $\frac{1}{2}$ —1 in. long. *Flowers* sessile, forming lax axillary peduncled spikes 1—5 in. long; bracts and bracteoles shorter than the perianth, ovate-lanceolate, acute, submembranous, persistent. *Perianth* pink, $\frac{1}{2}$ in. long; segments ovate-oblong, acute. *Fruit* $\frac{1}{10}$ — $\frac{1}{8}$ in. in diam., slightly compressed and margined, muriculate.

Common and widely distributed over the area of this flora, flowering usually after the rains are over. **DISTRIB.:** Plains of N. India from the Punjab to Bengal, and in Western C. and S. India; extending to Ceylon, Afghanistan, Baluchistan, Arabia and N. Africa. The leaves are often used as a pot-herb.

4. AMARANTUS, Linn.; Fl. Brit. Ind. iv, 718.

Erect or decumbent annual herbs. *Leaves* alternate. *Flowers* small, monœcious or polygamous, arranged in axillary clusters or in dense terminal and axillary spikes or panicles; bracts herbaceous, often persistent; bracteoles 2. **MALE fl.:** *Perianth* of 5 (rarely, 1—3 membranous ovate-lanceolate segments. *Stamens* 5 (rarely 1—3); filaments free, subulate or filiform; anthers 2-celled; staminodes none. **FEM. fl.** *Perianth-segments* oblong or spatulate, erect in fruit. *Ovary* ovoid, compressed; style short or none, stigmas 2 or 3; ovule solitary, sessile, erect. *Fruit* an orbicular or ovoid compressed utricle, or a circumscissile membranous or coriaceous capsule, entire or 2—3-toothed at the apex. *Seed* erect, orbicular, compressed, testa crustaceous; embryo annular, enclosing the floury albumen, cotyledons linear, radicle inferior. The

number of species cannot be definitely determined, as a large proportion of those described as such are known only in cultivation. Many of them are widely distributed in tropical and subtrop. regions of the world either cultivated or as weeds.

Bracteoles awned or setaceous, equalling or exceeding the sepals; fruit dehiscent, circumscissile:—

Stamens 5; Sepals 5:—

Leaf-axils with 5 spines; stems terete; leaves ovate or oblong, obtuse; bracts setaceous; flowers in dense or lax spikes

1. *A. spinosus*.

Leaf-axils not spinous; stems striate; leaves elliptic or ovate-lanceolate; bracts acicular; spikes thyrsoid:—

Leaves acute or acuminate; bracts recurved, much exceeding the oblong-lanceolate acuminate sepals

2. *A. paniculatus*.

Leaves obtuse, rarely acute; bracts hardly recurved, not greatly exceeding the obovate mucronate sepals

3. *A. caudatus*.

Stamens 3; sepals 3; leaves obtuse or emarginate:—

Stems branching above the middle, yielding under cultivation only one crop annually

4. *A. gangeticus*.

Stems branching near the base, yielding several crops annually

A. gangeticus
var. *tristis*.

Bracteoles acute, hardly awned, shorter than the sepals; fruit usually indehiscent; leaves obtuse, rounded or notched:—

Stamens 3; sepals 3:—

Fruit with an acute apex, indehiscent, rugose; clusters axillary and in terminal paniced slender spikes

5. *A. viridis*.

Fruit blunt at the apex:—

Fruit orbicular or broadly ovate, indehiscent, membranous:—

Procumbent; leaves small, 2-lobed; clusters all axillary

6. *A. Blitum*.

Tall, succulent; leaves large, oblong or rounded; clusters axillary and in terminal simple or lobed spikes

A. Blitum var.
oleracea.

Fruit ovoid, rugose, indehiscent or dehiscent; leaves obtuse, rarely retuse or 2-lobed; clusters all axillary

7. *A. polygamus*.

Stamens 2; sepals 2; fruit orbicular, compressed, membranous, indehiscent; clusters minute, all axillary; leaves small, linear oblong, obtuse or 2-lobed at the apex

8. *A. tenuifolius*.

1. *A. spinosus*, Linn. *Sp. Pl.* 991; Roxb. *Fl. Ind.* iii, 611; F. B. I. iv, 718; Watt *E. D.*; *Comm. Prod. Ind.* 63; Prain *Beng.* 869; Cooke *Fl. Bomb.* ii, 488.—Prickly Amaranth.

An erect spinous herb. Stems terete, glabrous, hard, often tinged with red; branches grooved, armed with sharp straight divaricate spines in the leaf axils. Leaves $1\frac{1}{4}$ —4 in. long, ovate or lanceolate, obtuse and spine-tipped, glabrous on upper surface, often scurfy beneath; main lateral nerves close, prominent beneath; petiole equalling or shorter than the blade. Flowers many, sessile, in dense axillary

clusters or in terminal and axillary more or less interrupted spikes; bracts usually longer than the sepals, linear and tipped with a bristle. *Perianth* of male flowers $\frac{1}{10}$ — $\frac{1}{8}$ in. long, with ovate acute bristle-tipped segments; perianth of female flowers much smaller and with oblong obtuse apiculate segments. *Stamens* 5. *Capsule* $\frac{1}{18}$ in. long, ovoid, thickened above, rugose; styles 2, spreading. *Seeds* black and shining.

Found abundantly in all parts of the area, and often troublesome as a weed in fields and gardens. **DISTRIB.:** Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya; extending to all tropical countries. The ashes of this plant are used in dyeing, the leaves are often eaten as spinach, and the roots are much used in native medicine.

2. *A. paniculatus*, *Linn. Sp. Pl. ed. 2, 1406; F. B. I. iv, 718; Watt E. D.; Comm. Prod. Ind. 63; Duthie Field and Gard. Crops, N. W. Prov. and Oudh, part iii, 23, t. 68; Collett Fl. Siml. 411; Prain Beng. Pl. 870; Cooke Fl. Bomb. ii, 489; A. frumentaceus, Buch.-Ham. in Roxb. Fl. Ind. iii, 609; Royle Ill. 320; A. DC. L'Orig. Pl. Cult. 382. A. Anardana, Buch.-Ham.; Royle Ill. 321.—Vern. *Chua, marsa, bathu, etc.**

A tall robust annual, up to 6 ft. high or more. *Stem* stout, grooved striate and often tinged with red. *Leaves* 2—6 in. long, elliptic or ovate-lanceolate, acute or acuminate, base cuneate; main lateral nerves slender, prominent beneath; petioles 1—4 in. long. *Spikes* dense, many-flowered, subsquarrose, red, green or golden-coloured, the whole forming a thyrsoid panicle of which the central spike is the longest; bracts recurved, much longer than the sepals. *Perianth* $\frac{1}{10}$ — $\frac{1}{8}$ in. long. *Sepals* 5, oblong, lanceolate, acute and shortly awned. *Stamens* 5. *Fruit* a capsule, $\frac{1}{8}$ in. long, ovoid and narrowing to the apex; styles usually 3, short. *Seeds* subglobose, white, red or black.

Cultivated as a cold-season crop within the area, but chiefly in the Sub-Himalayan tracts; it is also found as an escape. The minute seeds are very nutritious and afford wholesome food for a large number of the poorer class of natives. **DISTRIB.:** Largely grown as an autumn crop on the outer Himalayan ranges up to 10,000 ft. or more, as well as in the hilly districts of Peninsular India. It forms a very handsome crop when in full flower, especially on the Himalaya where it is usually grown in terraces, the crimson and golden kinds mixed together. The plant occurs also in E. and W. Asia and in Africa, either cultivated or as an escape.

3. *A. caudatus*, *Linn. Sp. Pl. 990; F. B. I. iv, 719; Watt E. D.; Comm. Prod. Ind. p. 63; Duthie Field and Gard. Crops, part iii, 24, t. 68 A; Collett Fl. Siml. 411; Prain Beng. Pl. 870; Cooke Fl. Bomb. ii, 491.*—Vern. *Kedari-chua.*

Similar in many respects to *A. paniculatus*, but in its typical state it may be distinguished by its smaller size, the obtuse leaves and by the very long and drooping terminal spike; the bracts also, which are hardly recurved, do not greatly exceed in length the obovate

mucronate sepals; also the utricle and seeds are smaller, the latter, as in *A. paniculatus*, varying very much in colour and shape.

This plant is cultivated for its grain in the northern portion of the area as a cold season crop, and also on the neighbouring Himalaya, where, the grain is known under the name of *râmdâna*. It is much grown in English gardens as well as in India as an ornamental plant under the name of "Love-lies-bleeding." In the warmer parts of Africa it takes the place of *A. paniculatus* as a grain-yielding crop.

4. *A. gangeticus*, *Linn. Syst. Nat. ed. 10, 1268*; *Roxb. Fl. Ind. iii, 606*; *Royle Ill. 321*; *F. B. I. iv, 719*; *Watt E. D.; Comm. Prod. Ind. 62*; *Duthie Field and Gard. Crops, part iii, 17, t. 67*; *Prain Beng. Pl. 870*; *Cooke Fl. Bomb. ii, 489*. *A. oleraceus*, *Willd. (not Linn.)*; *Roxb. Lc. 605*; *Watt E. D.; Comm. Prod. Ind. 62*. *A. lanceolatus*, *Roxb. Lc. 607*; *Watt E. D.; Comm. Prod. Ind. 62*. *A. atropurpureus*, *Roxb. Lc. 608*; *F. B. I. iv, 722*; *Watt E. D.* *A. tricolor*, *Willd.*; *Roxb. Lc. 608*. *A. melancholicus*, *Willd.*; *Roxb. Lc. 608*; *Royle Ill. 320*; *Watt E. D.* *A. lividus*, *Willd.*; *Roxb. Lc. 605*; *Watt E. D.; Comm. Prod. Ind. 62*.—*Vern. Lâl-sag, chaulai-sâg, labra* (Merwâra).

An erect stout glabrous annual. *Stem* 2—4 ft. high, branching above the middle, grooved and striate, glabrous or nearly so, often tinged with purple. *Leaves* very variable both as to size and colour, rhomboid or deltoid-ovate, obtuse or emarginate and often apiculate at the apex, tapering to the base and decurrent on the petiole; petioles up to 3 in. long. *Flowers* in axillary clusters and also forming long interrupted spikes; bracts membranous, exceeding the perianth, narrowly lanceolate and tipped with a slender awn. *Perianth* $\frac{1}{8}$ in. long. *Sepals* 3, lanceolate, tipped with a long capillary awn. *Stamens* 3. *Capsule* $\frac{1}{10}$ in. long, ovoid abruptly narrowed at the apex, rugose, membranous; styles 3, distinct. *Seeds* lenticular, black and shining.

Largely cultivated throughout India and in Ceylon and in other parts of Tropical Asia; also in Trop. Africa and America. This is an extremely variable plant especially in Bengal. The species described by Roxburgh, and enumerated above as synonyms of *A. gangeticus*, are regarded by Prain as representing well-marked races, some of which, and more particularly *A. oleraceus*, include many more or less distinguishable and definite sub-races or cultivated forms.

VAR. *tristis*, *Prain Beng. Pl. 870*; *Cooke Fl. Bomb. ii, 490*. *A. tristis*, *Willd.*; *Roxb. Fl. Ind. iii, 604*. *A. polygamus*, *Willd. (not of Linn.)*; *Roxb. Lc. 603*. *A. mangostanus* *L.*; *F. B. I. iv, 720*; *Watt E. D.*; *Prain Beng. Pl. 871*. An annual herb, branching from near the base. The leaves are as variable in shape and colour as are those of the type, from which it chiefly differs in that the plants can be cut down several times without injuring them, a new crop of shoots springing up. Roxburgh states that the plant is known only in cultivation, and that it is held in great esteem as a pot-herb by all classes of the natives.—*A. mangostanus*, *L.* is very probably only a stunted and prostrate form of *A. gangeticus*, or a feral state of the variety

tristis as suggested by Prain. *A. polygamus* of Roxburgh (now regarded as a synonym of *A. tristis*) is described by him as sometimes having the terminal clusters in spikes as in *A. gangeticus*.

5. *A. viridis*, *Linn. Sp. Pl. ed. 2, 1405; Roxb. Fl. Ind. iii, 605; F. B. I. iv, 720; Watt E. D.; Comm. Prod. Ind. 63; Prain Beng. Pl. 871; Cooke Fl. Bomb. ii, 490. A. fasciatus, Roxb. l.c. 609.*

An erect much-branched glabrous annual, 1–2 ft. high; branches sulcate, often tinged with purple. *Leaves* 1–3 in. long, ovate or deltoid-ovate, rounded and usually notched at the apex, the base truncate or cuncate, petioles $\frac{1}{2}$ –2 in. long. *Flowers* shortly stalked, pale-green, arranged in small axillary clusters and in slender axillary and terminal paniced spike-like racemes; bracts shorter than the sepals, ovate-oblong, acute, membranous and with a green keel. *Sepals* 3, similar to the bracts, but longer. *Stamens* 3. *Fruit* indehiscent, compressed, suborbicular, acute, rugose. *Seeds* minute, lenticular, black and shining.

A common weed in cultivated ground throughout India, flowering during the rainy and cold seasons. It is widely distributed in all tropical countries, and may be easily recognised by its slender paniced spikes and indehiscent herbaceous fruits. The tender tops are eaten. Roxburgh's *A. fasciatus* is regarded as a sport with a pale crescent-shaped band across the leaf.

6. *A. Blitum*, *Linn. Sp. Pl. 990; F. B. I. iv, 721; Watt E. D.; Prain Beng. Pl. 871.*

A glabrous procumbent annual. *Leaves* small, long-petioled, oblong ovate or rounded, usually 2-lobed at the apex; base acute. *Flowers* in axillary clusters. *Sepals* 3, shorter than the utricle, linear-oblong or lanceolate, obtuse and apiculate or acute. *Stamens* 3. *Utricle* orbicular or broadly ovate, membranous, usually indehiscent.

A common weed throughout India and in Ceylon, extending to many other countries in temperate and tropical regions. The plant is much used as a pot-herb in India.

VAR. *oleracea*, *F. B. I. iv, 721; Watt E. D.; Duthie Field and Garden Crops, part iii, 18; Prain Beng. Pl. 871; Cooke Fl. Bomb. ii, 490.—Vern. Chaulai.—A tall erect glabrous succulent herb. *Stem* stout, grooved and striate. *Leaves* $1\frac{1}{2}$ – $2\frac{1}{2}$ in. long, ovate-oblong or rounded, usually notched at the apex; base cuneate; nerves prominent beneath; petioles 1– $2\frac{1}{2}$ in. long. *Flowers* in axillary clusters and in terminal simple or branched spikes; bracteoles shorter than sepals. *Sepals* 3, linear-oblong, obtuse or acute. *Stamens* 3. *Utricle* $\frac{1}{10}$ in. long, broadly ovate and with a blunt apex; styles 3, very short. *Seeds* lenticular, dark-brown and shining.—Cultivated throughout India and in Ceylon. The leaves are extensively used as a pot-herb, and in the submontane tracts of Garhwal and Kumaon; this plant is grown also for its grain, and the parched seeds are either eaten with milk or mixed with sugar and made up into sweetmeat balls (*laddus*).*

7. A. polygamus, Linn. *Amœn. Acad.* iv, 294; Royle, *Ill.* 321; *F. B. I.* iv, 721; Watt *E. D.*; *Comm. Prod. Ind.* 63; Prain *Beng. Pl.* 871; *Cooke Fl. Bomb.* ii, 491. *A. polygonoides*, Willd.; Roxb. *Fl. Ind.* iii, 602; Royle *l.c.*

A diminutive annual glabrous weed. *Stems* prostrate or ascending, striate. *Leaves* $\frac{3}{8}$ —1 in. long, obovate, obtuse, rarely retuse or somewhat 2-lobed at the apex, often rigid and apiculate, base tapering; petioles $\frac{1}{8}$ — $\frac{1}{2}$ in. long. *Flowers* few, in axillary clusters; bracteoles membranous, shorter than the sepals, lanceolate-oblong, slightly awned, mid-nerve prominent. *Perianth* $\frac{1}{20}$ — $\frac{1}{18}$ in. long. *Sepals* 3, ovate-oblong, awned. *Stamens* 3. *Fruit* ovoid, rugose, tapering upwards, usually circumscissile; styles 3, distinct. *Seeds* lenticular, black and shining.

A common weed in gardens and cultivated land throughout India and in Ceylon, extending to Trop. Africa. Though not cultivated, this plant is largely used in India as a pot-herb, and is considered to be very wholesome. It is closely allied to *A. Blitum*.

8. A. tenuifolius, Willd. *Sp. Pl.* iv, 381; Roxb. *Fl. Ind.* iii, 602; *F. B. I.* iv, 722; Watt *E. D.*; Prain *Beng. Pl.* 871; *Cooke Fl. Bomb.* ii, 491.

A glabrous annual weed; branches many from the root, 6—18 in. long, spreading, prostrate or ascending. *Leaves* $\frac{1}{2}$ —1 in. long, linear or oblanceolate-oblong, rounded and usually notched at the apex, base tapering; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long, often obscured by the decurrent leaf-blade. *Flowers* in minute axillary clusters, bracteoles shorter than the sepals, ovate-lanceolate, obtuse, mid-nerve green. *Perianth* $\frac{1}{20}$ in. long. *Sepals* 2, ovate-oblong, subacute, concave. *Stamens* 2. *Utricle* indehiscent, $\frac{1}{16}$ in. in diam., orbicular, compressed, membranous, plicate when dry. *Seeds* lenticular, brown and shining.

A common weed in the plains of N. India; also in Western India, extending to Trop. Africa and other warm countries.

5. ÆRUA, Forsk.; Fl. Brit. Ind. iv, 727.

Erect prostrate or climbing herbs or undershrubs, often woody. *Leaves* alternate opposite or fascicled. *Flowers* small or minute, in simple or paniced spikes, 2-sexual or polygamous; bracts and bracteoles small. *Perianth* membranous or papery, sepaline, 5 (rarely 4)-lobed; segments equal or the outer broader. *Stamens* 5, rarely 4; filaments subulate, connate, with short or long intervening staminodes in a short hypogynous cup; anthers 2-celled. *Ovary* ovoid or subglobose; style simple, long or short, stigma capitellate or stigmas 2; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous utricle or a circumscissile capsule with a coriaceous crown. *Seed* inverse, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear, radicle superior.—Species about 15, in Trop. Asia and Africa.

Spikes axillary and terminal:—

- | | |
|--|--------------------------|
| Erect; leaves alternate, flowers dicecious . | 1. <i>Æ. tomentosa</i> . |
| Climbing; leaves alternate and opposite; flowers 2-sexual | 2. <i>Æ. scandens</i> . |
| Spikes all axillary; leaves alternate; flowers 1-sexual and 2-sexual | 3. <i>Æ. lanata</i> . |

1. *Æ. tomentosa*, *Forsk. Fl. Ægypt.-Arab. cxxii and 727; Fl. Trop. Afr. vi, 37. Æ. javanica, Wight; Royle Ill. 320; F. B. I. iv, 727; Watt E. D.; Cooke Fl. Bomb. ii, 493. Æ. Bovii, Edgew. in Journ. Linn. Soc. vi, 206. Achyranthes incana, Roxb. Fl. Ind. i, 671.—Vern. Chim (Merwára).*

A hoary tomentose undershrub, 2—3 ft. high. *Stem* branched, terete, as thick as a goose quill, densely stellate-tomentose. *Leaves* alternate, sessile or nearly so, 1—2½ in. long, linear-oblong or oblong-spathulate, acute obtuse or somewhat retuse, densely tomentose. *Flowers* dicecious, sessile, in densely woolly oblong or linear spikes 1—6 in. long and forming leafless terminal panicles; bracteoles ovate, acute, hyaline. *MALE* flowers: *Perianth* about $\frac{1}{15}$ in. long. *Sepals* elliptic-oblong, woolly on the back. *Ovary* rudimentary, with short style and bifid, stigma. *FEM.* flowers: *Perianth* $\frac{1}{16}$ in. long. *Sepals* subacute, apiculate. *Stigmas* 2, equalling the style. *Utricle* broadly ovoid. *Seeds* dark-brown and shining.

Abundant in the dry western and south-western portions of the area, also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *DISTRIB.*: Punjab, Rajputana, Sind, Central India and southwards through the W. Peninsula to Ceylon, also in Burma and Baluchistan, extending to Arabia, Trop. Africa and the Cape de Verde Islands. Edgeworth insists that his *Æ. Bovii* is a distinct species. It has much narrower leaves and is sweet-scented, whilst *Æ. javanica*, which grows with it, is not. Bossier regarded it as a variety. I have seen no specimens from the area of this flora.

2. *Æ. scandens*, *Wall. Cat. 6911; Royle Ill. 320; F. B. I. iv, 727; Watt. E. D.; Collett Fl. Siml. 414; Prain Beng. Pl. 874; Cooke Fl. Bomb. ii, 492. Achyranthes scandens, Roxb. Fl. Ind. i, 676.*

A climbing undershrub with long hoary tomentose branches. *Leaves* alternate and opposite, 1½—4 in. long, elliptic-lanceolate or ovate, obtuse or acute and mucronate, glabrous or softly hairy, base tapering into a short petiole. *Flowers* silvery-white, 2-sexual, arranged in ovoid or cylindrical axillary and terminal subsessile white-woolly spikes ¼—1 in. long, the spikes often in pairs and forming a lax terminal panicle; bracteoles shorter than the sepals, ovate, acuminate. *Perianth* $\frac{1}{16}$ in. long. *Sepals* lanceolate, acuminate. *Utricle* broadly ovate, acute. *Seeds* lenticular, black and shining.

Common in most parts of the area in waste ground, and often found climbing amongst bushes. *DISTRIB.*: Plains of Upper India from the Punjab to Bengal and Assam; outer Himalayan ranges from Kumaon to Bhutan up to 5,000 ft., also in C. and W. India and extending to China, Malay Islands, Philippines and Trop. Africa.

3. *Æ. lanata*, *Juss. in Mus. Par. ii, 131; F. B. I. iv, 728; Watt E. D.; Prain Beng. Pl. 874; Cooke Fl. Bomb. ii, 493.* *Achyranthes lanata*, *Linn.; Roxb. Fl. Ind. i, 676.*

An erect or prostrate undershrub. *Branches* many from a stout woody rootstock, terete and striate, pubescent or woolly. *Leaves* petioled, alternate, $\frac{3}{4}$ —1 in. long, those of the branches smaller, elliptic-obovate or suborbicular, obtuse or acute, entire, pubescent above and usually white-woolly beneath. *Flowers* minute, greenish-white, sessile, 1- or 2-sexual, arranged in small dense axillary heads or spikes which are sometimes crowded into globular clusters; bracteoles ovate, concave, apiculate. *Perianth* $\frac{1}{16}$ in. long, oblong, obtuse and often apiculate, silkily hairy on the back. *Utricle* ovoid, acute. *Seeds* black and shining.

An abundant weed over the greater portion of the area. **DISTRIB.:** Throughout the hotter parts of India and up to 3,000 ft. on the hills; also in Ceylon, extending to Arabia, Trop. Africa, Java and the Philippines. This plant is in general appearance very similar to, and may easily be mistaken for, *Nothosærua brachiata*. The woolly spikes are often used for stuffing pillows.

***Æ. monsonia*,** *Mart.; F. B. I. iv, 728; Prain Beng. Pl. 874; Cooke Fl. Bomb. ii, 493.* *Achyranthes Monsonia*, *Pers.; Roxb. Fl. Ind. i, 673.*—This species will very probably be found growing within the dry southern border of the area of this flora. It is common in Chota-Nagpur, W. Bengal, in C. and W. India, as well as Burma. *Leaves* filiform, in fascicles; *flowers* in peduncled spikes, 2-sexual, pale pink; *perianth-segments* 4.

6. NOTHOSÆRUA, Wight; Fl. Brit. Ind. iv, 726.

An annual with opposite spreading branches. *Leaves* opposite. *Flowers* very minute, 2-sexual, woolly, arranged in axillary solitary or clustered spikelets, bracteate and 2-bracteolate. *Sepals* 3—5, hyaline, obtuse, 1-nerved. *Stamens* usually 2, free; anthers 2-celled; staminodes none. *Ovary* oblong, compressed; stigma subsessile, capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous oblong compressed utricle, enclosed within the perianth. *Seed* inverse, lenticular; testa crustaceous; embryo hooked, surrounding floury albumen; cotyledons linear, radicle superior. A single species, found in Asia and in Trop. Africa.

***N. brachiata*,** *Wight Ic. vi. 1; F. B. I. iv, 726; Watt E. D.; Cooke Fl. Bomb. ii, 495.* *Pseudanthus brachiatus*, *Wight Ic. v, t. 1776 (excl. analysis), and vi, t. 1776 bis, fig. B.*

An erect slender herb, 1—2 ft. high, glabrous or minutely puberulous. *Stem* branched from the base, branches spreading. *Leaves* thinly membranous, $\frac{3}{4}$ —1½ in. long, elliptic-lanceolate, acute or subobtuse, tapering to the base; petiole short or obscure. *Flowers* sessile, glistening-white, crowded in small dense axillary subsessile cylindrical spikes $\frac{1}{8}$ — $\frac{1}{2}$ in. long; bracts and bracteoles hyaline, acute, persistent.

Perianth $\frac{1}{8}$ in. long, villous with silky hairs. *Sepals* acute or subacute, hyaline. *Seeds* minute, black and shining.

Near Saharanpur (Edgeworth), Moradabad (T. Thomson), Oudh (Wallich), Bundelkhand and Merwára (Duthie). **DISTRIB.:** Punjab Plain, Sind, C. Prov., and south to Mysore and Ceylon; also in Burma, extending to Mauritius and Trop. Africa. This plant is very similar in general appearance to *Ærua lanata*.

7. ACHYRANTHES, Linn.; Fl. Brit. Ind. iv, 729.

Herbs, often woody below. *Leaves* opposite, entire, petioled. *Flowers* 2-sexual, in slender simple or paniced spikes, soon deflexed; bracts and bracteoles spinescent. *Perianth-segments* 4–5, sepaline, rigid, somewhat connate below, lanceolate, aristate, shining, at length hardened and strongly ribbed. *Stamens* 2–5; filaments connate at the membranous base, with as many quadrate staminodes, each of which is toothed or has a toothed scale at its back; anthers 2-celled. *Ovary* oblong, subcompressed; style filiform, stigma capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* an oblong or ovoid utricle, areolate or rounded at the apex. *Seed* inverse, oblong, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear or lanceolate, radicle erect.—Species about 15, in tropical and subtropical regions.

A. aspera, Linn. *Sp. Pl.* 204; Roxb. *Fl. Ind.* i, 672; Royle III, 321; F. B. I. iv, 730; Watt *E. D.*; Collett *Fl. Siml.* 414; Prain *Beng. Pl.* 875; Cooke *Fl. Bomb.* ii, 495. Vern. *Chirchita*.

A coarse weed, 1–3 ft. high. *Stem* erect, simple or slightly branched; branches striate, pubescent. *Leaves* very variable, up to 5 in. long, elliptic obovate or suborbicular, usually rounded at the apex, tomentose or velvety on both surfaces, rarely glabrate; petioles $\frac{1}{4}$ – $\frac{3}{4}$ in. long. *Flowers* many, greenish-white, sharply deflexed against the stout pubescent rhachis of the terminal spikes which elongate in fruit up to as much as 20 in. in length; bracts shorter than the perianth, ovate, acuminate, aristate, persistent; bracteoles about as long as the bracts, ending in a spine which hardens in fruit and remains attached to the fruiting perianth. *Perianth* $\frac{1}{8}$ – $\frac{1}{4}$ in. long, glabrous and shining; sepals ovate-oblong, acuminate, white-margined. *Stamens* 5; staminodes truncate, fimbriate. *Utricle* oblong, enclosed in the hardened perianth. *Seed* subcylindrical, with a truncate apex, brown.

A very common weed of way-sides and waste places all over the area. **DISTRIB.:** Throughout India and in Ceylon, extending to Trop. Asia, Africa, Australia and America. The plant is used medicinally for various purposes. There appears to be amongst many of the peasant people of N. India a general belief in its efficacy as an antidote for the poison of snakes and scorpions. Colonel Madden mentions that in Oudh the plant is considered to have a paralyzing effect on scorpions. The fruit, when ripe, becomes easily detached from the

rhachis, carrying with it the hardened persistent perianth to which are attached the spine-like bracteoles.

8. PUPALIA, Juss. ; Fl. Brit. Ind. iv, 723.

Herbs or undershrubs. *Leaves* opposite, petioled. *Flowers* fascicled in simple or paniced spikes; fascicles containing one perfect flower, and several imperfect ones, the perianth-segments of which are reduced to stellately spreading hooked bristles; bracts and bracteoles scarious; perianth-segments of perfect flowers 5, slightly connate below, herbaceous, rarely equal, lanceolate, acuminate, 3—5-nerved. *Stamens* 5, filaments slightly connate below, anthers 2-celled, staminodes none. *Ovary* ovoid, style slender, stigma capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* an ovoid membranous utricle, enclosed in the perianth, its apex areolate. *Seed* inverse, lenticular, rostellate, testa thinly coriaceous, embryo annular; cotyledons linear, flat, radicle ascending.—Species 5, in Asia and Africa.

P. lappacea, Juss. in. *Ann. Mus. Par. ii*, 132; *F. B. I. iv*, 724; *Prair Beng. Pl.* 872; *Cooke Fl. Bomb. ii*, 497.

A large straggling undershrub; branches terete, tomentose. *Leaves* petioled, membranous, $1\frac{1}{2}$ —4 in. long, ovate or elliptic, acute or acuminate, tomentose on both surfaces, ciliate; base rounded or shortly cuneate; main nerves many, prominent beneath. *Flowers* in approximate or distant clusters arranged in terminal spikes 4—10 in. long; rhachis slender, tomentose; bracts $\frac{1}{8}$ — $\frac{1}{4}$ in. long, ovate, acuminate, pungent, villous; bracteoles $\frac{1}{2}$ in. long, ovate-oblong, apiculate, concave. *Perianth* $\frac{1}{2}$ in. long. *Sepals* lanceolate, aristate, 3-nerved, densely white-woolly. *Sterile flowers* reduced to a number of unequal glabrous hooked awns, enlarging, stellately spreading, yellowish during the fruiting time and supported during the flowering period by a lanceolate acute 3-nerved aristate bracteole. *Utricle* thinly membranous, oblong and abruptly narrowed to the apex. *Seed* $\frac{1}{16}$ in. long, ellipsoid, compressed, black and shining.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts eastwards; also in Bundelkhand and Merwára. Flowers towards the end of the rainy season. **DISTRIB.:** Behar, Punjab Plain and up to 3,000 ft. on the W. Himalaya; also in Rajputana, Sind and Deccan Peninsula, extending to S. E. Asia, Trop. Africa and Madagascar.

9. ALTERNANTHERA, Forsk. ; Fl. Brit. Ind. iv, 731.

Herbs, usually prostrate. *Leaves* opposite. *Flowers* 2-sexual, small, white, in axillary often clustered heads. *Perianth-segments* 5, sepaline, unequal; anterior and 2 posterior flattened; the 2 lateral ones innermost, concave. *Stamens* 2—5; filaments short, connate in a short cup, with or without interposed staminodes; anthers 1-celled. *Ovary* sub-orbicular or ovoid, style very short, stigma capitellate, rarely 2-fid; ovule solitary, pendulous from a long basal funicle. *Fruit* a compressed orbicular or obcordate utricle, often with thickened or winged margins.

Seed inverse, lenticular, testa crustaceous; embryo annular, surrounding the floury albumen, cotyledons narrow, radicle superior.—Species about 16, in tropical and sub-tropical regions, abundant in Australia and America.

A. sessilis, *R. Br. Prod.* 417; *Royle Ill.* 320; *F. B. I. iv*, 731; *Watt E. D.*; *Collett Fl. Siml.* 415; *Prain Beng. Pl.* 875. *A. triandra*, *Lamk.*; *Cooke Fl. Bomb. ii*, 499. *A. prostrata*, *Don. Prodr.* 86, *Achyranthes triandra*, *Roxb. Fl. Ind. i*, 678. Vern. *Ghardughi* (Rohilkhand).

A prostrate herb; branches many, often rooting from the lower nodes, glabrous or the younger ones with 2 opposite lines or hairs. *Leaves* shortly stalked, glabrous and rather fleshy, $\frac{1}{2}$ —2 in. or more long, linear-oblong lanceolate or elliptic, obtuse or subacute, sometimes subdentate. *Flowers* sessile, white and shining, arranged in small axillary sessile heads; bracteoles ovate, scarious. *Perianth* $\frac{1}{10}$ — $\frac{1}{8}$ in. long. *Sepals* ovate, acute, 1-nerved, scarious. *Ovary* broader than long, compressed. *Utricle* broadly obcordate, margins thickened. *Seed* suborbicular.

Common in all parts of the area in waste places and as a weed of cultivation. **DISTRIB.:** Throughout India and in Ceylon and up to 4,000 ft. on the Himalaya, extending to all warm countries.

GOMPHRENA GLOBOSA, *Linn.*; *Roxb. Fl. Ind. ii*, 63; *F. B. I. iv*, 732; *Watt E. D.*; *Prain Beng. Pl.* 876; *Cooke Fl. Bomb. ii*, 499. (The Globe amaranth).—A tall much-branched annual, hairy or subsilky. *Leaves* shortly stalked, pale-green, 2—4 in. long, elliptic or obovate-oblong. *Heads* large, globose, terminating the branches, yellowish-white or crimson; bracts leafy; bracteoles pinkish-purple. *Sepals* densely woolly, shorter than the long staminal tube. *Anthers* 1-celled. *Stigma* 2-fid.—Much cultivated in Indian gardens and often met with as an escape. Cultivated in most warm countries, having probably originated in America. It flowers in India during the rainy and cold seasons.

XCI.—CHENOPODIACEÆ.

Annual or perennial herbs or shrubs. *Leaves* usually alternate, simple, exstipulate. *Flowers* small, usually green, 1- or 2-sexual, usually regular, often dimorphic; bracts 1 or none, bracteoles none or 2. *Perianth* simple, sepaline, of 3—5 free or connate sepals, imbricate, often wanting in female flowers. *Stamens* usually 5, opposite the perianth-segments, perigynous or hypogynous; filaments free, sometimes with intervening staminodes; anthers 2-celled. *Ovary* ovoid globose or depressed, 1-celled; style terminal, short or long; stigma capitate or 2—3-lobed; or stigmas 2—5, free or slightly united; ovule solitary, basal or lateral, campylotropous. *Fruit* a small utricle, rarely a circumscissile capsule, enclosed in the often enlarged fleshy perianth when the latter is present. *Seeds* erect, inverse or horizontal, crustaceous coriaceous or membranous;

albumen floury or fleshy or none; embryo curved, annular or spiral.—Species about 520, widely dispersed throughout the world, and chiefly in saline soils.

Stems not twining; bracteoles free from the perianth; anthers erect or incurved in bud:—

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| Leaves flat; embryo annular or horseshoe-shaped:— | |
| Fruiting perianth not winged; albumen copious | 1. CHENOPODIUM. |
| Fruiting perianth with transverse wings; albumen scanty | 2. KOCHIA. |
| Leaves fleshy, $\frac{1}{2}$ terete; embryo spiral; albumen none:— | |
| Sepals not winged | 3. SUÆDA. |
| Sepals transversely winged | 4. SALSOLA. |
| Stems twining to the right; leaves flat, membranous; bracteoles 2, broad, adnate to the face of the perianth; anthers versatile; embryo spiral | 5. BASELLA. |

1. CHENOPODIUM, Linn.; Fl. Brit. Ind. v, 3.

Annual or perennial erect or prostrate herbs. *Leaves* alternate, entire lobed or toothed. *Flowers* minute, 2-sexual, in axillary clusters or cymes; bracts and bracteoles none. *Perianth* usually 5-lobed; segments concave, incurved. *Stamens* 5 or fewer, hypogynous or almost perigynous, anthers 2-celled. *Disk* none or annular. *Ovary* depressed-globose, rarely ovoid; stigmas 2—5, sometimes united below in a style; ovule solitary, sessile. *Fruit* a membranous utricle, enclosed in the perianth. *Seed* usually horizontal, testa crustaceous or coriaceous, embryo nearly or quite annular, surrounding the floury albumen. Species about 60, in all parts of the world. The fruit of some of the species is dimorphic.

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| A tall scentless herb; seeds smooth and shining | 1. <i>C. album</i> . |
| A low rather foetid herb; seeds rugose, dull-black | 2. <i>C. murale</i> . |

1. *C. album*, Linn. Sp. Pl. 219; Roxb. Fl. Ind. ii, 58; F. B. I. v, 3; Duthie Field and Gard. Crops, N. W. Prov. and Oudh, part iii, 21; Watt E. D.; Comm. Prod. Ind. 293; Collett Fl. Siml. 416; Prain Beng. Pl. 878; Cooke Fl. Bomb. ii, 501. *C. giganteum*, Don Prod. 74. *C. viride*, Linn.; Roxb. Fl. Ind. ii, 58. *C. laciniatum*, Linn.; Roxb. l.c. 59. *C. purpurascens*, Buch.-Ham. in Wall. Cat. 6955.—Vern. *Bathu*, *bathu-ság*, *chel* (Merwára). White Goose-foot.

An erect herb, 1—10 ft. or more high, green or more or less coated with white mealy pubescence, inodorous. *Stems* angled, often tinged with red or purple. *Leaves* very variable in size and shape, entire toothed or lobed; petioles slender, often equalling or longer than the blade. *Flowers* in clusters, forming compact or loosely paniced spikes, becoming thyrsoid under cultivation. *Sepals* $\frac{1}{16}$ — $\frac{1}{12}$ in. long, oblong-lanceolate, keeled on the back, closely investing the thin membranous utricle. *Stigmas* 2. *Seed* $\frac{1}{16}$ in. in diam. orbicular, compressed and with an acute margin, black and shining.

A very common weed throughout the area especially in cultivated ground and in waste places, very variable. **DISTRIB.:** Plains of Punjab and Bengal, extending to S. India; also on the Himalaya

from Kashmir to Sikkim up to 12,000 ft., and to still higher elevations in W. Tibet; also on the Khasia Hills where it is cultivated. The plant is very rich in potash salts and the leaves are often eaten raw as a salad or cooked as a pot-herb, and on the W. Himalaya it is much grown for its grain. Baden-Powell mentions that in the Punjab this plant is sometimes used in cleaning copper vessels preparatory to tinning them. In *C. viride* the leaves are narrower than in the type and almost entire, and the plant is much less mealy.

2. *C. murale*, *Linn. Sp. Pl.* 219; *F. B. I. v.* 4; *Watt E. D.*; *Cooke Fl. Bomb. ii.* 501.

A subglabrous rather fœtid herb. *Stem* 6—15 in. high, branches erect of ascending. *Leaves* stalked, bright-green and somewhat shining, 1—3 in. long, rhombic or deltoid-ovate, obtuse or acute, margins irregularly lobed and more or less sharply toothed, entire at the cuneate base. *Flowers* clustered in lax or dense cymes arranged in axillary racemes or panicles, the terminal leafless panicle much shorter than in *C. album*. *Sepals* $\frac{1}{8}$ in. long, oblong, subacute, closing over the utricle, slightly keeled. *Stigmas* 2. *Seeds* horizontal, orbicular, compressed, sharply keeled, dull-black, rugose.

Upper Gangetic Plain (T. Thomson), N. W. India (Royle). *DISTRIB.*: Punjab Plain (Edgeworth, etc.), and on the Himalaya in Kumaon and Nepal; Western and S. India, but Cooke says "scarcely indigenous in the Bombay Presidency"; also in Ceylon, extending to W. Asia, N. Africa and Europe, but introduced in N. America. The plant is used as a pot-herb in the Punjab.

2. **KOCHIA,** Roth; *Fl. Brit. Ind.* v, 10.

Herbs or undershrubs, usually villous or pubescent. *Stems* slender. *Leaves* alternate, sessile, narrow, entire. *Flowers* minute, axillary, solitary or in clusters, 2-sexual and female, rarely only male, ebracteate. *Perianth* subglobose; lobes 5, coriaceous, incurved and ultimately closing over the utricle, girt by 5 free or confluent wings. *Stamens* 5, usually exerted; anthers large, ovate. *Ovary* depressed-globose; style slender, stigmas 2 or 3, capillary. *Fruit* a depressed membranous utricle. *Seed* ovoid or orbicular, horizontal, testa membranous, albumen scanty, embryo annular. Species about 20, in Temp. Asia, N. and S. Africa and in N. W. America.

***K. indica*,** *Wight Ic.* 1791; *F. B. I. v.* 11; *Watt E. D.*; *Comm. Prod. Ind.*; *Cooke Fl. Bomb. ii.* 503.—Vern. *Bui*.

A tall erect annual, diffusely branching from the base. *Stem* and branches white, more or less villous or woolly, striate. *Leaves* $\frac{1}{4}$ — $1\frac{1}{2}$ in. long, elliptic or linear-lanceolate, acute, hairy on both surfaces, base tapering. *Flowers* axillary, solitary or in pairs. *Perianth* about $\frac{1}{16}$ in. across (when spread out), divided about $\frac{1}{4}$ of the way down, woolly; segments hooded, mucronate; wings (in fruit) broadly triangular-ovate, scarious. *Utricle* thinly membranous; stigmas 2, filiform. *Seed* $\frac{1}{16}$ in. in diam., orbicular or ovoid, black.

In the neighbourhood of Delhi (F. B. I.). **DISTRIB.:** Plains of Punjab and Sind, also in the drier parts of S. India, extending to Afghanistan. The plant is sometimes used as fodder for camels.

3. SUÆDA, Forsk. ; Fl. Brit. Ind. v, 13.

Herbs or shrubs. *Leaves* fleshy, ternate, terete, rarely flattish. *Flowers* minute, axillary, usually 2-sexual, bracteate and 2-bracteolate. *Perianth* short, globose or urceolate, 5-lobed or -partite; segments equal or not, simple, gibbous or almost winged. *Stamens* 5, filaments short, anthers large. *Ovary* usually sessile, with a wide base, adnate below to the perianth, style none, stigmas 2—5, minute, subulate, recurved. *Fruit* a small membranous or spongy utricle, included within the perianth. *Seed* erect, oblique or horizontal, testa crustaceous or coriaceous, albumen scanty or none, embryo slender and somewhat spiral. Species about 40, usually on desert saline tracts and sea-shores.

Perennial; stigmas 3; seed usually erect

1. *S. fruticosa*.

Annual or occasionally perennial; stigmas 2; seed usually horizontal

2. *S. maritima*.

1. *S. fruticosa*, Forsk. Fl. Ægypt.-Arab. 70, t. 9; F. B. I. v, 13; Watt E. D.; Comm. Prod. Ind. 519, Cooke Fl. Bomb. ii, 505. Salsola Lana, Edgew. in Hook. Journ. ii, 286.—Vern. Lunak, choti-láni.

A much-branched usually erect shrub. *Stem* pale, glabrous, branches usually slender. *Leaves* subsessile, fleshy, very variable, $\frac{1}{2}$ — $\frac{3}{8}$ in. long, linear or ellipsoid, obtuse, narrowed to the base, floral leaves shorter. *Flowers* 2-sexual, axillary, solitary or 2 or 3 together, the upper ones forming slender leafy spikes; bracteoles membranous, shorter than the perianth, ovate, acute, entire or denticulate. *Perianth* (in fruit) subglobose, about $\frac{1}{16}$ in. long; segments thick, oblong, concave, obtuse, incurved. *Utricle* obovoid; stigmas 3, short, spreading. *Seed* erect, obliquely ovoid, beaked, black and shining when ripe.

A common plant in saline soils, and often found as a gregarious bush in the usar tracts of the Upper Gangetic Plain and in Merwára. It flowers during the cold season. **DISTRIB.:** Plains of Punjab and Sind, also in Baluchistan, extending to Africa and the Mediterranean region. The plant is much eaten by camels, and a crude form of *barilla* is prepared from it in Sind.

2. *S. maritima*, Dumort. Fl. Belg. 22; F. B. I. v, 14; Watt E. D.; Comm. Prod. Ind. 114; Prain Beng. Pl. 878; Cooke Fl. Bomb. ii, 506. Salsola indica, Willd.; Roxb. Fl. Ind. ii, 62.—Vern. Lani, khari-láni.

An erect annual herb or occasionally an undershrub, glaucous-green. *Stems* $1\frac{1}{2}$ —2 ft. high, with many slender erect branches. *Leaves* many, $\frac{3}{8}$ —1 in. long, fleshy, semiterete, linear or filiform, subacute, floral leaves very small. *Flowers* in small subglobose clusters forming slender lax elongate spikes; bracteoles membranous, ovate, entire. *Perianth* minute; segments rounded, covering the utricle. *Stigmas* 2, slender. *Seed* horizontal, obliquely ovoid or suborbicular, black and shining.

In the neighbourhood of Delhi (C. B. Clarke), also on the usar tracts in the Upper Gangetic Plain (Durhic). Flowers during the hot season. **DISTRIB.:** Sea-coast of Bengal and Bombay and in S. India and Ceylon, extending to Siam, N. and W. Asia, N. Africa, Europe and N. America. The leaves, which are quite wholesome, are eaten by the poorer classes in times of scarcity.

4. SALSOLA, Linn.; Fl. Brit. Ind. v, 17.

Herbs or shrubs, branches not jointed. *Leaves* usually alternate, sessile and often amplexicaul, sometimes with pungent tips. *Flowers* small, axillary, solitary or fascicled, bracteoles 2. *Perianth* 5 (rarely 4)-partite; segments concave, accrescent in fruit, usually furnished with a broad scarious horizontal wing above the middle and completely embracing the utricle. *Stamens* 5 or fewer, usually hypogynous. *Fruit* an ovoid or orbicular fleshy or membranous utricle; stigmas 2 or 3, subulate or linear. *Seed* usually horizontal, testa membranous, albumen none, embryo spiral.—Species about 40, in Temp. Asia, Australia and N. America.

S. foetida, *Del. Fl. Egypt. Ill. (1812) n. 310*; *F. B. I. v, 18*; *Watt E. D.*; *Comm. Prod. Ind. 114*; *Gamb. Man. 552*; *Brand. Ind. Trees 519*; *Cooke Fl. Bomb. ii, 507*. *S. indica*, *Herb. Royle*.—Vern. *Lána, shora, gora-lána*.

A large much-branched hoary shrub up to 4 ft. or more in height. *Stem* stout; branches densely crowded, slender. *Leaves* minute, subglobose, fleshy; the floral ones imbricate and forming very short cylindrical spikes; bracteoles fleshy, $\frac{1}{10}$ in. long, broadly ovate or orbicular. *Perianth* silvery-white, not exceeding the bracteoles, oblong, obtuse; wings symmetrical, rounded, membranous and transparent, margins often overlapping. *Stigmas* 2, large, recurved.

Found in the districts of Delhi and Agra (Royle, Munro, etc.). Flowers in the cold season. **DISTRIB.:** Plains of Punjab and Sind; also in Baluchistan, Afghanistan, and westwards to Persia, Arabia and N. Africa. This plant is much used in the preparation of *barilla* (carbonate of soda). The branchlets often bear globose villous galls $\frac{1}{4}$ — $\frac{3}{4}$ in. in diam.; these latter are covered by linear leaves somewhat resembling the involucre of a composite. The plant is described as having a strong odour of rotten fish. It is eaten greedily by camels.

5. BASELLA, Linn.; Fl. Brit. Ind. v, 20.

Much-branched twining fleshy herbs. *Leaves* alternate, broad, entire. *Flowers* in spikes, 2-sexual, white, red or violet; bracts minute, caducous; bracteoles 2, united into a 2-lipped cup and adnate to the perianth. *Perianth* fleshy, 5-fid; at length berry-like; lobes short, incurved. *Stamens* 5, on the mouth of the perianth-tube; filaments short, erect in bud; anthers versatile, globose. *Styles* 3, stigmas 2, linear-clavate, papillose on the inner side, ovule sessile. *Fruit* a globose utricle, included within the fleshy perianth; pericarp thin,

adnate to the seed. *Seed* erect, sub-globose, testa crustaceous, albumen scanty, embryo plano-spiral; cotyledons large, thin, involute.—Species 2, in Asia and Trop. Africa, elsewhere cultivated in the tropics.

B. rubra, *Linn. Sp. Pl.* 272; *F. B. I. v.* 20; *Watt E. D.*; *Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii,* 19; *Prain Beng. Pl.* 882; *Cooke Fl. Bomb. ii,* 509. **B. alba**, *Linn.*; *Roxb. Fl. Ind. ii,* 104.—*Vern. Poi, lál-bachlu.* (Indian Spinach.)

A glabrous fleshy perennial much-branched climbing herb, often tinged with red. *Leaves* 2—5 in. long or more, broadly ovate, acute or acuminate, thick, entire, often cordate at the base; petioles $\frac{1}{2}$ —1 in. long. *Flowers* sessile, white or red, in lax axillary peduncled spikes 1—6 in. long; bracts apiculate, bracteoles longer than the perianth, oblong, obtuse. *Perianth* remaining closed, divided half-way down; lobes elliptic, obtuse. *Utricle* red white or black, about the size of a pea.

Wild and cultivated within the area. It flowers during the cold season. **DISTRIB.:** Throughout the hotter portions of India and in Ceylon extending to other parts of Trop. Asia and to Trop. Africa. Roxburgh describes five varieties in Bengal, 2 of them wild and 3 cultivated; also a further kind (*B. lucida*, L. and *B. cordifolia* Lamk.). This latter is a much larger and more succulent plant, and is the one chiefly grown in Bengal for use as a pot-herb. It is usually raised from cuttings and planted so as to climb over the roofs of native houses and on trellises, where it affords both shade and food.

The following cultivated species belonging to genera which are not indigenous within the area of this flora should be mentioned:—

BETA VULGARIS, *Linn.*; *F. B. I. v.* 5; *Watt E. D.*; *DC. L'Orig. Pl. Cult.* 46; *Duthie Field and Gard. Crops, part iii,* 19; *Prain Beng. Pl.* 879; *Cooke Fl. Bomb. ii,* 509. **B. benghalensis**, *Roxb. Fl. Ind. iii,* 59.—*Vern. Chukandar, palák, palang.* (Garden beet). Extensively grown in India for its root, which is used chiefly by Europeans as a salad. *B. benghalensis* is a form with more erect branches. It is much cultivated by the natives of N. India for the sake of its leaves which are eaten as a vegetable. *B. maritima* L., from which the beet and the mangold-wurzel are supposed by some to have originated, has decumbent branches. The genus *Beta* differs from *Chenopodium* in the presence of both bracts and bracteoles, and by the perianth becoming thickened and hard at the base.

SPINACIA OLERACEA, *Linn.*; *F. B. I. v.* 6; *Watt E. D.*; *DC. L'Orig. Pl. Cult.* 78; *Prain Beng. Pl.* 880; *Cooke Fl. Bomb. ii,* 509. **S. tetrandra**, *Roxb. Fl. Ind. iii,* 771; *Royle Ill.* 318.—*Vern. Palák* (Spinach). This plant is largely grown in Indian native gardens, and is much used as a pot-herb. Its original habitat as a wild plant is not known. It differs from the Genus *Chenopodium* in having 1-sexual flowers, the males being crowded in terminal leafless spikes and the females arranged in axillary clusters.

ATRIPLEX HORTENSIS, *Linn.*; *F. B. I. v.* 6; *Watt E. D.*; *Prain Beng. Pl.* 880; *Cooke Fl. Bomb. ii,* 502.—An erect succulent annual, often

tinged with red or purple. The flowers are 1-sexual or polygamodioecious. The female flowers have no perianth, its place being taken by 2 bracteoles which become dilated and form a 2-valved covering to the utricle. The plant is extensively cultivated as a pot-herb in the plains of Upper India, as well as on the Himalaya up to 12,000 ft. In Europe it is often grown as a vegetable under the name of "Orache" or "Mountain Spinach." The origin of this species is not known for certain.

- A. *NUMMULARIA*, *Lindl.* is an Australian shrub known in that country as the "Salt bush." It is much valued as affording good fodder for sheep in the drought-affected areas, where it is able to hold its own during very dry seasons when nearly all other vegetation disappears. For this reason it was introduced into India about twenty years ago by the writer in order to test its value as a reclamation plant on the *usar* tracts of the Upper Gangetic Plain. The results, however, proved to be unsatisfactory owing to the excessive moisture in that portion of India during the hot rainy season.

XCII.—POLYGONACEÆ.

Herbs or shrubs, very rarely trees. *Leaves* usually alternate, entire or sometimes serrulate; stipules scarious or membranous, usually sheathing the stem. *Flowers* small or medium-sized, regular, usually 2-sexual, solitary or in axillary cymose clusters pedicels usually jointed. *Perianth* inferior, simple; segments 3—6, free or connate, imbricate in bud. *Stamens* 5—8, rarely more or fewer, opposite the perianth-segments. *Disk* annular, glandular or none. *Ovary* free, sessile, 1-celled; styles 3 or 2, rarely 4, free or connate; stigmas capitate, peltate or fimbriate; ovule solitary, orthotropous, sessile or on a distinct funicle. *Fruit* a small hard nut, compressed or 3-gonous, rarely 4-gonous, enclosed in the persistent perianth. *Seed* erect, testa membranous, albumen floury, sometimes ruminant. Species about 600, chiefly in temperate regions.

- Perianth 4—5 (rarely 3)-cleft; stigmas capitate; fruit a compressed or 3-gonous nutlet 1. *POLYGONUM*.
 Perianth 6-cleft, the 3 inner segments much enlarged in fruit; stigmas fimbriate; fruit a small 3-quetrous nutlet 2. *RUMEX*.

1. *POLYGONUM*, Linn.; Fl. Brit. Ind. v, 23.

Herbs or shrubs, rarely climbing. *Leaves* alternate, entire, rarely toothed lobed; stipules tubular, membranous. *Flowers* 2-sexual, small or minute, axillary or terminal, clustered, the clusters sessile or in spiciform capitate or paniced racemes; pedicels short, usually jointed under the perianth, bracts and bracteoles membranous, ochreate. *Perianth* green or coloured, 4—5 (rarely 3)-cleft, the 2 outer lobes usually smallest. *Stamens* 5—8 (rarely 1—4), perigynous; filaments often dilated at the base or alternate with the lobes of an annular or glandular disk.

Ovary compressed or 3-gonous; styles 2 or 3, free or slightly connate, stigmas usually capitellate. *Fruit* a compressed or 3-gonous nutlet, covered or partially so by the persistent perianth; pericarp usually hard and often shining. *Seed* with the embryo lateral or excentric, radicle long, cotyledons small.—Species about 150, throughout the world, but chiefly in temperate regions.

Of the 79 species now known to occur within the area of British India, 45 are restricted to the Himalayan and the North-West Frontier regions; and of the remaining 34 species, fourteen are here included as inhabiting the Upper Gangetic Plain. The very useful "Census of the Indian Polygonums" prepared by Major Gage in 1903 as a contribution to Vol. II of the "Records of the Botanical Survey of India" has been freely made use of by the present writer.

- Inflorescence in axillary clusters.—Annual or perennial herbs with small leaves and hyaline stipules
- Inflorescence terminal, racemose spicate or capitate:—
- Inflorescence in elongate stout or filiform racemes or spikes:—
- Nutlets biconvex:—
- Bracts hairy:—
- Bracts coarsely hairy or strigose:—
- Leaves ovate, petioles 1—4 in. long 2. *P. orientale*.
- Leaves lanceolate, petioles less than $\frac{1}{2}$ in. long 3. *P. limbatum*.
- Bracts densely white-woolly 4. *P. lanigerum*.
- Bracts glabrous:—
- Perianth not glandular, ochreæ usually eciliate 5. *P. glabrum*.
- Perianth glandular, ochreæ shortly ciliate 6. *P. lapathifolium*.
- Nutlets trigonous:—
- Racemes stout and short, with closely imbricate bracts, perianth not glandular:—
- Bracts more or less hairy 7. *P. stagninum*.
- Bracts glabrous:—
- Leaves tapering to the acute base, marginal cilia of ochreæ longer than the tube 8. *P. barbatum*.
- Leaves tapering to a rounded or subcordate base, marginal cilia of ochreæ not longer than the tube 9. *P. serrulatum*.
- Racemes slender, filiform, bracts more or less distant:—
- Perianth glandular; stems shortly creeping below; nutlets not polished:—
- Ochreæ very shortly ciliate or eciliate; bracts glandular or not 10. *P. Hydropiper*.
- Ochreæ with cilia at least half as long as the tube; bracts always glandular 11. *P. flaccidum*.
- Perianth not glandular, very small; stems extensively creeping below; nutlets polished 12. *P. Posumbu*.
- Inflorescence capitate, compressed:—
- Heads with an involucre leaf at the base 13. *P. alatum*.
- Heads without an involucre leaf at the base 14. *P. capitatum*.

1. *P. plebejum*, R. Br. Prod. 420; F. B. I. v, 27; Watt E. D.; Collett Fl. Siml. 421; Gage in Rec. Bot. Surv. Ind. ii, 383; Prain Beng. Pl. 885 Cooke Fl. Bomb. ii, 512. *P. aviculare*, Don Prod. 72 (not of Linn.). *P. herniarioides*; Del.; Royle Ill. 313.

A prostrate diffusely branched herb, often with a woody rootstock; branches stout or slender, terete, striate, glabrous; lower internodes often longer than the leaves, upper shorter or very short. *Leaves* sessile or shortly stalked, $\frac{1}{8}$ — $\frac{2}{3}$ in. long, oblong or linear or obovate; stipules hyaline, rather short, lacerate to the middle and fimbriate, nerves usually obscure. *Flowers* axillary, solitary or 2—3-nate, sessile or nearly so. *Perianth* pink, about $\frac{1}{16}$ in. long, divided nearly to the base; segments short, broad, rounded or the 2 outer ones acute. *Nutlets* 3-gonous, shining.

Throughout Trop. India, ascending to 6,000 ft. on the Himalaya from Bhutan to Kashmir, but not in Ceylon. Beyond India it extends to Afghanistan, Egypt, Trop. and S. Africa, Madagascar, Java, Philippines, and Australia. Regarding this very variable species Sir Joseph Hooker remarks that, if he was right in bringing all the ten varieties (or forms) described by him in the Fl. Brit. India under one species, this is a far more protean plant than *P. aviculare* with which it is generally compared, but from which it differs entirely in habit, in the usually few-nerved stipules and in the rhombic smooth nutlet. *P. aviculare* is abundant on the W. Himalaya and in W. Tibet. Major Gage, after a careful and detailed examination of the many specimens included in the Calcutta Herbarium, as forms or varieties of *P. Plebejum*, enumerates 8 varieties in his census. At the same time he is very much inclined to regard them as representing 4 distinct species, and that they might be grouped as follows:—

I.	{	plebejum (proper).	II. {	indica.
		effusa.		brevifolia.
		elegans.		III. Griffithii.
		micranthema.		IV. polyneura.

He draws attention also to the fact that, apart from morphological considerations, the altitudinal distribution of the constituents, as given in his census, tends to support this view. Of the eight varieties therein mentioned, and which may be regarded for the present as belonging to a single species, all except *polyneura* appear to have been recorded as growing within the limits of this flora. The descriptions are mainly Hooker's, taken from the Fl. Brit. India.

VAR. 1. PLEBEJUM (proper).—Branches stout or slender. Lower internodes often longer than the leaves, upper shorter or very short. *Leaves* $\frac{1}{8}$ — $\frac{2}{3}$ in. long; upper often much shorter, oblong or linear, obtuse, margins often recurved. *Flowers* sunk amongst the stipules, rarely exerted. *Sepals* short, broad, rounded.—Dehra Dun, Lucknow, Bundelkhand. **DISTRIB.:** Common from Assam to N. W. India and on the outer Himalayan ranges; found also in N. Kanara and extending to Africa and Australia.

VAR. 2. EFFUSA.—A slender rather flaccid plant with long internodes. *Leaves* narrowly linear or widening upwards from a very narrow base, tip rounded. *Flowers* all or mostly pedicelled. *Sepals* short, broad.—Dehra Dun (King), N. W. India (Royle),

Mcwára (Duthie). **DISTRIB.:** Bengal to Bombay and Sind. *P. effusum*, Meissn. Herb. Strach. and Winterb. No. 22. Usually in wet places.

VAR. 3. ELEGANS.—Black when dry. Branches stout, grooved, smooth or scaberulous; internodes longer or shorter than the leaves. *Leaves* $\frac{1}{3}$ — $\frac{1}{2}$ in. long; upper as long as the lower, linear-lanceolate, acute or acuminate, rarely obtuse, margins flat or revolute; stipules fimbriate, brownish. *Flowers* sessile or shortly pedicelled. *Sepals* narrow, the two outer acute.—Sub-Himalayan tracts of Rohilkhand and N. Oudh (Wallich, Duthie), Saugor (Vicary). **DISTRIB.:** Bengal, Nepal, Assam and Tenasserim, extending to Australia. *P. elegans*, Roxb.; Fl. Ind. ii, 291. Hooker describes this as a large form passing into *plebejum* (proper) by insensible transitions. It is also *P. prostratum* of Roxb. l.c.

VAR. 4. MICRANTHEMA.—A small plant with slender branches. *Leaves* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, linear or linear-oblong, obtuse at the apex and narrowed towards the base; upper crowded, as long as the often distant lower, stipules short. *Flowers* very minute, pedicelled, crowded in the upper axils. *Sepals* narrow, obtuse. *Nutlets* minute, $\frac{1}{30}$ — $\frac{1}{20}$ in. in diam.—Dehra Dun (King), Siwalik range and N. Oudh (Duthie). **DISTRIB.:** Bengal in sandy river beds, also in Sind. Hooker regards this as only a small state of *P. plebejum*, into which it passes by insensible gradations. Cooke Fl. Bomb. ii, 514. *P. micranthemum* Franchet.

VAR. 5. INDICA.—Branches uniformly spreading all round from the crown and leafy, internodes short. *Leaves* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, linear or obovate-oblong, flat, obtuse or apiculate; stipules very short. *Flowers* crowded in the axils, pedicels shorter than the perianth or none. *Sepals* broad, 2 outer acute. *Nutlets* $\frac{1}{14}$ in.—Saugor (Jerdon). **DISTRIB.:** Common in Central and S. India, also in the Bombay Pres., extending to Africa and Australia. Watt E. D.; Cooke Fl. Bomb. ii, 513. *P. indicum*, Heyne.

VAR. 6. BREVIFOLIA.—Rootstock woody; branches stout, often 1—2 ft. long, dark-brown, grooved; internodes of branchlets very short, concealed by the leaves and stipules which latter show as a continuous white villous band on the underside of the branchlets. *Leaves* $\frac{1}{3}$ — $\frac{1}{4}$ in. long, obovate, acute or apiculate, flat, coriaceous, dark-brown when dry. *Flowers* sessile, almost concealed by the stipules. *Sepals* narrow, outer acute. *Nutlets* $\frac{1}{14}$ — $\frac{1}{12}$ in.—Abundant within the area in dry places. **DISTRIB.:** Bengal to Garhwal and W. India, also in Burma and extending to Africa. Prain Beng. Pl. 886; Cooke Fl. Bomb. ii, 514. A short form with crowded leaves; allied to *indica*, and differing from *Griffithii* by its stout habit and narrower longer leaves which are less covered by the stipules.

VAR. 7. GRIFFITHII.—Branches excessively numerous from the root, very slender flexuous and quite naked below; branchlets with the internodes so close that they look woolly from the crowded and fimbriate stipules. *Leaves* shorter than the almost nerveless stipules,

orbicular or broadly obovate, flat, apiculate. *Flowers* minute, subsessile, hidden amongst the stipules. *Sepals* rounded, the 2 outer apiculate.—N. W. India (Falc.); abundant in the Jumna and Chambal ravines of Agra and Etawah (Duthie), and in Bundelkhand (Duthie) and Saugor (Jerdon). This very distinct-looking plant is considered by Hooker to be probably a modified form of *brevifolia* with the bases of the branches buried in soil and hence almost leafless and very slender.

2. *P. orientale*, *Linn. Sp. Pl.* 362; *F. B. I. v.* 30; *Collett Fl. Siml.* 421; *Prair Bengal. Pl.* 886; *Gage in Rec. Bot. Surv. Ind. ii.* 386; *P. pilosum*, *Roxb. Fl. Ind. ii.* 286.

A tall erect branching annual, 4—10 ft. high, usually softly pubescent or silkily villous; stems robust, grooved, branches hollow. *Leaves* 6—9 in. long, ovate or ovate-cordate, acuminate; petioles 1—4 in. long, stipules short, truncate, hirsute, ciliate at the mouth, expanded or tightly embracing the stem. *Racemes* laxly paniced, cylindrical, 3—5 in. long, peduncles stout, erect or drooping; bracts crowded, 3—6-flowered, strigosely tomentose and ciliate. *Flowers* large; perianth white red or green, 4 or 5 partite. *Stamens* 7—8, included. *Styles* connate below, stigmas capitellate. *Nutlets* $\frac{1}{8}$ in. long, orbicular, compressed, with rounded margins and rather concave faces, black and shining when ripe.

Dehra Dun, in swamps (Falconer, Duthie); Sub-Himalayan tracts of N. Oudh. *Flowers* during the rainy season. *DISTRIB.*: Himalaya eastwards from Kashmir, ascending to 5,000 ft.; also in Bengal, Assam and Burma; extending to Turkestan, Siam, China, Japan, Java and Borneo. The plant is often cultivated, and in that condition it often becomes almost glabrous.

3. *P. limbatum*, *Meissn. in DC. Prod. xiv.* 123; *F. B. I. v.* 30; *Prair Bengal. Pl.* 886; *Gage in Rec. Bot. Surv. Ind. ii.* 387; *Cooke Fl. Bomb. ii.* 515.

Annual. Stem simple, very stout, erect or prostrate below, pubescent or glabrous. *Leaves* shortly petioled, 4—8 in. long, lanceolate, acuminate, tapering below, scaberulous on both surfaces; stipules cylindrical, strigose; mouth truncate, with a spreading or recurved scabrid and ciliate herbaceous limb. *Flowers* in short erect paniced racemes, peduncles strigose; bracts crowded, hispid. *Nutlets* $\frac{1}{8}$ in. in diam., orbicular, compressed, margins rounded, faces convex.

Saharanpur, Rohilkhand (T. Thomson), N. Oudh (R. Thompson), Bundelkhand (Vicary), Saugor (Jerdon); usually in wet ground. *DISTRIB.*: Garhwal, Bengal, W. and S. India; extending to Egypt and Trop. Africa.

4. *P. lanigerum*, *R. Br. Prod.* 419; *Royle Ill.* 313; *F. B. I. v.* 35; *Prair Bengal. Pl.* 886; *Gage l.c.* 394. *P. lanatum*, *Roxb. Fl. Ind. ii.* 285.

A robust annual (or perhaps sometimes perennial), 2—5 ft. high. *Stem* stout, prostrate below and rooting at the nodes, clothed with snow-white tomentum; branches slender, deep-red within especially at the

nodes. *Leaves* shortly stalked, narrowly lanceolate, acuminate, densely white-cottony beneath; stipules membranous, striate; mouth unequally truncate, sparsely ciliate. *Racemes* slender, 1—2 in. long; peduncles spreading, white-tomentose; bracts small, crowded, densely white-woolly. *Perianth* small, white or pink, eglandular. *Stamens* 6. *Style* 2-cleft. *Nutlets* small, orbicular, black and shining.

In ditches and wet places, chiefly in the northern portion of the area, from Dehra Dun eastwards along the Sub-Himalayan tracts. *Flowers* during the rainy season. **DISTRIB.:** Rajputana, and on the outer Himalayan ranges from the Punjab to Sikkim, ascending to 5,000 ft. in Garhwal and Kumaon; also in Bengal, Assam and Burma; and extending to China, Java, the Philippines, Egypt, Trop. and S. Africa, America and N. Australia.

5. *P. glabrum*, Willd. Sp. Pl. ii, 447; Roxb. Fl. Ind. ii, 287; Royle Ill. 313; F. B. I. v, 34; Watt E. D.; Collett Fl. Siml. 422; Prain Beng. Pl. 886; Gage Lc. 393; Cooke Fl. Bomb. ii, 514.

An erect glabrous annual, 2—5 ft. high. *Stems* stout, simple or slightly branched, procumbent below and usually tinged with red. *Leaves* 3—9 in. long, lanceolate, acuminate, tapering at the base, glabrous and usually gland-dotted, lateral nerves close; petioles $\frac{1}{8}$ — $\frac{1}{2}$ in.; stipules 1—1 $\frac{1}{2}$ in. long, closely embracing the stems when young, veins conspicuous, mouth truncate, eciliate. *Racemes* erect, slender, 2—4 in. long, forming a terminal panicle, peduncles usually glabrous; bracts glabrous, $\frac{1}{8}$ in. long, ovate, obtuse; margins membranous, rarely ciliate. *Perianth* $\frac{1}{8}$ — $\frac{1}{4}$ in. long, pink or white, not glandular; segments ovate-oblong, obtuse. *Stamens* 6—8. *Styles* 2, rarely 3, connate below. *Nutlets* $\frac{1}{8}$ in. in diam., sub-orbicular and biconvex, or 3-angled in the 3-styled flowers.

Abundant in all parts of the area in swamps and by streams. **DISTRIB.:** Throughout the greater part of India in wet places, ascending to 6,000 ft. on the Himalaya, also in Ceylon. It is found also in China, Australia, Africa and America. Hooker (in F. B. I., l.c.) notes that it is difficult to separate this species from smooth forms of *P. Persicaria*, of which it may be regarded as the tropical representative in India. It is, however, as he says, a much larger plant, less branched and with more attenuate leaves, which turn brown when drying; also in normal specimens the stipules and bracts are eciliate. The pungent leaves and young shoots are cooked by the natives in certain parts of India and eaten as an adjunct to other vegetables.

6. *P. lapathifolium*, Linn. Sp. Pl. 360; F. B. I. v, 35 (var. *laxa*); Gage Lc. 395; Prain Beng. Pl. 886; Duthie in Strachey Cat. Pl. Kumaon (1906) 258. *P. laxum*, Reichb. *P. nutans*, Roxb. Fl. Ind. ii, 285. *P. simlense*, Royle ex Bab. in Trans. Linn. Soc. xviii (1841), 102; Collett Fl. Siml. 422 (in part). *P. quadrifidum*, Herb. S. and W. No. 24).

An erect branching usually pale-green annual. *Stems* often tinged with red. *Leaves* sessile, elliptic-ovate or lanceolate, glandular beneath; stipules usually shortly ciliate. *Racemes* erect or nodding, dense or

(in Indian specimens) rather lax; bracts eciliate, peduncles and pedicels glandular. *Perianth* greenish, glandular, nerves strong. *Stamens* usually 6. *Nutlets* orbicular, biconvex.

Collected by Dr. T. Thomson in the Moradabad District. This is the only authentic record I have seen of its occurrence within the area of this flora, though doubtless existing in other localities. **DISTRIB.:** From Bengal to the N. W. Frontier, ascending to 5,000 ft. on the Himalaya; also in Assam and Burma. This is the var. *laxa* of the Fl. Brit. Ind., distinguished from the type by its cylindrical and more lax racemes.

7. *P. stagninum*, *Buch.-Ham. ex Meissn. in Wall. Pl. As. Rar. iii, 56; F. B. I. v, 37; Prain Beng. Pl. 887; Gage in Rec. Bot. Surv. Ind. ii, 397.*

A simple or branched annual. *Stems* erect or ascending, eglandular. *Leaves* 3—5 in. long, lanceolate or linear-lanceolate, strigosely pubescent on both surfaces, often glandular beneath, usually silky when young, turning grey when dry; stipules strigose, cilia shorter than the tube. *Racemes* erect, many-flowered; peduncles usually long and stout, sub-silkily strigose; bracts close, more or less hairy and ciliate on the margins. *Perianth* white, eglandular. *Styles* long connate below. *Nutlets* 3-gonous, pitchy black.

In wet places in the Sub-Himalayan tracts from Dehra Dun to N. Oudh. **DISTRIB.:** Himalayan outer ranges from the Punjab to Sikkim; also in Bengal, Assam and Burma. This plant is so closely related to *P. barbatum* that, apart from certain differences in regard to pubescence, characters which are not invariably constant, the two might well be united under one species, treating *P. stagninum* as a variety of *P. barbatum*, as already suggested by Sir Joseph Hooker and Major Gage.

8. *P. barbatum*, *Linn. Sp. Pl. 362; Royle Ill. 313; F. B. I. v, 37; Watt E. D.; Prain Beng. Pl. 887; Gage l.c. 397. P. rivularc, Kæn.; Roxb. Fl. Ind. ii, 290.*

A stout annual. *Stems* erect, glabrous or nearly so. *Leaves* 4—7 in. long, lanceolate or linear-lanceolate, acuminate, tapering to the acute base, glabrous except the ciliolate margins and midrib beneath; stipules strigose, the mouth with cilia which exceed the length of the tube. Peduncles quite glabrous. *Racemes* erect, slender, weak, 2—4 in. long; bracts crowded, glabrous, margins sparingly and shortly ciliate. *Perianth* white, eglandular. *Stamens* 5—8. *Styles* 3-cleft. *Nutlets* trigonous.

Common within the area usually in wet places. **DISTRIB.:** Hotter parts of India from Assam and Bengal to the N. W. Frontier, and from the Cent. Prov. to S. India and Ceylon; also in Burma extending to the Malay Peninsula, China, Japan, Trop. Africa and Australia. This species differs from *P. serrulatum* by the acute base of the leaves and by the much longer bristles of the stipules; the leaves also turn brown when drying. Watt mentions that in China and Japan this plant yields a blue dye similar to that of indigo.

9. P. serrulatum, Lagasc. *Gen. and Sp. Pl.* 14; *F. B. I.* v, 38; *Prair Beng. Pl.* 887; *Gage l.c.* 399; *Cooke Fl. Bomb.* ii, 515. *P. flaccidum*, Roxb. *Fl. Ind.* ii, 291 (not of Meissn. or Boiss).—Vern. *Pánimirsch*.

An annual. *Stems* prostrate and rooting below; branches 2—4 ft. high, glabrous, often reddish. *Leaves* sessile, drying green, 2—5 in. long, linear or elliptic-oblong, acute or acuminate, glabrous or sparsely hairy on upper surface and midrib; base rounded or cordate; stipules strigose; mouth truncate, with bristles on the margin nearly as long as the tube. *Racemes* paniced, slender, erect, $\frac{1}{2}$ —2 in. long; bracts glabrous, strongly and often squarrosely ciliate. *Perianth* white, $\frac{1}{8}$ in. long, eglandular. *Stamens* 5—8. *Styles* 3, connate below. *Nutlets* trigonous, $\frac{1}{2}$ in. long, polished.

Common within the area in swamps and by river-banks. **DISTRIB.:** From Assam and Bengal to the Indus, ascending to 7,000 ft. on the W. Himalaya; also in Central and S. India and in Ceylon; extending to Burma, China, the Malay Pen., W. Asia, S. Eur., Africa, America and Australia.

10. P. Hydropiper, Linn. *Sp. Pl.* 361; *Royle Ill.* 317; *F. B. I.* v, 39; *Watt E. D.*; *Collett Fl. Siml.* 423; *Prair Beng. Pl.* 887; *Gage l.c.* 401.—Water-pepper.

A rather robust glabrous annual. *Stems* much-branched, minutely glandular, 12—18 in. high, swollen at the joints, prostrate and rooting at the lower nodes. *Leaves* shortly stalked, rarely more than 3 in. long, lanceolate or oblong-lanceolate, variable in width and in the length of the apical portion, usually covered with impressed glands glabrous or with the midrib scabrid beneath; stipules glabrous or sparsely strigose with hairs that are sunk in the tissue, very shortly ciliate or eciliate. *Racemes* decurved, filiform, flexuous, leafy at the base; bracts more or less interrupted, glabrous, glandular or not; mouth naked or minutely ciliate. *Perianth* pink, very glandular. *Nutlets* usually trigonous, opaque, granulate.

In wet places, chiefly in the northern portion of the area, from Dehra Dun and Rohilkhand eastwards. **DISTRIB.:** From Assam and Bengal to the N. W. Frontier, ascending to 7,000 ft. on the Himalaya, also on the Khasia Hills; extending to Europe, N. Africa, Java, N. America and Australia. The fresh plant contains an acrid juice, which is used as a powerful diuretic.

11. P. flaccidum, Meissn. in *DC. Prod.* xiv, 107 in part, excl. syn. (not of Roxburgh); *F. B. I.* v, 39; *Prair Beng. Pl.* 887; *Gage l.c.* 402. *P. tenellum*, Roxb. *Fl. Ind.* ii, 289.

A glabrous or pubescent annual or perennial. *Root* shortly creeping. *Stems* 2—3 ft. high, slender, shortly creeping below, simple or branched. *Leaves* usually stalked, 2—6 in. long, lanceolate or elliptic-lanceolate, acuminate, quite glabrous except sometimes on the midrib and nerves beneath, or strigosely hairy beneath or on both surfaces, more or less glandular, brown when dry; stipules strigose or hirsute, marginal cilia half as long as the tube or longer. *Racemes* subpaniculate,

sometimes 6 in. long and very slender; bracts usually very distant, glabrous or more or less ciliate, glandular or not. *Perianth* bright-pink or white (Roxburgh) closely glandular. *Stamens* 8. *Nutlets* small, trigonous, dull-black, minutely rugose.

In wet ground, Upper Gangetic Plain (T. Thomson), Dehra Dun (King). Flowers during the rainy season. **DISTRIB.:** Throughout India in wet places, ascending to 6,000 ft. on the Kumaon Himalaya; also in Ceylon, Malay Pen. and Islands and China.

12. *P. Posumbu*, *Buch.-Ham. in Don. Prod.* 71 (not of Wallich); *F. B. I. v.*, 38; *Gage l.c.* 425.

A very slender flaccid perennial herb. *Stems* extensively creeping then ascending or decumbent. *Leaves* petioled, membranous, 1—3 in. long, elliptic-lanceolate, caudate-acuminate, glabrous or sparsely hairy; stipules slightly strigose; cilia stiff, longer than the tube. *Racemes* erect, filiform, 1—3 in. or longer; bracts minute, imbricate or distant, very shortly ciliate. *Perianth* very small, eglandular. *Nutlets* smooth and polished.

Dehra Dun (King). **DISTRIB.:** Sub-tropical and temperate Himalaya from Kashmir to Sikkim ascending to 9,000 ft. also in Assam and on the Khasia Hills, extending to Java, China and Japan.

13. *P. alatum*, *Buch.-Ham. in Don. Prod.* 72; *F. B. I. v.*, 41; *Watt E. D.*; *Prain Beng. Pl.* 887; *Collett Fl. Siml.* 423 (in part); *Gage l.c.* 404; *Cooke Fl. Bomb. ii.*, 516. *P. punctatum*, *Buch.-Ham. l.c.*; *Trimen Fl. Ceyl. iii.*, 413. *P. nepalense*, *Meissn.*

A procumbent glabrous or sparsely hairy annual. *Stems* 1—2 ft. long, rooting at the nodes; branches many, ascending. *Leaves* $\frac{3}{4}$ —1 $\frac{1}{2}$ in. long, deltoid-ovate, acute or subobtuse, entire, minutely punctate; base subtruncate or subcordate, shortly cuneate; petioles winged, amplexicaul at the base; stipules membranous, obliquely truncate, eciliate but with a tuft of hairs at the base. *Flowers* in compressed peduncled heads, with an involucre leaf at the base of each head; peduncles glandular-hairy above; bracts membranous, $\frac{1}{8}$ — $\frac{1}{2}$ in. long, eciliate. *Perianth* $\frac{1}{8}$ in. long, 4 fid. *Nutlets* $\frac{1}{2}$ in. long, broadly ovoid, compressed, usually biconvex, black and minutely pitted.

Dehra Dun (Duthie). Flowers during the rainy season. **DISTRIB.:** Abundant on the Himalaya up to 10,000 ft., Parasnath in Bengal also in Assam, Burma and on the hills of W. and S. India, extending to Ceylon, China, Afghanistan and Africa. The above description refers to var. *nepalensis* of Hook. f. *F. B. I. v.*, 42.

14. *P. capitatum*, *Buch.-Ham. ex. Don. Prod.* 73; *F. B. I. v.*, 44; *Collett Fl. Siml.* 423, fig. 134; *Gage l.c.* 428.

A perennial herb. *Stems* many, leafy, 6—10 in. long, creeping from a stout woody usually twisted rootstock, usually reddish and clothed with brown hairs. *Leaves* crowded, bifarious, shortly stalked, $\frac{1}{2}$ —1 $\frac{1}{2}$ in. long, ovate-elliptic, acute, downy on both surfaces, rather thick, eglandular, turning brown when dry; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in., with 2 small

rounded glandular hispid auricles at the base. *Inflorescence* capitate; heads $\frac{1}{4}$ — $\frac{3}{4}$ in. in diam., dense-flowered, glandular and hairy; peduncles often glandular-hispid; involucre leaf none; bracts flat, ovate, acute, eciliate, glabrous. *Perianth* pink, 5-cleft, segments obtuse. *Stamens* 8. *Nutlets* 3-gonous, $\frac{1}{8}$ in. long.

Dehra Dun, in crevices of rocks in many of the ravines (Duthie). Probably in other localities in Sub-Himalayan tracts eastwards. **DISTRIB.:** Sub-tropical and temperate Himalaya, up to 6,000' ft.; also on the Khasia hills and extending to China.

2. RUMEX, Linn.; Fl. Brit. Ind. v, 58.

Perennial or annual herbs, rarely shrubs. *Leaves* mostly radical or cauline, alternate; stipules hyaline ochreate, often disappearing with age. *Flowers* 2-sexual or monœcious, in axillary clusters or in whorls arranged in simple or paniced racemes. *Perianth-segments* 6, rarely 4; inner accrescent, entire or toothed, midrib often enlarged or tubercled. *Stamens* 6, filaments short, anthers oblong. *Ovary* 3-gonous, styles 3, stigmas fimbriate. *Fruit* a small nut, enclosed in the usually enlarged inner perianth-segments, angles acute. *Seed* erect, embryo lateral, nearly straight, cotyledons linear or oblong.—Species about 140, in all temperate and in many tropical regions.

Flowers 2-sexual; inner fruiting sepals coriaceous; styles terminal; leaves never hastate:—

Inner fruiting sepals with narrow margins and few or no teeth:—

Leaves gradually narrowed into the petioles, tips usually acute; flowers distinctly stalked; inner fruiting sepals brownish-yellow

(*R. maritimus*).

Leaves cordate at the base and with a contraction just above it, tips always obtuse; flowers shortly stalked; inner fruiting sepals much longer and almost black

1. *R. nigricans*.

Inner fruiting sepals with wide much-toothed wings:—

Teeth of wings not hooked

2. *R. dentatus*.

Teeth of wings usually hooked

3. *R. nepalensis*.

Flowers 1-sexual or polygamous; inner fruiting sepals membranous; styles from the angles of the ovary; leaves hastate

(*R. hastatus*).

1. *R. nigricans*, Hook. f. in *F. B. I. v*, 59; *Prain Beng. Pl.* 888.

An erect annual, $\frac{1}{2}$ — $1\frac{1}{2}$ ft. high. *Leaves* linear-oblong, obtuse, contracted above the cordate base, margins often waved or crisped. Flowering branches rigid, spreading, with or without leaves. *Flowers* shortly pedicelled, densely crowded in globose distant whorls or confluent heads. *Perianth* enlarging in fruit, nearly black, inner sepals large and with a conspicuous oblong dark-coloured tubercle on the back; tips acute; margins very narrow, entire or with one or two short straight teeth or spines. *Styles* terminal.

Edges of tanks near Banda in Bundelkhand (Mrs. Bell), **DISTRIB.:** Bengal, Behar, Khasia Hills and in the Deccan Peninsula. This

species is very similar to the European *R. conglomeratus*, but the leaf is panduriform, and the tips of the valves are acute.

2. *R. dentatus*, *Linn. Mant. ii*, 226; *Royle Ill.* 313; *F. B. I. v*, 59; *Watt E. D.*; *Prain Beng. Pl.* 889; *Cooke Fl. Bomb. ii*, 518.

An erect annual, 1—2 ft. high. *Stems* grooved, glabrous, usually tinged with red. *Leaves* 3—4 in. long, oblong, obtuse, glabrous, base rounded or cordate, petioles of radical leaves up to $2\frac{1}{2}$ in. long. *Flowers* shortly pedicelled, 2-sexual, arranged in distinct leafy or leafless whorls. *Perianth* $\frac{1}{8}$ — $\frac{1}{5}$ in. long; inner segments broadly ovate, reticulate-veined, much enlarged in fruit and with an ovoid-oblong smooth tubercle on its back, margins irregularly toothed or pectinate; the teeth numerous, short, straight, not hooked. *Nutlets* $\frac{1}{10}$ in. long, acutely 3-gonous or almost winged.

N. W. India (Royle), Dehra Dun (King), Sub-Himalayan tracts of N. Oudh and Gorakhpur (R. Thompson and Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell). **DISTRIB.**: From Bengal and Assam to W. and S. India; also on the Himalaya up to 1,000 ft. in Kumaon and extending to China. Hooker alludes to a specimen from Oudh in which the inner segments of the perianth are very narrowly winged, thus showing a transition to *R. nigricans*. The roots yield a dye which is said to be used in Sind.

3. *R. nepalensis*, *Spreng. Syst. ii*, 159; *F. B. I. v*, 60; *Collett Fl. Siml.* 428.

Annual or occasionally perennial. Root sometimes with tuberous fibres (Boiss.) *Stems* stout, erect, 2—4 ft. high, branched. *Leaves* at the base of the stems up to 14 in. long, oblong or triangular-ovate, acute or obtuse, base cordate, petioles very slender; upper leaves sessile or nearly so, narrowed to the base. *Whorls* distant, on elongate nearly leafless racemes. *Fruiting sepals* orbicular-ovate, broadly winged, one or more with an oblong tubercle on the back, wing pectinately toothed and strongly reticulate, teeth usually with hooked tips.

Dehra Dun (King), and in the Sub-Himalayan tracts of N. Oudh and Gorakhpur (Duthie). **DISTRIB.**: Temp. Himalaya from Bhutan to Kashmir, up to 9,000 ft. or more; also on the hills of W. and S. India and extending to W. Asia and S. Africa. Its habit is that of *R. obtusifolius*, a common European species.

R. MARITIMUS, *Linn.*; *F. B. I. v*, 59; *Watt E. D.*; *Prain Beng. Pl.* 888.—There is a record of this plant having been found by Mr. A. O. Hume in marshes by the banks of the Jumna near Etawah. There are, however, no specimens at Kew from the area of this flora. As the plant appears to be fairly abundant in Bengal its occurrence within the eastern border of the Upper Gangetic Plain may be regarded as probable. I have therefore included it in the clavis where its distinguishing characters will be found. It occurs also in Assam and in the Central Provinces, and extends to N. Africa, Europe and in N. and S. America.

- R. HASTATUS**, *Don Prod.* 74; *Royle Ill.* 314; *F. B. I.* v, 60; *Watt E. D.*; *Brandis Ind. Trees* 521; *Collett Fl. Siml.* 428, fig. 136; *Gamble Man. Ind. Timb.* 553. Vern. *Chulmora* (Kumaon).—A somewhat glaucous perennial herb or small shrub, 1–2 ft. high. Rootstock woody. Leaves 1–2½ in. long, broadly triangular or hastately 3-lobed. Flowers minute, polygamous, pedicels lengthening in fruit. Inner enlarged sepals $\frac{1}{8}$ – $\frac{1}{4}$ in. in diam., orbicular, notched at both ends, usually bright pink and very delicately veined.—Found occasionally in Dehra Dun at the base of the Himalaya. It is a common plant, on the W. Himalaya, ascending to 8,000 ft. and is found usually on exposed rocks and dry stony hillsides. The hill-station of Almora in Kumaon is said to have been so-called by reason of the abundance of this plant in that neighbourhood. The leaves are very acid and may be eaten as salad.
- R. VESICARIUS**, *Linn.*; *Roxb. Fl. Ind.* ii, 209; *F. B. I.* v, 61; *Duthie Field and Gard. Crops* iii, 45; *Watt E. D.*; *Collett Fl. Siml.* 428; *Prairie Beng. Pl.* 889. Vern. *Chuka-sák*. A pale-green rather fleshy glabrous annual. Leaves ovate. Flowers monoecious. Fruiting sepals $\frac{1}{2}$ in. across, orbicular, hyaline.—Cultivated in many parts of India as a vegetable. It is found wild on the hills of the W. Punjab, also in Afghanistan, Persia, the Levant and in N. Africa.
- CALLIGONUM POLYGONOIDES**, *Linn.*; *Brandis For. Fl.* 372; *Ind. Trees* 520; *F. B. I.* v, 22; *Watt E. D.* *Gamble Man.* 552; *Cooke Fl. Bomb.* ii, 510. Vern. *Phog. phok*.—An almost leafless shrub or small tree found within the arid districts of N.-W. India on both sides of the Indus, extending as far north as Lahore and eastwards to Bikanir, often gregarious. It is found also in Sind, and beyond India in Persia, Armenia and Syria. During the hot season the bushes are covered with the fragrant pinkish flowers which after falling are swept up by the country people and eaten cooked. The fruit is densely setose. I have seen no specimens from the area included in this flora.
- FAGOPYRUM ESCULENTUM**, *Mæench*; *Don Prod.* 73; *Royle Ill.* 317; *F. B. I.* v, 55. *Watt E. D.*; *DC. L'Orig. Pl. Cult.* 279; *Duthie Field and Gard. Crops N. W. Prov. and Oudh* iii, 25, t. 83. Vern. *Pháphrd, kulti, ogra*. (*Buckwheat*).—An erect glabrous annual 1–3 ft. high. Leaves triangular-cordate, acute. Flowers white or pink, in terminal subcapitate cymes. Nuts trigonous, acutely angled.—Much cultivated for its grain in Dehra Dun and in the Sub-Himalayan tracts eastwards, as well as in the hilly districts of Central and S. India; also extensively on the Himalayan ranges and up to 12,000 ft. in W. Tibet. Another species, known as *F. tataricum*, and distinguished by having the angles of the nuts blunt, is a much taller and coarser plant, and is usually restricted to the Himalaya and at rather higher elevations. It is much cultivated by the inhabitants of the higher villages.
- ANTIGONUM LEPTOPUS**, *Hook. and Arn.*; *Gamble Man.* 552; *Prairie Beng. Pl.* 889; *Cooke Fl. Bomb.* ii, 519. The Coral Creeper.—A large handsome climbing shrub with bright pink flowers. It is a native of S. America, and is largely grown in the gardens of N. India.

MUEHLENBECKIA PLATYCLADOS, *Meissn.* (*Cocoloba platyclada*, F. Muell.).—A quaint-looking glabrous shrub with flattened leaf-like branches (phylloclades) is often grown in the gardens of Upper India. It is a native of the Solomon Islands.

XCIII.—ARISTOLOCHIACEÆ.

Herbs or shrubs, often climbing, usually more or less foetid. *Leaves* alternate, entire or lobed; stipules none. *Flowers* 2-sexual, often large, usually lurid, terminal axillary or lateral solitary racemose or cymose, with or without bracts. *Perianth* simple, more or less adnate below to the ovary, regular or irregular, 3-lobed or tubular, lobes valvate. *Stamens* 6 or more, adnate in 1 or 2 series to the top of the ovary or round the style; anthers erect; cells parallel, dehiscing dorsally. *Ovary* 4–6-celled; placentas parietal, free or extending to the axis; style columnar, stigma lobed; ovules many, anatropous. *Fruit* a capsule or berry. *Seeds* many; albumen copious, fleshy, embryo minute.—Species about 200, chiefly tropical.

ARISTOLOCHIA, Linn.; Fl. Brit. Ind. v, 74.

Shrubs or perennial herbs, often twining. *Leaves* with the petioles dilated at the base, and often with a stipule-like leaf of an undeveloped bud in the axil. *Perianth* coloured, tube inflated below, then contracted, hairy within; limb dilated, oblique, usually 2-lipped. *Stamens* 6, rarely 5 or more than 6; adnate in 1 series above the ovary, filaments or connectives not distinguishable from the style; anthers adnate to the column, dehiscing extrorsely. *Ovary* inferior, more or less perfectly 6-celled, rarely 5- or 4-celled, style or column short and thick, divided above into 3 or 6 (rarely more) obtuse or linear lobes, ovules 2-seriate. *Fruit* a capsule, lantern-like, septicidally 6 (rarely 5)-valved, or splitting through the placentas. *Seeds* horizontal, often covered by the remains of the placenta.—Species about 180, chiefly tropical.

A. bracteata, Retz. *Obs. Bot. fasc. v, 29*; Roxb. *Fl. Ind. iii, 490*; Royle *Ill. 330*; F. B. I. v, 75; Watt *E. D.*; Prain *Beng. Pl. 890*; Cooke *Fl. Bomb. ii, 524*.—Vern. *Kiramar*.

A slender decumbent glabrous perennial herb. *Stems* 12–18 in. long, weak, prostrate; branches striate, glabrous. *Leaves* 1½–3 in. long and broad, reniform or broadly ovate, usually widely and shallowly cordate at the base, glaucous beneath, finely reticulate-veined, glabrous; petioles ½–1¼ in. *Flowers* solitary; pedicels with a large sessile orbicular or subreniform bract at or near the base. *Perianth* 1–1¼ in. long, base subglobose; tube cylindrical, with a trumpet-shaped mouth, villous inside with purple hairs; lip as long as the tube, linear, dark-purple, margins revolute. *Capsule* ¾–1 in. long, oblong-ellipsoid, 12-ribbed, glabrous. *Seeds* ¼ in. long, triangular with a cordate base.

Banks of Jumna and Ganges (Royle), Bundelkhand (Edgeworth), Gwalior (Maries). Flowers at the end of the rainy season. **DISTRIB.:** Bengal, W. and S. India and in Ceylon, extending to Arabia and Tropical Africa. The whole plant is intensely bitter, and it is much used by Hindu doctors for its purgative and anthelmintic properties.

A. INDICA, Linn.; Roxb. *Fl. Ind.* iii, 489; Royle *Ill.* 330; F. B. I. v, 75; Watt *E. D.*; Prain *Beng. Pl.* 891; Cooke *Fl. Bomb.* ii, 594; Brandis *Ind. Trees* 522. (Indian Birthwort).—A climbing perennial herb with the under surface of the leaves green. It occurs in Nepal and over the greater part of Bengal, also in W. and S. India, and in Ceylon. It is found in gardens within the area of this flora, and the very bitter roots, like those of *A. bracteata*, are used medicinally. Several exotic species are grown in Indian gardens as ornamental plants, notably some from Brazil with curious and highly coloured flowers.

XCIV.—PIPERACEÆ.

Herbs or shrubs, usually aromatic. *Leaves* alternate opposite or whorled, entire, gland-dotted; stipules none or 2, connate or adnate to the petiole. *Flowers* minute, 1- or 2-sexual, in axillary or terminal catkin-like spikes, subtended by a peltate bract. *Perianth* none. *Stamens* 2—6, rarely 7—8, hypogynous; anthers often jointed on the filaments, the cells sometimes confluent and bursting longitudinally. *Ovary* of 3 or 4 carpels free or connate at the base, each with many ovules, or ovary 1-celled with a solitary orthotropous ovule; stigmas distinct on the free carpels or ovary-lobes, or terminal on the undivided ovary, occasionally solitary, sessile, simple or penicillate. *Fruit* small, indehiscent, or of cocci or follicles. *Seeds* globose, ovoid or oblong, testa thin; albumen copious, floury, embryo enclosed in an amniotic cavity at the end of the albumen remote from the hilum, cotyledons minute or obsolete, radicle superior.—Species over 1,000, in tropical and subtropical regions, chiefly American.

Flowers 2-sexual; ovary of 3 or 4 free or connate carpels

1. HOULTUYNIA.

Flowers usually dioecious; ovary 1-celled

2. PIPER.

1. HOULTUYNIA, Thunb.; Fl. Brit. Ind. v, 78.

Perennial herbs. *Leaves* alternate, usually cordate; stipules broad, membranous. *Spikes* terminal and leaf-opposed, peduncled, dense, usually with an involucre of 4—6 white petaloid bracts. *Flowers* minute. *Perianth* none. *Stamens* 3—6, filaments adnate at the base to the ovary, anthers oblong. *Ovary* of 3—4 partially connate 1-celled carpels; styles free, erect, stigmatose on the inner surface; ovules many, on parietal placentas. *Fruit* subglobose, bursting between the styles. *Seeds* many, globose, testa membranous.—Species 2, one in N. W. America and the other Indian, extending to Siam, China and Japan.

H. cordata, Thunb. *Fl. Jap.* 214, t. 26; Royle *Ill.* 331; *F. B. I.* v, 78; *Kanjilal For. Fl. ed.* 2, 324; *Collett Fl. Siml.* 429.

A perennial herb with a creeping rootstock. *Stem* erect, 1—3 ft. high, leafy, angular, herbaceous, pubescent at the nodes. *Leaves* cauline, $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long and broad, broadly ovate-cordate, acuminate, 5-nerved, abruptly narrowed into the petiole, glabrous or with the nerves pubescent beneath, gland-dotted; petiole 1—2 in.; stipules membranous, linear-oblong, obtuse, emarginate or bifid, adnate to the channelled petiole, ciliate on the margins. *Spikes* $\frac{1}{2}$ in. long, dense-flowered, elongating in fruit; bracts $\frac{1}{4}$ — $\frac{1}{2}$ in. long, rounded or oblong. *Stamens* 3.

Sub-Himalayan tracts in N. Oudh (Duthie). *DISTRIB.*: Trop. Himalaya from the Punjab to Sikkim, up to 5,000 ft.; also Assam, the Khasia Mts. and Ceylon, extending to China and Japan.

2. PIPER, Linn.; *Fl. Brit. Ind.* v, 78.

Shrubs, rarely herbs, erect or scandent, often glandular and aromatic, branches with swollen nodes. *Leaves* usually entire and often oblique, stipules various. *Flowers* very minute, dioecious, rarely 2-sexual, spicate, each in the axil of a bract, with or without 2 lateral bracteoles; bracts peltate or cupular, adnate to the rachis, sometimes decurrent, with or without raised margins; bracteoles (when present) forming low ridges on each side of the flower or connate in a semilunar form. *Stamens* 2—4, rarely more; filaments short, anthers 2-celled, the cells distinct. *Ovary* 1-celled, style short, conic, beaked, or none, stigmas 2—5; ovule solitary, erect. *Fruit* a small ovoid or globose 1-seeded berry. *Seeds* usually globose, albumen floury within. Species about 600, in tropical and sub-tropical regions.

P. brachystachyum, Wall. *Cat.* 6656 in part; Royle *Ill.* 332; *F. B. I.* v, 87; *Kanjilal For. Fl. ed.* 2, 325; *Gamble Man.* 554; *Collett Fl. Siml.* 430; *Brandis Ind. Trees* 523.—Vern. *Pahāri pān*.

A glabrous much-branched rambling shrub. *Stems* often very long climbing on trees and rocks and rooting at the nodes; branches slender, rigid, terete, the lower often warted. *Leaves* petioled, thinly coriaceous, 3—7 in. long, elliptic or ovate-lanceolate, obtusely caudate-acuminate, base acute; nerves prominent beneath; petioles slender, $\frac{1}{4}$ — $\frac{1}{2}$ in.; leaves of the climbing stems much smaller, orbicular, pointed. *MALE* spikes 2—3 in. long, slender, drooping; bracts minute, peltate. *Stamens* 2, anthers reniform; cells confluent, dehiscing across the tip. *FEM.* spikes very shortly peduncled $\frac{1}{4}$ — $\frac{1}{2}$ in. diam., globose or shortly oblong in fruit. *Berries* $\frac{1}{10}$ in. in diam.; stigmas 3, very minute.

Dehra Dun on the banks of the Re nadi (Kanjilal), Sub-Himalayan tracts of N. Oudh in damp places (Duthie). *DISTRIB.*: Sub-tropical Himalaya from Simla to Bhutan, up to 5,000 ft.; also on the Khasia and Nilgiri Hills.

PIPER BETLE, Linn.; *Roxb. Fl. Ind.* i, 158; *F. B. I.* v, 85; *Duthie Field and Gard. Crops N. W. Prov. and Oudh* iii, 51, tt. 91 and 91A; *Watt*

E. D.; *Comm. Prod. Ind.* 891; *Gamble Man.* 554; *Brandis Ind. Trees* 523; *Cooke Fl. Bomb.* ii, 528. Vern. *Pán, tambuli*, etc. (Betel pepper).—A perennial dioecious creeper extensively cultivated in the hotter and damper parts of India and in Ceylon extending to the Malay Islands. It is believed to have come originally from Java. The leaves mixed with portions of areca-nut, lime and catechu, are universally chewed by the natives of India, to which are added by well-to-do classes other ingredients such as cardamoms, nutmeg, and camphor. For further particulars as to cultivation, etc., see Watt's *Comm. Prod. of India* 891.

P. NIGRUM, L. Vern. *Gul-mirch, kala-mirch*. (Black pepper).—This furnishes the ordinary pepper of commerce, black and white, the latter resulting in the grinding of the fruit after the removal of the outer skin. The plant is wild in Travancore and Malabar, and is cultivated in the hotter parts of India and in Ceylon and in the tropics generally.

PEPEROMIA PELLUCIDA, H. B. & K.; *Prair Beng. Pl.* 894; *Cooke Fl. Bomb.* ii, 629.—A slender much-branched glabrous and succulent annual. Has been introduced comparatively recently from S. America, and is becoming naturalized in various parts of India, and as a weed in the gardens of N. India.

XCV.—LAURACEÆ.

Aromatic trees or shrubs, very rarely (*Cassytha*) leafless parasites. *Leaves* usually alternate, gland-dotted, exstipulate. *Flowers* small, regular, 2- or 1-sexual, in axillary cymes clusters panicles or racemes; bracts deciduous, often involucrate or none. *Perianth* usually inferior; tube short, sometimes enlarged in fruit; lobes of limb small, usually 6, rarely 4, in two series, usually all similar and equal, imbricate, rarely sub-valvate, herbaceous or petaloid. *Stamens* usually a multiple of the perianth-lobes, in 2—4 series on the tube; filaments flattened, inner or some or all often 2-glandular at the base; anthers erect, 2- or 4-celled, rarely 1-celled, cells dehiscing by up-curved at length deciduous valve-like lids. *Ovary* sessile at the base of the perianth-tube, 1-celled, style terminal, stigma simple or discoid or dilated; ovule solitary, pendulous from the apex of the cell, anatropous. *Fruit* a dry or fleshy berry on an often thickened peduncle, naked or rarely enclosed in or adnate to the perianth-tube. *Seed* pendulous, testa membranous, albumen none; cotyledons plano-convex, fleshy; radicle superior, minute.—Species about 1,000, chiefly in the warmer regions of Asia, Australia, America and the Pacific Islands.

Trees or shrubs:—

Anthers of the two outermost rows of stamens opening inwards, those of the third row opening outwards;

flowers hermaphrodite, usually paniced:—

Anthers all 2-celled; perianth deciduous

Anthers all 4-celled; perianth persistent:—

Perianth-lobes reflexed in fruit

1. *BEILSCHMIEDIA*.

2. *MACHILUS*.

Perianth-lobes erect in fruit; flowers often polygamous	3. PRUCEBE.
Anthers of each row of stamens opening inwards, 4-celled; flowers dioecious, in umbels, each umbel supported by an involucre of bracts:—	
Leaves penninerved; stamens 9 or more, glands of the inner row sessile	4. LITSEA.
Leaves 3-nerved above the base; stamens usually 6, glands of inner row stalked	5. NEOLITSEA.
Leafless parasitic twining herbs	6. CASSYTHA.

1. BEILSCHMIEDIA, Nees; Fl. Brit. Ind. v, 121.

Evergreen trees or shrubs. *Leaves* alternate or opposite, penninerved. *Flowers* small, 2-sexual, usually in panicles. *Perianth-tube* short; lobes subequal. *Stamens* 9, perfect, those of the two outer series with eglandular filaments and with the anthers introrsely 2-celled; those of third series with 2-glandular filaments and with the anthers extrorsely 2-celled; anthers of the innermost series replaced by ovoid or cordate staminodes. *Ovary* sessile, free from the perianth, narrowed into the style, stigma obtuse. *Fruit* an oblong ovoid or globose berry; pedicel not or slightly thickened, the perianth quite deciduous. *Seed* with a membranous testa.—Species about 20, all tropical.

B. Roxburghiana, Nees in Wall. *Pl. As. Rar. ii*, 69; Brandis *For. Fl.* 378; *Ind. Trees* 528; *F. B. I. v*, 121; *Watt. E. D.*; *Gamble Man.* 559; *Prain Beng. Pl.* 897; *Haines For. Fl. Ch. Nagpur* 151. *B. fagifolia*, Nees; *F. B. I. v*, 122. *Laurus bilocularis*, Roxb. *Fl. Ind. ii*, 311.—Vern. *Konhaia* (Oudh).

A large or medium-sized almost evergreen tree. *Bark* ash-coloured. *Branches* many, spreading horizontally and forming a dense shady head. *Leaves* coriaceous, 6—10 in. long, elliptic or oblong-lanceolate, obtuse or bluntly acuminate, glabrous, dark-green and shining; base cuneate; main lateral nerves 6—12 pairs, prominent on both surfaces and finely and distinctly reticulate between; petioles $\frac{1}{2}$ —1 in. long. *Peduncles* axillary and from the base of the young shoots, a little shorter than the petioles, pubescent, bearing a raceme or panicle of 6—12 flowers; bracts ovate, caducous. *Perianth* 6-partite; segments spreading or reflexed, $\frac{1}{4}$ in. long, linear-oblong, hairy on both sides. *Filaments* hairy; anthers bilocular. *Berry* 1—1 $\frac{1}{2}$ in. long or more and about 1 in. in diam., narrowly oblong-obovoid, dark-purple when ripe and covered with a whitish-grey bloom which is easily rubbed off.

Forests of N. Oudh in the districts of Gonda and Bahraich, in shady ravines (R. Thompson). *Flowers* Mar.—April when the old leaves are falling. *DISTRIB.*: From Kumaon to Assam, Tipperah and Burma, also in Ch. Nagpur. The wood is white rather hard and even-grained, and is said to be used in Assam for making boats. I have not seen the specimens from N. Oudh.

2. MACHILUS, Nees; Fl. Brit. Ind. v, 136.

Evergreen trees. *Leaves* alternate, usually crowded at the ends of the branchlets, penninerved. *Flowers* small, 2-sexual, in axillary panicles.

Perianth-tube short or obsolete; lobes persistent, spreading or reflexed in fruit. *Stamens* 9, perfect, filaments of the 1st and 2nd rows eglandular and with introrse 4-celled anthers; of the 3rd row with 2 stipitate glands at the base and with extrorse 4-celled anthers; those of the 4th row replaced by stipitate cordate staminodes. *Ovary* sessile, narrowed into the style, stigma discoid. *Fruit* a globose or oblong berry seated on the persistent perianth.—Species about 20, in E. Asia.

Leaves up to 6 in. long, somewhat glaucous beneath, main lateral nerves 8–12 pairs; perianth villous within; drupe globose, $\frac{1}{4}$ – $\frac{1}{2}$ in. in diam.

1. *M. Gamblei*.

Leaves up to 10 in. long, distinctly glaucous beneath, main lateral nerves 12–18 pairs; perianth silky-tomentose outside; drupe globose, $\frac{1}{3}$ – $1\frac{1}{2}$ in. in diam.

2. *M. Duthiei*.

1. **M. Gamblei**, *King in F. B. I. v.*, 138 and 860; *Kanjilal For. Fl. ed. 2*, 327; *Gamble Man.* 566; *Brandis Ind. Trees* 531.—Vern. *Kāwala*.

A small or moderate-sized tree with dark grey bark; shoots and young leaves beneath finely silky. *Leaves* 3–6 in. long, elliptic-lanceolate to obovate, acute or acuminate, entire, thinly coriaceous, impressed-punctate on both surfaces, glaucous and glabrous beneath when mature, main lateral nerves 8–12 pairs, slender; petioles $\frac{1}{2}$ in., slender. *Panicles* lax, few-flowered. *Sepals* linear-oblong, villous within. *Drupe* globose, $\frac{1}{4}$ – $\frac{1}{2}$ in. in diam., black when ripe.

Dehra Dun, in shady and swampy localities, fairly common (Kanjilal). Flowers in March and April. *DISTRIB.*: Outer ranges of Himalaya eastwards to Bhutan and the Duphla Hills at from 2–4,000 ft., also in the Assam Valley.

2. **M. Duthiei**, *King in F. B. I. v.*, 861; *Kanjilal For. Fl. (ed. 2)*, 327; *Gamble Man.* 567; *Duthie in Ann. R. Bot. Gard. Calc. ix*, part I, 67, t. 83; *Collett Fl. Siml.* 431, fig. 138; *Brandis Ind. Trees* 531.—Vern. *Kāwala bhadrao* (Garhwal), *bhojo* (Jaunsar).

A medium-sized tree with a thin dark-grey rather rough bark; young parts finely silky. *Leaves* thickly coriaceous when mature, becoming reflexed in age, 6–10 in. long, oblong or elliptic-lanceolate, acuminate, often subfalcate, dark-green and shining above, glaucous beneath; main lateral nerves 12–20 pairs; petioles about $\frac{1}{3}$ in. long. *Panicles* about 6 in. long when in flower, peduncles and pedicels rather stout, elongating and drooping in fruit, often tinged with red. *Flowers* $\frac{1}{2}$ in. in diam. *Sepals* linear-oblong, finely silky outside, reflexed in fruit. *Drupe* globose, $\frac{2}{3}$ – $\frac{3}{4}$ in. in diam., changing from a dark sage-green colour to purple or almost black.

Sub-Himalayan tract of Rohilkhand in the Kota Dun at 2,000 ft. (Herb. Strachey and Winterbottom, *Machilus* No. 1); Kumaon Bhābar at Barmdeo (Herb. S. and W. No. 3), Kotri Dun at 1,800 ft. (Brandis). Flowers during April and May. *DISTRIB.*: W. Temp. Himalaya from Chamba and Simla to Nepal, ascending to 8,000 ft. This handsome tree is abundant in shady places on northern slopes of the outer Himalayan ranges, especially in Jaunsar and Garhwal.

It is sometimes found associated with *M. odoratissima*, Nees to which the present species and some others had previously been referred, but it may easily be recognized by its larger leaves, the pubescent panicle-branches and flowers and especially by its globose drupes.

3. PHOEBE, Nees; Fl. Brit. Ind. v, 141.

Evergreen shrubs or trees. *Leaves* alternate, scattered or in clusters at the ends of the branchlets, penninerved. *Flowers* small, 2-sexual or polygamous, in axillary or sub-terminal panicles. *Perianth-tube* short; lobes 6, subequal, erect, accrescent and clasping the base of the fruit. *Stamens* 9, perfect; those of the 2 outer rows eglandular at the base and with extrorse 4-celled anthers; of the 3rd row 2-glandular at the base, with extrorse 2-celled anthers, those of the 4th row replaced by cordate or sagittate staminodes. *Ovary* sessile, narrowed into the style, stigma discoid. *Fruit* an ellipsoid or oblong berry, clasped at the base by the hardened perianth-segments.—Species about 26, in India and Malaya.

Quite glabrous except the young shoots and the perianth
inside

Panicles and flowers puberulous

1. *P. lanceolata*.

2. *P. pallida*.

1. ***P. lanceolata***, Nees Syst. Laurin. 109, F. B. I. v, 141; Brandis For. Fl. 377; Ind. Trees 532; Watt E. D.; Kanjilal For. Fl. (ed. 2), 328; Gamble Man. 568; Collett Fl. Siml. 432; Prain Beng. Pl. 900. *Laurus lanceolaria*, Roxb. Fl. Ind. ii, 308.—Vern. *Haulia* (Hind.), *tumri* (Dehra Dun).

A small evergreen tree with yellowish-white bark, quite glabrous except the very young parts and the perianth inside. *Leaves* thinly coriaceous, usually crowded towards the ends of the branches, 6–9 in. long, elliptic-lanceolate, caudate-acuminate, narrowed below into a short petiole; main lateral nerves 6–10 pairs. *Flowers* pale-yellow, 2-sexual, or sometimes polygamous, $\frac{1}{10}$ – $\frac{1}{8}$ in. long, arranged in lax axillary panicles 2–4 in. long; peduncles slender, about 2 in. long when in flower, elongating in fruit. *Perianth-segments* broad, obtuse, villous inside, erect in fruit. *Fruit* narrowly ellipsoid, clasped at the base by the hardened perianth, black when ripe.

Sub-Himalayan tracts from Dehra Dun (Gamble) to the forest of N. Oudh (Brandis). Flowers Feb.—June. **DISTRIB.:** Outer Himalayan ranges from Simla to Bhutan up to 6,000 ft; also on the Khasia Hills and in Burma. The wood is hard and close-grained and is said to be used for planks.

2. ***P. pallida***, Nees Syst. Laurin. 112; Brandis For. Fl. 377; Ind. Trees 532; F. B. I. v, 142; Gamble Man. 567.

A small tree with finely puberulous shoots. *Leaves* coriaceous, 6–9 in. long, elliptic-lanceolate, or oblanceolate, acuminate, pubescent beneath when young; main lateral nerves 8–10 pairs, very oblique, deeply impressed above, prominent beneath. *Panicles* long-peduncled. *Flowers* puberulous.

Moist ravines in the forests of E. Oudh (Brandis). Flowers in June.
 DISTRIB.: Kumaon Himalaya up to 5,000 ft., and eastwards to Nepal and Sikkim. Perhaps too closely allied to *P. lanceolata* to be regarded as more than a variety.

4. LITSEA, Lamk.; Fl. Brit. Ind. v, 155.

Trees or shrubs, usually evergreen. *Leaves* alternate, rarely opposite or subopposite, penninerved, rarely 3-nerved from the base, buds naked or scaly. *Flowers* small, diœcious, usually umbellate; umbels 4—6 (rarely more)-flowered, sessile or shortly peduncled; peduncles clustered, rarely solitary, axillary or in the leaf-scars, sometimes racemose or fascicled on common peduncles; bracts involucrate, 4—6, rarely more in one involucre, coriaceous or membranous. *Perianth-tube* ovoid campanulate or very short; lobes of limb 6 or 4, equal or unequal, sometimes small or obsolete. *MALE flowers*: *Stamens* 9 or 12 in trimerous flowers, 6 in dimerous flowers, occasionally fewer than 6, rarely more than 12; filaments of 1st and 2nd rows usually eglandular, those of the 3rd (and 4th if present) 2-glandular; anthers all introrse, 4-celled. *Ovary* minute or obsolete, very rarely perfect. *FEM. fls.* *Staminodes* 9 or 12, or in the dimerous flowers 6 (rarely more than 12). *Ovary* enclosed in the perianth-tube or free; style short or long, stigma usually irregularly lobed. *Fruit* a drupe or berry seated on the unenlarged perianth, or partly clasped at the base by the often much enlarged discoid or cupular perianth-tube. *Seed* with a thin testa.—Species about 140, in Trop. Asia, Australia and the Pacific Islands, rare in Africa and America.

Perianth-lobes incomplete or none; leaves oblong or ovate-acute, lower surface sparingly pubescent or closely tomentose; fruit globose, seated on the slightly enlarged perianth-tube

2. *L. chinensis*.

Perianth-lobes complete, 6- or 5-partite:—

Leaves elliptic or elliptic-oblong; upper surface glabrous; lower surface grey- or tawny-pubescent; main lateral nerves 5—10 pairs; fruit ovoid, on a very small perianth-tube

2. *L. polyantha*.

Leaves usually narrowly lanceolate, acute or acuminate, grey-hoary, rarely glabrous beneath; main lateral nerves 8—15 pairs; fruit on the enlarged per.-tube, ellipsoid

3. *L. salicifolia*,
var. *laurifolia*

1. *L. chinensis*, Lamk. *Encycl. Method*, iii, 574; *Cooke Fl. Bomb.* ii, 539; *Gamble in Journ. As. Soc. Beng.* LXXV, part. 1, 131. *L. sebifera*, Pers. *Syn.* ii, 4; *F. B. I.* v, 157; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 329; *Gamble Man.* 570; *Prain Beng. Pl.* 902; *Brandis Ind. Trees*, 536. *Tetranthera laurifolia*, Blume; (not of Roxb.); *Brandis For. Fl.* 379. *T. apetala*, Roxb. *Fl. Ind.* iii, 819; *Royle Ill.* 325. *T. Roxburghii*, Nees; *Royle l.c.*—Vern. *Muida*, *gwa* (Hind.), *medh* (Oudh), *chandna* (Debra Dun).

A small or medium-sized evergreen tree, very variable in habit foliage and inflorescence. *Bark* dark-grey, cork-like, with an inner viscid

layer. Young parts inflorescence and underside of leaves more or less pubescent or tomentose. *Leaves* thinly coriaceous, 5—9 in. long, ovate oblong or elliptic-lanceolate, acute obtuse or rounded at the apex, glabrous or pubescent on the upper surface, grey-pubescent beneath and usually glabrescent when mature; main lateral nerves 8—12 pairs, and with fine reticulations between; petioles $\frac{1}{2}$ — $1\frac{1}{2}$ in. long. *Flowers* globose, white or yellowish, $\frac{1}{4}$ in. in diam. before expansion, arranged in axillary peduncled corymbose or racemose umbels; bracts 4, tomentose. *Perianth* very irregular, the segments often wanting, tube long and silky. *Stamens* 9 to 20 or more; filaments villous. *Fruit* globose, $\frac{1}{4}$ in. in diam., supported by the slightly enlarged perianth-tube.

Fairly common in the forests of Dehra Dun and Saharanpur, especially in shady ravines; also in the Sub-Himalayan districts of Rohilkhand, N. Oudh and Gorakhpur. It flowers in the rains and the fruit ripens during the cold season. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon, extending to the Malay Islands, China and Australia. The wood of this tree, as described by Gamble, is greyish-brown or olive-grey, moderately hard and durable, and it is not attacked by insects. The granular and viscid inner bark (*meda-lakri*) is said to be good for sprains and bruises.

2. *L. polyantha*, Juss. in Ann. Mus. Par. vi, 211; F. B. I. v, 162; Watt E. D.; Kanjilal For. Fl. (ed. 2), 330; Gamble Man 571; Collett Fl. Siml. 433; Prain Beng. Pl. 903; Brandis Ind. Trees 536. *Tetranthera monopetala*, Roxb. Fl. Ind. iii, 821; Brand. For. Fl. 380; t. 45.—Vern. *Maida*, *katmarra* (Hind.), *karkawa*, *karka* (Dehra Dun).

A moderate-sized evergreen tree, the young parts inflorescence and underside of leaves rusty-tomentose. *Bark* dark-grey, finally exfoliating in corky-scales. *Leaves* alternate, very variable, 4—8 in. long or more, elliptic-oblong ovate or obovate, tip usually rounded or retuse, glabrous above, rusty-tomentose and strongly reticulate-veined beneath; main lateral nerves 5—10 pairs, base rounded or cordate, petiole $\frac{1}{2}$ —1 in. long. *Umbels* 5—6-flowered, densely tomentose, pedicels stout, bracts 4—5. *Perianth* white, 6- or 5-partite. *Stamens* 9—13, filaments hairy. *Fruit* ovoid, about $\frac{1}{4}$ in. long, seated on the small unchanged perianth.

Common in the forests of Dehra Dun and Saharanpur and eastwards to the Sub-Himalayan tracts of Rohilkhand and N. Oudh, often found in shady ravines and on the banks of streams. Flowers March—May, the new foliage appearing at about the same time, and the fruit ripens about 3 or 4 months later. **DISTRIB.:** Salt Range and Punjab Himalaya and eastwards to Nepal up to 3,000 ft., also in Assam, Bengal, Central India, Orissa, Burma and Malay Peninsula, extending to Java and China. The wood of this tree is similar in appearance to that of *L. chinensis*, but is softer and less durable. Its medicinal properties are the same. The leaves when crushed have a strong scent of cinnamon, they are used in Assam for feeding the Muga silk-worm.

3. *L. salicifolia*, Hook. f. var. *laurifolia*, F. B. I. v, 167; Prain Beng. Pl. 903. *Tetranthera salicifolia*, Roxb. *T. laurifolia*, Roxb. Fl. Ind. iii, 823; *T. lanceæfolia*, Roxb. l.c. 822.

An evergreen bush or small tree; branchlets puberulous. *Leaves* subdistichous, 3—5 in. long, variable in shape from elliptic to linear-lanceolate or linear-oblong, obtuse or acute or acuminate, brownish and glabrous above, grey-hoary rarely glabrous beneath; lateral nerves 8—15 pairs, prominent beneath; petioles $\frac{1}{2}$ —1 in. *Umbels* clustered; pedicels short, slender. *Stamens* 6—9; filaments villous. *Fruit* $\frac{1}{2}$ in. long, narrowly ellipsoid, seated on the funnel-shaped or clavate perianth-tube.

Forests in the Sub-Himalayan tracts of N. Oudh (Brandis). **DISTRIB.:** Outer Himalayan ranges from Nepal to Sikkim, up to 6,000 ft.; also in Assam, the Garo, Khasia and Naga Hills, Bengal Plain, Sundribuns and Chittagong, extending to Upper and Lower Burma.

5. **NEOLITSEA**, Merr.; included under *Litsea* in Fl. Brit. Ind. v, 178.

Evergreen trees. *Leaves* alternate opposite or in whorls, 3-nerved, more or less lanceolate; buds perulate. *Flowers* dicecious, in 3—7-fld. umbellules arranged in clusters or short racemes in the axils of the upper leaves or on the branchlets between the nodes, the clusters with small bracts at their bases; involucre bracts 4, deciduous; pedicels elongating. *Perianth* 4-partite. *Stamens* of male flowers 6; those of the 2 outer rows eglandular; the inner biglandular; anther-cells all introrse or the lower lateral. *Staminodes* of fem. flowers 6, arranged as the stamens, usually linear or linear-clavate. *Ovary* ovoid, style thick, stigma usually peltate, in the male flowers none or rudimentary. *Fruit* a globose or elliptic-oblong berry, seated on the slightly enlarged disciform perianth-tube; pedicels somewhat elongate; pericarp smooth. *Cotyledons* hemispheric.—Species about 30, in India or Malaya, one or more extending to the Philippines and Australia.

N. lanuginosa, Duthie. *Tetradenia lanuginosa*, Nees in Wall. Pl. As. Rar. ii, 64. *Litsea lanuginosa*, Nees Syst. Laur. 634; Brandis For. Fl. 382; Ind. Trees 540; F. B. I. v, 178; Kanjilal For. Fl. (ed. 2), 331; Gamble Man. 573; Collett Fl. Siml. 433. *Tetranthera Cuipala*, Don. Prod. 65.

A tall or moderate-sized tree, with brownish bark. Leaf-buds conspicuous, enclosed within softly pubescent scales, the terminal ones often up to 1 in. in length. *Leaves* alternate or more or less crowded in whorls towards the ends of the branchlets, thickly coriaceous, 6—12 in. long, elliptic-lanceolate or -oblanceolate, acute or acuminate, softly tomentose beneath when young, soon becoming glabrous and glaucous, prominently 3-nerved above the base; petioles $\frac{1}{4}$ — $\frac{3}{4}$ in. *Flowers* and bracts villous, the latter soon falling; pedicels of fem. flowers longer than those of the males. *Perianth-segments* fringed, silky outside. *Stamens* longer than the perianth; glands of the 2 inner

filaments long-stalked. *Berry* about $\frac{1}{2}$ in. long, its pedicel thickened towards the apex.

Dehra Dun, in the Mothronwala swamp (Kanjilal). Flowers Feb.—June. **DISTRIB.:** Outer Himalayan ranges from Kashmir, sparingly at about 3,000 ft., and eastwards to Sikkim up to about 6,000 ft., also on the Khasia Hills.

6. CASSYTHA, Linn.; Fl. Brit. Ind. v, 187.

Filiform twining parasites, adhering to their hosts by suckers. *Leaves* of minute scales or none. *Flowers* minute, bisexual, sometimes dimorphic, in spikes heads or racemes, bracteoles 3. *Perianth-tube* short and globose, or in the same species often as long as the limb and turbinate; segments 6, the 3 outer smaller. *Stamens* 9 or 6, perfect, those of the 1st row with eglandular filaments and introrsely 2-celled anthers; of the 2nd row similar or reduced to staminodes; of the 3rd row with 2-glandular filaments and extrorsely 2-celled anthers; those of the 4th row replaced by sessile or stipitate staminodes. *Ovary* globose, free in flower, in fruit closely covered by the enlarged perianth; stigma sessile, small or capitate. *Fruit* a small drupe, enclosed in the succulent perianth-tube and crowned by the perianth-lobes. *Seed* with thin testa, cotyledons at length confluent.—Species 15, one of which is widely spread throughout the tropics; 1 or 2 are found in S. Africa and in Borneo; the rest are Australian.

C. filiformis, Linn. *Sp. Pl.* 35; Roxb. *Fl. Ind.* ii, 314, *F. B. I.* v, 188; Watt *E. D.*; Prain *Beng. Pl.* 904; Cooke *Fl. Bomb.* i, 541.—Vern. *Amarbeli*.

A twining leafless parasite with the habit of *Cuscuta*, quite glabrous or the young parts puberulous. *Stems* long, slender, cord-like, often intricately matted, branched, dark-green. *Flowers* small, sessile, in lax dense divaricate spikes $\frac{1}{2}$ —2 in. long; bracteoles small, rounded, ciliate. *Perianth* twice as long as the bracteoles, tube short; segments 6, in two rows, the three outer short; the inner longer, oblong, acute, concave, valvate. *Fruit* about $\frac{1}{4}$ in. in diam., globose, smooth, white, enclosed in the fleshy perianth-tube and crowned by the erect segments.

Burdelkhand (Edgeworth), and probably in many other localities within the area. **DISTRIB.:** Throughout the greater part of India, especially near the sea-coast, also, in Ceylon, the S. Andaman Islands, extending to the Malay Pen. and Islands, Arabia, Mascarene Islands, Trop. Africa, Australia, Polynesia and America.

The following plants belonging to genera not indigenous within the area of this flora deserve to be briefly mentioned:—

CINNAMOMUM ZEYLANICUM, Nees in Wall. *Pl. As. Rar.* ii, 74; *F. B. I.* v, 131; DC. *L'Orig. Pl. Cult.* 116; Brandis *For. Fl.* 375; *Ind. Trees* 533; Watt *Comm. Prod. Ind.*; Prain *Beng. Pl.* 899; Cooke *Fl. Bomb.* ii, 535, *Laurus Cinnamomum*, Roxb. *Fl. Ind.* ii, 295.—The bark of this tree yields the true cinnamon of commerce. It is found wild in

W. & S. India, Ceylon and Burma, and is cultivated in the Malay Islands and elsewhere in the tropics.

C. TAMALA, *T. Nees and Eberm.*; *F. B. I. v, 128*; *C. albiflorum*, *Nees*; *Royle Ill. 325*. *Laurus Cassia*, *Roxb. Fl. Ind. ii, 297*. Vern. *Dalchini, tezpat*.—A moderate-sized evergreen tree, closely allied to *C. zeylanicum*. It is found abundantly on the outer Himalayan ranges up to 7,000 ft., and the root-bark and leaves are much valued for medicinal purposes.

C. CAMPHORA, *T. Nees and Eberm.* (The Camphor tree of China and Japan).—An evergreen tree much cultivated in Indian gardens. It thrives fairly well in Dehra Dun, and in the Government Garden at Saharanpur.

PERSEA GRATISSIMA, *Gærtn. f.* (The Avocada or Alligator Pear). A native of Trop. S. America. It is cultivated in Indian gardens. The pear-shaped fruit, about 4—6 in. long, contains a single seed which is embedded in a soft pulp.

LAURUS NOBILIS, *Linn.* (Sweet Bay or Laurel).—A small slow-growing evergreen tree of the Mediterranean region, and well-known on account of its aromatic leaves.

XCVI.—ELÆAGNACEÆ.

Shrubs or trees, copiously covered with silvery or brown scales. *Leaves* alternate or opposite, entire, exstipulate, usually coriaceous. *Flowers* small, regular, 2-sexual or dioecious, arranged in axillary fascicles spikes or racemes, rarely from leafless axils; bracts small, deciduous or none. *Perianth* in 2-sexual or female flowers tubular, narrowed above the ovary and persistent below, deciduous above; limb 2—4-lobed, rarely truncate; perianth in male flowers reduced to a 2—4-lobed limb. *Stamens* of 2-sexual flowers adnate to the throat of the perianth, those of the male flowers adnate to the base of the perianth, 4 alternate with or 8 both opposite to or alternate with the perianthlobes; filaments free, usually short; anther oblong, 2-celled; cells parallel, contiguous, staminodes in fem. flowers none. *Ovary* free, 1-celled; style terminal, linear or dilated above, stigma lateral; ovule solitary, erect, basal, anatropous. *Fruit* a nut, enclosed in the perianth-tube. *Seed* erect, testa hard, albumen scanty or none, embryo straight; cotyledons thick, fleshy; radicle inferior, very short.—Species 17, in north temperate and tropical regions.

ELÆAGNUS, *Linn.*; *Fl. Brit. Ind. v, 201*.

Flowers 2-sexual, solitary or 2—3-nate, or sometimes on short leafless or leafy branchlets, bracts none. *Perianth* with an oblong or globose persistent base, narrowed above the ovary into a campanulate or funnel-shaped deciduous limb, yellow or white within, valvately 4-lobed and usually with a prominent ring inside above the constriction. *Stamens* 4,

on the mouth of the perianth. *Style* linear, included. *Fruit* enclosed in the persistent accrescent usually berry-like perianth-base, pericarp thin. *Seed* with a hard shining testa.—Species 12, in S. Europe, Temp. and Trop. Asia, Australia and N. America.

E. latifolia, *Linn. Sp. Pl.* 121; *Brandis For. Fl.* 390, t. 46; *Ind. Trees* 547; *F. B. I.* v, 202; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 334; *Gamble Man.* 581; *Prain Beng. Pl.* 908; *Cooke Fl. Bomb.* ii, 543; *E. conferta*, *Roxb. Fl. Ind.* i, 440; *Royle Ill.* 323. *E. arborea*, *Roxb. Ic.* 441; *Don. Prod.* 67.—Vern. *Ghiwai*.

A much-branched evergreen usually scandent shrub; branches often spinescent; young shoots densely clothed with shining rust-coloured scales. *Leaves* variable, thin or more or less coriaceous, 3—5 in. long, broadly elliptic to lanceolate, obtuse, acute or acuminate; upper surface pale-green, scurfy, the lower coated with silvery white or rust-coloured glistening scales; lateral nerves 6—8 pairs; base acute or rounded; petioles scaly, $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* usually many in a cluster, straw-coloured, scented; pedicels elongating in fruit. *Perianth* $\frac{1}{2}$ in. long, clothed with silvery scales, as are the pedicels; lobes $\frac{1}{2}$ in. long, ovate, acute, spreading. *Style* hairy. *Fruit* crowned by the upper free portion of the perianth, about 1 in. long, ellipsoid or pear-shaped with 8 strong blunt ribs, pinkish when ripe and rough with small white spots; endocarp white, woolly within. *Seed* $\frac{3}{4}$ in. long.

Dehra Dun, usually in swampy ground (Kanjilal); also in the Sub-Himalayan tracts eastwards. *Flowers* Nov.—Feb., and the fruit ripens during May and June. **DISTRIB.:** Subtrop. Himalaya from the Sutlej to the Mishmi Hills, ascending to about 8,000 ft., and from Bengal and the Konkan southwards to Ceylon; extending to Burma, the Malay Peninsula and China. The sub-acid astringent fruit is much eaten by the village people and is sometimes used as a preserve. The wood affords a good fuel.

XCVII.—LORANTHACEÆ.

Evergreen parasitic shrubs. *Leaves* opposite, usually entire, coriaceous, exstipulate, sometimes absent. *Flowers* 2- or 1-sexual, in racemes spikes heads or fascicles; bracts usually scale-like, bracteoles usually 2. *Perianth* simple or double. *Sepals*, or simple perianth when sepaloid, adnate to the ovary, in fem. flowers solid or obsolete; limb annular or cupular, entire or shortly toothed. *Petals*, or simple perianth-segments when petaloid, 3—6, rarely 2, valvate, free or more or less connate in a tube or in a sheath split on the upper side. *Stamens* as many as and opposite the corolla-lobes and usually adnate to them; filaments usually filiform; anthers usually 2-celled, bursting longitudinally or by pores. *Disk* epigynous or in fem. flowers within the stamens, fleshy and rather prominent or none. *Staminodes* in fem. flowers and

rudimentary ovary in male flowers rarely present. *Ovary* inferior, at first apparently solid, at length 1-celled; style short or long, stigma simple; ovule solitary, erect, adnate throughout to the walls of the ovary. *Fruit* a 1-seeded berry or drupe. *Seed* adnate to the pericarp; albumen fleshy, often toothed at the apex, or none; embryo straight, usually fleshy, radicle superior.—Species about 500, mostly tropical.

Flowers bisexual; style long

1. LORANTHUS.

Flowers unisexual; style short or none

2. VISCUM.

1. LORANTHUS, Linn.; Fl. Brit. Ind. v, 203.

Semiparasitic shrubs, usually on trees. *Leaves* opposite, rarely alternate, usually thick and fleshy or coriaceous, nerves obscure. *Flowers* 2-sexual, usually coloured, in spikes racemes or cymes, axillary or on the old nodes; bracts concave or oblique, cupular; bracteoles 2, free or connate with the bract or none. *Perianth* double. *Calyx-tube* adnate to the ovary; limb short, truncate or 4–6-toothed or obsolete. *Petals* 4–6, valvate, free or more or less connate in a tube with spreading tips, or in a sheath split behind; tube naked or with conniving scales at the base. *Stamens* 4–6, adnate to the petals; anthers adnate or versatile, with parallel cells. *Disk* none. *Style* columnar, filiform, rarely twisted. *Fruit* a berry or drupe, 1-seeded. *Embryo* usually fleshy, cotyledons 2 or 4.—Species about 350, mostly tropical.

Corolla of 4 free petals; flowers small, shortly pedicelled, rusty-pubescent; anthers continuous with the filaments, distinctly 2-celled

1. *L. ligustrinus*.

Corolla gamopetalous, 4–5-lobed or-partite, the tube split above; anther-cells indistinct; flowers nearly always mealy or scurfy:—

Corolla 4-fid; calyx hardly produced above the ovary; leaves mealy or scurfy on the lower and usually also on the upper surface:—

Fruit mealy, clavate; young shoots and leaves covered with flocculent white fugacious mealy tomentum; flowers long-pedicelled in solitary or fasciated racemes, scurfy white-tomentose

2. *L. pulverulentus*.

Fruit tomentose, pyriform; young shoots and leaves covered with short soft rusty or white scurfy tomentum:—

Leaves less than 3 in. wide, sessile or shortly petioled; base cuneate or rounded, rarely subcordate, appressed tomentose or glabrate beneath

3. *L. Scurrula*.

Leaves large, exceeding 3 in. in width, orbicular or broadly ovate; base cordate or rounded, densely tomentose beneath; petioles long

4. *L. cordifolius*.

Corolla 5-fid; calyx distinctly produced above the ovary; leaves and flowers glabrous; fruit oblong

5. *L. longiflorus*.

1. *L. ligustrinus*, Wall. in Roxb. Fl. Ind. (ed. Carey and Wall.) ii, 219; Don. Prod. 143; Brandis For. Fl. 395; Ind. Trees 549; F. B. I. v, 207; Kanjilal For. Fl. (ed. 2), 336; Gamble Man. 582; Prain Beng. Pl. 811.

A parasitic shrub, or sometimes a small terrestrial tree parasitic on roots; young shoots and inflorescence rusty-pubescent; bark pale-

coloured, closely lenticellate. *Leaves* glabrous, opposite or the upper alternate, $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, lanceolate, obtuse acute or acuminate, pinnerved, brown or black when dry, thinly coriaceous; nerves obscure; base acute; petioles $\frac{1}{8}$ — $\frac{1}{4}$ in. *Racemes* axillary, single or in pairs, $\frac{1}{2}$ in. long. *Flowers* 4-merous, $\frac{1}{2}$ in. long; pedicels very short; buds subterete, swollen at the base; bracts rather large, orbicular. *Calyx-limb* entire. *Corolla* pink outside, deep-red within. *Petals* 4, free, linear, reflexed from the middle. *Ovary* urceolate, rusty-pubescent. *Fruit* $\frac{1}{4}$ in. long, ovoid, truncate, brown when ripe.

Dehra Dun, occasionally met with in the forests (Kanjilal); Siwalik range in the Timli Pass (Griffith). *Flowers* May—July. *DISTRIB.*: Outer Himalayan ranges from the Jumna to Sikkim, ascending to 4,000 ft.; also in Assam, the Khasia Hills and in Chittagong.

2. *L. pulverulentus*, Wall. in Roxb. Fl. Ind. (ed. Carey and Wall.) ii, 221; Brandis For. Fl. 396; Ind. Trees 549; F. B. I. v, 211; Kanjilal For Fl. (ed. 2), 337; Gamble Man. 582; Prain Beng. Pl. 911.

A robust branch-parasite; branchlets and young leaves clothed with white flocculent fugacious mealy tomentum. *Leaves* opposite, long-petioled, 2—8 in. long, broadly ovate, acute or obtuse, glabrous, dark-brown when dry; nerves distinct, arching. *Racemes* solitary or in fascicles, $\frac{1}{2}$ — $2\frac{1}{2}$ in. long; bracts minute. *Flowers* about 1 in. long, on long pedicels, scurfily white-tomentose. *Calyx-limb* none. *Corolla* slender, curved, green when fresh, cream-coloured when dry; tube terete, split above; lobes 4, connate. *Fruit* clavate, mealy.

Forests of Dehra Dun and Saharanpur, and in the Sub-Himalayan tracts eastwards; often found on *dhák*, *shisham* and on other trees. *Flowers* Dec.—June. *DISTRIB.*: Subtropical Himalaya, from Chamba and Garhwal to Bhutan, up to 3,000 ft., also in N. Bengal and in the C. Provinces.

3. *L. Scurrula*, Linn. Sp. Pl. ed. 2, 472; Roxb. Fl. Ind. i, 550; F. B. I. v, 208; Kanjilal For. Fl. (ed. 2), 336; Gamble Man. 582; Prain Beng. Pl. 911; Cooke Fl. Bomb. ii, 546; Brandis Ind. Trees 549.

A large bushy branch-parasite, very variable. *Branches* terete; bark often copiously lenticellate; young parts rusty-tomentose. *Leaves* opposite, sessile or stalked, coriaceous, $1\frac{1}{2}$ —3 in. long, less than 3 in. wide, elliptic or ovate-oblong, obtuse, glabrous or nearly so above, more or less rusty-tomentose beneath, or subglabrous beneath (when mature); base sub-acute or rounded, rarely sub-cordate. *Flowers* $\frac{1}{2}$ —1 in. long, arranged in axillary short-peduncled rusty or grey-tomentose sub-racemose fascicles; pedicels slender; buds clavate; bracts minute, obliquely ovate, concave, tomentose. *Calyx* sub-cuncate; limb truncate, very short. *Corolla* greenish-yellow, tomentose; lobes 4, narrow, acute. *Fruit* $\frac{1}{8}$ — $\frac{1}{4}$ in. long, pyriform, tomentose. *Albumen* pink, obtusely quadrangular at the radicle end, the other end terminating in a hard elongated point, surrounded by a green sticky layer; embryo green, fusiform; radicle not distinguishable from the tigellus (Talbot in Trees Bomb. ed. 2, p. 289).

Siwalik range (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers during the cold season. **DISTRIB.:** Throughout the greater portion of India (except the Punjab and Sind), extending to Ceylon and the Malay Peninsula and Islands.

4. *L. cordifolius*, Wall. in Roxb. Fl. Ind. (ed. Carey and Wall.) ii, 222; Don Prod. 143; Brandis For. Fl. 396; Ind. Trees 549; F. B. I. v, 209; Kanjilal For. Fl. (ed. 2), 337; Collett Fl. Siml. 438; Prain Beng. Pl. 911.

A stout branch-parasite; young shoots and leaves covered with soft rusty or white scurfy tomentum. *Leaves* opposite, orbicular or broadly ovate, exceeding 3 in. in width, obtuse or rounded at the apex; base rounded or cordate; lower surface densely white-tomentose; petioles about $\frac{1}{2}$ in. long or more. *Flowers* $\frac{3}{4}$ –1 in. long, arranged in short lateral 2-chotomous corymbs, densely rufous or white-tomentose; buds acute. *Corolla* slender, curved, terete; tube split behind; lobes 4, short, acute. *Fruit* clavate, $\frac{1}{2}$ in. long, tomentose.

Dehra Dun and Siwalik range (Kanjilal), also in N. Oudh in the Bahraich forests (Duthie). Flowers during the cold season. **DISTRIB.:** Outer Himalayan ranges from Kashmir to Nepal, up to 5,000 ft.; abundant on *Woodfordia* in Behar and Chota Nagpur, extending southwards to the Nilgiri Hills and Ceylon. It is very closely allied to *L. Scurrula* from which it may be distinguished by its greater size, its much broader and usually cordate leaves and by the copious white tomentum.

5. *L. longiflorus*, Desr. in Lamk. Encycl. Meth. iii, 598; Brandis For. Fl. 397; Ind. Trees 549; F. B. I. v, 214; Watt E. D.; Kanjilal For. Fl. (ed. 2), 337; Gamble Man. 583; Collett Fl. Siml. 439; Prain Beng. Pl. 911; Cooke Fl. Bomb. ii, 548; *L. bicolor*, Roxb. Fl. Ind. i, 548.—Vern. *Banda, patha*.

A large bushy usually glabrous branch-parasite; bark grey, smooth. *Leaves* usually opposite, glabrous and thickly coriaceous, 3–7 in. long, very variable in shape and venation, ovate elliptic or linear-oblong, obtuse; midrib prominent, usually red, secondary nerves obscure; petioles stout, $\frac{1}{3}$ – $\frac{1}{2}$ in. long. *Flowers* in stout spreading axillary or supra-axillary unilateral racemes, often two from an axil; pedicels short; bracts broadly ovate, concave, subacute. *Calyx* distinctly produced above the ovary, $\frac{1}{2}$ in. long, hoary-tomentose, tube cylindrical; limb cupular truncate or shortly 5-toothed. *Corolla* usually glabrous; tube curved, widened upwards, split on the back, red or orange, rarely pink or white; lobes 5, linear, reflexed, $\frac{3}{8}$ in. long, green or yellowish. *Fruit* $\frac{1}{3}$ – $\frac{1}{2}$ in. long, ovoid-oblong, crowned by the cup-shaped calyx, black when ripe. *Albumen* white, copious, with five linear teeth at the top surrounding the green embryo, which resembles a small nail $\frac{1}{4}$ in. long with a flattened head representing the radicle. (Talbot in *Trees Bomb.*, ed. 2, p. 290).

Abundant in all parts of the area and especially in the forest tracts, where it is very destructive to a great many kinds of trees, especially

the *mango*, the *mahua*, and *nim*. It flowers chiefly during the cold season. **DISTRIB.**: More or less throughout India, ascending to 3,000 ft. in the W. Himalaya; also in Ceylon, Burma and Australia.

In the Government garden at Saharanpur there used to exist a very interesting specimen in which this species of *Loranthus* played a prominent part as illustrating the occurrence of parasitism on the branches of an epiphyte (*Ficus religiosa*). This latter, having commenced life as an epiphyte on the stem of a Wild Date Palm (*Phoenix sylvestris*), rapidly developed its aerial roots downwards so as ultimately to form a continuous casing round the entire trunk of the palm from a height of 20 feet or more. The presence of some kind of lichen growth on the woody branches of the *Loranthus* would have added a further link to the interesting symbiotic history of this remarkable composite specimen of vegetation.

2. **VISCUM**, Linn. ; Fl. Brit. Ind. v, 223.

Shrubs, semi-parasitic on trees. *Leaves* flat and thick, or reduced to small scales or teeth. *Flowers* small, dioecious or monoecious, fascicled or rarely solitary in the axils or on nodes, rarely terminal; bracts usually small; bracteoles free or connate, rarely obsolete. *Perianth-tube* of male-flowers short, solid, of the females adnate to ovary; limb 3—4 lobed, lobes usually deciduous. *Stamens* 3—4; anthers broad, sessile, adnate to the perianth-lobes; cells confluent, opening by many pores. *Ovary* inferior; stigma sessile or subsessile, large, pulvinate. *Fruit* a succulent berry, the mesocarp soft and viscid. *Embryo* in fleshy albumen, solitary or 2 in each seed.—Species about 30, in temp. and trop. regions.

Branches leafy, terete
Branches leafless, flattened

1. *V. monoicum*,
2. *V. articulatum*.

1. **V. monoicum**, Roxb. Hort. Beng. 105; Fl. Ind. iii, 763; Brandis For. Fl. 393; Ind. Trees 552; F. B. I. v, 224; Watt E. D.; Gamble Man. 584; Prain Beng. Pl. 912; Cooke Fl. Bomb. ii, 552.

A large parasitic shrub. *Branches* slender, smooth, terete, slightly swollen at the nodes. *Leaves* shortly petioled, rather thin and usually drying black, 1—5 in. long, variable in width, obliquely ovate or lanceolate, often falcately curved, acute or acuminate; basal nerves 3—5, prominent. *Flowers* minute, monoecious, greenish, arranged in axillary sessile or shortly stalked usually 3-flowered fascicles; central flower of each fascicle usually male; bracts truncate, apiculate. *Perianth-lobes* 3 or 4, triangular-oblong. *Berry* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, oblong, narrowed at both ends.

Bundelkhand (Edgeworth); Forests of N. Oudh (Vicary, R. Thompson, Duthie), Gorakhpur (Vicary). Flowers in May. **DISTRIB.**: Behar, Chota Nagpur, W. and C. Bengal, Sundribuns; also in the Nepal and Sikkim Terai, Khasia Hills, Bombay Pres., S. India, Ceylon and Burma. The Bundelkhand specimens collected by Edgeworth near Banda on *Zizyphus xylopyrus* and *Bassia latifolia* indicate a more robust habit of growth. The leaves are much broader and excessively coriaceous, and

the light brown colour to which they have dried gives them a different aspect as compared with typical specimens from other localities in N. India. Trimen says that in Ceylon the plant dries to a pale yellowish-brown colour. Sir Joseph Hooker was of opinion that the Banda plant might prove to be a different species. The only available material now at Kew is, however, insufficient to settle this point.

2. *V. articulatum*, *Burm. f. Fl. Ind.* 311; *F. B. I.* v, 226; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2)*, 339; *Gamble Man.* 584; *Collett Fl. Siml.* 440; *Prain Beng. Pl.* 913; *Brandis Ind. Trees* 552; *Cooke Fl. Bomb. ii*, 553; *V. attenuatum*, *DC.*; *Brandis For. Fl.* 394. *V. dichotomum*, *Don. Prod.* 142. *V. opuntioides*, *Heyne*; *Roxb. Fl. Ind. iii*, 736.—*Vern. Budu, pand.*

A much-branched parasitic leafless shrub forming pendulous tufts 6 in. to 3 ft. long. *Branches* jointed, the internodes 1–2 in. long, flattened somewhat narrowed at each end, readily disarticulating, pale-green when fresh, yellowish-brown when dry and longitudinally furrowed. *Flowers* monoecious, very minute, 3–4-merous, very shortly stalked, 1–6 together in fascicles at the nodes, each with a cupular bract at the base. *Perianth* of male flowers reflexed. *Female* flowers 2-bracteolate, the perianth-lobes, erect, triangular. *Berry* $\frac{1}{4}$ in. in diam., subglobose, greenish-yellow, smooth.

Bundelkhand (Edgeworth), Siwalik range near Dehra Dun (Kanjilal). *DISTRIB.*: Sub-trop. Himalaya from the Punjab eastwards to Sikkim and up to 3,000 ft.; also in Central, W. and S. India and Ceylon; extending to Burma and the Malay Peninsula and Islands to Australia. *V. dichotomum* appears to be the more common form within the area of this flora, and may be distinguished by its more robust habit and by its thicker and broader internodes.

V. ALBUM, *Linn.* is the true "Mistletoe," easily distinguished from the other species of this genus by its large flat coriaceous leaves, the dioecious flowers, and by its white almost transparent berries. In India it is confined to the N. W. Himalaya at elevations between 4,000 and 9,000 ft. It is found on various trees, but very rarely on oaks. It extends westwards through Afghanistan to the Atlantic and to N. Asia and eastwards to Japan.

XCVIII.—SANTALACEÆ.

Trees shrubs or herbs, often semi-parasitic on roots. *Leaves* alternate or opposite, quite entire, sometimes scale-like or none, nerves inconspicuous, stipules none. *Flowers* 2- or 1-sexual, regular, usually small, in simple or compound cymes, bracts usually small or sometimes leafy; bracteoles 2, free or connate, sub-opposite, sometimes one or both obsolete. *Perianth* superior or inferior, simple, green or coloured; limb 3–8-toothed-lobed or -partite, lobes with often a tuft of hair behind the anthers. *Stamens* as many as and opposite the perianth-lobes, adnate

above, rarely at its base; filaments filiform or broad; anthers 2-celled, bursting inwards or laterally. *Disk* epigynous or perigynous. *Ovary* usually inferior and 1-celled, style usually short, stigma entire or 3-6-lobed; ovules 2-3, adnate to or pendulous from a central column, rarely solitary and basal. *Fruit* a nut or drupe. *Seed* globose or ovoid, smooth rugose or sulcate, testa thin or obsolete; albumen copious, fleshy, radicle superior.—Species about 250, in temp. and trop. regions.

OSYRIS, Linn.; Fl. Brit. Ind. v, 231.

Shrubs, glabrous, branchlets acutely angular. *Leaves* alternate, entire, exstipulate. *Flowers* small, axillary, polygamous; male-flowers in clusters, the bisexual often solitary. *Perianth-tube* solid in the male-flowers, of the bisexual flowers adnate to the ovary; lobes 3-4, triangular, valvate, with a tuft of hairs on the face. *Stamens* 3 or 4, inserted at the base of the perianth-lobes; anther-cells distinct. *Disk* angular. *Ovary* inferior, sunk in the perianth-tube, style short, stigmas 3-4-fid; ovules 2-4, pendulous from a short stout central placenta. *Fruit* a globose or ovoid drupe. *Seed* globose, solitary.—Species 5 or 6, in S. Europe, Africa and India.

O. arborea, Wall. Cat. 4035; Royle Ill. 322; Brandis For. Fl. 399; Ind. Trees 554; F. B. I. v, 232; Watt E. D.; Kanjilal For. Fl. (ed. 2), 340; Gamble Man. 588; Collett Fl. Siml. 442, i, 144; Cooke Fl. Bomb. ii, 555.

A large usually glabrous shrub; young branches sharply triangular, puberulous at the tips. *Leaves* subsessile, coriaceous, glaucous, becoming black when dry, 1-2 in. long, elliptic or oblong-lanceolate or obovate-oblong and mucronate, base cuneate. *Flowers* minute, polygamous (male and 2-sexual), yellowish-green. *Male-flowers* shortly stalked, arranged in long-peduncled 5-10-flowered umbels or panicles. *Bisexual flowers* solitary in the axils, the peduncles elongating and dropping in fruit. *Perianth* 3-lobed. *Stamens* 3, opposite the perianth-lobes and alternate with the lobes of the fleshy disk. *Drupe* subglobose, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diam., yellow or red when ripe.

Dehra Dun and Siwalik range, and in the Sub-Himalayan tracts eastwards. Flowers Dec.—April. **DISTRIB.**: Outer Himalayan ranges from the Sutlej to Bhutan, up to 7,000 ft. (but not in Sikkim); extending to Central and S. India, Ceylon and Upper Burma.

SANTALUM ALBUM, Linn.; Roxb. Fl. Ind. i, 442; F. B. I. v, 231; Watt Comm. Prod. Ind. 976; Brandis Ind. Trees 553; Gamble Man. 585; Prain Beng. Pl. 914; Cooke Fl. Bomb. ii, 555.—Vern. *Chandan* (Sandalwood Tree).—A small glabrous evergreen tree with drooping branches. The yellowish-brown strongly-scented heartwood constitutes the well-known sandalwood of commerce. The tree is indigenous in the Western Peninsula southwards from Nasik and the N. Circars, cultivated elsewhere.

XCIX.—EUPHORBIACEÆ.

Herbs, shrubs or trees, often with milky juice. *Leaves* usually alternate, rarely divided or compound; stipules usually small, caducous or persistent, rarely connate in a bud-protecting sheath, sometimes replaced by glands or thorns. *Flowers* usually small or minute, always 1-sexual; inflorescence various, usually compound, sometimes (in *Euphorbia*) consisting of single naked 1-stamened florets in a perianth-like involucre surrounding a pistil, more often with the main inflorescence contripetal axillary or racemose, the subdivisions cymose, sometimes wholly cymose on terminal dichotomous panicles, or reduced to simple clusters or solitary florets; bracts usually solitary, small and scale-like, sometimes enlarged or 2—3-connate and forming an involucre; bracteoles often 2 within each bract or numerous in the more open cymes. *Perianth* often small, sometimes obsolete, often dissimilar in the two sexes, usually simple, calycine and with the segments valvate or imbricate, sometimes calycine 2-seriate and imbricate with the segments all similar, or occasionally dissimilar and rarely double, the inner then of 4 or 5 scale-like or very rarely conspicuous petals. **MALE-flowers.** Torus sometimes forming an intra-staminal disk or disk-glands or of lobes alternate with the stamens of the outer series. *Stamens* 1-many, free or connate; anthers 2-celled, with longitudinal transverse or porous dehiscence. **FEMALE-flowers.** *Sepals* usually larger and less connate than in the male. *Disk* hypogynous, entire or of distinct glands, or none. *Staminodes* often present. *Ovary* superior, usually of 3 more or less united carpels, styles as many as the carpels, united free or divided, stigmas usually on the inner face of the styles or style-arms; ovules 1—2 in each carpel, pendulous from the inner angle of the cell, the funicle often thickened. *Fruit* usually a capsule of three 2-valved 1—2-seeded cocci separating from a persistent axis, or a drupe with 1—3 cells, or of one or more combined nuts. *Seeds* laterally attached at or above the middle of the cells with or without an aril or caruncle at the hilum; embryo straight, enclosed in fleshy albumen; cotyledons flat, leafy, radicle superior, albumen rarely none and cotyledons fleshy. Species about 4,000, throughout the world, except in Arctic regions, but chiefly tropical.

Flowers monœcious, in heads resembling single flowers consisting of a calyx-like involucre enclosing several flowers without a perianth, viz., many males, each consisting of a solitary pedicelled stamen surrounding a single central female consisting of a 3-carpelled pistil; fruit a capsule.—Herbs shrubs or small trees with milky juice

1. EUPHORBIA.

Flowers dicecious or monœcious; inflorescence mostly axillary or lateral; perianth of sepals always present and sometimes also petals:—

Stamens of the outer or only series opposite the sepals, or if stamens are all in centre of the flower the cells of the 2—many-carpelled ovary are each 2-ovuled; petals, when present, minute; sepals in one or two series:—

Leaves 3-foliolate, leaflets crenate; fruit a berry.—

A large tree

2. BISCHOFIA.

- Leaves simple, usually entire:—
- Male flowers in axillary fascicles or solitary in the axils:—
- Corolla of 5 (rarely 6) scale-like petals:—
- Ovary 2-celled; fruit indehiscent.—Trees or scandent shrubs 3. BRIDELIA.
- Ovary 3-celled; fruit a capsule.—A small deciduous tree 4. CLEISTANTHUS.
- Corolla absent in both sexes; sepals imbricate:—
- Styles confluent in a column or cone; disk none in either sex; anthers 3—8, adnate to a central column; fruit a capsule.—Evergreen shrubs or trees 5. GLOCHIDION.
- Styles separate or if partially connate the style-arms and stigmas free:—
- Styles or style-arms slender:—
- Pistillode in males large; disk present in both sexes; filaments free.—Dioecious shrubs 6. FLUGCEA.
- Pistillode absent in males:—
- Disk none in either sex:—
- Shrubs or small trees 7. BREYNIA.
- Disk present in the fem. and often in the male flowers; filaments free or united; fruit usually a capsule, rarely a berry or drupe.—Herbs, shrubs or trees 8. PHYLLANTHUS.
- Style much dilated; fruit a 1-seeded drupe:—
- Stamens 2—4, central.—An evergreen tree 9. PUTRANJIVA.
- Stamens 4—many, surrounding a broad disk.—An evergreen tree 10. CYCLOSTEMON.
- Male flowers in axillary paniced spikes or racemes; stamens free round a rudimentary pistillode; fruit a drupe.—Trees or shrubs with dioecious flowers 11. ANTIDESMA.
- Stamens of the outer or only series alternate with the sepals, or, if stamens are all in the centre of the flower the cells of the 2—3- (rarely 4-) carpelled ovary are each 1-ovuled; petals, if present, often exceeding the sepals:—
- Petals present in both sexes; fruit a capsule:—
- Flowers solitary or clustered on the rhachis of a terminal raceme.—Trees or shrubs, rarely herbs 12. CROTON.
- Flowers in axillary bracteate racemes; leaves sinuate-toothed or lobed; fruit a capsule.—Hispid or stellately tomentose herbs 13. CHROZOPHORA.
- Petals none in either sex; male sepals 4—5, imbricate, free; fruit a capsule.—A stout undershrub 14. BALIOSPERMUM.
- Male calyx closed in bud, usually membranous, splitting valvately into 3—5 concave sepals, the sepals of the fem. calyx sometimes imbricate:—
- Styles distinct, often, 2-fid multifid or papillosely fimbriate:—
- Filaments free:—
- Stamens few; anther cells united by their bases only; styles very long, laciniate or fimbriate; fruit a capsule.—Herbs 15. ACALYPHA.
- Stamens many; anther-cells attached by a narrow or broad connective:—
- Leaves opposite; flowers dioecious, rather large, appearing before the leaves; anther-cells oblong; fruit a drupe.—A soft-wooded tree 16. TREWIA.

- Leaves alternate or opposite; flowers minute, dioecious; anther-cells globose; fruit a capsule.—A small evergreen tree . . . 17. MALLOTUS.
- Filaments connate in bundles or branched; fruit a capsule:—
Flowers dioecious, male and fem. in axillary or infra-axillary spikes; seeds with a thin fleshy coat; fruit a capsule.—An evergreen willow-like shrub . . . 18. HOMONOIA.
- Flowers monœcious, in terminal subpanicked racemes, the upper ones male and crowded, lower fem.; seeds with a firm coat; fruit a capsule.—A tree-like annual herb with palmate serrate-lobed leaves . . . 19. RICINUS.
- Styles united below in a stout column and continuous with the body of carpels; male calyx valvately 3—5-partite; stamens 3; fruit a capsule.—Twinning perennial herbs . . . 20. TRAGIA.
- Calyx of male flowers open in bud; leaves alternate; stamens 2; styles free or connate at the base; fruit a capsule.—Trees with monœcious flowers in terminal spikes . . . 21. SAPTUM.

1. EUPHORBIA, Linn.; Fl. Brit. Ind. v, 244.

Herbs, shrubs or small trees of various habit and provided with copious milky juice. *Stems* slender and leafy or thick and fleshy, sometimes leafless or nearly so. *Leaves* alternate or opposite, usually entire. *Flowers* monœcious, combined in an inflorescence of many male florets surrounding a solitary female, all enclosed within a small 4—5-lobed turbinate or campanulate perianth-like involucre, involucre-lobes with thick glands at the sinuses, glands with often a petaloid spreading white or coloured limb. *MALE-FLOWERS* composed of a simple pedicelled stamen without floral envelopes, anthers 2-celled. *FEMALE-FLOWERS* consisting of a 3-celled pedicelled ovary in the centre of the involucre, also without floral envelopes; styles 3, free or connate, stigmas simple or 2-fid. *Fruit* a capsule of three 2-valved cocci separating elastically from a persistent axis and dehiscing ventrally or both ventrally and dorsally. *Seeds* albuminous; cotyledons broad, flat.—Species about 600, chiefly in subtropical and warm temp. regions.

Stems not developed above ground; leaves all radical.—

A dwarf perennial glabrous herb . . .

1. *E. acaulis.*

Stems well developed above ground; leaves not all radical:—

Shrubs or small trees with thick fleshy and often prickly branches:—

Branches ascending, armed with pairs of short persistent spines:—

Style-arms 2-cleft; branches prominently 3—6-angled; leaves few, less than 1 in. long, soon falling . . .

2. *E. antiquorum.*

Style-arms undivided:—

Branches prominently 5—7-angled and with flat intervening spaces; leaves 4—6 in. long . . .

3. *E. Royleana.*

Branches terete or 5-angled; leaves many, 6—12 in. long:—

Branches subterete, the spines arising from low distant spirally arranged tubercles . . .

4. *E. nerifolia.*

- Branches angular, the spines arising from thick subconfluent tubercles arranged in more or less regular rows
- Branches spreading, unarmed, cylindric; leaves none or few and small; style-arms 2-lobed, short, recurved
- Annual or perennial herbs with slender erect ascending or prostrate stems, leafy throughout:—
- Leaves alternate below and opposite above or all alt. except the uppermost floral leaves, exstipulate; glands of involucre 2-horned, without a petaloid limb:—
- Rootstock not proliferous; seeds strophiolate:—
- Leaves less than 2 in. long; seeds oblong, with a whitish rugose or tuberculate testa.—An annual
- Leaves over 2 in. long; seeds oblong, bluish.—An annual or perennial herb
- Rootstock usually with proliferous shoots; seeds globose, smooth, without a strophiole
- Leaves all opposite, stipulate or, if stipules are absent the leaf-attachments are connected by a transverse interpetiolar raised line; glands of involucre not 2-horned:—
- Glands of involucre with a prominent membranous petaloid limb:—
- Floral leaves distichously imbricating and concealing the involucre.—Erect dichotomously branching herbs clothed with long soft hairs:—
- Limb of glands sinuate at the apex, rose-coloured
- Limb of glands pectinate
- Floral leaves not distichously imbricating; involucre in many-flowered cymes; leaves serrulate; capsule hairy
- Glands of involucre with a narrow wing or wingless:—
- An erect or ascending herb 6–20 in. high, hispid with crisped hairs; leaves $\frac{1}{2}$ – $1\frac{1}{2}$ in. long, acute
- Prostrate herbs; leaves less than $\frac{1}{2}$ in. long, rounded or retuse at the apex:—
- Stems more or less hispidly hairy; capsule pubescent or hirsute:—
- Leaves crenulate; capsule pubescent; seeds furrowed
- Leaves entire; capsule hirsute; seeds pitted
- Stems and capsule glabrous:—
- Leaves about as broad as long; seeds smooth
- Leaves much longer than their breadth; seeds obscurely transversely rugose
5. *E. ligularia*.
- E. Tirucalli*.
(p. 189).
6. *E. dracunculoides*.
7. *E. Rothiana*.
8. *E. proliferu*.
9. *E. elegans*.
10. *E. cristata*.
11. *E. hypericifolia*.
12. *E. hirta*.
13. *E. thymifolia*.
14. *E. granulata*.
15. *E. microphylla*.
16. *E. Clarkeana*.

1. *E. acaulis*, Roxb. Hort. Beng. (1814) 36; Fl. Ind. ii, 472; Cooke Fl. Bomb. ii, 562. *E. fusiformis*, Buch.-Ham. ex Don Prod. (1825), 62; F. B. I. v, 257; Prain Beng. Pl. 923. *E. nana*, Royle Ill. 329, t. 82, ff. 2 & 3.—Vern. *Ban muli* (Rohilkhand).

A dwarf unarmed glabrous herb. *Stem* reduced to a long stout underground, cylindric rootstock 6–18 in. long or more. *Leaves* all radical, sessile, fleshy, glabrous, 6–8 in. long, obovate or oblanceolate, obtuse or subacute, base cuneate, margins curled, nerves not showing. *Cymes* from the crown of the rootstock and appearing after the leaves have fallen, dichotomously branched, very variable in length,

3—many-fid; bracts ovate, or the upper or all truncate and 3-fid. *Involucres* about $\frac{1}{4}$ in. long, subsessile or on peduncles of variable length, hemispheric; lobes spathulate, fimbriate. *Capsule* $\frac{1}{2}$ in. in diam., pedicels $\frac{1}{2}$ in. long. *Cocci* compressed, styles connate to the middle. *Seeds* broadly ovoid, subacute, smooth.

Siwalik range from Dehra Dun and Saharanpur eastwards along the Sub-Himalayan tracts to N. Oudh and Gorakhpur (Royle, Falconer, T. Thomson, Duthie and others). It flowers during the hot season, and the leaves develop afterwards and fall off during the rains. *DISTRIB.*: Tropical Himalaya up to 1,500 ft. from Garhwal to Nepal and Bengal; also in the Konkan and on the Deccan hills.

2. *E. antiquorum*, Linn. *Sp. Pl.* 450; Roxb. *Fl. Ind.* ii, 468; Brandis *For. Fl.* 438; *Ind. Trees* 558; *F. B. I.* v, 255; Watt *E. D.*; *Comm. Prod. Ind.* 530; *Gamble Man.* 590; *Prair Beng. Pl.* 923; *Cooke Fl. Bomb.* ii, 563.—Vern. *Tidhara-sehd.*

A large shrub or small tree 15—30 ft.; trunk stout, cylindrical or fluted; bark thick, rough, brown; branches many, jointed, fleshy, green, more or less whorled when young, prominently 3-(sometimes 4—6) winged, the wide fleshy wings sinuately repand-crenate, narrowed towards the joints and armed with pairs of persistent spines at the protuberances of the angles. *Leaves* few, soon deciduous, shortly petioled, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, obovate-oblong; tip rounded or subtruncate, crenate; nerves obscure. *Involucres* ternate, forming short peduncled cymes in the sinuses, hemispheric, nearly $\frac{1}{2}$ in. broad, yellow; the two lateral ones on thick pedicels, the central one sessile and female; bracteoles many, fimbriate. Glands 5, large, broader than long. *Capsule* about $\frac{1}{2}$ in. in diam.; cocci compressed, glabrous; styles 2-fid.

Occasionally met with in village hedges, and sometimes in gardens as a cultivated plant. *DISTRIB.*: Throughout the hotter parts of India and in Ceylon; also in Burma and the Andaman Islands. It is largely used for hedges, and the wood is believed by Indian peasants to possess the power of warding off lightning strokes. The acrid milky juice supplies remedies for a great variety of ailments.

3. *E. Royleana*, Boiss. in *DC. Prod.* xv, part 2, 83; Brandis *For. Fl.* 438; *Ind. Trees* 558; *F. B. I.* v, 257; Watt *E. D.*; *Comm. Prod. Ind.* 531; *Kanjilal For. Fl. ed.* 2, 343; *Gamble Man.* 591; *Collett Fl. Siml.* 446. *E. pentagona*, Royle *Ill.* 329, t. 82, fig. 1.—Vern. *Thor* (N. Ind.), *thuor* (Dehra-Dun), *Sihund* (Kumaon).

An erect glabrous fleshy cactus-like shrub up to 16 ft. high and with a girth of usually 2—3 ft., or occasionally up to 5 ft. *Branches* with 5—7 prominent angles and 5—7 broad flat intervening faces; the spines in pairs on the protuberant portions of the undulating edges. *Leaves* few, inserted on the angles of the branches, alternate, sessile, soon falling off, 4—6 in. long, spathulate, rounded and shortly mucronate at the apex, tapering to the base; main lateral nerves quite indistinct until dry. *Involucres* hemispheric, greenish-yellow, about $\frac{1}{2}$ in. across, arranged 3 or more together in axillary sub-sessile cymes;

lobes cuneate, fimbriate. *Styles* free nearly to the base. *Capsules* about $\frac{3}{4}$ in. in diam., trigonous, on pedicels up to $\frac{1}{2}$ in. long; cocci compressed, glabrous.

Siwalik range, and on exposed rocky slopes on the northern side of Dehra Dun. In flower and fruit during the hot season, the new leaves appearing during the rains. **DISTRIB.:** Outer ranges of the W. Himalaya from Kumaon to the Jhelum ascending to 6,000 ft.; also on the Salt range of the Punjab. The plant is easily propagated and is often used for hedges; and the white dry wood affords abundant fuel. Although the milky juice of this plant contains a considerable amount of *guttapercha*, the attempts to extract it with profit have hitherto failed. The actid juice is often used medicinally.

4. *E. neriifolia*, *Linn. Sp. Pl.* 451; *Royle Ill.* 328; *Cooke Fl. Bomb.* ii, 564; *E. Nivulia*; *Buch.-Ham. in Trans. Linn. Soc.* xiv, 286; *Wight Ic.* 1862; *Brandis For. Fl.* 439; *Ind. Trees* 558; *F. B. I.* v, 255; *Kanjilal For. Fl. (ed. 2)*, 345; *Gamble Man.* 590; *Prain Beng. Pl.* 923. *E. neriifolia*, *Willd.*; *Roxb. Fl. Ind.* ii, 467. *Rheede Hort. Mal.* ii, t. 43.—Vern. *Thor, senhur, sij.*

A large erect glabrous shrub or small tree up to 20 ft. or more; trunk cork-like when old. *Branches* fleshy, cylindric, not ribbed, subverticelled, with pairs of sharp persistent spines arising from low conical truncate distant spirally arranged tubercles. *Leaves* alternate, fleshy, clustered towards the ends of the branches, sessile or nearly so, 4–8 in. long, obovate or obovate-oblong or linear, rounded at the apex and often mucronate, tapering towards the base, deciduous; midrib prominent beneath, lateral nerves obscure. *Involucres* ternate, forming small shortly peduncled solitary or twin 3-flowered cymes from above the leaf-scars on the tubercles, the central flower of each cyme usually male, sessile, and the first to appear, the 2 lateral ones male or 2-sexual and pedicelled; lobes of involucres large, erect, ovate, fimbriate; glands transversely oblong; bracteoles numerous, fimbriate. *Capsule* $\frac{1}{4}$ in. broad; styles connate to the middle, undivided. *Seeds* smooth.

Dry rocky hills of Merwára and in the Ajmere country (possibly wild). It is used for hedges in Dehra Dun and probably elsewhere in the Upper Gangetic Plain. The plant flowers and ripens seed during the hot season, and the new leaves appear during the rains. **DISTRIB.:** Outer ranges of N. W. Himalaya on dry exposed rocks; also in Bengal, Sind and Gujarat, extending to S. India and Burma; cultivated elsewhere.

5. *E. ligularia*, *Roxb. Hort. Beng.* 36; *Fl. Ind.* ii, 465; *Royle Ill.* 328; *Cooke Fl. Bomb.* ii, 563. *E. neriifolia*, *Dalz. and Gibs (not of Linn.)*; *F. B. I.* v, 255; *Watt E. D.*; *Comm. Prod. Ind.* 530; *Gamble Man.* 590; *Prain Beng. Pl.* 923; *Brandis For. Fl.* 439; *Ind. Trees* 558.—Vern. *Sehund, mansa-sij.*

An erect fleshy glabrous shrub or small tree up to 20 ft. high. *Branches* scattered, ascending, the younger ones 5-sided and angled and with short sharp black persistent spines arising from thick tubercles which

are arranged in 5 irregular rows. *Leaves* alternate, fleshy, from near the ends of the branches, 6—12 in. long, obovate-oblong or subspathulately obovate, acute, deciduous, base narrowed into a short petiole, margins undulate. *Involucres* hemispheric, yellowish, smooth, arranged in small stout dichotomous shortly peduncled 3—15-flowered cymes; the lateral ones of the cymes with short thick pedicels, the central sessile and usually male; lobes large, erect, roundish, fimbriate, glands transversely oblong; bracteoles very many, fimbriate. *Styles* connate above the middle, stigmas capitate. *Capsules* deeply 3-lobed, about $\frac{1}{2}$ in. broad. *Cocci* compressed, glabrous.

On waste land near villages, but not truly wild within the area of this flora. The leaves drop off in the autumn, the new ones appearing again in May after the plant has flowered. **DISTRIB.:** Rocky places in Orissa, the Deccan, S. India, Ceylon, also in Baluchistan and in the Malay Islands, elsewhere cultivated and often used for fences. The milky juice of this plant is used medicinally, and the root mixed with pepper is regarded as an antidote for snake bites. The plant is sacred to Mansa, the goddess of serpents.

6. *E. dracunculoides*, Lamk. *Encycl. Method.* ii, 428; Roxb. *Fl. Ind.* ii, 474; *F. B. I.* v, 262; Watt *E. D.*; Prain *Beng. Pl.* 924; Cooke *Fl. Bomb.* ii, 564.

A glabrous dichotomously much-branched annual. *Stems* many, erect, leafy, 12—18 in. high. *Leaves* sessile, $1\frac{1}{4}$ — $2\frac{1}{4}$ in. long, linear or linear-lanceolate, subacute; base acute, rarely rounded or subcordate; floral leaves shorter, broader at the base. *Involucres* subsessile, solitary, broadly campanulate, $\frac{1}{10}$ in. across, glabrous outside, hairy within; lobes ovate, ciliolate; glands semi-lunate. *Filaments* pubescent. *Capsules* smooth, $\frac{1}{8}$ — $\frac{1}{4}$ in. in diam.; styles free to the base, shortly 2-fid. *Seeds* $\frac{1}{8}$ in. long, ellipsoid, rounded at the base, grooved on one side and with a strophiole at the oblique depressed apex; testa whitish, leprous, rugose or tuberculate.

N. W. India (Royle), Moradabad (T. Thomson), Sub-Himalayan tracts in Rohilkhand and N. Oudh (Duthie), Bundelkhand (Mrs. Bell). Usually in cultivated ground. Flowers April to June. **DISTRIB.:** Plains of Punjab and Bengal, and southwards to Kanara and Coromandel; also in Arabia and Trop. Africa.

7. *E. Rothiana*, Spreng. *Syst.* iii, 796; *F. B. I.* v, 263; Cooke *Fl. Bomb.* ii, 564. *E. glauca*, Roxb. *Fl. Ind.* ii, 473.

An erect glaucous annual or perennial herb. *Stem* 1—2 ft. high, glabrous, terete, copiously branched above, often tinged with red; branches slender, some in whorls from the upper axils, others in a whorled umbellate crown from the top of the stem, all again dichotomously branched. *Leaves* of the stem alternate, sessile, 2— $4\frac{1}{2}$ in. long, linear-lanceolate or oblanceolate, acute, mucronulate, entire, glabrous, tapering to the base; leaves beneath the whorled crown of branches 4, sessile, radiating, broader than those of the stem; floral leaves (bracts) beneath the dichotomous forks opposite, broadly ovate or orbicular, acute, mucronate, rounded at the base. *Involucres* solitary in the

upper axils and terminal, $\frac{1}{10}$ in. across, campanulate, glabrous or hairy outside, villous within; pedicels short; lobes sub-quadrate, ciliate; glands crescent-shaped. *Capsules* about $\frac{1}{4}$ in. in diam., glabrous; styles $\frac{1}{10}$ in. long, free almost to the base, 2-fid at the apex. *Seeds* $\frac{1}{8}$ — $\frac{1}{3}$ in. long, semicylindric, rounded at the base, grooved on one side and with a fleshy rugulose strophiole at the oblique depressed apex, smooth, bluish-grey when ripe.

Bundelkhand on black soil (Edgeworth). **DISTRIB.:** Hills of Central and Southern India and in the Bombay Presidency; also in Ceylon.

8. *E. prolifera*, *Buch.-Ham. ex Don Prod.* 62; *F. B. I. v.* 264; *Collett Fl. Siml.* 447. *E. cuneifolia*, *Roxb. Fl. Ind. ii.* 471.

A glabrous perennial herb. *Stems* many, up to 1 ft. high, erect from a stout woody rootstock, often emitting from near the base proliferous barren shoots bearing very narrow acute leaves. *Stem-leaves* alternate, sessile, coriaceous, 1—3 in. long, narrowly linear or linear-oblong or spatulate, obtuse or acute; upper or floral leaves sometimes oblong or ovate; nerves 3, very slender. *Involucres* $\frac{1}{4}$ in. in diam. shortly campanulate; lobes triangular, fimbriate, glabrous on both sides; glands yellow, stalked, peltate reniform or crescent-shaped, the horns usually short and blunt, the intervening margins entire or toothed, bracteoles many. *Capsule* $\frac{1}{4}$ in. in diam., smooth; styles connate below the middle. *Seeds* globose, smooth.

Dehra Dun (Gamble), Moradabad (T. Thomson), Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). **DISTRIB.:** Punjab Plain, Central and W. Himalaya from Nepal to Kashmir ascending to 6,000 ft. in Kumaon, also in China.

9. *E. elegans*, *Spreng. Syst. iii.* 794; *F. B. I. v.* 246; *Cooke Fl. Bomb. ii.* 566.

A dichotomously branched annual, 1—2 ft. high, clothed with long soft spreading hairs. *Leaves* opposite, crowded or in distant pairs, subsessile, $\frac{1}{4}$ — $\frac{3}{4}$ in. long, broadly elliptic-oblong, often obliquely so, obtuse, serrulate towards the tips; stipules minute, setaceous; floral leaves up to $\frac{5}{8}$ in. long, broadly elliptic or obovate, closely imbricating and forming short spikes at the ends of the branches. *Involucres* $\frac{1}{4}$ in. long, turbinate, hairy on both sides; limb $\frac{1}{4}$ in. or more; lobes pink, obovate-cuneate, sinuate at the tip. *Capsule* hairy, cocci globose; styles elongate, 2-fid. *Seeds* quadrangular, transversely grooved, glabrous.

Malwa near Indore, in black soil (Edgeworth). **DISTRIB.:** Central and W. India; found on rocks, and often as a weed of cultivation.

10. *E. cristata*, *Heyne ex Roth Nov. Sp.* 226; *F. B. I. v.* 247; *Prair Beng. Pl.* 924.

An annual herb, clothed with long flexuous hairs. *Stem* slender, 6—10 in. long, prostrate or ascending, dichotomously branched. *Leaves* slightly hairy on both surfaces, opposite, subsessile, membranous, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, obliquely ovate-cordate, obtuse, serrulate upwards, stipules short, subulate. *Floral leaves* suborbicular, distichously

imbricate in a rounded head. *Involucres* subsolitary, $\frac{1}{8}$ in. in diam., pubescent, throat ciliate, lobes linear-lanceolate, limb of glands pectinately laciniate and fimbriate. *Cocci* globose. *Seeds* with 3 or 4 parallel furrows, white.

Bundelkhand (Duthie) usually in cultivated ground; C. India at Mandu (Edgeworth). This latter locality is just within the southern boundary of the area of this flora. *DISTRIB.*: W. Behar, S. India, Ceylon and extending to Ava.

11. *E. hypericifolia*, *Linn. Sp. Pl. ed. 1, 454*; *F. B. I. v, 249*; *Watt E. D.*; *Collett Fl. Siml. 445, fig. 145*; *Prain Beng. Pl. 924*; *N. E. Brown in Fl. Trop. Afr. vi, 498*; *E. pilulifera, Linn. l.c. E. indica, Lamk. E. uniflora, Roxb. Fl. Ind. ii, 472. E. parviflora Roxb. l.c.*

An erect decumbent annual, 3—18 in. long, branching at the base, glabrous or puberulous. *Leaves* shortly stalked, opposite, $\frac{1}{4}$ — $1\frac{1}{2}$ in. long, very variable in shape from linear-oblong to elliptic-ovate, subacute to rounded or retuse at the apex; base obliquely rounded or cordate; margins minutely serrulate, rarely entire, puberulous or glabrous on one or both sides; stipules minute or none. *Cymes* axillary, $\frac{1}{8}$ — $\frac{1}{2}$ in. in diam., laxly few-flowered or densely many-flowered; peduncles $\frac{1}{10}$ — $\frac{3}{4}$ in. long, often with a pair of leaves at the apex. *Involucres* very minute, cup-shaped; glands orbicular or transversely elliptic, entire, green, bordered by a conspicuous white or pink rounded limb. *Capsule* $\frac{1}{2}$ in. in diam., pubescent or glabrous; styles short, deeply bifid. *Seeds* ellipsoid, 4-angled, transversely rugose, reddish-brown with a glaucous hue.

Abundant within the area of this flora as a weed in waste places, flowering all through the year. *DISTRIB.*: Throughout the hotter parts of India, ascending to 4,500 ft. on the Himalaya; widely dispersed in all warm regions.

12. *E. hirta*, *Linn. Sp. Pl. ed. 1, 454*; *Roxb. Fl. Ind. ii, 472*; *N. E. Brown in Fl. Trop. Afr. vi, 496. E. pilulifera, Jacq. (not of Linn.); F. B. I. v, 250*; *Watt E. D.*; *Comm. Prod. Ind. 531*; *Prain Beng. Pl. 925*; *Cooke Fl. Bomb. ii, 568.*

An annual with erect or ascending stems up to 2-ft. high, clothed with long often yellowish crisped hairs; branches often 4-angled. *Leaves* opposite, shortly stalked, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, elliptic-oblong obovate or oblong-lanceolate, acute or subacute, dentate or serrulate, dark-green above, pale beneath; base narrow, obliquely cordate; main nerves few, distinct; stipules pectinate, soon falling. *Involucres* many, stalked, less than $\frac{1}{20}$ in. long, crowded in small axillary shortly stalked cymes; glands minute, globose, limb very small or obsolete. *Capsule* $\frac{1}{20}$ in. in diam., appressedly hairy. *Seeds* $\frac{1}{10}$ in. long, ovoid, trigonous, minutely rugose, reddish-brown.

An abundant weed within the area of this flora, flowering during the greater part of the year. *DISTRIB.*: Throughout the hotter parts of India; also in Ceylon and in nearly all tropical and subtropical regions. The plant has medicinal properties similar to those of *E. thymifolia*.

13. *E. thymifolia*, Linn. *Sp. Pl.* 454; Roxb. *Fl. Ind.* ii, 473; F. B. I. v, 252; Watt *E. D.*; Collett *Fl. Siml.* 446; Prain *Beng. Pl.* 925; Cooke *Fl. Bomb.* ii, 569.

A small annual herb, more or less hispidly pubescent, the whole plant often with a pale coppery tinge. *Stems* prostrate, and usually closely flattened on the ground, 4—12 in. long, divaricately branched, slender, cylindric. *Leaves* very small, opposite, petioled, $\frac{1}{8}$ — $\frac{1}{4}$ in. long, obliquely oblong, obtuse, crenulate, glabrous above, glaucous and usually slightly pubescent beneath; stipules elongate, fimbriate. *Involucres* minute, axillary, solitary or 2—3 together in the axils, campanulate, very shortly stalked; glands very minute or none, limb none. *Capsules* erect, shortly stalked, $\frac{1}{16}$ in. broad, obtusely keeled, pubescent. *Seeds* $\frac{1}{20}$ in. long, quadrangular, bluntly pointed and with 5—6 shallow transverse furrows.

Very common within the area, and often a conspicuous garden weed especially on gravel-walks, flowering during the greater portion of the year. *DISTRIB.*: Throughout the greater part of India and in Ceylon, ascending to over 5,000 ft. on the Himalayas. It is found also in all hot countries except Australia. The leaves and seeds are said to be aromatic and astringent and the juice acts as a violent purgative. Trimen remarks that the severed end of a branch made to touch lightly the surface of water has the singular effect of violently repelling all floating particles in the neighbourhood.

14. *E. granulata*, Forsk. *Ægypt.-Arab.* 94; F. B. I. v, 252; Watt *E. D.*; Prain *Beng. Pl.* 925; Cooke *Fl. Bomb.* ii, 569.

A small hispidly hairy prostrate perennial herb. *Branches* many, 3—6 in. long, very brittle. *Leaves* opposite, shortly petioled, coriaceous, $\frac{1}{10}$ — $\frac{1}{4}$ in. long, obliquely oblong or obovate-oblong, rounded or retuse at the apex, quite entire, villous on both surfaces; base narrow, rounded or subcordate; stipules minute, ciliolate. *Involucres* very minute, axillary and on short leafy branchlets, sessile, turbinate; glands usually without a limb. *Capsule* $\frac{1}{8}$ in. in diam., cocci hirsute, not keeled; styles very short, 2-fid. *Seeds* $\frac{1}{30}$ in. long, 4-angled, bluntly pointed, faintly pitted, testa mucous when moistened.

Jumna ravines near Agra (Duthie); Chambal ravines near Etawah (Duthie); Rohilkhand, Bundelkhand and Malwa (Edgeworth). *DISTRIB.*: Plains of Punjab and Sind, Chota Nagpur and in S. India; extending to Afghanistan, Arabia, Egypt and the Canary Islands. The leaves are said to be often used as a pot-herb.

15. *E. microphylla*, Heyne ex Roth *Nov. Pl. Sp.* 229; F. B. I. v, 252; Watt *E. D.*; Prain *Beng. Pl.* 925; Cooke *Fl. Bomb.* ii, 570. *E. Chamæsyce*, Willd.; Roxb. *Fl. Ind.* ii, 473.

A subglabrous annual, or perennial (according to Roxburgh). *Stems* many, prostrate, very slender, spreading from the root and dichotomously branched, pale, glabrous, brittle. *Leaves* opposite, coriaceous, $\frac{1}{8}$ — $\frac{1}{4}$ in. long and about as broad, obliquely oblong rounded-oblong or subquadrate, rounded truncate or retuse at the apex, entire or

toothed only at the broad end, margins often pink; stipules minute, triangular, 2-partite or laciniately toothed. *Involucres* axillary, subsolitary, minute, very shortly stalked, broadly campanulate, glabrous; lobes triangular, apiculate; glands very shortly stalked and with a very small limb. *Capsule* glabrous, $\frac{1}{18}$ in. in diam., obtusely keeled; styles short, deeply 2-fid. *Seeds* less than $\frac{1}{20}$ in. long, obtusely 4-angled, blunt at the apex, pale-brown, smooth, mucous when moistened.

Bundelkhand (Edgeworth); Sub-Himalayan tracts of N. Oudh in the districts of Gonda, Bahraich and of Gorakhpur (Duthie); on the banks of the Ganges (Madden). *DISTRIB.*: Bengal, Behar, Konkan, Madras, extending to Burma and Java.

16. E. Clarkeana, *Hook. f. F. B. I. v.*, 253; *Cooke Fl. Bomb. ii.*, 570. *E. granulata*, (*Herb. Royle*). *E. Heyneana*, *Boiss.* (in part).

A glabrous annual. *Stems* many, 3—8 in. long, usually prostrate and spreading. *Leaves* opposite, $\frac{1}{2}$ — $\frac{3}{8}$ in. long, very shortly stalked, dichotomously spreading, coriaceous and glabrous, often crowded towards the ends of short branchlets, obliquely linear-oblong, entire or toothed at the rounded apex, glabrous, base almost auricled on one side; stipules rather large, setaceous from a broad toothed base. *Involucres* axillary, solitary, $\frac{1}{30}$ in. long, campanulate, glabrous; lobes lanceolate, toothed; glands minute, without a limb. *Capsule* glabrous, $\frac{1}{18}$ in. in diam., cocci keeled. *Seeds* $\frac{1}{20}$ in. long, acutely 4-angled and with a blunt point, obscurely transversely rugose, pale-brown, mucous when moistened.

Jumna ravines in the Meerut district (Duthie). *DISTRIB.*: N. W. India (Royle), and from Delhi to Lahore (*Herb. Kew*); also in Sind and the W. Peninsula.

E. TIRUCALLI, *Linn.*; *Roxb. Fl. Ind. ii.*, 470; *Brandis For. Fl.* 439; *Ind. Trees* 558; *F. B. I. v.*, 254; *Watt E. D.*; *Comm. Prod. Ind.* 531; *Prair Beng. Pl.* 924; *Gamble Man.* 591; *Cooke Fl. Bomb. ii.*, 570.—*Vern. Sehnd.* Usually known to Europeans as the "Milk-bush". A shrub or small tree up to 20 ft. high, with very smooth spreading terete rush-like almost leafless branches. Originally introduced from Tropical E. Africa the plant has become naturalized in many of the drier parts of India. It is a very useful hedge-plant, for by reason of its acrid milky juice cattle refuse to touch it. The wood is not attacked by insects, and being fairly strong and close-grained it is often used for rafters, also a good charcoal suitable for blasting powder can be prepared from it.

E. PULCHERRIMA, *Willd.* Is the well-known *Poinsettia* so extensively grown in gardens throughout the hotter parts of India on account of its large, very handsome crimson or whitish upper floral leaves. It is a native of Mexico.—*Poinsettia pulcherrima*, *R. Grah.*

E. SPLENDENS, *Boj.* Is a small very prickly and much-branched shrub with very showy crimson flowers. It is largely grown in the gardens of Upper India and makes a pretty hedge. It is a native of Madagascar.

E. GENICULATA, *Orteg.* Is an annual herb introduced from Trop. America. It is often met with as a weed in Indian gardens. The narrow floral leaves are green towards the apex and almost white near the base.

2. BISCHOFIA, Blume; Fl. Brit. Ind. v, 344.

A large tree. *Leaves* alternate, 3-foliolate, leaflets often crenate. *Flowers* minute, dioecious, in axillary or lateral paniced racemes; males scattered or clustered, the females with longer pedicels. *Petals* and disk none. **MALE-flowers.** *Sepals* 5, concave, obtuse, imbricate, concealing the anthers. *Stamens* 5, filaments short, anthers large, cells parallel. *Pistillode* short, broad. **FEMALE-flowers.** *Sepals* 5, ovate, caducous. *Staminodes* small or none. *Ovary* exserted, 3—4-celled; styles long, stout, entire, stigmatic on the inner face, ovules 2 in each cell. *Fruit* a globose fleshy berry with 3—4 cells, lined with a parchment-like 2-valved endocarp. *Seeds* turgidly oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat; radicle straight, elongate.—A single species, confined to India and China and to the Malay and Pacific Islands.

B. javanica, *Blume Bijdr.* 1168; *Brandis For. Fl.* 446; *Ind. Trees* 558; *F. B. I. v.* 345; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2)* 351; *Gamble Man.* 607; *Prair Beng. Pl.* 926; *Cooke Fl. Bomb. ii.* 571. *Andrachne trifoliata*, *Roxb. Fl. Ind. iii.* 728; *Royle Ill.* 327.—Vern. *Kain, kein* (Hind.), *paniála* (Dehra Dun), *irum* (Oudh).

A large very handsome quick-growing deciduous tree; trunk erect, 30—40 ft. high and often of considerable girth; bark rough, dark-grey; branches spreading, forming a large shady oval head. *Leaves* alternate; common petiole 3—6 in. long, terete; leaflets 3—6 in. long, elliptic, acuminate, crenate, glabrous; main lateral nerves 6—8 pairs; stalks of the lateral leaflets $\frac{3}{8}$ — $\frac{5}{8}$ in., that of the terminal leaf up to $1\frac{1}{2}$ in. long, channelled; stipules and stipels caducous. *Flowers* greenish-yellow, arranged in slender axillary and lateral peduncled racemes. **MALE-flowers** on very short slender pedicels. *Sepals* $\frac{1}{20}$ in. long. *Anthers* globular. **FEM.-flowers** on pedicels longer and stouter than those of the male and elongating in fruit. *Sepals* $\frac{1}{10}$ in. long, not persistent. *Styles* nearly $\frac{1}{3}$ in., linear. *Fruit* $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam., reddish-brown when ripe. *Seeds* $\frac{1}{8}$ in. long, brown, shining.

Moist shady ravines and in swampy places in Dehra Dun and eastwards along the Sub-Himalayan tracts, common in the forests of Gonda and Gorakhpur. The new leaves appear in February and March, and they turn red before falling. It flowers during April and May. **DISTRIB.:** Outer ranges of Himalaya from Kumaon eastwards; also in Assam, Burma, Bengal, W. Ghats and southwards to the Nilgiris, but not in Ceylon; found also in the Malay and Pacific Islands. The reddish close-grained wood is much valued for its durability under water and is largely used in the making of bridges and in some parts of India for boat-building.

3. BRIDELIA, Willd. ; Fl. Brit. Ind. v, 267.

Shrubs or trees. *Leaves* alternate, quite entire, sometimes with strong straight nerves and prominent veins. *Flowers* small or minute, monœcious or dioecious, arranged in axillary or spicate clusters, sessile or very shortly pedicelled; bracts small, scale-like. *MALE-FLOWERS* numerous. *Perianth* double. *Calyx*-segments 5, valvate. *Petals* 5, short, scale-like, stalked or spatulate. *Disk* broad, pulvinate or adnate to the calyx-tube. *Stamens* 5; filaments united below in a column which bears a terminal pistillode, free and spreading above; anthers-cells 2, parallel. *FEMALE-flowers* few or solitary. *Calyx-segments* usually narrower than in the male. *Disk* double, the inner forming a membranous central truncate cone often enclosing the young ovary. *Ovary* 2 (rarely 3)-celled, glabrous; styles free or shortly united below, forked or sub-entire. *Fruit* a small drupe with one or two usually 1-seeded cocci or pyrenes. *Seed* with usually fleshy sometimes membranous albumen, cotyledons thin or fleshy.—Species about 30, in Trop. Asia, Africa and Australia.

Flowers dioecious; leaves deciduous; main lateral nerves 15—20 pairs, straight, prominent; drupe globose.—A small tree with stout more or less persistent spines

1. *B. retusa*.

Flowers monœcious; leaves persistent; nerves more or less arching:—

Leaves glabrous or slightly tomentose beneath, but not glaucous; main lateral nerves 10—15 pairs; calyx in fruit not enlarged; drupe fusiform.—A small tree

2. *B. montana*, var. *communis*.

Leaves pubescent beneath, or if at length glabrous then glaucous beneath; main lateral nerves 6—9 pairs; calyx in fruit distinctly enlarged; drupe oblong.—A scandent sometimes spinose shrub

3. *B. stipularis*.

1. *B. retusa*, Spreng. *Syst. Veg.* iii, 48; Brandis *For. Fl.* 449, t. 55; *Ind. Trees* 560; *F. B. I.* v, 268; *Watt. E. D.*; *Kanjilal For. Fl.* (ed. 2) 345; *Gamble Man.* 595; *Prain Beng. Pl.* 927; *Cooke Fl. Bomb.* ii, 572. *B. spinosa*, Willd.; *Roxb. Fl. Ind.* iii, 735.—Vern. *Káj, hája* (Hind.), *lamkana* (Ajmir), *gaya* (Dehra Dun).

A small or moderate-sized erect deciduous tree, more or less spinescent when young; bark grey. *Leaves* coriaceous, elliptic-oblong, ovate or obovate, acute, obtuse or rounded at the apex, the base usually rounded, bright-green and glabrous on the upper surface and turning pinkish-purple before falling, often finely tomentose beneath; main lateral nerves 15—25 pairs, straight, prominent, finely reticulate between; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long, stipules ovate-lanceolate, unequal at the base, deciduous. *Flowers* dioecious, greenish-yellow, sessile or shortly pedicelled, arranged in dense axillary clusters or in long axillary or terminal paniced spikes exceeding the leaves; bracts small, obovate, villous. *Calyx* $\frac{1}{8}$ in. in diam.; lobes fleshy, spreading, triangular-ovate, acute, glabrous and often ringed with red; tube pubescent. *Petals* of males obovate, pectinate; of the fem. sub-spathulate. *Disk* of male flower thick and pulpy; of the fem. truncate, enclosing the ovary. *Drupe* fleshy, subglobose, $\frac{1}{2}$ in. in diam., seated on the

persistent hardly enlarged calyx, flesh-coloured or purplish-black when quite ripe.

Siwalik range (T. Thomson); forests of Dehra Dun and Saharanpur, often associated with *sál*; plentiful in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand and Rajputana. Flowers May—July, and the fruit ripens in the cold season. **DISTRIB.:** Outer Himalayan ranges from Kashmir to Mishmi up to 3,500 ft., and southwards to S. India and Ceylon, extending to Burma and Malacca. The wood is much valued for various purposes, and it lasts well under water; the bark is used for tanning, the sweetish fruit is eaten, and the leaves afford good fodder for cattle. An earlier name for this plant under *Bridelia* is *B. spinosa*, Willd.—See Cooke Fl. Bomb. 1c.

2. *B. montana*, Willd. Sp. Pl. iv, 978, var. *communis*, Prain Beng. Pl. 928. *B. montana*, Royle Ill. 327 (not of Willd.); Brandis For. Fl. 450; Ind. Trees 560, F. B. I. v, 269; Watt E. D.; Kanjilal For. Fl. (ed. 2), 346; Gamble Man. 596; Collett Fl. Siml.; 448.—Vern. *Gondni* (Saharanpur).

A small or moderate-sized glabrous deciduous tree; trunk short, with a low spreading crown; bark dark-grey; branchlets often warted. *Leaves* membranous, very variable, 4—7 in. long, obovate-oblong or broadly obovate, obtuse, acute or abruptly mucronate, entire, often shining above, paler beneath, but not glaucous; main lateral nerves 8—15 pairs, slightly arched; petioles $\frac{1}{10}$ — $\frac{1}{4}$ in. long, stipules deciduous. *Flowers* monœcious, small, greenish-yellow, shortly pedicelled and arranged in dense axillary clusters; bracts many, very short, ciliate. *Calyx* $\frac{1}{8}$ — $\frac{1}{4}$ in. in diam.; lobes triangular-ovate, not enlarging in fruit. *Petals* broadly ovate, entire. *Fruit* $\frac{1}{2}$ in. long, ovoid-oblong or fusiform.

Dehra Dun and in the ravines of the Siwalik range; forests of N. Oudh. Flowers in April and May. **DISTRIB.:** Along the base of the W. Himalaya from the Jhelum to Kumaon, ascending to 4,000 ft.; also in Bengal the Khasia Hills and in Upper Burma. The foliage is lopped for cattle-fodder.

3. *B. stipularis*, Blume Bijdr. 597; Brandis For. Fl. 449; Ind. Trees 560; F. B. I. v, 270; Watt E. D.; Gamble Man. 596; Prain Beng. Pl. 928; Cooke Fl. Bomb. ii, 573. *B. scandens*, Willd.; Roxb. Fl. Ind. iii, 736.—Vern. *Madlatah*, *undergupa* (Oudh).

A large more or less scandent evergreen shrub with dark-grey or brownish bark. *Stem* 2—8 in. in diam.; branches often with long deflexed spines, the young shoots pubescent or fulvous-tomentose. *Leaves* subcoriaceous, 2—6 in. long, elliptic-oblong or obovate, obtuse or subacute, rounded or cordate at the base, glabrous or puberulous above, fulvous-tomentose beneath, margins sometimes undulate or repand; main lateral nerves 8—12 pairs, slightly arching, the transverse veins parallel and at right angles, petioles $\frac{1}{2}$ in. long. *Flowers* monœcious, greenish-yellow, in small dense axillary clusters or long spikes which are often subtended by hairy obliquely ovate-lanceolate acute stipule-

like bracts $\frac{1}{8}$ in. long; male-flowers sessile; females pedicelled, pubescent or glabrate. *Calyx* $\frac{1}{8}$ in. in diam., distinctly enlarging in fruit; lobes connate below, lanceolate-acuminate. *Petals* $\frac{1}{10}$ in. long, sub-orbicular, shortly cuneate at the base, crenulate towards the apex. *Drupe* nearly $\frac{1}{2}$ in. long, oblong, obtuse, smooth, bluish-black and juicy when ripe.

Sub-Himalayan tract, abundant in the *sâl* forests of Oudh and Gorakhpur. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Peninsula and Islands. The earliest name of this plant under *Bridelia* is *B. scandens*, Willd.—See Cooke Fl. Bomb. l.c.

4. **CLEISTANTHUS**, Hook. f.; Fl. Brit. Ind. v, 274.

Trees or shrubs. *Leaves* alternate, bifarious, entire. *Flowers* monœcious, small or minute, in axillary clusters or spikes, all sessile or the females shortly pedicelled. **MALE** flowers: *Calyx*-segments 5, valvate. *Petals* 5, short, scale-like, stalked or spatulate. *Disk* broad, entire or sinuate. *Stamens* 5; filaments connate below in a central column, bearing a pyramidal or 3-lobed pistillode, free and spreading above; anther-cells parallel. **FEM.**-flowers: *Calyx* less deeply lobed than in the male, cupular under the ovary. *Disk* double, the inner conic or turbinate, more or less enclosing the young ovary. *Ovary* 3 (rarely 4)-celled, usually clothed with long hairs; ovules 2 in each cell; styles 3, free, 2-fid. *Fruit* a sessile or stipitate subglobose or depressed capsule with three 2-valved cocci. *Seeds* without an aril or arillode; albumen copious or scanty; cotyledons thin or fleshy, often folded.—Species about 30, in Tropical India, Malaya and Africa.

C. collinus, Benth. in Gen. Pl. iii, 268; *F. B. I.* v, 274; *Gamble Man.* 597; *Brandis Ind. Trees* 561; *Prair Bengal. Pl.* 928. *Lebidioropsis orbicularis*, *Muell-Arg.*; *Brandis For. Fl.* 450; *Watt E. D.* *Cluytia collina*, *Roxb. Fl. Ind.* iii, 732.

A small tree with a dark rough bark; branches stiff, smooth or pustulate. *Leaves* coriaceous, $1\frac{1}{2}$ —4 in. long, orbicular broadly obovate or elliptic, rounded or retuse at the apex, glaucous beneath, pale when dry; main lateral nerves 5—8 pairs, very slender; petiole $\frac{1}{8}$ in., slender. *Flowers* in small axillary and shortly spicate villous clusters. *Calyx* $\frac{1}{4}$ in. in diam., ovate-lanceolate. *Petals* narrow, fleshy, incurved. *Disk* of male-flowers pulvinate; of the females conical with a thick margin. *Ovary* globose, glabrous; styles free, thick, stigmas lobed. *Capsule* sessile, rounded, $\frac{3}{4}$ in. in diam., obscurely 3-lobed, dark-brown, shining and wrinkled when dry. *Seeds* $\frac{1}{8}$ in. in diam., globose, reddish-brown.

Forests of Bundelkhand. *Flowers* in June, and the fruit ripens during the cold season. **DISTRIB.:** From the C. Provinces, Chota Nagpur and Circars to S. India and Ceylon. The hard and tough dark-coloured wood is much valued for posts and poles. The capsules, as well as the leaves and roots, are said to be very poisonous.

5. GLOCHIDION, Forst.; Fl. Brit. Ind. v, 305.

Evergreen trees or shrubs. *Leaves* alternate, bifarious, shortly petioled, entire. *Flowers* small, in axillary clusters, monœcious or diœcious. *Perianth* simple. *Petals* none. *Disk* none. **MALE-flowers:** *Sepals* 6, rarely 5, spreading, in 2 series, imbricate. *Stamens* connate in an ellipsoid or oblong sessile column; anthers 3—8 (or more), cells linear, bursting outwards, connectives produced as free points or connate in an umbonate head. *Pistillode* none or rarely minute. **FEMALE-flowers:** *Calyx* usually of 6 short imbricate sepals, or shortly tubular and unequally toothed or cleft. *Ovary* 3—15-celled; styles connate in a globose conic or subclavate column lobed or toothed at the tip, ovules 2 in each cell. *Fruit* a capsule of three or more 2-valved cocci, often with twice as many lobes as cells, globose or orbicular and depressed or intruded at the base and apex, crowned by the enlarged style; cocci coriaceous or crustaceous, the epicarp separable or not. *Seeds* hemispherical or laterally compressed, testa crustaceous and with often a succulent coat; albumen copious, fleshy, cotyledons flat.—Species 135, in Asia and Polynesia.

Anthers 4 or more; leaves glabrous beneath:—

Pedicels of male flowers stout, about $\frac{1}{4}$ in. long; leaves glaucously purplish beneath

1. *G. multiloculare*.

Pedicels of male flowers filiform, $\frac{1}{4}$ — $\frac{3}{4}$ in. long; leaves pale-green beneath

2. *G. lanceolarium*.

Anthers 3; leaves softly tomentose beneath

3. *G. velutinum*.

1. *G. multiloculare*, Voigt Hort. Suburb. Calc. 152; F. B. I. v, 307; Gamble Man. 601; Prain Beng. Pl. 930; Brandis Ind. Trees, 572. *Bradleia multilocularis*, Spreng.; Roxb. Fl. Ind. iii, 696.

An evergreen shrub or small tree with usually drooping branches, branchlets angular, glabrous or puberulous. *Leaves* thinly coriaceous, purplish-brown, 3—5 in. long, oblong, linear-oblong or obovate, obtuse or subacute, apiculate, lower surface glaucous; main lateral nerves 5—8 pairs and with many prominent transverse veins between; petioles stout, $\frac{1}{10}$ in. long, stipules triangular-ovate, cuspidate. **MALE-flowers** small; pedicels stout, $\frac{1}{4}$ in. long. *Perianth* $\frac{1}{8}$ in. in diam. *Sepals* oblong. *Anthers* 4—12, adnate to the middle, connectives very short. **FEM-flowers** $\frac{1}{4}$ in. in diam., stoutly pedicelled. *Ovary* 10—15-celled; style low, slightly furrowed. *Capsule* orbicular, $\frac{3}{4}$ —1 in. in diam.; epicarp thin, reddish, separating from the coriaceous cocci. *Seeds* persistent on the axis, furnished with a fleshy orange-red coat.

Abundant in the grass-lands of the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. **DISTRIB:** N. Behar, Sikkim Terai, Assam, Sylhet and Upper Burma.

2. *G. lanceolarium*, Voigt Hort. Suburb. Calc. 153; F. B. I. v, 308; Watt E. D.; Kanjilal For. Fl. (ed. 2), 348; Gamble Man. 601; Prain Beng. Pl. 930; Cooke Fl. Bomb. ii, 577; Brandis Ind. Trees 573. *Phyllanthus lanceolarium*, Muell. Arg.; Brandis For. Fl. 453. *Bradleia lanceolaria*, Roxb. Fl. Ind. iii, 697.

A small or medium-sized glabrous evergreen tree; bark grey, with longitudinal wrinkles; branchlets angular, glabrous. *Leaves* coriaceous, glabrous and shining, 3—6 in. long, elliptic-oblong or lanceolate, acuminate, pale-green beneath, base acute, decurrent on the petiole; main lateral nerves 6—10 pairs, slender; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in., stout, channelled; stipules triangular, acuminate. *Flowers* pale-green. MALE-flowers many, glabrous, on filiform pedicels $\frac{1}{2}$ — $\frac{3}{4}$ in. long. *Sepals* $\frac{1}{3}$ in. long, linear-oblong. *Anthers* 4—6; connectives $\frac{1}{4}$ the length of anthers, acute. FEM-flowers smaller, few, sessile or nearly so, mostly in the upper axils, a few mixed with the males. *Sepals* unequal, lanceolate, acute, rigid, glabrous. *Ovary* hairy, 6—8-celled; style shortly exserted, glabrous near the toothed apex. *Capsule* hoary, about $\frac{3}{4}$ in. in diam., orbicular, depressed, usually 6—8-lobed. *Seeds* often persistent on the axis.

Dehra Dun, fairly common in swampy places and in moist shady ravines; also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during the cold season. **DISTRIB.:** Outer Himalayan ranges from Kumaon and Nepal eastwards, up to 4,000 ft.; also in Chota Nagpur, Bengal and Assam, extending to the Shan Hills and Upper Burma. Roxburgh states that it sometimes grows to be a large tree with hard and durable wood. The seeds yield an oil for burning, and the bark is used medicinally.

3. *G. velutinum*, *Wight Ic. t.* 1907—2; *F. B. I. v.* 322; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 348; *Gamble Man.* 602; *Collett Fl. Siml.* 451; *Pram Beng. Pl.* 931; *Cooke Fl. Bomb. ii.* 578; *Brandis Ind. Trees* 574. *Phyllanthus nepalensis*, *Muell. Arg.*; *Brandis For. Fl.* 453.—*Vern. Chamari* (Dehra Dun).

A small or moderate-sized tree; young branches petioles under surface of leaves and inflorescence clothed with soft velvety pubescence. *Leaves* thinly coriaceous, 2—4 $\frac{1}{2}$ in. long, from orbicular to elliptic-oblong or lanceolate, obtuse acute or acuminate, base usually rounded, upper surface puberulous or glabrate; main lateral nerves 6—8 pairs, prominent beneath, transverse veins distinct; petioles stout, $\frac{1}{10}$ — $\frac{1}{2}$ in.; stipules triangular, cuspidate. *Flowers* small, greenish-yellow, arranged in axillary clusters, the male and female usually in the same cluster. MALE-flowers stalked. *Sepals* $\frac{1}{3}$ in. long, ovate, sub-acute, keeled and pubescent on the back. *Staminal-column* $\frac{1}{10}$ in.; anthers 3, connate below, connectives acute. FEM-flowers sessile or nearly so, pubescent. *Sepals* as in male. *Ovary* 4—7-celled, tomentose; style longer than the ovary, enlarged at the truncate, 4—7-toothed apex. *Capsule* $\frac{1}{3}$ — $\frac{1}{2}$ in. in diam., orbicular-depressed, 4—7-lobed. *Seeds* bright-red, often persistent on the tree.

Common in the forests of Dehra Dun and Saharanpur (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers from February to April. **DISTRIB.:** Hot valleys of the Outer Himalaya from Kashmir eastward to Sikkim, ascending to 4,000 ft.; also Assam, Khasia Hills and Burma, and from Central India and the Deccan to the Nilgiris. The bark is used for tanning.

6. FLUGGEA, Willd.; Fl. Brit. Ind. v, 328.

Unarmed or spinescent shrubs. *Leaves* small, alternate, distichous, entire. *Flowers* minute, dioecious, axillary, pedicelled, apetalous; males numerous, clustered; females few, in lax fascicles, perianth simple, 5-cleft. MALE-flowers: *Sepals* 5, subpetaloid, imbricate. *Petals* none. *Stamens* 5, rarely 4 or 3, alternating with as many disk-glands, filaments free, anthers erect; cells parallel, bursting longitudinally. *Pistillode* 2—3-fid. FEMALE-flowers: *Sepals* as in male. *Petals* none. *Disk* flat, annular, toothed. *Ovary* 1—3-celled; styles 3, recurved, usually 2-fid, ovules 2 in each cell. *Fruit* globose, coriaceous, or with a fleshy epicarp, bursting irregularly or into distinct 2-valved cocci. *Seeds* triquetrous, with convex backs and acute faces, testa crustaceous, albumen scanty, embryo curved; cotyledons flat, broad.—Species 6, in the tropics of the Old World.

Unarmed; leaves 1—3 in. long
Spinous; leaves rarely exceeding 1 in. long

1. *F. microcarpa*.
2. *F. Leucopyrus*.

1. *F. microcarpa*, Blume Bijdr. 580; *F. B. I. v*, 328; *Kanjilal For. Fl.* (ed. 2), 349; *Gamble Man.* 603; *Collett Fl. Siml.* 451; *Prain Beng. Pl.* 931; *Gooke Fl. Bomb.* ii, 581; *Brandis Ind. Trees* 569. *Securinega obovata*, *Muell. Arg.*; *Brandis For. Fl.* 455. *Phyllanthus virosus*, *Willd.*; *Roxb. Fl. Ind.* iii, 659; *Royle Ill.* 328 (*Fluggea*). *P. retusus*, *Roxb. l.c.* 657; *Royle Ill.* 327 (*Fluggea*).—Vern. *Dalme* (Hind.), rithoul (Dehra Dun).

A large unarmed glabrous shrub or small tree; bark smooth, thin, rusty or reddish-brown, marked with small lenticular specks; branchlets slender, angular, compressed. *Leaves* very variable, shortly petioled, thin, glabrous, 1—3 in. long, elliptic or obovate, rounded at the apex, rarely retuse or subacute, base usually acute; main lateral nerves 5—7 pairs, very slender; under-surface glaucous and with loose reticulate venation; petioles slender, $\frac{1}{8}$ — $\frac{1}{4}$ in. *Flowers* very small, arranged in axillary clusters from a crowd of minute bracts; the males very many; the females 1—5, rarely more. MALE-flowers on filiform pedicels. *Sepals* spreading, $\frac{1}{16}$ in. long, obovate-oblong, obtuse, concave. *Stamens* usually 5, exerted; filaments opposite the sepals, slender. *Pistillode* large, 3-fid. FEM.-flowers. *Pedicels* shorter than those of males. *Sepals* as in males. *Ovary* glabrous, styles deeply bifid. *Berry* globose, of two sizes, mostly minute and with a dry pericarp, a few $\frac{1}{2}$ in. in diam. and white with a fleshy pericarp. *Seeds* 3—6, minutely punctate.

Dehra Dun, in scrub forest (Kanjilal), and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand and Merwára. Flowers in April and May. **DISTRIB.:** Hilly parts of the Punjab westwards to the Suliman range; Himalaya from Kashmir to Bhutan up to 5,000 ft., also in Bengal and in Central, W. and S. India, extending to Ceylon, Burma, Malaya, China, Australia and Trop. Africa. The hard close-grained reddish wood is used for agricultural implements, and the bark is said to be used for intoxicating fish.

2. F. Leucopyrus, Willd. *Sp. Pl.* iv, 757; *F. B. I.* v, 328; *Gamble Man.* 603; *Brandis Ind. Trees* 569; *Cooke Fl. Bomb.* ii, 581. *Securinega Leucopyrus*, Muell. *Arg.*; *Brand. For. Fl.* 456, t. 54 (in part). *Phyllanthus Leucopyrus*, Kæn. *Mss.*; *Roxb. Fl. Ind.* iii, 658.—Vern. *Hartho, ainta* (Brandis), *salipan* or *halepan* (Merwára).

A large glabrous bush with rigid straggling branches; branchlets slender, angular, ending in sharp spines. *Leaves* $\frac{3}{8}$ —1 in. long, rarely longer, obovate obcordate or rotundate, glaucous and with indistinct reticulate venation beneath. *Flowers* as in *F. microcarpa*. *Berry* 3-celled, globose, about $\frac{1}{4}$ in. in diam., smooth, white when ripe; styles 3, bifid. *Seeds* 2 in each cell.

In the Sub-Himalayan tracts of Kheri (N. Oudh) and Gorakhpur. Flowers May and June. **DISTRIB.:** Outer ranges of the Kumaon Himalaya up to 5,000 ft.; common also in the Punjab Plain and in Sind, extending to Kanara, the Carnatic, Ceylon and Upper Burma.

7. BREYNIA, Forst.; *Fl. Brit. Ind.* v, 329.

Shrubs or small trees. *Leaves* small, alternate, petioled, entire, often distichous. *Flowers* monœcious, axillary, minute; pedicels distinct, solitary or the males in fascicles. *Perianth* simple. **MALE-flowers:** *Calyx* turbinate or hemispheric with a truncate limb; margin often thickened and lobulate opposite the minute inflexed and rounded lobes. *Petals* none. *Disk* none. *Stamens* 3, filaments connate; anthers slender, adnate to the whole length of the column; cells linear, parallel, distinct. *Pistillode* none. **FEM.-flowers:** *Calyx* coriaceous, turbinate or rotate; limb broadly and shortly 6-lobed, often much enlarged and disciform in fruit. *Petals* disk and staminodes none. *Ovary* 3-celled, fleshy above, globose truncate or depressed at the apex; styles 3, sessile or connate in a short column, each 2-fid or 2-lobed; or stigmas 3, minute, simple and immersed in a cavity at the top of the ovary; ovules 2 in each cell. *Fruit* globose or depressed, more or less succulent, indehiscent or with a 6-valved pericarp enclosing 3—6 imperforate indehiscent cocci. *Seeds* with a membranous testa, hilum without a caruncle, albumen fleshy, cotyledons broad, radicle long.—Species 12, in Trop. Asia, Africa and the Pacific Islands.

B. rhamnoides, Muell. *Arg. in DC. Prod.* xv, part 2, 440; *Brandis For. Fl.* 455; *Ind. Trees* 568; *F. B. I.* v, 330; *Watt E. D.*; *Gamble Man.* 604; *Prain Beng. Pl.* 933; *Cooke Fl. Bomb.* ii, 583. *Phyllanthus Vitis-Idoca*, *Roxb. Fl. Ind.* iii, 665.—Vern. *Tikkar* (Oudh).

A shrub or small tree, quite glabrous. *Bark* rough, yellowish-brown. *Branches* many, horizontal; branchlets flexuous, angular. *Leaves* many, membranous, distichous, shortly stalked, $\frac{5}{8}$ —1 $\frac{1}{2}$ in. long, elliptic, obtuse or subacute, pale beneath, turning dark-brown or black when dry, base subacute or rounded; petiole $\frac{1}{8}$ in.; stipules $\frac{1}{8}$ in., subulate from a triangular base. *Flowers* very small, on filiform pedicels, the males usually in small fascicles, females generally solitary. **MALE-flowers:** *Calyx* turbinate or subcampanulate, mouth entire or

obscurely lobed. *Staminal column* truncate at the apex and produced beyond the adnate anthers. *FEM.-flowers.*: *Calyx* cup-shaped; hardly enlarged in fruit; lobes 6, acute. *Ovary* exserted, oblong, truncate; styles very short. *Fruit* globose, about $\frac{1}{4}$ in. in diam. smooth, succulent, dull-red or purple.

Sub-Himalayan tracts and in the forests of Oudh and Bundelkhand; abundant in open scrub lands and often met with in hedges. Flowers in April and May. *DISTRIB.*: Throughout tropical India; extending to Ceylon, Burma, China, the Malay Islands and the Philippines.

8. PHYLLANTHUS, Linn.; Fl. Brit. Ind. v, 285.

Herbs, shrubs or trees. *Leaves* distichous, the branchlets with their leaves often resembling pinnate leaves, entire, stipules usually narrow or none. *Flowers* small, monœcious, rarely diœcious, axillary or on the old nodes; males usually many, fascicled, sub-sessile or pedicelled, rarely few or solitary; females in the same or in distinct axils with longer pedicels, solitary or few; perianth simple. *MALE-flowers.*: *Sepals* 4—6, free or nearly so, imbricate, more or less 2-seriate. *Disk* glandular, rarely none. *Stamens* 3, rarely 4 or 5, in the centre of the flower, filaments free or connate, anthers 2-celled, oblong or didymous, rarely reniform; cells parallel or diverging, dehiscence extrorse, vertical or transverse. *Pistillode* none. *FEM.-flowers.*: *Sepals* as in male. *Petals* none. *Disk* glandular. *Ovary* usually 3-celled; styles free or connate, usually 2-fid and with slender arms; ovules 2 in each cell. *Fruit* of 3 crustaceous or coriaceous rarely bony 2-valved cocci, sometimes a 4-celled berry or a drupe with a 3—4-celled bony epicarp. *Seeds* trigonous, testa crustaceous, hilum without a caruncle, albumen fleshy, cotyledons flat or flexuous.—Species about 400 in all warm countries.

Stamens 5, in 2 series, the 3 inner filaments connate.—A shrub, often scandent

Stamens 3, filaments united in a column, rarely free and recurved:—

Anthers erect, slits vertical, connective usually produced:—

Fruit large, fleshy, containing 3 bony 2-valved cocci; disk absent in the male-flowers; styles connate below, twice 2-fid.—A tree

Fruit a capsule of 3 crustaceous 2-valved cocci; disk present in the male and fem. flowers; styles once 2-fid, free; stipules peltate.—Herbs:—

Leaves scattered, cuneate-obovate; capsule smooth

Leaves close-set, distichously imbricating, oblong or linear-oblong; capsule echinate

Anthers didymous, reniform, the cells subglobose, slits very short; fruit a capsule; styles once 2-fid, free or connate:—

Seeds finely tubercled; stipules peltate.—A perennial herb or undershrub

Seeds with parallel ribs on the back; stipules simple, not peltate.—An annual weed

1. *P. reticulatus.*

2. *P. Emblica.*

3. *P. maderaspatensis.*

4. *P. urinaria.*

5. *P. simplex.*

6. *P. Niruri.*

1. **P. reticulatus**, Poir. *Encycl. Méth.* v, 298; Brandis *For. Fl.* 453; *Ind. Trees* 570; F. B. I. v, 288; Watt *E. D.*; *Comm. Prod. Ind.* 887; *Gamble Man.* 598; *Prair Beng. Pl.* 935; *Cooke Fl. Bomb.* ii, 585. *P. multiflorus*, Willd.; *Roxb. Fl. Ind.* iii, 664 (not of *Roxb. Ic.*).—Vern. *Panjuli, kabonan* (Merwára).

A large often scandent shrub, glabrous or pubescent; branchlets slender, drooping, smooth or lenticellate; bark thin, greyish-brown. *Leaves* variable, thin, glabrous or nearly so, pale beneath, 1–2 in. long, oblong elliptic or rotundate, obtuse or acute at the apex; base rounded acute or subcordate; main lateral nerves 6–8 pairs, slender; petioles up to $\frac{1}{8}$ in. long; stipules shorter than the petioles, ovate, acute, sometimes bristle-pointed. *Flowers* axillary, males in fascicles, the females solitary, pedicels slender. *Calyx* $\frac{1}{10}$ in. long, glabrous; segments oblong, obtuse, alternating with the glands of the disk. **MALE-flowers.**: *Stamens* 5, the three inner connate, the two outer free and shorter. **FEM-flowers.**: *Ovary* 5–10-celled; ovules 2 in each cell, superposed; styles 3, minute, 2-lobed. *Fruit* a globose berry, about $\frac{1}{8}$ in. diam., smooth and shining, dark-purple when ripe. *Seeds* usually 10, trigonous, crustaceous, punctulate.

Meerut (T. Thomson), Rohilkhand (Edgeworth), N. Oudh and Gorakhpur (Duthie); often found climbing amongst bushes and in hedges. **DISTRIB.**: Throughout tropical India from Sind, Bengal and Sikkim to S. India and Ceylon; also in Burma, the Andaman Islands, Malay Archipelago, China and Trop. Africa. The leaves bark and juice are used medicinally. Manson states that the charcoal prepared from this species is much used in Burma for lighting hookas.

2. **P. Emblica**, Linn. *Sp. Pl.* 982; *Roxb. Fl. Ind.* iii, 671; Brandis *For. Fl.* 454, t. 52; *Ind. Trees* 570; F. B. I. v, 289; Watt *E. D.*; *Comm. Prod. Ind.* 886; *Kanjilal For. Fl.* (ed. 2), 346; *Gamble Man.* 599; *Collett Fl. Siml.* 450; *Prair Beng. Pl.* 935; *Cooke Fl. Bomb.* ii, 585. *Embllica officinalis*, Gærtn.; *Royle Ill.* 327.—Vern. *Ambala, ámla, aonhla, aola*. (Embllic myrobalan.)

A moderate-sized deciduous tree with usually a crooked trunk; bark light-grey, or greenish, peeling off in small irregular patches, red inside. *Branches* spreading, branchlets glabrous or finely pubescent, often deciduous. *Leaves* small, subsessile, distichously arranged along the branchlets and thus simulating the leaflets of a pinnate leaf, $\frac{3}{8}$ — $\frac{1}{2}$ in. long, narrowly linear, obtuse, pale-green, glabrous or puberulous beneath; stipules minute, ovate, finely acute. *Flowers* greenish-yellow, arranged in axillary fascicles on the leaf-bearing branchlets or on the naked portion below the leaves; bracts fimbriate. **MALE-flowers** many, shortly pedicelled. *Sepals* 6, oblong, obtuse, $\frac{1}{10}$ in. long. *Disk* none. *Anthers* 3, erect, on a short column, slits vertical. **FEM-flowers** few, subsessile. *Sepals* as in male. *Disk* cupular, lacerate. *Ovary* 3-celled; styles connate at the base, twice 2-fid and with acute lobes. *Fruit* fleshy, globose, pale-yellow and often tinged with pink when ripe, about $\frac{1}{2}$ in. in diam., obscurely 6-lobed, breaking up when dry into three 2-seeded crustaceous cocci. *Seeds* 6, trigonous.

Abundant in forest tracts within the area of this flora, and often planted near villages and as a roadside tree. Flowers March to May, and the fruit ripens during the cold season. **DISTRIB.:** Throughout tropical and subtropical India, chiefly in the dry deciduous forests, ascending to 4,500 ft. on the Himalaya; also in Ceylon, Burma, the Malay Islands and China. The acid fruit is eaten as a pickle, and the bark leaves and fruit are used in dyeing and tanning. The hard red wood is valued for poles and, being durable under water, it is much used for well-work. Excellent charcoal is prepared from it. It is said that chips of the wood thrown into muddy water will clear it effectually. For further particulars regarding the medicinal and other useful properties of this tree see Watt's Dictionary.

3. *P. maderaspatensis*, Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 654; F. B. I. v, 292; Watt E. D.; Prain Beng. Pl. 935; Cooke Fl. Bomb. ii, 586. *P. obcordatus*, Willd.; Roxb. Fl. Ind. iii, 656.—Vern. Hazarmani.

A glabrous annual but occasionally often with a woody rootstock. *Stems* erect, 1—3 ft., ascending or decumbent below. *Leaves* scattered, $\frac{1}{4}$ — $1\frac{1}{4}$ in. long, cuneate, ovate, with a rounded truncate or subcordate and mucronate apex, tapering at the base into the very short petiole, glaucous beneath, the lateral nerves few and rather conspicuous; stipules membranous, peltate, acute. *Flowers* axillary; males minute, in small clusters, subsessile; females solitary and longer, shortly stalked. *Sepals* 6, obovate, rounded at the apex, green margined with white. *Stamens* 3, filaments connate; anthers erect and with vertical slits. *Styles* 3, minute, free, 2-lobed. *Capsule* $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam., depressed-globose, 3-lobed, glabrous. *Seeds* $\frac{1}{16}$ in., trigonous, rounded on the back, muriculate in fine lines, glabrous.

Dehra Dun (Edgeworth), Malwa, in black soil (Edgeworth). **DISTRIB.:** Drier parts of India from Bengal and C. India to S. India and Ceylon; also in Trop. Africa, Java, China and Australia.

4. *P. urinaria*, Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 660; F. B. I. v, 293; Watt E. D.; Prain Beng. Pl. 935; Cooke Fl. Bomb. ii, 587.

An annual or rarely perennial, glabrous or nearly so. *Stems* erect; branches few, often tinged with red; branchlets flattened and slightly winged, minutely hispid at the angles. *Leaves* sessile, distichously imbricate, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, oblong or linear-oblong, tip rounded or apiculate, pale beneath, glabrous or the margins minutely hispid; base rounded, usually oblique; stipules peltate, acute from a broad base. *Flowers* minute, solitary, subsessile. *Sepals* green, ciliolate, those of the males suborbicular; of the females oblong, not enlarged in fruit. *Filaments* very shortly connate; anthers erect, the slits vertical. *Capsule* $\frac{1}{2}$ in. in diam., globose, obscurely lobed, echinate. *Seeds* trigonous, rounded on the back, transversely furrowed.

5. *P. simplex*, Retz. Obs. Bot. fasc. v, 29; Roxb. Fl. Ind. iii, 654; F. B. I. v, 295; Watt E. D.; Collett. Fl. Siml. 450; Prain Beng. Pl. 936; Cooke Fl. Bomb. ii, 587.

A glabrous perennial herb or an undershrub, very variable, usually with a long tap-root; branches flattened. *Leaves* many, distichous and often imbricate, sessile, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, linear-oblong, obtuse and apiculate; stipules peltate, sagittate, brownish, scarious. *Flowers* usually solitary, on slender or stout pedicels, the females larger than the males. *Sepals* about $\frac{3}{10}$ in. long, oblong, obtuse, those of the female flowers slightly enlarged in fruit. *Stamens* 3, filaments free; anthers didymous, the slits very short so that when the cells are confluent the dehiscence appears to be transverse. *Styles* short, once 2-fid, free or connate. *Capsule* globose, $\frac{1}{10}$ in. in diam. obscurely 3-lobed, crustaceous, rough but not echinate. *Seeds* minute, trigonous, rounded on the back, finely tubercled, dark-brown.

Dehra Dun (Gamble), Pilibhit, N. Oudh in the districts of Kheri and Bahraich (Duthie). *DISTRIB.*: Throughout the hotter parts of India and up to 2,000 ft. in Kumaon; also in Ceylon, Malay Islands, China and in the Pacific Islands.

6. P. Niruri, *Linn. Sp. Pl.* 941; *Roxb. Fl. Ind.* iii, 659; *F. B. I.* v, 298; *Watt E. D.*; *Comm. Prod. Ind.* 887; *Prain Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 587.—Vern. *Jar-ámli*, *jangli-ámli*.

A glabrous annual, up to 2 ft. high. *Stems* often branching from the base, angular; branchlets slender, spreading. *Leaves* many, sessile distichous and often overlapping, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, elliptic-oblong, obtuse or rarely subacute, glaucous beneath, nerves obscure; stipules lanceolate-subulate, acute. *Flowers* axillary, numerous, very minute, the males solitary or 2—3-nate, the females solitary, on short pedicels. *Sepals* of male flowers $\frac{1}{10}$ in. long, rounded; those of the female twice as long, oblong, subacute, white-margined, not enlarging in fruit. *Stamens* 3; anthers didymous, on a short column. *Styles* minute, free, 2-lobed. *Disk* of males of minute glands; of females annular, lobed. *Capsule* depressed-globose, $\frac{1}{10}$ in. in diam., smooth, obscurely lobed. *Seeds* trigonous, rounded on the back and with parallel regular longitudinal ribs.

A common garden weed and in cultivated fields within the area; Dehra Dun (Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell), etc. *Flowers* in July and August. *DISTRIB.*: Throughout the hotter parts of India, also in Ceylon and in most tropical countries, but not in Australia. The plant is much used as a diuretic by the natives of India.

P. DISTICHUS, *Muell.-Arg.*; *F. B. I.* v, 304; *Watt E. D.*; *Prain Beng. Pl.* 936; *Gamble Man.* 600; *Brandis Ind. Trees* 570; *Cooke Fl. Bomb.* ii, 589. *P. longifolius*, *Roxb. Fl. Ind.* iii, 672. *Cicca disticha*, *Linn.*; *Royle Ill.* 327.—A small glabrous deciduous tree with pinnately distichous leaves and small reddish flowers in dense clusters. The acid fruit, about as large as a big gooseberry, is much used in tarts or as a pickle. The tree is a native of the Malay Islands and in Madagascar. It is met with in gardens within the area of this flora and in other parts of India.

9. PUTRANJIVA, Wall.; Fl. Brit. Ind. v, 336.

Trees. *Leaves* alternate, evergreen, entire or serrulate, penninerved and reticulate. *Flowers* monoecious or dioecious, axillary pedicelled; the males clustered, the females subsolitary. *Petals* and *disk* none. **MALE-flowers:** Calyx unequally 3—6-lobed, imbricate. *Stamens* 2—4, in the centre of the flower, filaments free or partially connate; anthers erect, cells parallel. *Pistillode* none. **FEM-flowers:** Calyx as in male. *Ovary* ovoid, 2—3-celled; styles short, spreading, dilated into broad fleshy arms, ovules 2 in each cell. *Fruit* an ovoid or globose drupe; endocarp hard, 1-celled. *Seed* solitary, ovoid, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 2, India and Ceylon.

P. Roxburghii, Wall. *Tent. Fl. Nep.* 61; *Royle Ill.* 347, t. 83 bis; *Brandis For. Fl.* 451, t. 53; *Ind. Trees* 566; *F. B. I.* v, 336; *Watt E. D.*; *Collett Fl. Siml.* 452; *Kanjilal For. Fl.* (ed. 2), 349; *Gamble Man.* 604; *Prain Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 590. *Nageia Putranjiva*, Roxb. *Fl. Ind.* iii, 766.—Vern. *Jiaputa*, *putjia* (Hind.), *patji* (Oudh), *juti* (Kumaon bhábar), *putranjiva* (Sansc.).

A moderate-sized evergreen tree, almost glabrous except the young shoots; bark-grey, whitish when young. *Branches* drooping. *Leaves* alternate, coriaceous, dark-green, shining, 2½—4 in. long, obliquely elliptic-oblong or ovate, obtuse, acute or shortly acuminate, entire or distantly serrulate; main lateral nerves many, with reticulate venation between; petioles ¼ in. long, pubescent; stipules small, triangular, acute, deciduous. *Flowers* small, yellow, dioecious. **MALES** very shortly pedicelled, arranged in dense axillary often spike-like clusters. *Sepals* 3—5, oblong, obtuse, ciliolate. *Stamens* usually 3, filaments more or less connate at the base, anthers globose. **FEM-flowers** 2—3; pedicels ½—¾ in. long, pubescent. *Sepals* 5—6, broadly elliptic, obtuse, concave, ciliolate. *Ovary* 3-celled, tomentose; styles 3, short, recurved, stigmas crescent-shaped. *Drupe* ½—¾ in. long, ovoid-globose, rounded or pointed at the apex, white-tomentose. *Putamen* pointed, very hard, deeply wrinkled, 1-seeded.

Moist shady forests in the Dehra Dun and Saharanpur forest divisions and eastwards along the Sub-Himalayan tracts. *Flowers* April and May, and the fruit ripens during the cold season. **DISTRIB.:** Throughout Tropical India, also in Ceylon and Burma. The whitish strong and durable wood is used by turners. Rosaries are made of the hard stones of the fruit to place round the necks of Hindu children to keep them in good health. The leaves are lopped for fodder and the seeds yield an oil which is used for burning.

10. CYCLOSTEMON, Blume; Fl. Brit. Ind. v, 339.

Trees. *Leaves* alternate, coriaceous, entire or crenulate, base often unequal. *Flowers* dioecious, in axillary clusters. *Petals* none. **MALE-flowers:** *Sepals* 4—6. *Stamens* many or few, inserted round a globose or depressed disk; filaments short, free; anthers erect, the cells parallel. *Pistillode* none or minute. **FEM-flowers:** Calyx as in male. *Disk*

annular or none. *Ovary* 2—4-celled, style elongate or none; stigmas dilated, fleshy or connate in a peltate disk, ovules 2 in each cell. *Fruit* subglobose or ovoid, indehiscent; pericarp hard, 2-celled. *Seeds* solitary in each cell, albumen fleshy, cotyledons broad and flat.—Species about 18, in Trop. India, Malaya and Africa.

C. assamicus, *Hk. f. in F. B. I. v, 342; Kanjilal For. Fl. (ed. 2), 350; Gamble Man. 607; Prain Beng. Pl. 937; Brandis Ind. Trees 567.*

A small evergreen tree with very thin greenish-grey bark. *Leaves* 3—5 in. long, ovate or elliptic-oblong, obtuse or subacute at the apex, dark-green, glabrous, shining; base rounded or acute, usually oblique; margins undulate; main lateral nerves 8—10 pairs, slender; petioles up to $\frac{1}{2}$ in. long; stipules none. *Flowers* globose, green. **MALE**-flowers in clusters. *Stamens* about 12. **FEM.**-flowers solitary. *Ovary* 2-celled, densely silky; stigmas 2, subsessile, fleshy. *Fruit* shortly pedicelled, $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovoid or elliptic-oblong, rusty-tomentose. *Seeds* solitary in each cell; testa coriaceous, red.

Forests of Dehra Dun in swamps (Kanjilal) and eastwards along the Sub-Himalayan tract. *Flowers* Nov.—Dec. **DISTRIB.**: Kumaon up to 2,500 ft. and eastwards to the Darjeeling Terai, Assam, Khasia Hills, and from Chota Nagpur to Eastern Bengal and the Circars. The wood is hard and tough and with an even grain.

11. ANTIDESMA, Linn.; Fl. Brit. Ind. v, 354.

Trees or shrubs. *Leaves* alternate, entire, stipules narrow. *Flowers* dioecious, apetalous, small or minute, in slender axillary or in terminal simple or branched spikes or racemes. **MALE**-flowers: *Calyx* 3—5, rarely 6—8-lobed or partite. *Disk* entire or lobed. *Stamens* 2—5, rarely more, inserted on or around the disk, often irregularly; filaments inflexed in bud, anthers lunate or didymous; cells globose, approximate or distant, connective thickened. *Pistillode* minute or obsolete. **FEM.**-flowers: *Calyx* as in male. *Disk* usually annular or cushion-like. *Ovary* usually 1-celled; stigmas 2—4, usually short, 2-fid or 2-partite; ovules 2, pendulous. *Fruit* a small more or less compressed drupe, crowned by the sublateral or terminal stigmas. *Seed* small, albumen fleshy; cotyledons broad, flat.—Species about 70, in the tropical regions of the Old World.

Leaves very obtuse; *flowers* sessile; *stamens* 4—7; *ovary* hairy

1. *A. Ghæsembilla*.

Leaves acute or acuminate; *flowers* pedicelled; *stamens* usually 2; *ovary* glabrous

2. *A. diandrum*.

1. **A. Ghæsembilla**, *Gærtn. Fruct. i, 189, t. 39; Brandis For. Fl. 446; Ind. Trees 564; F. B. I. v, 357; Watt E. D.; Gamble Man. 610; Prain Beng. Pl. 938; Cooke Fl. Bomb. ii, 592. A. paniculatum, Roxb. Fl. Ind. iii, 770. A. pubescens, Roxb. Lc.*

A small deciduous tree with greyish bark; branchlets pubescent or fulvous-tomentose. *Leaves* 2—4 in. long, oval obovate or orbicular-oblong, rounded or emarginate at the apex, glabrous or nearly so on

the upper surface, pubescent or tomentose beneath; base rounded or subcordate; main lateral nerves 5—6 pairs; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in. long; stipules about as long as the petioles, lanceolate, acute, downy. *Flowers* greenish-yellow, sessile, arranged in slender paniced spikes. *MALE-flowers: Calyx* 5—7-partite, densely fulvous-hairy. *Stamens* 4—7; anthers crescent-shaped. *Disk* 5-part., pubescent. *FEM.-flowers: Calyx* as in the male. *Disk* annular. *Ovary* densely hairy; stigmas minute, recurved. *Drupe* subglobose when fresh, $\frac{1}{2}$ in. in diam., reddish or black when ripe.

Common in the Sub-Himalayan forests of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June. *DISTRIB.:* Outer Himalayan ranges at low elevations, from the Sutlej to Bhutan; also in Assam, Bengal, and from C. W. and S. India to Ceylon; extending to Burma, the Andamans, the Malay Pen. and Islands, China and Australia. The acid fruit is eaten, as well as the leaves. The Simla locality mentioned in Fl. Brit. Ind. refers to *Glochidion velutinum*.

2. A. diandrum, Roth Nov. Pl. Sp. 369; Brandis For. Fl. 447; Ind. Trees 565; F. B. I. v, 361; Watt E. D.; Kanjilal For. Fl. (ed. 2), 352; Gamble Man. 610; Prain Beng. Pl. 938; Cooke Fl. Bomb. ii, 593. *Stilago diandra*, Roxb. Fl. Ind. iii, 759.—Vern. *Kāli-khatai* (Dehra Dun), *dhakki* (Oudh), *amli* (Hind.).

A small deciduous tree or bush, the young parts usually glabrous; outer bark smooth, grey. *Leaves* bright-green, turning red before falling, thin, shortly petioled, varying in size from 1 to 5 in. in length, lanceolate or ovate-lanceolate, acute or acuminate, glabrous above, rarely pubescent beneath; stipules linear, acute, about twice as long as the petioles. *Flowers* minute, all pedicelled, in long slender glabrous or pubescent racemes; bracts ovate, shorter than the pedicels. *MALE-flowers: Calyx* $\frac{1}{10}$ in. long; lobes 4, short, obtuse. *Stamens* 2, rarely 3, at the base of the glabrous lobed disk. *FEM.-flowers: Pedicels* stouter than in the male. *Calyx* $\frac{1}{8}$ in. long; lobes deeper than in the male. *Ovary* glabrous. *Drupe* $\frac{1}{2}$ in. in diam., purplish-red when ripe.

Common in the *sāl* forests of Dehra Dun and Saharanpur, and eastward along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June, and the fruit ripens in the cold season. *DISTRIB.:* Outer ranges of Himalaya from Garhwal and Kumaon eastwards; also in Bengal and in Central, W. and S. India, extending to Ceylon and Burma. The pinkish-grey wood is hard and close-grained. The leaves and small reddish fruits have a pleasantly acid taste, and are much eaten either raw or pickled.

12. CROTON, Linn., Fl. Brit. Ind. v, 385.

Trees or shrubs, rarely herbs. *Leaves* alternate, rarely opposite or whorled, usually with 2 glands at the base. *Flowers* usually monoecious, solitary or clustered on the rhachis of a terminal raceme; bracts small. *MALE-flowers: Calyx* 5 (rarely 4 or 6)-partite, segments imbricate or

subvalvate. *Petals* 5, rarely 4 or 6, never larger and sometimes smaller than the calyx. *Disk* of 4 or 6 glands, opposite the sepals. *Stamens* many, inserted on the hairy receptacle; filaments free, inflexed in bud; anthers adnate, the cells parallel. *Pistillode* none. *FEM.-flowers*: *Sepals* rarely accrescent in fruit. *Petals* smaller than the sepals. *Disk* as in the males. *Ovary* 3 (rarely 2 or 4)-celled; ovules solitary in each cell; style usually slender, 2—4-cleft. *Capsule* subequally 6-valved or of 3 separating 2-valved cocci. *Seeds* smooth, caruncle small, testa crustaceous, albumen copious, cotyledons broad.—Species upwards of 500, in all hot countries.

C. oblongifolius, Roxb. *Hort. Beng.* 69; *Fl. Ind.* iii, 685; *Brandis For. Fl.* 440; *Ind. Trees* 577; *F. B. I.* v, 386; *Watt E. D.*; *Gamble Man.* 614; *Prain Beng. Pl.* 943; *Cooke Fl. Bomb.* ii, 599.—Vern. *Arjunna* (Oudh).

A medium-sized deciduous tree; young parts inflorescence and ovary clothed with minute orbicular silvery scales. *Leaves* crowded towards the ends of the branchlets, 5—10 in. long, oblong-lanceolate, subacute, glabrous (when mature), crenate or serrate, penninerved; base usually acute, without apparent glands above the petioles; petioles $\frac{3}{8}$ — $1\frac{1}{2}$ in. long. *Flowers* yellowish-green, solitary or clustered in the axils of minute bracts on long erect often fascicled racemes. *MALE-flowers* many, on the upper portion of the raceme. *Calyx* divided about $\frac{3}{4}$ towards the base; segments $\frac{1}{10}$ in. long or more, ovate, obtuse. *Petals* $\frac{1}{8}$ in. long, elliptic-lanceolate, obtuse, woolly. *Stamens* 12, inflexed in bud; filaments hairy below. *FEM.-flowers* at the base of the racemes; pedicels short, stout. *Sepals* acute, the margins ciliate. *Petals* $\frac{1}{12}$ in. long, obovate, the margins densely woolly. *Styles* 3, nearly $\frac{1}{8}$ in. long, each divided into 2 slender curled branches $\frac{1}{8}$ in. long. *Capsules* $\frac{1}{8}$ in. in diam., subglobose, slightly 3-lobed, clothed with minute orbicular scales. *Seeds* ellipsoid, rounded on the back.

Common and often gregarious in the Gonda district of N. Oudh and in the Corakhpur district (Brandis). The leaves turn red before falling in March, and the new foliage appears soon afterwards. *DISTRIB.*: Bengal, Ch. Nagpur, Silhet, Central, W. and S. India and in the dry region of Ceylon; also in the mixed forests of Burma. The bark, leaves and fruit are used in native medicine.

C. TIGLIUM, Linn.; *Roxb. Fl. Ind.* iii, 682; *Brandis For. Fl.* 440; *F. B. I.* v, 393; *Watt E. D.*; *Gamble Man.* 614; *Prain Beng. Pl.* 943; *Cooke Fl. Bomb.* ii, 600.—Vern. *Jaipal* (The Purging Croton).

A small evergreen tree, with the young shoots stellately hairy. *Leaves* glabrous and membranous, 2—4 in. long, ovate, acuminate serrate, 3—5-nerved. *Stamens* 15—20. *Capsule* $\frac{1}{4}$ —1 in. long, ovoid, 3-gonous. The plant is not truly indigenous in India, but it is frequently found as if wild, and in some parts of India is becoming naturalized. It is often cultivated in native gardens for the sake of the powerfully purgative oil yielded by the seeds. The so-called garden "Crotons," with variegated leaves, and which are much cultivated in Indian gardens, belong to the genus *Codiaeum*.

13. CHROZOPHORA, Neck.; Fl. Brit. Ind. v, 408.

Diffuse densely hispid or stellately tomentose herbs or under-shrubs. *Leaves* alternate, sinuate-toothed or lobed, wavy or plaited, 2-glandular at the base. *Flowers* monœcious, in sessile axillary bracteate racemes; males crowded in the upper part of the raceme; females solitary and pedicelled. *MALE fl.* *Calyx* globose or ovoid, splitting into 5 valvate segments. *Petals* 5, short. *Disk* obscure. *Stamens* 5—15, filaments connate below in 1—3 series, anthers oblong; cells parallel, contiguous. *Pistillode* none. *FEM. fl.* *Sepals* 5, very narrow, sometimes setaceous or obsolete. *Disk* of 5 short broad glands alternate with the petals. *Ovary* 3-celled; styles 2-fid, erect or spreading, ovules solitary in each cell. *Fruit* a capsule of 3 hispid tomentose or scaly almost fleshy 2-valved cocci. *Seeds* without a strophiole, testa shining, albumen fleshy; cotyledons broad, flat.—Species about 7, Asiatic, Mediterranean and African.

Ovary and capsule clothed with stellate tomentum and silvery scales; stamens 5

1. *C. obliqua*, VAR. *hierosolymitana*.

Ovary and capsule clothed with stellate tomentum, but without silvery scales; stamens 15, in 2 series:—

An erect stellately hairy herb sparingly branched below; leaves up to 4 in. long, pale-green; sepals of female flowers triangular

3. *C. Rottleri*.

Prostrate woolly herbs diffusely branching from the root; leaves up to 1½ in. in diam., often dark purplish-brown; sepals of female flowers linear:—

Leaves about as broad as long, eglandular at the base
Leaves longer than broad, 2-glandular at the base

3. *C. prostrata*.

C. prostrata, VAR. *parvifolia*.

1. *C. obliqua*, *A. Juss. Tent. Euphorb. 28*, VAR. *hierosolymitana*, *Spreng. Syst. 850*. *C. verbascifolia*, *A. Juss. Croton tinctorius, Wall. Cat 7716 G*.

Leaves ovate, nearly as long as broad, usually more or less toothed, clothed on both sides with stellate tomentum. *Stamens* 5. *Ovary* and capsule clothed with stellate hairs and silvery scales. *Seeds* glabrous.

The only locality recorded for this plant as occurring within the area of this flora is Muttra, where specimens are said to have gathered many years ago by Colonel Hardwicke, but by no other collector east of the Jumna subsequently. The plant appears to be widely distributed in the Punjab Plain from Ambala to Rawal Pindi and on the Salt Range; it extends also to Arabia, Palestine (Garden of Gethsemane near Jerusalem, collected by Sieber), and North Africa.

2. *C. Rottleri*, *A. Juss. Tent. Euphorb. 28*. *C. plicata*, *Dalz. and Gibs. (not of A. Juss.)*; *Royle Ill. 329*; *F. B. I. v, 409*; *Watt E. D.*; *Prain Beng. Pl. 944*; *Cooke Fl. Bomb. ii, 607*. *Croton plicatus, Vahl*; *Roxb. Fl. Ind. iii, 681*.

An erect hoary annual herb up to 2 ft. high, with a long straight slender tap-root. *Stem* usually naked below, sparingly branched above. *Leaves* 2—4 in. long, ovate to orbicular, often obscurely 3-lobed, thick, rugose, pale-green, stellate-hairy on both surfaces; petioles

1—2 in. long. *Male flowers.* Calyx $\frac{1}{8}$ in. long. *Petals* smaller, very thin, ovate-lanceolate. *Stamens* 15, in two whorls. *Fem. flowers.* *Sepals* $\frac{1}{2}$ in. long, triangular. *Petals* shorter and narrower. *Capsules* $\frac{1}{3}$ in. in diam., densely stellate-hairy, but without silvery scales.

Mirzapur at Sháhganj (J. D. H.). *DISTRIB.:* Punjab Plain (T. Thomson); Sind (Stocks); Gujarát (D. and G.); Dharwar (Cooke); Deccan (D. and G., Graham, Cooke); Behar (J. D. H.); Bengal (Prain); Chota Nagpur (Haines); Burma (Griff); also in Madras Pres., extending to N. Africa and Spain. The root and leaves are stated by Stewart to be used medicinally in the Punjab.

3. *C. prostrata*, Dalz. in Dalz. and Gibs. Bomb. Fl. 233; Cooke Fl. Bomb. ii, 607. *C. plicata*, forma prostrata, Hook. f. in F. B. I. v, 410.

A procumbent humifuse stellately woolly herb; branches many, spreading from the root, woolly-tomentose. *Leaves* $\frac{1}{2}$ —1 in. long and about as broad, deeply bullate, often dark purplish-brown, finely pubescent above, densely stellate-woolly beneath, base eglandular. *Flowers* in short few-flowered axillary racemes; bracts linear, $\frac{1}{8}$ — $\frac{1}{4}$ in. long. *Male flowers.* Calyx $\frac{1}{8}$ in. long. *Petals* smaller, elliptic-lanceolate. *Stamens* 15, in two whorls. *Fem. flowers.* *Sepals* linear, acute. *Petals* linear, smaller and narrower than the sepals. *Capsule* $\frac{1}{4}$ in. in diam., stellately woolly, without silvery scales.

Gorakhpur district (Duthie); Naorangah (Jacquemont). *DISTRIB.:* Bengal, in Behar, Patna (Buch.-Hamilton)-Wall. Cat. 7716 *C. partly*; Punjab Plain, Lahore (T. Thomson), Multan (Edgeworth 8028), Jabalpur (Vicary); C. India, Guna (King); C. Prov., Nimar district near Hewra (Duthie); without locality (R. Thomson); also in the Bombay and Madras Presidencies, and extending to N. Africa.

VAR. *parvifolia*. *C. parvifolia*, Klotzsch ex Schweinf. Pl. Nilot. 10. *Leaves* longer than broad, 2-glandular at the base. Bundelkhand, in black soil (Edgeworth 8029); N. Oudh in the Kheri district (Duthie); Lucknow (T. Anderson); Mirzapur (Griffith), Farakhabad and Fatehpur (Griffith 4794). *DISTRIB.:* Punjab Plain; (Edgeworth 126), (T. Thomson 1508), (Drummond 3061, 6348), Sind (Stocks 547); extending south to Bombay and Madras Presidencies, also in N. Africa.

14. **BALIOSPERMUM**, Blume; Fl. Brit. Ind. v, 461.

Erect shrubs. *Leaves* alternate, sinuate-toothed or lobed, penninerved or 3—5-nerved at the 2-glandular base. *Flowers* small, monœcious or diœcious, apetalous, arranged in panicles or racemes. **MALE fl.** globose. *Sepals* 4—6, membranous, orbicular, concave, imbricate. *Disk* of 4—6 glands. *Stamens* 10—30; filaments slender, free; anthers terminal, the cells adnate throughout to the broad connective, dehiscing introrsely, the slits at length becoming lateral. *Pistillode* none. **FEM. fl.** *Sepals* 5—6, lanceolate, entire or toothed, sometimes accrescent in fruit. *Disk* entire. *Ovary* 3-celled; styles rather long, stout, 2-fid or-partite, stigmas smooth, ovules solitary in each cell. *Fruit* a capsule of three 2-valved

crustaceous cocci. *Seeds* ovoid, testa crustaceous, albumen fleshy, cotyledons flat and broad.—Species 6, in India and Malaya.

B. axillare, *Blume Bijdr.* 604; *F. B. I.* v, 461; *Kanjilal For. Fl.* (ed. 2), 357; *Gamble Man.* 624; *Prair Bengal. Pl.* 946, *Brandis Ind. Trees* 583, *Cooke Fl. Bomb.* ii, 608. *B. indicum*, *Dcne. in Jacquem. Voy. Bot.* 154, t. 155. *B. montanum*, *Muell. Arg., Watt E. D.*; *Croton polyanthum*, *Roxb. Fl. Ind.* iii, 682; *Royle Ill.* 327, 328.

A stout leafy undershrub 3—6 ft. high with herbaceous branches from the root, glabrous except the young shoots and sometimes the leaves beneath. Leaves firmly coriaceous, very variable in size and shape; the upper 2—3 in. long, lanceolate, penninerved; the lower 6—12 in. long, often palmately 3—5-lobed and with sinuate-toothed margins; base rounded or cuneate; petioles 2—6 in. long; stipules of 2 glands. *Flowers* usually monœcious, arranged in many axillary racemes or contracted panicles, all male or with a few females at the base. **MALE** flowers: *Calyx* globose, $\frac{1}{10}$ in., 4—5-partite, often slightly hairy; segments finely mottled. *Disk* of 6 glands. *Stamens* about 20. **FEM.** flowers. *Sepals* not enlarging in fruit. *Disk* thin, $\frac{1}{10}$ in. in diam. *Ovary* hairy styles about $\frac{1}{10}$ in. long, thick, 2-partite, dull-red. *Capsules* $\frac{1}{2}$ — $\frac{1}{4}$ in. long, obovoid, usually hairy. *Seeds* $\frac{1}{3}$ in. long, smooth, mottled.

Dehra Dun, in shady places, and eastwards along the Sub-Himalayan forest tracts, where it often forms a considerable portion of the undergrowth. It flowers and produces fruit almost throughout the year. **DISTRIB.:** Outer ranges of Himalaya from Kashmir to Bhutan up to 3,000 ft.; also Assam, Khasia Hills, Bengal, Chittagong, Burma and Siam, and from C. & W. India to Travancore; extending to Java and the Malay Peninsula. The seed, which resembles that of the Castor-oil plant, but smaller, is used as a drastic purgative, and the root and leaves are much employed in Hindu medicine.

15. ACALYPHA, Linn.; Fl. Brit. Ind. v, 414.

Herbs, shrubs or trees. *Leaves* alternate, toothed or crenate, rarely entire, penniveined or 3—5-nerved. *Flowers* small, monœcious or occasionally dioecious, apetalous and without a disk, arranged in axillary or terminal racemes; males minute, without bracts; females 1—2, within a peduncled solitary bract, or sometimes at the base of large accrescent leafy bracts, low on the male spikes or on separate spikes. **MALE** flowers: *Sepals* 4, valvate, more or less connate in a membranous calyx. *Stamens* usually 8, or many on a convex receptacle; filaments short, free; anther-cells distinct, divaricate, often becoming twisted or flexuous. *Pistillode* none. **FEM.** flowers: *Sepals* 3—4, minute, imbricate. *Ovary* 3-celled; styles filiform, often long and laciniate or fimbriate; ovules solitary in each cell. *Fruit* a capsule of 3 minute 2-valved crustaceous cocci. *Seeds* subglobose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 225, in trop. and sub-trop. regions of the world.

Bracts distant, shortly dentate; capsule hispid
Bracts crowded, fimbriate; capsule glabrous

1. *A. indica.*
2. *A. ciliata.*

1. *A. indica*, Linn. *Sp. Pl.* 1003; Roxb. *Fl. Ind.* iii, 675; Royle *Ill.* 327; F. B. I. v, 416; Watt *E. D.*; Prain *Beng. Pl.* 948; Cooke *Fl. Bomb.* ii, 610.

An erect annual herb, 1—2½ ft. high. Branches many, angular, finely pubescent. Leaves thin, glabrous, 1—3 in. long, ovate or rhomboid-ovate, obtuse or subacute, crenate-serrate; base cuneate, 3-nerved; petioles slender, usually longer than the blade; stipules minute. Flowers in lax erect axillary elongate spikes; the males minute, clustered towards the summit of the spike, cbracteate; the females in clusters of 3—5, subtended by a shortly stalked leaf-like truncate dentate many-nerved bract ¼—½ in. in diam. Capsules hispid, concealed by the bracts, often only 1-seeded. Seed ⅛ in. long, ovoid, smooth, pale-brown.

Very common within the area, especially as a garden weed, flowering during the greater part of the year. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon, extending to Java and Trop. Africa.

2. *A. ciliata*, Forsk. *Fl. Ægypt.-Arab.* 162; Roxb. *Fl. Ind.* iii, 676; F. B. I. v, 417; Watt *E. D.*; Collett *Fl. Siml.* 452; Prain *Beng. Pl.* 948; Cooke *Fl. Bomb.* ii, 611.

A stout herb, 1—2½ ft. high. Stems erect; branches few, pubescent when young. Leaves thin, 1¾—3 in. long, ovate, acuminate or caudate-acuminate, finely serrate, pubescent on the veins beneath; base usually rounded, 5-nerved; petioles spreading, slender, usually exceeding the leaf-blade. Flowers in axillary androgynous spikes ½—¾ in. long; the males few, very minute and sessile at the top of the spike; the females many and crowded at its base; bracts large, pale-green, 1—2-flowered, exceeding the capsules, strongly nerved, the many nerves ending in long subulate hispid teeth. Capsules glabrous; cocci very thin, white. Seeds globose-ovoid, smooth, ⅛ in. long.

Dehra Dun (Duthie), Bundelkhand (Edgeworth) and probably in many other localities within the area. **DISTRIB.:** W. Himalaya from Kashmir to Kumaon up to 6,000 ft., and southwards from Bengal and Bombay to S. India and Ceylon, extending to Arabia and Trop. Africa.

16. TREWIA, Linn.; Fl. Brit. Ind. v, 423.

Soft-wooded trees. Leaves opposite, broadly ovate or orbicular; entire; base cordate, 3—5-nerved. Flowers rather large, dioecious, appearing before the leaves, apetalous and without a disk; males in lax lateral racemes, one to each bract; females solitary on long peduncles or racemose. **MALE fl.:** Calyx globose, splitting into 3—4 broad concave often reflexed segments. Stamens many, on a convex receptacle, filaments free, anthers dorsifixed, oblong, the cells parallel and contiguous. Pistillode none. **FEM. fl.:** Sepals 3—5, broad, imbricate, caducous. Ovary 2—4-celled; styles connate below, long, terete, entire, papillose throughout, ovules solitary in each cell. Fruit 2—4-celled, indehiscent or opening loculicidally, endocarp crustaceous. Seeds ovoid, testa hard, albumen fleshy, cotyledons broad and flat.—Species 2, one in India extending to Ceylon, the other apparently endemic in W. and S. India.

T. nudiflora, Linn. Sp. Pl. 1193 (*Trewia*); Roxb. Fl. Ind. iii, 837; Brandis For. Fl. 443; Ind. Trees 590; F. B. I. v, 423; Watt E. D.; Kanjilal For. Fl. (ed. 2), 353; Gamble Man. 617; Prain Beng. Pl. 948; Cooke Fl. Bomb. ii, 614.

A medium-sized deciduous tree with a smooth grey bark. Young shoots and the leaves beneath and the inflorescence clothed with cottony wool or sometimes nearly glabrous. Leaves 3—7 in. long, ovate, acuminate, glabrous and bright-green above; base rounded or cordate, 3—5-nerved; petioles 1—3 in. long; stipules minute, acute, caducous. MALE flowers $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., pale-green, arranged in pendulous racemes 3—8 in. long; pedicels short, slender, horizontal. Sepals valvate, concave. Stamens many. FEM. flowers solitary or 2—3 together, on long peduncles. Sepals 3—5, imbricate, caducous. Ovary woolly; styles $\frac{1}{2}$ — $\frac{3}{4}$ in. long, yellow. Fruit almost woody, globose, 1—1 $\frac{1}{2}$ in. in diam. Seeds smooth and polished, dark-brown.

Ravines and damp places in the forests of Dehra Dun and Saharanpur, extending eastwards along the Sub-Himalayan forest tracts of Rohilkhand, N. Oudh and Gorakhpur. The tree is leafless from Jan. to March, the new leaves appear during March and April, and the flowers between Feb. and April, and the fruit ripens during the cold season. **DISTRIB.**: Kumaon, Assam and the Khasia Hills, and southwards throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Pen. and Islands. Brandis states that this tree, reproduces abundantly from root-suckers. The soft white wood is used for making drums.

17. MALLOTUS, Lour.; Fl. Brit. Ind. v, 427.

Trees or shrubs. Leaves opposite or alternate, entire toothed or 3-lobed, penniveined or 3—7-nerved, sometimes peltate, often gland-dotted beneath and sometimes with glandular areas at the base on the lower surface. Flowers small, dioecious or monoecious, apetalous, arranged in axillary or terminal simple or branched spikes or racemes; males fascicled, females solitary in the bracts. MALE flowers: Calyx globose or ovoid, 3—5-partite, lobes valvate. Disk none. Stamens many, crowded on the flat or convex receptacle, filaments free, anthers small, dorsifixed; the cells globose or shortly oblong, parallel, adnate to the wide connective, often distinct. Pistillode none or very minute. FEM. flowers: Calyx spathaceous or 3—6-lobed or-partite. Disk none or small; styles free or connate below, spreading or recurved above, entire plumose or papillose, ovules solitary in each cell. Fruit a capsule of 2—3 (rarely 4) 2-valved tubercled echinate paleaceous or smooth cocci. Seeds ovoid oblong or globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 70—80, in tropical regions of the Old World.

M. philippinensis, Muell.-Arg. in Linnæa xxiv, 196; Brand. For. Fl. 444; Ind. Trees 590; F. B. I. v, 442; Watt E. D.; Comm. Prod. Ind. 755; Kanjilal For. Fl. (ed. 2), 353; Gamble Man. 619; Collett Fl. Siml. 453; Prain Beng. Pl. 950; Cooke Fl. Bomb. ii, 615. *Rottlera tinctoria*,

Roxb. Fl. Ind. iii, 827; *Royle Ill. 329*.—Vern. *Kamela, raini* (Dehra Dun), *reoni* (Bundelkhand), *rohni* (Oudh), *senduria* (Merwára).

A small much-branched evergreen tree with a thin dark-grey bark; young parts and inflorescence tawny or rusty-pubescent. *Leaves* alternate, variable in size and shape, 3–6 in. long, ovate, ovate-oblong or lanceolate, acuminate, entire or sometimes toothed, glabrous above, sub-glaucously pubescent and with many close-set orbicular reddish glands beneath, reticulately veined, base rounded or acute, strongly 3-nerved and with 4–7 pairs of lateral nerves above the basal ones; petiole about half the length of the blade, fulvous-pubescent and with two small sessile glands one on each side of the summit. *Flowers* small, dioecious. *MALE* flowers sessile or nearly so, in erect terminal spikes longer than the leaves. *Sepals* usually 4, lanceolate, acute. *FEM.* flowers sessile in short spikes. *Sepals* 3 or 4. *Capsules* $\frac{1}{3}$ – $\frac{1}{2}$ in. in diam., 3-lobed and 3-valved, covered with a bright red powder composed of fine grains of a resinous substance mixed with minute stellate hairs. *Seeds* about $\frac{1}{8}$ in. in diam., subglobose, black.

Very common within the area, and often associated with *sál*. Flowers during the cold season and the fruit ripens from March to May. *DISTRIB.*: Outer Himalayan ranges from the Indus eastwards, up to 4,500 ft.; and throughout tropical India; extending to Ceylon, Burma, the Andaman and Malay Islands, China and Australia. The red resinous grains with which the ripe capsules are covered is the well known *kamela* powder. It is much valued as a dye, especially for silk, and is also extensively used as a vermifuge. The bark is sometimes employed in tanning, and the wood affords good fuel.

18. HOMONOIA, Lour.; Fl. Brit. Ind. v, 455.

Rigid shrubs. *Leaves* alternate, long, narrow and subentire or short and toothed, glandular-lepidote. *Flowers* usually dioecious, apetalous and without any disk, arranged in many- or few-flowered axillary spikes, or from the old wood. *MALE* flowers: *Calyx* globose, splitting into 3 valvate segments. *Stamens* many, in a dense globose cluster of branched filaments; anther-cells sub-globose, divaricate, connective obscure. *Pistillode* none. *FEM.* flowers: *Sepals* 5–8, narrow, unequal, imbricate, caducous. *Ovary* 3-celled, styles entire, spreading, papillose, ovules solitary in each cell. *Fruit* a small capsule of 3 smooth 2-valved cocci. *Seeds* rounded on the back, slightly angular on the inner face; testa crustaceous, hard with a thin fleshy coat, albumen fleshy, cotyledons broad and flat.—Species 3 or 4, Indian or Malayan.

H. riparia, *Lour. Fl. Cochinch. 637*; *Brandis For. Fl. 445*; *Ind. Trees 593*; *F. B. I. v, 455*; *Watt E. D.*; *Gamble Man. 622*; *Prair Beng. Pl. 951*; *Cooke Fl. Bomb. ii, 620*. *Adelia neriifolia, Roth*; *Roxb. Fl. Ind. iii, 849*.

A small evergreen willow-like shrub with brown bark; branchlets young leaves and inflorescence pubescent. *Leaves* erect, closely set, 3–6 in. long, linear-oblong or linear-lanceolate, acute, apiculate, entire or

serrulate towards the tip, glabrous above, densely clothed beneath with reddish-brown orbicular gland-like scales; base acute or rounded; main lateral nerves 10—30 pairs, the veins between them reticulate; petioles $\frac{1}{4}$ — $\frac{3}{8}$ in. long; stipules $\frac{1}{2}$ in. long, linear-lanceolate, acute. *Flowers* dioecious, sessile, in axillary bracteate spikes 2—5 in. long; rhachis pubescent; bracts ovate-acuminate, pubescent. **MALE** flowers: *Sepals* 3, broadly elliptic, concave, glabrous, $\frac{1}{2}$ in. long. *Anthers* red. **FEM.** flowers. *Sepals* usually 5, narrowly ovate, acuminate, $\frac{1}{2}$ in. long, pubescent. *Ovary* pubescent; styles 3, shortly connate at the base. *Capsule* globose, $\frac{1}{2}$ in. in diam., tomentose. *Seeds* $\frac{1}{8}$ in. long, smooth, yellowish-brown.

Bundelkhand, in rocky river-beds (Edgeworth, Duthie, etc.). **DISTRIB.:** Bengal, Sikkim, Chittagong, Assam, Khasia Hills, Burma and southwards to Central and W. India to Ceylon; extending to the Andaman Islands, Cochinchina and Java.

19. RICINUS, Linn.; Fl. Brit. Ind. v, 457.

A tall glabrous and glaucous annual, sometimes shrubby or tree-like. *Leaves* alternate, broad, palmately lobed; lobes 7 or more, serrate. *Flowers* monoecious, rather large, in terminal subpaniculate racemes. *Perianth* simple and without any disk, the male flowers crowded in the upper portion of the inflorescence, the females below. **MALE** flowers: *Calyx* membranous, splitting valvately into 3—5 segments. *Stamens* very many; filaments connate and repeatedly branched; anthers with distinct distant sub-globose divergent cells. *Pistillode* none. **FEM.** flowers: *Calyx* spathaceous, caducous. *Ovary* 3-celled; styles entire, 2-fid or 2-partite; ovules solitary in each cell. *Fruit* a prickly capsule of three 2-valved cocci. *Seeds* oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat.—A single species, probably of African origin, now widely cultivated in tropical countries.

R. communis, Linn., Roxb. *Fl. Ind.* iii, 689; Royle *Ill.* 328; Brandis *For. Fl.* 445; Ind. *Trees* 593; DC. *L'Orig. Pl. Cult.* 339; Duthie and Fuller *F. and G. Crops* ii, 38, t. 43; F. B. I. v, 457; Watt *E. D.; Comm. Prod. Ind.*, 915; Gamble *Man.* 622; Prain *Beng. Pl.* 952; Cooke *Fl. Bomb.* ii, 627.—Vern. *Arand*, etc.—The Castor-oil plant, or Palma Christi.

The Castor-oil plant is much cultivated within the area of this flora and throughout the hotter parts of India. It frequently runs wild, and in many places has become naturalized. The tall perennial bushy kind is often grown in hedges, or in fields as a shelter for other crops. In order to obtain oil of the best quality the plant is usually grown as an annual, and often as a pure crop. The oil is largely used for burning and as a lubricant, and (when cold-drawn) for medicinal purposes. The plant is much cultivated in gardens for the sake of the brightly coloured foliage of some of its varieties. For full particulars regarding its cultivation in India, and the extraction and the various uses of the oil see Watt's "Commercial Products of India."

20. TRAGIA, Linn.; Fl. Brit. Ind. v, 464.

Perennial usually twining or climbing herbs, hispid with stinging hairs. *Leaves* alternate, simple or palmately 3-lobed, serrate, 3—5-nerved at the base. *Flowers* monoecious, in terminal and leaf-opposed androgynous racemes, apetalous and without any disk; the males uppermost in the raceme, females below and few. MALE flowers: *Calyx* globose or obovoid, valvately 3—5-partite. *Stamens* 1—3, rarely many, filaments free or connate; anthers ovate or oblong, cells parallel and contiguous. *Pistillode* minute, 3-fid or none. FEM. flowers: *Sepals* 6, imbricate, entire or pinnatifid, often enlarged, hardened and stellately spreading in fruit. *Ovary* 3-celled; styles united below in a stout column, free spreading and entire above; ovules solitary in each cell. *Fruit* a capsule of three 2-valved cocci, endocarp crustaceous. *Seeds* globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 50, chiefly tropical.

A twining herb; leaves simple; style circinnately revolute

1. *T. involucrata*.

An erect or sometimes climbing herb; leaves palmately 3-partite; styles slightly spreading, not revolute

2. *T. cannabina*.

1. **T. involucrata**, Linn. *Sp. Pl.* 980; Roxb. *Fl. Ind.* iii, 576; Royle *Ill.* 327; F. B. I. v, 465; Watt *E. D.*; Prain *Beng. Pl.* 952; Cooke *Fl. Bomb.* ii, 621.

A perennial more or less hispid herb, with scattered stinging hairs. *Stems* elongate, slender, twining. *Leaves* 1—4 in. long, variable, oblong-lanceolate to broadly ovate, acuminate, serrate, hairy; base rounded or cordate; petioles $\frac{1}{8}$ — $\frac{3}{8}$ long; stipules $\frac{1}{4}$ in. long, ovate, acute, somewhat auricled at the base. *Flowers* yellowish, shortly stalked, usually in hairy racemes 1—2 in. long; bracts $\frac{1}{10}$ in. long, lanceolate, acute. MALE flowers: *Sepals* 3, broadly elliptic or orbicular, concave, glabrous, $\frac{1}{10}$ in. long. *Stamens* 3. *Pistillode* minute, 3-fid. FEM. flowers: *Sepals* 6, ovate, pinnatifid, very hispid, $\frac{1}{8}$ in. long, elongating in fruit. *Ovary* 3-lobed, hispid; styles 3, united below in a stout column which is often as long as the circinnately revolute branches. *Capsules* $\frac{1}{3}$ in. in diam., 3-lobed, white, hispid. *Seeds* globose, smooth.

Forests of N. Oudh (R. Thompson), Kheri district (Duthie) DISTRICTS.: Throughout India from the Punjab and the outer Himalayan ranges eastwards to Assam, and south to Burma, S. India and Ceylon; also in China. The plant is not eaten by cattle. The root, leaves and fruit are used medicinally.

2. **T. cannabina**, Linn. *f. Suppl.* 415; Roxb. *Fl. Ind.* iii, 575; Cooke *Fl. Bomb.* ii, 622. *T. involucrata*, var. *cannabina*, Muell.-Arg.; F. B. I. v, 465.

An erect or climbing shrub 4—5 ft. high, not twining, more or less hispid and with stinging hairs. *Stems* stout, terete, woody. *Leaves* palmately 3-partite, up to 3 $\frac{1}{2}$ in. long; lobes toothed or pinnatifid, the mid-lobe much longer than the lateral ones. Male flowers and calyx of female flowers as in *T. involucrata*. *Styles* 3, slightly spread-

ing, not revolute. *Capsules* $\frac{3}{8}$ in. across, 3-lobed, hirsute; lobes globose. *Seeds* globose, smooth, $\frac{1}{8}$ in. in diam.

Jumna ravines near Etawah (Duthie), Bundelkhand (Duthie), and probably in other localities within the area of this flora. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon; often found in hedges.

21. SAPIUM, P. Br.; Fl. Brit. Ind. v, 469.

Trees and shrubs. *Leaves* alternate, entire, serrate or toothed, penninerved, petiole often 2-glandular at the top. *Flowers* monoecious, in terminal simple or branched spikes or racemes, apetalous and without any disk; males above, several in each bract; females in the lower part of the spikes or racemes, or in separate spikes, solitary in the bracts. **MALE** flowers: *Calyx* membranous, shortly 2-3-lobed or toothed, or splitting to the base into 2 or 3 valvate segments. *Stamens* 2 or 3, filaments free; anther-cells ovoid, distinct, contiguous, parallel. *Pistillode* none. **FEM.** flowers: *Calyx* 3-fid or 3-partite. *Ovary* 2-3-celled, styles free or connate at the base, spreading and recurved, entire; ovules solitary in each cell. *Fruit* a crustaceous capsule, fleshy or pulpy, rarely woody, at length loculicidally 3-valved. *Seeds* globose, with a strophiole, usually long-persistent on the columella, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 25, all tropical.

S. insigne, *Trimen Syst. Cat. Ceyl. Pl.* 83; *F. B. I. v*, 471; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2) 356; *Collett Fl. Siml.* 453; *Gamble Man.* 625; *Prair Beng. Pl.* 954; *Cooke Fl. Bomb. ii*, 622; *Brandis Ind. Trees* 585. *Falconeria insignis*, *Royle Ill.* 354, t. 84 a or t. 98. *F. Wallichiana*, *Royle l.c.f.* 3. *Excoecaria insignis*, *Muell.-Arg.*; *Brandis For. Fl.* 442.—Vern. *Khinna*, *khurun*, *khiria*, *khirni*, *lendwa*.

A medium-sized glabrous deciduous tree or shrub, with a thick acrid milky juice; bark grey, rough and cork-like when old; branches thick and soft. *Leaves* bright-green, crowded towards the ends of the branches, 5-10 in. long, elliptic- or oblong-lanceolate, acuminate, crenate-serrate; base acute, sometimes unequal; main lateral nerves 10-16 pairs, slender; petioles 1-1 $\frac{3}{4}$ in. long, with 2 conspicuous glands at the apex. *Flowers* appearing before the leaves, yellowish green, in 1-sexual robust spikes 3-8 in. long. **MALE FLOWERS** sessile, $\frac{1}{2}$ - $\frac{1}{3}$ in. in diam., the central flower of each fascicle opening first. *Sepals* 2, open in bud, orbicular, concave, $\frac{1}{18}$ in. in diam. *Stamens* 2, filaments very short, anthers scarlet. **FEM. FLOWERS** shortly stalked. *Sepals* ovate-acuminate. *Styles* 3, short spreading, slightly connate at the base. *Capsules* $\frac{1}{3}$ in. in diam., subglobose, at first fleshy, becoming dry and irregularly dehiscent when ripe, closely packed on the robust rhachis.

Dehra Dun and Sub-Himalayan tract eastwards. Flowers Jan.—March. **DISTRIB.:** Outer warm valleys of the Himalaya on dry rocky slopes from the Beas eastwards to Bhutan (not in Sikkim) up to 5,500 ft.; also in Assam, Chittagong and Burma; extending to the Bombay

Pres., S. India and Ceylon. The soft white wood is used for making the cylinders of native drums. The acrid milky juice, said to be poisonous, is sometimes used externally in medicine. The tree is frequently killed by frost at the higher elevations.

SAPIUM SEBIFERUM, Roxb.; *Fl. Ind.* iii, 693; *F. B. I.* v, 470; *Watt E. D.*; *Comm. Prod. Ind.* 979; *Kanjilál For. Fl.* (ed. 2), 355; *Gamble Man.* 624; *Prain Beng. Pl.* 954; *Brandis Ind. Trees* 584; *Cooke Fl. Bomb.* ii, 623. *Excœcaria sebifera*, *Muell.-Arg.*; *Brandis For. Fl.* 441. *Stillingia sebifera*, *Michx.*; *Royle Ill.* 328.—Vern. *Tár-charbi* (Dehra Dun), *pahári shisham* (Saharanpur). (Chinese Tallow-tree). A small quick-growing deciduous tree, somewhat resembling in its foliage the shisham-tree (*Dalbergia Sissoo*). It is cultivated in many parts of the Upper Gangetic Plain, and has become quite naturalized, especially in Dehra Dun. It flowers June—Aug., and the seeds ripen Oct.—Dec. The tree is indigenous in China and Japan, where the white tallow-looking wax surrounding the seeds is used for burning. The leaves before falling become beautifully coloured with orange and scarlet.

The following plants belonging to genera not mentioned above should be briefly noticed:—

PEDILANTHUS TITHYMALOIDES, *Poit.*—A shrub with fleshy branches, allied to *Euphorbia*, from which it chiefly differs in its conspicuous scarlet slipper-shaped involucre. It was introduced into India from the West Indies, and is grown in hedges in many parts of the country. *Royle* (*Ill.* 328) mentions it as a possible substitute for ipecacuanha (*Psychotria Ipecacuanha*), which is a native of Brazil.

JATROPHA CURCAS, *Linn.*; *Royle Ill.* 328; *Brandis For. Fl.* 442; *Ind. Trees* 576; *F. B. I.* v, 383; *Watt E. D.*; *Kanjilál For. Fl.* (ed. 2), 352; *Gamble Man.* 613; *Prain Beng. Pl.* 941; *Cooke Fl. Bomb.* ii, 578.—Vern. *Safed arand.* (Physic-nut). A soft-wooded evergreen shrub or small tree introduced from Trop. America. It is often found in a semi-wild condition in the vicinity of villages or is planted in hedges. The oil extracted from the seeds is much used for burning, as well as medicinally. Other exotic species of *Jatropha*, including *J. gossypifolia*, *multifida* and *podagrica*, are more or less cultivated in Indian gardens for ornamental purposes.

ALEURITES MOLUCCANA, *Willd.*; *Royle Ill.* 327; *F. B. I.* v, 384; *Watt E. D.*; *Gamble Man.* 613; *Prain Beng. Pl.* 942; *Cooke Fl. Bomb.* ii, 626. *A. triloba*, *Forst.*; *Roxb. Fl. Ind.* iii, 629. Belgaum Walnut.

A handsome tree with polymorphous leaves and white flowers. It is a native of the Malay Archipelago, whence it was introduced into India and is now largely grown in gardens. The edible seeds contain a large quantity of oil, which is used for cooking as well as medicinally.

MANIHOT UTILISSIMA, *Pohl.* is the Bitter Cassava plant, from the pounded roots of which mandioc or cassava meal is prepared, also tapioca. It is a tall plant with tuberous roots and palmate leaves. It was introduced from S. America by the Portuguese and is occasionally cultivated in Indian gardens.

C. URTICACEÆ.

Herbs shrubs or trees. *Leaves* usually alternate, often oblique; stipules various. *Flowers* cymose or in clusters, usually minute, monœcious or diœcious and sometimes 2-sexual or polygamous, often crowded on the surface of a fleshy flat concave or globose receptacle or (in *Ficus*) on the inner walls of a closed receptacle; bracts usually small or none, but sometimes 2—4 or more in an involucre; bracteoles small or none, but sometimes conspicuous. *Perianth* simple, calycine, regular or irregular, equally or unequally toothed lobed or partite, segments imbricate or valvate. *Disk* hypogynous, obscure or none. *Stamens* as many as and opposite the perianth-lobes, rarely fewer or more, filaments usually free at the base, anthers 2-celled. *Pistillode* in male flowers small or none. *Ovary* superior, 1-celled, style often eccentric, simple or 2-fid, with stigmatose arms, or stigmas sessile, plumose or penicillate, ovule solitary. *Fruit* simple, as a drupe or samara, or of small free achenes, or compound in a confluent mass of perianths and pericarps. *Seed* erect, lateral or pendulous, testa membranous; albumen copious scanty or none, embryo straight or curved.—Species 1,500 or more, chiefly in tropical and sub-tropical regions of the world.

Plants with watery juice:—

Antthers in bud erect; style 2-fid; ovule pendulous:—

Flowers usually 2-sexual or polygamous—

Trees or shrubs with penninerved deciduous leaves:—

Fruit dry, samaroid 1. HOLOPTELEA.

Fruit a drupe.—Trees or shrubs:—

Leaves glabrous or softly pubescent; male-sepals imbricate; cotyledons broad 2. CELTIS.

Leaves scabrous; male-sepals induplicate-valvate; cotyledons narrow 3. TREMA.

Flowers usually diœcious.—Herbs with digitate leaves 4. CANNABIS.

Antthers in bud inflexed; style undivided or none; ovule erect:—

Leaves and stem with stinging hairs.—

Herbs with alternate leaves and connate stipules 5. GIRARDINIA.

Leaves and stems without stinging hairs:—

Female perianth 3—5-partite or obsolete; stigma penicillate; flowers in cymes or clustered on a fleshy receptacle:—

Leaves opposite; flowers minute, in dense cymose heads 6. PILEA.

Leaves alternate; flowers on a fleshy receptacle; female perianth minute or obsolete 7. ELATOSTEMA.

Female perianth tubular, shortly toothed or subentire, enclosing the achene:—

Fruiting perianth dry, membranous; stigma filiform:—

Stigma persistent.—Shrubs or small trees 8. BOEHMERIA.

Stigma jointed to apex of ovary, deciduous.—Herbs or under shrubs 9. POUZOLZIA.

Fruiting perianth more or less fleshy:—

Stigma sessile, subpeltate, ciliate 10. VILLEBRUNEA.

Stigma penicillate 11. DEBREGEASIA.

Female perianth none; flowers minute, in small cymose globose heads; stigma penicillate.—A shrub with the leaves snowy-white beneath 12. MAOUTIA.

Plants with milky juice:—

Anthers in bud reversed; stamens inflexed; ovules pendulous, anatropous.—Shrubs or trees:—

Female sepals fleshy and confluent in fruit, enclosing the achenes; styles 2-fid; flowers many, in spikes, or the fern. flowers subcapitate

13. MORUS.

Female sepals not fleshy in fruit.—A small tree or shrub with very rough leaves

14. STREBLUS.

Anthers in bud erect:—

Flowers all exposed; inflorescence congested in globose or oblong heads:—

Flowers dioecious, in small globose heads; stamens 4.—A subsucculent spinescent shrub

15. CUDRANIA.

Flowers monoecious, in large oblong heads; stamen 1.—Erect evergreen unarmed trees

16. ARTOCARPUS.

Flowers attached to the inner walls of a closed receptacle, monoecious rarely dioecious.—

Trees or erect or climbing shrubs, often epiphytic

17. FICUS.

1. HOLOPTELEA, Planch.; Fl. Brit. Ind. v, 481.

A large deciduous tree. *Leaves* alternate, distichous, penninerved, entire; stipules lateral, scarious. *Flowers* polygamous or 2-sexual, the males without a rudimentary ovary, arranged in fascicles at the scars of the previous year's shoots which are scaly but leafless. *Perianth* simple, calycine, 4—8-partite; lobes imbricate, often unequal. *Stamens* 4—8, usually 6—8; filaments erect, at length exerted, anthers hairy. *Ovary* stipitate, compressed; style short, 2-fid, the arms stigmatose within throughout their length; ovule solitary, pendulous. *Fruit* dry, indehiscent, samaroid or flat, the nucleus expanded into an obliquely ovate reticulate wing. *Seed* flat, albumen none, cotyledons longitudinally complicate; radicle small, superior.—A single species, confined to India, Ceylon and Cochin China.

H. integrifolia, Planch. in *Ann. Sc. Nat. Ser. 3*, 259; *F. B. I. V*, 481; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2)* 360; *Gamble Man.* 628; *Prair Beng. Pl.* 958; *Cooke Fl. Bomb. ii*, 629; *Brandis Ind. Trees* 595. *Ulmus integrifolia*, *Willd.*; *Roxb. Fl. Ind. ii*, 68; *Royle Ill.* 341; *Brandis For. Fl.* 431.—Vern. *Pápri*, *banchilla* (Saharanpur), *Kunj* and *dhamna* (Oudh), *chilla* (Bundelkhand). Indian Elm.

A large spreading almost glabrous deciduous tree. *Bark* grey; branchlets lenticellate; young shoots often pubescent. *Leaves* more or less coriaceous, or sometimes almost membranous, 3—5 in. long, elliptic, acuminate, entire (those of the seedlings and shoots often serrate), glabrous and shining or sometimes pubescent beneath; base unequally rounded or subcordate; main lateral nerves 5—7 pairs; petioles about $\frac{1}{2}$ in. long. *Flowers* $\frac{1}{2}$ in. across. *Perianth* pubescent; segments 4—5-partite. *Stamens* usually 6 or 7; filaments glabrous, anthers pubescent. *Ovary* stalked, compressed, the jointed stalk lengthening as the fruit ripens; styles stigmatose on the inner side. *Samara* obliquely

elliptic or suborbicular, about 1 in. in diam.; wing reticulately veined, notched at the apex.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Bundelkhand and in the forest tracts of Merwara. It is frequently met with near villages and in many gardens, within the area of this flora. The new leaves appear in March and April soon after the tree has flowered, and the fruit, which ripens during the hot season, remains for a long time on the tree. **DISTRIB.:** Outer Himalayan ranges from Jamu eastwards up to 2,000 ft., extending to Assam and Burma, and southwards from Bengal through Central, Western and South India to the dry region of Ceylon. The wood is used chiefly for fuel and charcoal. It emits a very unpleasant odour when freshly cut.

2. CELTIS, Linn.; Fl. Brit. Ind. v, 481.

Trees or shrubs, sometimes evergreen. *Leaves* alternate, bifarious, ovate, entire or serrate, base 3-nerved; stipules lateral, free. *Flowers* small, polygamous, solitary or cymose, male and androgynous cymes usually at the base of the shoots, the females in the upper axils. *Sepals* 4 or 5, imbricate. *Petals* none. *Stamens* 4 or 5, short, erect in bud, inserted round a woolly torus. *Ovary* sessile; style central, arms simple or lobed, plumose, ovule pendulous. *Fruit* a small ovoid or globose drupe; endocarp hard, smooth or rugose. *Seed* with a membranous testa, albumen scanty or none, embryo curved; cotyledons broad, inflexed flat or replicate, surrounding the upcurved radicle.—Species about 60, in temperate and tropical regions chiefly in the N. Hemisphere.

C. australis, Linn. *Sp. Pl.* 1043; Brandis *For. Fl.* 428, t. 50; *Ind. Trees* 595; *F. B. I. V.*, 482; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2)*, 360; *Gamble Man.* 629; *Collett Fl. Siml.* 455. *C. caucasica*, Willd.; *J. L. Stewart in Journ. Agri.-Hort. Soc. Ind. xiii*, pt. 3, 299.—Vern. *Kharak, kharak-chena* (Dehra Dun).—Nettle-tree.

A medium-sized deciduous tree with bluish-grey or brown bark which is often speckled with whitish dots and in large trees horizontally wrinkled; branchlets drooping; young branches, leaves and petioles more or less hairy. *Leaves* 3—5 in. long, obliquely ovate or ovate-lanceolate, acuminate, serrate or entire towards the base, rough and coriaceous when full-grown, dark-green and glabrous on upper surface; base acute or rounded, sometimes oblique and with 3 strong nerves, midrib penninerved above; petioles $\frac{1}{2}$ in., stipules subulate, shorter than petioles, caducous. *Flowers* pale yellow, the females in the upper axils, long-pedicelled rather larger than the males. *Sepals* oblong, with woolly margins, deciduous. *Ovary* woolly. *Drupe* yellowish or black, ovoid or subglobose, $\frac{1}{2}$ in. in diam. or less, its pedicel $\frac{1}{2}$ —2 in., putamen rugose.

Dehra Dun, both planted and self-sown it is probably wild in the forests of N. Oudh, (Wallich, Duthie; and in the Bijnor forests of Rohilkhand (Stewart). *Flowers* March—May, often before the leaves appear. **DISTRIB.:** W. Himalaya eastwards to Nepal up to 8,000 ft.; Punjab,

on the Salt range; extending to Chitral, Afghanistan, Baluchistan, and westwards to S. Europe. The wood is strong and tough and is used in the manufacture of oars, whip-handles; agricultural implements, etc. In the south of France and in Spain the tree is much cultivated for such purposes. The sweet fruit is sometimes eaten, and the leaves are much used for fodder. The villagers on the lower slopes of the North-West Himalaya very frequently store their winter supplies of fodder in the forks of the branches of this tree.

3. TREMA, Lour.; Fl. Brit. Ind. v, 483.

Shrubs or trees. *Leaves* alternate, 3—7-nerved at the base; stipules lateral, caducous. *Flowers* monœcious subdiœcious or polygamous, in small axillary cymes. *Perianth* simple. MALE flowers. *Sepals* 4 or 5, induplicate-valvate or subimbricate. *Stamens* 4 or 5, erect in bud. *Pistillode* small or none. FEM. flowers. *Sepals* as in male when stamens are present, flat and subimbricate in the absence of stamens. *Ovary* sessile; style central, with 2 linear arms, ovule pendulous. *Fruit* a small straight ovoid or subglobose drupe, usually tipped by the style, endocarp hard. *Seed* small, testa membranous, albumen fleshy, cotyledons narrow, radicle ascending.—Species about 20, in tropical and sub-tropical regions of the world.

Leaves distinctly unequal at the base, softly pubescent beneath

1. *T. orientalis*.

Leaves almost equal at base, very scabrid on both surfaces

2. *T. pulitoria*.

1. *T. orientalis*, Blume *Mus Bot.* ii, 62; *F. B. I. V.* 484; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 361; *Gamble Man.* 630; *Prain Beng. Pl.* 960; *Cooke Fl. Bomb.* ii, 631; *Brandis Ind. Trees* 597. *Sponia orientalis*, *Planch.*; *Royle Ill.* 341; *Brandis For. Fl.* 430. *Celtis orientalis*, *Lin.*; *Roxb. Fl. Ind. II.* 65.—Indian Nettle-tree or Charcoal-tree.

A small quick-growing short-lived evergreen tree; bark thin, dark-grey, with many lenticels. *Branches* spreading, straight; branchlets hairy. *Leaves* 2—3 in. long, obliquely ovate, acuminate, crenate-serrulate, rather rough on the upper surface, soft beneath with white pubescence; base unequally rounded or subcordate, 3-nerved, lateral nerves above the basal ones 3—4 pairs; petioles $\frac{1}{4}$ — $\frac{3}{8}$ in.; stipules as long as the young petioles, deciduous. *Cymes* lax, spreading, pubescent, usually exceeding the petioles. MALE FLOWERS: *Sepals* elliptic-lanceolate. *Stamens* 5, longer than the sepals. *Pistillode* small. FEM. FLOWERS: *Sepals* as in the male. *Drupe* ovoid, $\frac{1}{8}$ in. in diam., glabrous, black when ripe.

Dehra Dun, usually in swampy ground and eastwards along the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. Flowers during the greater part of the year. **DISTRIB.:** More or less throughout India, extending to Ceylon, the Malay Islands and China. This tree is remarkable for its sudden appearance in clearings of moist forest; it is also very useful for planting on landslips. The wood produces a good charcoal suitable for making gunpowder, and the inner bark yields a strong fibre much used for binding loads.

2. T. politoria, Planch. in *Ann. Sc. Nat. Ser. 3, X*, 326; *Ind. Trees* 597; *F. B. I. V*, 484; *Kanjilal For. Fl. (ed. 2)*, 362; *Gamble Man.* 631; *Collett Fl. Siml.* 456; *Prair Beng. Pl.* 960. *Sponia politoria*, Planch.; *Brandis, For. Fl.* 430.—Vern. *Kagshi, kuri* (Dehra Dun), *Khardâ* (Saharanpur), *jaun* and *bâtu* (Bijnor), *banharria* (Oudh), *rabna* (Merwâra).

A small sparingly branched evergreen tree with a short trunk and stout branchlets which are scabrid with firm white hairs swollen at the base. *Leaves* bifarious, 2—5 in. long, oblong or ovate-lanceolate, acuminate, serrulate, very scabrous on both surfaces, dark-green and usually shining above, paler beneath; base nearly equal, rounded or cordate, 3-nerved; petiole $\frac{1}{4}$ in. long, stipules exceeding the petioles. *Flowers* in compact cymes, usually monoecious. *Drupe* globose, seated on the persistent perianth.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Merwâra (Lowrie). *Flowers* April—June. *DISTRIB.*: Salt range of Punjab and lower Himalayan valleys eastwards to Bhutan; Bengal, C. India and Mt. Abu in Rajputana. This tree, like the preceding, is very useful for planting on landslips. The foliage affords good fodder for cattle, and the inner bark yields a strong fibre. The hard rough leaves are much used for polishing wood and ivory.

4. CANNABIS, Tournef.; *Fl. Brit. Ind.* v, 487.

A tall annual. *Leaves* alternate or the lower opposite, upper 1—3, lower 5—11-partite, penninerved; lobes lanceolate, serrate; stipules lateral. *Flowers* small, dioecious, rarely monoecious; males in axillary paniced cymes; females in axillary racemes; bracts in females convolute, leafy. *MALE flowers.* *Sepals* 5, imbricate. *Stamens* 5, erect in bud; filaments filiform, anthers oblong. *Pistillode* none. *FEM. flowers.* *Perianth* hyaline, embracing the base of the ovary. *Ovary* sessile, of 2 carpels, 1 fertile and 1 sterile, 1-locular; *ovule* pendulous, reversed, campylotropous; style central; arms 2, filiform, caducous. *Fruit* a somewhat compressed crustaceous nut. *Seed* somewhat flattened; albumen unilateral, fleshy, embryo curved; cotyledons broad, thick; radicle up-curved, incumbent.—A single species, wild in Central Asia, and possibly in Northern India.

C. sativa, Linn.; *Roxb. Fl. Ind.* iii, 772; *Royle Ill.* 333; *Madden in Journ. As. Soc., Beng.* xvii (1848), pt. 1, 399; *A. DC. L'Orig. Pl. Cult.* 117; *Duthie and Fuller in Field and Gard. Crops* i, 80, t.t. 19 and 20; *Watt E. D.; Comm. Prod. Ind.* 249; *F. B. I. V*, 487; *Kanjilal For. Fl. (ed. 2)*, 385; *Collett Fl. Siml.* 456; *Prair Beng. Pl.* 960; in *Sc. Memb. Med. Dept. (New ser. 1904)* No. 12.—*Cooke Fl. Bomb.* ii, 659.—Vern. *Bhang, siddhi, ganja, charas.* (Hemp).

Abundant throughout the greater part of India in waste ground and by roadsides; also widely distributed up to considerable elevations on the Himalaya, especially in the vicinity of habitations and on the sites of much frequented camping grounds along the principal trade-

routes leading to C. Asia. For this reason it is difficult to ascertain to what extent, if at all, this plant may be regarded as truly indigenous in British India. The following are the more important products derived from this plant:—*charas*, *bhāng*, *ganja*, also the fibre and the seeds. *Charas* is the narcotic resinous substance which appears on the stems and inflorescence, and is collected chiefly from cultivated female plants. This substance is imported into India chiefly from C. Asia where the drier climate is more suitable for its cultivation. *Bhāng* consists of the dried leaves and flowers and is largely prepared in India, as also is *ganja*, the name given to the dried flowering tops of the cultivated female plant. Both *bhāng* and *ganja* are often mixed with tobacco and smoked. The cultivation of the plant for its fibre (hemp) is mainly restricted to some of the warm valleys of the W. Himalaya between Nepal and Kashmir. The male plant yields the best fibre and is always cultivated, as the fibre yielded directly by the wild-growing plant is worthless. Hemp seeds are well known as a favourite food of cage-birds, and in India they are often roasted and eaten by the Himalayan villagers. For further information regarding this plant see Watt in Commercial Products of India, p. 249.

5. GIRARDINIA, Gaud. ; Fl. Brit. Ind. v, 550.

Herbs or undershrubs with stout stinging hairs. *Leaves* alternate, 3-nerved, entire or lobed, serrate; stipules connate, foliaceous. *Flowers* in clusters, monœcious or sometimes dioecious; clusters in simple or paniced spikes or heads, armed with stinging hairs. *Perianth* simple. **MALE** flowers. *Sepals* 4–5, valvate. *Stamens* 4–5, inflexed in bud, filaments free. *Pistillode* globose or cupular. **FEM.** flowers. *Perianth* tubular, ventricose, 2–3-toothed, at length splitting on one side and spathe-like. *Ovary* straight; stigma subulate, papillose, ovule erect. *Fruit* a broad compressed achene, seated on the perianth, pericarp rather thick. *Seed* with a membranous testa, albumen scanty, cotyledons broad.—Species 7, in Trop. Asia and Africa.

G. heterophylla, Dcne. in Jacquem. Voy. Bot. 151, t. 153; Brandis For. Fl. 404; F. B. I. V, 550; Kanjilal For. Fl. (ed. 2), 384; Gamble Man. 656; Collett Fl. Siml. 462, fig. 149; Watt Comm. Prod. Ind. 161. *Urtica heterophylla*, Willd.; Roxb. Fl. Ind. iii, 586.—Vern. *Bichua*, *chichru*, *kushki*.

A coarse erect perennial herb 4–10 ft. high, closely beset with slender rigid sharp stinging hairs. *Leaves* 4–12 in. long and often as broad, broadly ovate, acuminate; base cordate or truncate; margins usually sharply and falcately dentate, rarely entire; under surface usually glabrous except for the bristly stinging hairs on the nerves; petioles 3–6 in. long, densely armed with stinging hairs; stipules about $\frac{1}{2}$ in. long, ovate. *Flowers* small, monœcious, densely crowded. **MALE** flowers in long slender often paniced spikes. *Perianth* 4-partite. *Stamens* usually 4. *Pistillode* globose. **FEM.** flowers crowded in simple or paniced spikes and usually forming a stout densely bristly

inflorescence up to 6 in. long or more. *Perianth* $\frac{1}{10}$ in. long, 3-lobed, splitting when the fruit ripens; lobes triangular, acute. *Style* filiform. *Achenes* $\frac{1}{2}$ in. long, flat, obliquely ovate.

Abundant in Dehra Dun and eastwards along the Sub-Himalayan tract. Flowers during the rainy season. **DISTRIB.:** Sub-tropical and temp. Himalaya from Kashmir to Sikkim, up to 7,000 ft.; also in Assam and the Khasia Hills, extending to Burma, Java and China. The stems yield a strong silk-like fibre which is used for making twine or ropes, and sometimes (in Sikkim) a coarse kind of cloth is made from it. The leaves are often used as a vegetable by the village people of the Western Himalaya.

VAR. zeylanica, *F. B. I. l.c.* 551. *G. zeylanica*, *Dcne. l.c.* 152; *Prair. Beng. Pl.* 961; *Cooke Fl. Bomb. ii.* 633. *Urtica zeylanica*, *Burm.*—Leaves pinnatifidly lobed; margins rather bluntly serrate; stipules broadly cordate; female inflorescence (in fruit) densely compacted into oblong or reniform masses. This variety occurs in the dry southwestern hilly portion of the area of this flora and extends through Central India and the Deccan to Travancore and Ceylon. It is often known as the *Nilgiri nettle*, which name, however, should more correctly be referred to *G. palmata*, *Gaud.* (*G. heterophylla*, **VAR. palmata**, *F. B. I. l.c.*) as being the more prevalent variety found on the Nilgiris.

6. PILEA, Lindl.; Fl. Brit. Ind. v, 551.

Herbs, rarely undershrubs. *Leaves* opposite, in equal or unequal pairs, entire or serrate, 3-nerved at the base, rarely penninerved; stipules connate, intrapetiolar. *Flowers* minute, monœcious or diœcious, in axillary long or short peduncled dichotomously branching cymes, bracts small or none. *Perianth* simple. **MALE** flowers: *Sepals* 2—4, free or connate in a cup, often gibbous or horned on the back. *Stamens* 2—4, *Pistillode* conical or oblong. **FEM.** flowers: *Sepals* 3, rarely 4, very small and unequal, dorsal longest, sometimes gibbous or hooded. *Staminodes* minute and scale-like or none. *Ovary* straight; stigma sessile, pinnicillate, ovule erect. *Fruit* an ovoid or oblong compressed membranous or crustaceous achene, sometimes clasped at the base by the persistent sepals. *Seed* erect, testa thin, albumen very scanty, cotyledons broad.—**Species** about 100, tropical or sub-tropical, none found in Australia.

P. peploides, *Hook. and Arn. Bot. Beech. Voy.* 96; *F. B. I.* v, 554.

A very small tufted glabrous herb, branching from the base. *Stems* or branches 3—5 in. long, succulent flaccid. *Leaves* $\frac{1}{2}$ in. long and broad, orbicular-ovate, rounded at the apex, entire or crenate above the middle; base cuneate, 3-nerved; petiole as long as the blade; stipules obscure. *Flowers* minute, indense sessile androgynous, globose heads $\frac{1}{4}$ in. in diam. *Achenes* very minute sub-globose, smooth.

In the Kheri district of N. Oudh, and in the Gorakhpur district (Duthie's collectors). **DISTRIB.:** From the Punjab Himalaya to the Sikkim Terai also in Cachar and Burma, extending to China, Japan, Java and to the Sandwich and Galapagos Islands.

P. Muscosa, *Lindl.* A minute creeping herb with entire penninerved leaves is often found as a garden weed in damp places and is known as the *Gunpowder Plant* owing to the profuse discharge of pollen from the anthers when the plant is shaken. It has been introduced from S. America.

7. ELATOSTEMA, Forst., *Fl. Brit. Ind.* v, 562.

Herbs or undershrubs. *Leaves* alternate or with sometimes a minute leaf sub-opposite to the normal leaf, distichous, sessile or sub-sessile, usually very oblique and unequal-sided, 3-nerved at or near the base; stipules lateral or intrapetiolar. *Flowers* very minute, crowded on sessile or peduncled unisexual usually involucrate receptacles; bracts oblong or ovate, the outer sometimes with a dorsal spur or horn, bases nearly free or more or less confluent in a fleshy circular or lobed disk, the tips usually projecting from its margin; bracteoles densely crowded, those of the male heads usually oblong, of the females spatulate; florets often in clusters, each cluster surrounded by a partial bract, giving the head a lobed appearance. **MALE** flowers: *Sepals* 4 or 5, two or more usually tubercled or spurred on the back. *Stamens* 4 or 5, inflexed in bud. *Pistillode* minute. **FEM.** flowers: *Sepals* 3—5, very minute, much shorter than ovary, persistent. *Staminodes* minute or none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* a minute ellipsoid or fusiform usually ribbed achene subtended by the very minute perianth. *Seed* usually exalbuminous, testa membranous, cotyledons ovate or semiterete.—Species about 50, tropics of the Old World except in Australia.

E. sessile, *Forst. Char. Gen.* 106, var. *polycephala*, *Hk. f. in F. B. I. V.* 563; *Collett Fl. Siml.* 466. *Procris punctata*, *B.-Ham. in Don Prod.* 61.

Stem 1—2 ft., often bent at the joints, prostrate and rooting below.

Leaves sessile or nearly so, membranous, 4—8 in. long, obliquely oblanceolate or oblong, coarsely serrate, the tip caudate, bright green when dry, cystoliths abundant on upper surface. *Receptacles* solitary or 2—3 together, $\frac{1}{4}$ — $\frac{1}{2}$ in. diam., the males sessile, the fem. shortly stalked and without involucre bracts; bracteoles very minute, villous, hyaline. *Achenes* very minute, ellipsoid, acute at both ends, ribbed.

Dehra Dun, in shady ravines. **DISTRIB.:** Himalaya from the Punjab eastwards and up to 8,000 ft.; also in Assam, and southwards to the Nilgiri Hills and Ceylon; extending to trop. Africa, the Malay and Pacific Islands, China and Japan.

8. BOEHMERIA, Jacq.; *Fl. Brit. Ind.* v, 575.

Shrubs or small trees. *Leaves* opposite or alternate, toothed, 3-nerved at the base; stipules usually free, deciduous. *Flowers* monoecious or dioecious, both sexes in axillary spicate racemed or paniced clusters; bracts small, scarious. **MALE** flowers: *Perianth* 3—5-lobed or partite, valvate. *Stamens* 3—5, inflexed in bud. *Pistillode* clavate or globose. **FEM.** flowers: *Perianth* tubular, 2—4-toothed, angled winged or

ventricose in fruit. *Ovary* included; stigma filiform, persistent, ovule erect. *Fruit* a crustaceous achene, at first closely invested by the perianth, at length free. *Seed* with membranous testa, albumen copious or scanty, cotyledons ovate.—Species about 45, chiefly tropical.

Leaves all alternate.—A tree .

1. *B. rugulosa*.

Leaves mostly opposite—Shrubs:—

Leaves lanceolate; petioles up to one inch long

2. *B. macrophylla*.

Leaves broadly ovate or orbicular; petioles exceeding one inch:—

Female spikes long, overtopping the terminal leaves .

3. *B. platyphylla*.

Female spikes short, erect, not overtopping the terminal leaves

4. *B. scabrella*.

1. *B. rugulosa*, Wedd. in *Ann. Sc. Nat. Ser. 4, i, 200*; Brandis *For. Fl.* 403; *Ind. Trees* 617; *F. B. I. V, 577*; Kanjilal *For. Fl. (ed 2), 380*; Gamble *Man.* 657. *B. nervosa*, Madden in *Journ. As. Soc. Beng.* xvii, pt. 1, 587.—Vern. *Geti, genthi* (Dehra Dun).

A small or medium-sized evergreen tree; young parts and under surface of leaves hoary; branches terete; bark brown, deeply fissured. *Leaves* alternate, coriaceous, 3—5 in. long, elliptic-lanceolate, acuminate, crenulate, rugulose and dark-green above, paler or velvety pubescent beneath strongly 3-nerved, the intervening veins and veinlets conspicuously anastomosing; petiole $\frac{1}{2}$ —1 in. long; stipules ovate, connate. *Flowers* dioecious, in sessile globose clusters forming simple axillary spikes 3—8 in. long, each cluster in the axil of a cordate bract.

Dehra Dun, in shady ravines and eastwards along the Sub-Himalayan tracts. Flowers in the rainy season. **DISTRIB.:** Outer Himalayan ranges from the Sutlej to Bhutan, ascending to 4,000 ft.; also in Upper Burma.

The wood of this tree is much used by the villagers of Garhwal and Kumaon in the manufacture of many of their household articles, such as cups, boxes, combs, etc., also the vessels which they employ for holding milk. The tree is highly recommended for planting on dry bare slopes, and should be protected where found growing naturally in such situations.

2. *B. macrophylla*, Don, *Prod.* 60; Brandis *For. Fl.* 403; *Ind. Trees* 617; *F. B. I. V, 577*; Watt *E. D.*; Kanjilal *For. Fl. (ed. 2), 380*; Gamble *Man.* 658.—Vern. *Bara siaru* (Dehra Dun).

A short or small tree; bark greyish-brown, rough with small lenticels; branchlets stout, obtusely 4-angled, usually strigose. *Leaves* opposite, 6—12 in. long, lanceolate, caudate-acuminate, obtusely serrate, upper surface sparsely hispid, rugulose and pustular, softly or hispidly pubescent or glabrate beneath; petiole $\frac{1}{2}$ —1 in. long; stipules lanceolate, midrib hairy. *Spikes* elongate, pendulous, leafless, simple or branched below. *Clusters* globose, $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam.; bracts lanceolate. *Fruit* obovate, cuneate, compressed, ciliate, with a 2—4-toothed neck.

Ravines on Nagsidh Hill in Dehra Dun (Kanjilal), and in river-beds eastwards along the Sub-Himalayan tract. Flowers Aug.—Sep. **DISTRIB.:** Sub-tropical Himalaya from the Jumna to Mishmi, up to 4,000 ft., and from the Khasia Hills south to Chota Nagpur; also

in Upper Burma and extending to China. The bark yields an excellent fibre of which fishing nets and lines are made.

3. *B. platyphylla*, *Don Prod.* 60; *Brandis For. Fl.* 403; *Ind. Tree* 617; *F. B. I. V.*, 573; *Watt E. D.*; *Kanjilal For. Fl. (ed. 2)*, 381; *Gambl. Man.* 658; *Collett Fl. Siml.* 466.—Vern. *Siâr* (Dehra Dun).

A large shrub up to 12 ft. high, with dark-brown and rather rough branches. *Leaves* mostly opposite, 4—9 in. long, broadly ovate, cordate elliptic or suborbicular, acuminate or caudate, coarsely toothed more or less rugose, sparsely hispid-pubescent or glabrate on both surfaces; base 3-nerved; petiole 1—5 in. *Flowers* dioecious or monoecious. *Male spikes* often branching generally not exceeding the leaves. *Fem. spikes* simple, far-exceeding the terminal leaves, becoming brown when achenes are ripe.

Shady ravines and banks of streams in Dehra Dun (Kanjilal), also in the Sub-Himalayan tracts eastwards. Flowers April—Aug. Widely distributed in India, and very variable, especially on the outer ranges of the Himalaya up to 5,000 ft. The bark yields a strong white fibre and the foliage affords a good fodder for cattle.

4. *B. scabrella*, *Gaud. in Freyc. Voy.* 500; *C. B. Clarke in Journ. Linn. Soc. XV*, 124; *Prain Beng. Pl.* 964; *Cooke Fl. Bomb.* 636. *B. platyphylla* var. *scabrella*, *Wedd.*; *F. B. I. V.*, 578; *Watt, E. D.* *Urtica scabrella*, *Roxb. iii*, 581.

A shrub with soft glabrous or strigose branches. *Leaves* usually opposite, 3½—7 in. long, broadly ovate obovate or sub-orbicular, acuminate or cuspidate, sharply serrate with triangular teeth, usually rugose and lacunose beneath; base rounded or cordate, 3-nerved; petioles ¼—4 in. long; stipules lanceolate, acute. *Flowers* in small globose clusters on slender erect spikes. *Male spikes* crowded in the lower axils, the female spikes usually solitary, not exceeding the terminal leaves. **MALE FLOWERS:** *Sepals* 4, ovate, acuminate. **FEM. FLOWERS:** *Perianth* ⅞ in. long, pubescent, shortly contracted round the base of the persistent style into a small 4-toothed mouth. *Achenes* compressed, shining, closely invested by the turgid persistent perianth.

Dehra Dun and eastwards along the Sub-Himalayan tract. **DISTRIB.:** More or less throughout India from the outer Himalayan ranges; also in Ceylon.

***B. Nivea*,** *Gaud.*; *Brandis For. Fl.* 402; *F. B. I. V.*, 576; *Watt E. D.*; *in Agril. Ledger No. 15* (1898); *Comm. Prod. Ind.* 143; *Gamble Man.* 657; *Prain Beng. Pl.* 964; *Cooke Fl. Bomb. ii*, 637. *Urtica nivea*, *L.*

This is the well known *rheea* or China grass, a native of China, Japan and the Malay Islands. It yields a most valuable fibre and has been cultivated for several years in various parts of India. The expense, however, involved in its cultivation, and the difficulties met with in the extraction and preparation of the fibre have hitherto kept it in the background as a marketable fibre plant.

B. Tenacissima, Gaud. (*Urtica tenacissima*, Roxb.) is regarded by most authors as a tropical variety of the above, differing chiefly by having the under surface of its leaves green instead of pure white. It is found wild in the Malay Peninsula and its native name is *râmi*.

9. POUZOLZIA, Gaud.; Fl. Brit. Ind. v, 580.

Herbs or undershrubs. *Leaves* alternate or the lower, rarely all, opposite, usually entire, 3-nerved at the base, smaller upwards, the uppermost often reduced to bracts; stipules free, often persistent. *Flowers* minute, usually monoëcious, in 1-sexual or androgynous clusters sessile in the axils of the leaves or bracts, bractcoles small, individual florets pedicelled. **MALE** flowers: *Perianth* 4 or 5-partite or-lobed, rarely 3-part.; lobes valvate, with concave or abruptly inflexed tips and transversely plicate bracts. *Stamens* 4 or 5, rarely 3. *Pistillode* clavate or oblong. **FEM.** flowers: *Perianth* tubular, often beaked; mouth contracted, 2-4-toothed. *Ovary* included, stigma filiform, jointed at the top of the ovary, soon deciduous, ovule erect. *Fruit* a small achene with brittle shining pericarp, enclosed in but usually free from the marcescent perianth. *Seed* with membranous testa, albumen very scanty or none, cotyledons ovate.—Species about 50, in the tropics of the Old World.

Lobes of male perianth usually 4, convex or gibbous on the back; stamens 4, rarely 5:—

Leaves toothed—A small shrub

Leaves quite entire—A perennial herb

Lobes of male perianth 5, abruptly inflexed above the middle; stamens 5—A perennial herb

1. *P. viminea*.

2. *P. indica*.

3. *P. pentandra*.

1. P. viminea, Wedd. in DC. *Prod.* xvi, i, 228; Brandis *For. Fl.* 405; *Ind. Trees* 617; *F. B. I. V*, 581; Kanjilal *For. Fl.* (ed. 2), 381, Gamble *Man.* 658. Collett *Fl. Siml.* 467; *Boehmeria frondosa*, Don *Prod.* 59.

A small shrub with slender virgate pubescent or strigose branchlets.

Leaves alternate, $\frac{1}{2}$ —5 in. long, ovate or oblong-lanceolate, acuminate, dentate, smooth or scaberulous on the upper surface, strigose or pubescent beneath and often with a grey or white tomentum; base 3-nerved; petioles $\frac{1}{2}$ —2 in. long, strigose. *Perianth* of male flowers 4-partite; segments convex on the back. *Stamens* 4. *Fruit* angled or obscurely margined.

Dehra Dun, in moist shady ravines. Flowers during the rainy season.

DISTRIB.: Himalaya from the Sutlej eastwards to Sikkim, ascending to 7,000 ft.; also in Burma, Assam and in the Malay Peninsula and Islands. The leaves are eaten in Sikkim by the Lepchas as a cooked vegetable. The bark yields a fibre suitable for making ropes.

2. P. indica, Gaud. in Freyc. *Voy.* 503; *F. B. I. V*, 581; Collett *Fl. Siml.* 467; Prain *Beng. Pl.* 965; Cooke *Fl. Bomb.* ii, 638. *Urtica suffruticosa*, Roxb. *Fl. Ind.* iii, 584.

A perennial herb, very variable as to size and habit, glabrous, hoary or pubescent. *Stem* erect or prostrate, 6—20 in., stout or slender.

Leaves opposite or alternate, $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, ovate to lanceolate, obtuse,

acute or acuminate, entire, hairy; base acute or rounded; lateral nerves 1 pair above the 3 basal ones; petioles $\frac{1}{2}$ —1 in.; stipules ovate acuminate, ciliate. *Flowers* strigose with simple or hooked hairs. **MALE FLOWERS:** *Sepals* 4, dorsally rounded, acute. *Stamens* 4. *Pistillode* small, clavate. **FEM. FLOWERS:** *Perianth* tubular, persistent ribbed, 2-fid at the apex, closely investing the achenes. *Achenes* $\frac{1}{10}$ in. long, broadly ovoid, shining.

Abundant within the area and often met with as a garden weed. **DISTRIB.:** Throughout trop. and sub-trop. India and in Ceylon, ascending to 7,000 ft. on the Himalaya, eastwards to Burma and south to Malay Peninsula and Islands, also in China.

VAR. alienata, Wedd. in *F. B. I. V.*, l.c. *P. nana*, Don *Prod.* 60. *Urtica alienata*, Linn.; *Roxb. Fl. Ind.* iii, 582. It differs from the type in having the leaves mostly opposite, long-petioled and ovate, and the leaf-base is usually rounded. It is said to be common in India, but I have seen no specimens from the Upper Gangetic Plain.

3. P. pentandra, Benn. *Pl. Jav. Rar.* 64, t. 14; *F. B. I. V.*, 583; *Watt E. D.*; *Collett Fl. Siml.* 468; *Prain Beng. Pl.* 965; *Cooke Fl. Bomb.* ii, 638. *Urtica pentandra*, *Roxb. Fl. Ind.* iii, 583.

A tall erect glabrous perennial herb, 2—3 ft. high; stem terete below, usually angular above, diffusely branched. *Leaves* sessile or shortly stalked; the lower opposite, 1—4 in. long, oblong-lanceolate, acute or acuminate, strongly 3-nerved, ciliate; the upper much smaller than the lower ones and mostly alternate, linear-oblong, acuminate or cuspidate, exceeding the flower-clusters, the base often cordate. *Flowers* in clusters in the axils of the floral leaves (bracts) of an erect or nodding terminal spike up to 18 in. long. **MALE FLOWERS** stalked, truncate in bud, ciliate. *Perianth* 5-partite. *Stamens* 5. **FEM. FLOWERS:** *Perianth* (in fruit) with 2 or 3 broad lateral wings.

Dehra Dun (Gamble and Duthie), Pilibhit (Duthie), Gorakhpur (Burkill). **DISTRIB.:** Trop Himalaya from Kangra eastwards to Assam Khasia Hills and Bengal and south to Orissa and Kanara, extending to Afghanistan, Java and China. A very variable species of which four varieties are described in *Fl. Br. Ind.*

10. VILLEBRUNEA, Gaud.; *Fl. Brit. Ind.* v, 589.

Trees or shrubs. *Leaves* alternate, petioled, entire or crenulate penninerved or 3-nerved at the base; stipules partially connate intrapetiolar. *Flowers* dioecious, densely capitately fascicled, fascicles solitary or laxly cymose; bracts small, often linear; bracteoles cup-shaped, sometimes connate. **MALE flowers:** *Perianth* 4-partite; segments ovate, acute, valvate or slightly imbricate, subglobose in bud. *Stamens* 4. *Pistillode* obovate—clavate. **FEM. flowers:** *Perianth* tubular, adnate to the ovary; mouth narrowed, minutely toothed. *Ovary* erect, covered by the adherent perianth; stigma sessile, small or discoid, ovule erect. *Fruit* a crustaceous achene, adnate to the slight fleshy perianth. *Seed* straight, often acuminate, testa membranous, albumen usually scanty, cotyledons

broadly ovate.—Species about 8, in India and the Malay Archipelago extending to Japan.

V. frutescens, *Blume Mus. Bot. Lugd. ii, 168*; *Brandis For. Fl. 406*; *Ind. Trees 610*; *F. B. I. V, 590*; *Watt E. D., Kanjilal For. Fl. (ed. 2), 382*; *Gamble Man. 659*; *Collett Fl. Siml. 468*. *Urtica frutescens, Roxb. Fl. Ind. iii, 589*.

A shrub or small tree with slender pubescent branches; bark dark-grey, rough. *Leaves* membranous, 4—8 in. long, elliptic, oblong lanceolate or ovate, rarely suborbicular, acuminate or caudate, crenulate except towards base; base rounded or subcordate, 3-nerved to the middle and penninerved above, sparsely pilose on the upper surface, grey or white beneath with woolly hairs, or glabrate; petioles $\frac{1}{2}$ —4 in. long; stipules $\frac{1}{2}$ in., lanceolate, pubescent. *Flowers* in subsessile clusters or short cymes in the axils of the previous year's leaves. *Fruit* of many minute dry ovoid nuts, surrounded at the base by the fleshy perianth and bracteoles.

Dehra Dun, often found by the sides of water-courses, and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.:** Outer Himalayan ranges from the Sutlej to Sikkim, ascending to 5,000 ft.; also in Assam and on the Khasia Hills, and on the Nilgiris in S. India, extending to China and Japan. The fibre is used for ropes.

11. DEBREGESIA, Gaud.; Fl. Brit. Ind. V, 590.

Shrubs or trees. *Leaves* alternate, petioled, serrate-crenate, 3-nerved at the base; stipules connate, intrapetiolar, 2-fid. *Flowers* monoecious or dioecious, in dense globose paniced spicate or sessile clusters, bracts of male clusters scarious. **MALE** flowers: *Perianth* usually 4 (rarely 3 or 5)-partite, lobes valvate. *Stamens* 4, rarely 3 or 5, inflexed in bud. *Pistillode* glabrous or woolly at the base. **FEM.** flowers: *Perianth* ovoid or obovoid, with a contracted and minutely toothed mouth, succulent in fruit. *Ovary* straight, included; stigma sessile, pennicillate; ovule erect. *Fruit* an achene, at first adnate to the fleshy perianth. *Seed* with membranous testa, albumen copious or scanty, cotyledons short and broad.—Species 5, in Trop. Asia and Africa.

Flower-heads in 2-chotomous cymes; male sepals exceeding the bracteoles; leaves clothed beneath with ash-coloured tomentum

1. *D. velutina*.

Flower-heads sessile or subsessile; male sepals shorter than the bracteoles; leaves clothed beneath with snow-white tomentum

2. *D. hypoleuca*.

1. D. velutina, *Gaud. in Bot. Voy. Bonite t. 90*; *F. B. I. V, 590*; *Watt E. D.; Comm. Prod. Ind. 160*; *Kanjilal For. Fl. (ed. 2), 383*; *Gamble Man. 660*; *Cooke Fl. Bomb. ii, 640*; *Brandis Ind. Trees 618*. *D. longifolia, Wedd.; Brandis For. Fl. 405*.—Vern. *Tushiari, siaru* (Dehra Dun).

A tall erect shrub or small tree; bark thin, brown, rough; branches and petioles pubescent or tomentose. *Leaves* 2—7 in. long, linear

or oblong-lanceolate, acuminate, serrulate, upper surface rugose, pubescent or scabrid and dark-green, veins prominently reticulate; lower surface ashy-tomentose; base rounded or acute, 3-nerved and with 2—3 pairs from the midrib above; petioles $\frac{1}{2}$ — $1\frac{1}{4}$ in.; stipules scarious, 2-fid. *Flowers* in compact heads, arranged in lateral 2-chotomous cymes. **MALE FLOWERS:** *Sepals* 4, exceeding the bracteoles. *Stamens* 4. **FEM. FLOWERS:** *Perianth* tubular, with a small 4-toothed mouth. *Fruiting clusters* $\frac{1}{2}$ in. in diam., consisting of an aggregation of fleshy perianths and their contained achenes.

Dehra Dun and eastwards along the Sub-Himalayan tracts. Flowers during July and Aug. and the fruit ripens during the cold seasons. **DISTRIB.:** Sub-trop. Himalaya up to 5,000 ft. from Garhwal to Sikkim, also in Assam, and on the Khasia Hills; and from Konkan to S. India and Ceylon, extending to Java. The strong fibre yielded by the stems is used for ropes and bow-strings. The orange-coloured ripe fruit resembles a small raspberry and is eaten.

2. D. hypoeluca, *Wedd. Monogr.* 463, t. 15; *F. B. I. V.* 59, *Watt E. D.*; *Comm. Prod. Ind.* 160; *Kanjilal For. Fl.* (ed. 2), 383; *Gamble Man.* 660; *Collett Fl. Siml.* 468. *D. bicolor,* *Wedd. Brandis For. Fl.* 405. *Urtica bicolor,* *Roxb. Fl. Ind.* iii, 589; *Bœhmeria salicifolia,* *Don Prod.* 60.—Vern. *Sansáru* (Dehra Dun).

A large shrub with a thin grey bark; branches and leaves beneath clothed with snow-white wool. *Leaves* somewhat coriaceous, 3—6 in. long, lanceolate or oblong-lanceolate, acuminate, serrulate, scabrid with minute round elevated white dots on the upper surface, densely clothed beneath with white tomentum; base rounded or acute; main nerves 3 from the base, and with 3—5 pairs from the midrib above; petioles $\frac{1}{2}$ —1 in.; stipules 2-fid. *Flowers* usually dioecious, arranged in rounded sessile or subsessile axillary heads. **MALE FLOWERS:** *Sepals* 4, shorter than the bracteoles, white-tomentose outside. *Stamens* 4. **FEM. flowers:** *Perianth* tubular, narrowed to a minute 4-toothed mouth.

Dehra Dun and Siwalik range in the Bijnor district. Flowers in March and April and the fruit ripens June—Aug. **DISTRIB.:** Sub-tropical and Temp. Himalaya from the Sarda river in Kumaon westwards to the Indus, up to 6,000 ft.; also on the Punjab Salt range and extending to Afghanistan, W. Asia and Abyssinia. The fibre of the stems is much used for making ropes. The fruit becomes yellow when ripe and is eaten.

12. MAOUTIA, *Wedd.*; *Fl. Brit. Ind.* v, 592.

Shrubs. *Leaves* alternate, petioled, crenate, 3-nerved, white-tomentose beneath; stipules connate, intrapetiolar. *Flowers* minute, monoecious or sometimes androgynous, in small cymose globose heads. **MALE flowers:** *Perianth* 5-part., valvate. *Stamens* 5, inflexed in bud. *Pistillode* woolly. **FEM. flowers:** *Perianth* none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* an ovoid achene, with a crustaceous

or fleshy pericarp. *Seed* with membranous testa, cotyledons elliptic or oblong. Species 8, in Trop. Asia and Polynesia.

M. Puya, *Wedd. in Ann. Sc-Nat. Sér. 4, i, 193*; *Royle Ill. 333*; *Brandis For. Fl. 406*; *Ind. Trees 619*; *F. B. I. V, 592*; *Watt E. D.*; *Comm. Prod. Ind. 163*; *Kanjilal For. Fl. (ed. 2), 384*; *Gamble Man. 660*. *Bœhmeria frutescens*, *Don Prod. 59 (not of Thunb.) Vern. Pua, poi (Hind), dhaul-kágshi (Dehra Dun)*—Nepal Hemp.

A shrub, with dark-grey bark marked with vertical lines of brown lenticels; branches clothed with long soft hairs. *Leaves* membranous, 4—8 in. long, elliptic, caudate-acuminate, coarsely dentate with large triangular teeth, scabrid above, intensely white beneath with densely matted soft hairs except on the pubescent nerves, prominently 3-nerved from the rounded or subacute base, and with 3—4 pairs of lateral nerves from the midrib above; petioles 1—5 in. long; stipules lanceolate, 2-fid. *Flowers* minute, in small round unisexual or androgynous heads which are arranged in slender axillary and terminal cymose panicles shorter than the petioles. *Achenes* gibbously ovoid, trigonous, hispid.

Dehra Dun, and Siwalik Range, in ravines and on banks of streams; also eastwards along the Sub-Himalayan tract. Fl. and fr. May to November. **DISTRIB.**: Outer Himalaya eastwards from Garhwal up to 4,000 ft.; also on Khasia Hills and extending to Burma and Japan. The plant yields a strong fine white fibre suitable for making fishing nets and lines, and was formerly known as the wild *rhea* of Sikkim.

13. MORUS, Linn.; Fl. Brit. Ind. v, 491.

Trees or shrubs with milky juice. *Leaves* alternate, entire or toothed or 3-lobed, base 3—5-nerved; stipules small, lateral, caducous. *Flowers* monœcious or diœcious, spicate. **MALE** flowers in elongate catkin-like spikes. *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud. Pistillode turbinate. **FEM.** flowers in long and cylindric, or in short oblong or subglobose spikes. *Sepals* 4, decussate, imbricate, accrescent and succulent in fruit. *Ovary* included, straight 1-celled; style central, 2-part. or 2-fid; ovule pendulous. *Fruit* of many achenes enclosed in the succulent perianths and aggregated in berrylike spikes or heads. *Seed* subglobose, albumen copious, fleshy, embryo incurved; cotyledons oblong, equal, radicle ascending. Species about 10, in temperate and tropical regions.

1. M. indica, *Linn. Sp. Pl. 986*; *Roxb. Fl. Ind. iii, 596*; *Royle Ill. 337*; *Brandis For. Fl. 408*; *Ind. Trees 612*; *F. B. I. V, 492*; *Watt E. D.*; *Comm. Prod. Ind. 785*; *Kanjilal For. Fl. (ed. 2), 365*; *Gamble Man. 635*; *Prair Beng. Pl. 968*; *Collett Fl. Siml. 457*; *Cooke Fl. Bomb. ii, 658*; *M. parvifolia*, *Royle Lc.*—*Vern. Tut, tutris sia tut, sia tunt.* Small-leaved mulberry.

A deciduous tree or shrub. *Leaves* ovate, caudate-acuminate, coarsely and unequally serrate, 2—5½ in. long, pubescent or scabrous when old. *Male spikes* lax, on short slender peduncles. *Fem. spikes* short, ovoid. *Sepals* 4, the two inner flat or concave, the outer ones more

less keeled; styles long, hairy, connate high up. *Fruit* dark-purple when ripe.

Wild on the outer Himalayan ranges up to 7,000 ft., and on the Sub-Himalayan tract eastwards to Sikkim and upper Burma. It is largely cultivated as a shrub in Bengal and Burma for feeding silk-worms, as well as on the Nilgiri Hills. In N. India the new foliage and flowers appear in February and March and the fruit ripens in May. The wood is hard and close-grained.

2. *M. lævigata*, *Wall. Cat* 4649; *Royle Ill.* 337; *Brandis For. Fl.* 409; *Ind. Trees* 613; *Gamble Man.* 636; *Prair Bengal. Pl.* 968; *Cooke Fl. Bomb. ii*, 658. *M. cuspidata*, *Wall.*—Vern. *Tut.*

A large or medium-sized tree; young shoots stipules and bud-scales clothed with long soft hairs. *Leaves* 3—7 in. long, ovate, cuspidate, finely serrate, often cordate at the base; petioles 1—1½ in. *Spikes* drooping, male spikes very hairy, the female almost glabrous. *Sepals* of fem. thin, two inner flat, outer ones keeled. *Styles* nearly free, papillose from base. *Fruit* long, cylindric, yellowish-white, insipid.

Tropical and subtrop. Himalaya from the Indus to Assam, wild and cultivated, ascending to 4,000 ft., also in Burma. A variety (*M. viridis*, *B.-Ham.*) with the leaves rounded at the apex is cultivated in Behar.

3. *M. alba*, *Linn.*; *Royle Ill.* 336; *Roxb. Fl. Ind.* iii, 594; *DC. L'Orig. Pl. Cult.* 119; *Brandis For. Fl.* 407, t. 47; *Ind. Trees* 612; *F. B. I. V*, 492; *Watt E. D.*; *Comm. Prod. Ind.* 784; *Gamble Man.* 634; *Kanjilal For. Fl. (ed. 2)*, 364; *Collett Fl. Siml.* 457; *Cooke Fl. Bomb. ii*, 658. *M. tatarica*.—Vern. *Tut, tutri, tuntri*. White Mulberry.

A small or medium-sized deciduous tree; young parts petioles and underside of leaves more or less pubescent. *Leaves* 2—3 in. long or more, ovate, acute, dentate or often lobed; upper surface usually glabrous; base cordate; petioles ½—1 in. *Flowers* on short ovoid spikes, monœcious, the male and female often on distinct branches. *Sepals* of fem. fls. 4, the two inner flat or concave, the outer ones keeled. *Styles* free. *Fruiting spikes* white or red, sweet.

This is the Mulberry which has been used chiefly throughout north-western India for supplying food for silkworms. For this purpose, as well as for the sake of its edible fruit, it is widely cultivated in the Punjab, Kashmir and in many other parts of the N. W. Frontier. Although often met with as apparently wild in many places, its original home is probably in N. Asia or China. Within the area of this flora the young leaves and the flowers appear in February. The fruit, which ripens during May and June is much eaten by the people, by whom many distinct forms are recognized, varying in the size of the tree and in the shape and colour of the fruiting spikes. The wood is much used in making furniture and agricultural implements, and on many of the Punjab rivers for boat-building. The leaves afford excellent fodder for sheep and goats, and the twigs are used for binding loads.—Closely allied to the preceding species is *M. atropurpurea*, *Roxb. Fl. Ind.* iii, 595. It was introduced from China, and is now cultivated in various parts of India. The leaves

are cordate, serrate and rarely lobed, smooth, and the long cylindrical fruiting spikes are dark-purple when ripe.—*M. NIGRA*, Linn.; *Brandis For. Fl.* 407; *DC. L'Orig. Pl. Cult.* 121.—Vern. *Sháh tut.* (Black Mulberry). This tree is extensively cultivated in the Peshawar Valley, in Kashmir, also in many parts of the N. W. frontier, and beyond in Baluchistan and Afghanistan. It is also grown in Europe, in W. and Cent. Asia and in China. Its original home is not known with certainty, though it is said to be wild in Persia, whence it was introduced to Greece and Italy.—*M. SERRATA*, Roxb. *Fl. Ind.* iii, 596; *Brandis For. Fl.* 409; *Ind. Trees* 612; *Gamble Man.* 635; *Kanjilal For. Fl.* 365.—Vern. *Kimu, humu, tut, tunt.*—A large deciduous tree, cultivated in Dehra Dun, but wild on the outer ranges of the W. Himalaya up to 9,000 ft. Leaves 2–8 in. long, broadly ovate-cordate, acuminate, coarsely toothed or serrate, softly pubescent beneath. Flowers diœcious. Styles hairy, connate below. Fruit shortly cylindrical, purple and sweet when ripe. The wood, which seasons well and takes a fine polish, is valued for cabinet work and is also used for making agricultural implements and tennis bats. The tree is often lopped for cattle fodder.

14. STREBLUS, Lour.; *Fl. Brit Ind.* v, 489.

Unarmed shrubs or trees with milky juice. *Leaves* alternate, penninerved, scabrid; stipules small, lanceolate. *Flowers* axillary, usually diœcious; males in peduncled heads or spikes; fem. flowers solitary or 2–4 together, stalked, bracteate. **MALE FLOWERS:** *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud. *Pistillode* dilated at the top. **FEM. FLOWERS:** *Sepals* 4, imbricate, embracing the ovary. *Ovary* straight, retuse; style central, with very long arms, ovule pendulous. *Fruit* membranous, straight, subglobose, laxly covered by the persistent perianth. *Seed* globose, testa membranous, albumen none, embryo globose; one cotyledon very large, fleshy, embracing the smaller one and the ascending radicle.—Species 2, Indian and Malayan.

S. asper, Lour. *Fl. Cochinch.* ii, 615; *Brandis For. Fl.* 410; *Ind. Trees* 615; *F. B. I. V.* 489; *Watt E. D.*; *Kanjilal (ed. 2).* 362; *Gamble Man.* 632; *Prair Beng. Pl.* 962; *Cooke Fl. Bomb.* ii, 642. *Trophis aspera*, Retz. (*exl. syn.*); *Roxb. Fl. Ind.* iii, 761.—Vern. *Siora* (Hind.), *dahia* and *kuchna* (Saharanpur), *rusa* (Oudh).

A small usually gnarled evergreen tree attaining 20 ft. in height, but very frequently merely a shrub. Bark thick, soft, grey or greenish-white or brown, becoming rough when old. Branchlets many, rigid and often much interwoven, pubescent. *Leaves* 2–4 in. long, elliptic or rhomboid or obovate, acute or acuminate, margins more or less toothed towards the apex, rough on both surfaces with minute raised dots especially beneath; main lateral nerves 4–6 pairs; petioles about $\frac{1}{2}$ in. long; stipules obliquely lanceolate. *Flowers* usually diœcious. **MALE FLOWERS** in shortly stalked globose heads. *Perianth* campanulate. *Sepals* hairy outside. **FEM. FLOWERS** solitary, on slender axillary usually fascicled pedicels $\frac{1}{2}$ in. long. *Fruit* a 1-seeded subglobose berry about the size of a pea, yellow when ripe.

Common along river-banks and in hedges near villages, especially in Bundelkhand and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Jan.—March, fruiting May—July. The new leaves appear in March. **DISTRIB.:** Along the base of the W. Himalaya eastwards to Bengal and through C. W. and S. India to Ceylon; extending to Burma, Siam and China. The wood of this tree resembles that of a fig. It is useful, however, by reason of its toughness and elasticity. The rough leaves are used for polishing wood and ivory. The tree is much lopped for fodder, and the fruit is eaten.

15. CUDRANIA, Trecul; Fl. Brit. Ind. v, 538.

Shrubs, often scandent, or small trees, usually spinous. *Leaves* alternate, entire penninerved; stipules lateral, small. *Flowers* dioecious, bracteolate. **MALE FLOWERS:** *Sepals* 3—5, oblong, obtuse, adnate to 2—4 bracts, imbricate. *Stamens* 4, erect, more or less adnate to the sepals. *Pistillode* subulate or obsolete. **FEM. FLOWERS:** *Sepals* broader than in the male, embracing the ovary. *Ovary* straight; style terminal, simple or 2-armed; arms stout or slender; ovule pendulous. *Fruit* of ovoid compressed crustaceous achenes enclosed in the enlarged fleshy bracts and perianth and forming globose and fleshy heads. *Seed* with a membranous testa, albumen scanty, cotyledons twisted and folded, embracing the slender upcurved radicle.—Species 3 or 4, in Asia, E. Africa, Australia and New Caledonia.

C. javanensis, Trecul in *Ann. Sc. Nat. Sér. 3, VIII, 123*; Brand. *For. Fl.* 425; *Ind. Tress* 614; *F. B. I. V, 538*; *Watt E. D.*; *Kanjilâl For. Fl. (ed. 2), 378*; *Gamble Man. 651*; *Prair Beng. Pl. 970*.—Vern. *Manda*.

A large straggling or subscaudent spiny shrub or small tree; bark smooth, thin, yellowish-brown, with oblong horizontal lenticels; branchlets pubescent; spines usually curved. *Leaves* glabrous subcoriaceous, 1—4 in. long, oblong or obovate to oblanceolate, obtuse, acute or acuminate; base obtuse; lateral nerves slender, 8—10 pairs; petioles $\frac{1}{2}$ in. or less. *Flower-heads* solitary or in pairs, pubescent; the males $\frac{1}{2}$ in. across; the female-heads enlarging to $\frac{3}{4}$ in. in diam. when in fruit. **FEM. FLOWERS:** *Perianth-lobes* 4, thickened and velvety at the tips. *Styles* 2-fid. *Fruit* an irregularly shaped compound berry somewhat resembling a small custard-apple (*Anona*), pinkish-orange and velvety when ripe.

Dehra Dun and Siwalik range and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Apr.—June, and the fruit ripens in Aug. **DISTRIB.:** Trop. Himalaya from the Sutlej eastwards to Sikkim; also Khasia Hills, E. Bengal, Orissa and Ceylon; extending to Burma, the Malay Peninsula, China, East Africa and Australia. The wood is used as fuel and the ripe fruit is eaten. The leaves of this shrub are often attacked by a fungus which converts them into a whitish brittle mass. This substance which is known by the name of 'Mande-ki-roti' is eaten by the villagers in Dehra Dun. This shrub bears a great resemblance to *Plecosperrum spinosum* both in habit

and foliage, but in the latter the stamens are inflexed in bud, as in the tribe *Moreæ*, and the spines are and more slender and nearly straight. I have seen no specimens of *Plecospermum* from within the area of this flora and I am inclined to believe that *Cudrania javanensis* has often been mistaken for it.

16. ARTOCARPUS, Forst.; Fl. Brit. Ind. v, 539.

Evergreen trees with milky juice. *Leaves* alternate, coriaceous, often very large, entire or pinnately lobed, penninerved, stipules lateral. *Flowers* monœcious, densely crowded on globose or oblong unisexual solitary usually axillary receptacles often mixed with scale-like bracts peltate bracts. **MALE FLOWERS:** *Perianth* 2 4-lobed or partite; lobes obtuse, concave, valvate or slightly imbricate. *Stamen* 1, erect. *Pistillode* none. **FEM. flowers.** *Perianth* tubular, confluent below with the receptacle, limb minute. *Ovary* straight, style central or lateral; stigma entire, rarely 2—3-fid, ovule pendulous. *Fruit* a much enlarged fleshy oblong cylindrical globose or lobed receptacle, clothed bearing on its outer surface the accrescent fleshy perianths and carpels (anthocarps), which have hard spinous or truncate or pyramidal or flat apices. *Achenes* deeply sunk in the fleshy mass. *Seed* pendulous, exalbuminous, embryo straight or incurved, cotyledons fleshy; radical very short, superior.—Species about 40, in Trop. Asia, Malaya, China and the Pacific Islands.

A. Lakoocha, Roxb. *Fl. Ind. iii*, 524; Royle *Ill.* 337; Brandis *For. Fl.* 426; *Ind. Trees* 612; *F. B. I. V*, 543; *Watt E. D.*; King in *Ann. R. Bot. Gard. ii*, 14, t. 13; *Kanjilal For. Fl. (ed. 2)*, 379; *Gamble Man. Ind. Timb.* 655; *Prain Beng. Pl.* 971; *Cooke Fl. Bomb. ii*, 657.—Vern. *Barhal, dhen.*

A large deciduous tree 50—60 ft. high, with a wide-spreading head; bark thick, rough, dark-grey; young parts clothed with soft grey or tawny tomentum. *Leaves* subcoriaceous, 4—12 in. long, oblong elliptic or subobovate, entire or (or the young shoots) sometimes serrate, dark-green glabrous and shining above, softly tomentose beneath; base rounded or truncate; main lateral nerves 6—12 pairs with conspicuous reticulations between; petioles $\frac{1}{2}$ —1 in. long, pubescent when young; stipules lanceolate, caducous. *Flowers* in axillary globose shortly stalked heads, the male and female heads from different axils; bracteoles peltate, puberulous. **MALE FLOWERS:** *Sepals* 2—3, truncate, puberulous. *Stamen* 1, its filament tapering from a broad base; anther exerted, short, broad, 2-celled. **FEM. FLOWERS:** *Fruit-clusters* 2—3 in. in diam. lobulate, smooth, velvety, yellow when ripe. *Achenes* surrounded by the fleshy perianths, the whole immersed in a common fleshy receptacle.

Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in swampy ground. Often planted in gardens within the area and by roadsides. The leaves fall during the cold season and are again renewed with the flowers at the beginning of the hot season. **DISTRIB.:** Trop. and Subtrop.-Himalaya, ascending to 4,000 ft. in Kumaon, also eastwards to Burma and south to Travancore,

Ceylon and Malacca. The fruit is largely eaten by the natives of India, either cooked or raw, or as a pickle. A fibre suitable for cordage is obtained from the bark, and the wood yields a yellow dye.

A. *INTEGRIFOLIA*, Linn. f. *Suppl.* 412. A large evergreen tree with leaves 4—8 in. long, thickly coriaceous and glabrous. *Fruit* 1—2½ ft. long. The tree is largely cultivated throughout the warmer parts of India and in Burma and is quite wild in the forests of the Western Ghats. The fruit, which is known generally as the *Jack-fruit*, is much eaten as are also the seeds which are cooked. The wood, which somewhat resembles that of mahogany, has been extensively used in the manufacture of furniture.

A. *INCISA*, Linn. f. *Suppl.* 411 is the *Bread-fruit tree*, a native of the Pacific Islands. It is cultivated in some of the hottest parts of India, but it does not thrive well if planted at any great distance from the sea.

17. FICUS, Linn.; Fl. Brit. Ind. v, 494.

Trees or shrubs, sometimes scandent or epiphytic; juice milky. *Leaves* alternate, rarely opposite, entire lobed toothed or serrate; stipules enveloping the bud, caducous. *Flowers* minute, usually monoëcious, on the inner walls of a fleshy receptacle, the mouth of which is closed by imbricate bracts; florets often mixed with bracteoles, of four forms: male, female, gall and (rarely) neuter; receptacles usually androgynous, the males nearest the mouth; male fem. and gall flowers sometimes occur in the same receptacle, or males and galls may be in one set, females and neuters in another, or males and galls in one set, females only in another. **MALE flowers:** *Perianth* 2—6-fid, or-partite. *Stamens* 1 or 2, rarely 3—6, erect in bud. **NEUTERS.** *Perianth* as in males. **FEM. flowers:** *Perianth* as in the male or imperfect or obsolete. *Ovary* straight or oblique, style excentric; stigma entire or 2-armed, acute or obtuse; ovule pendulous. **GALL flowers:** *Perianth* as in female. *Ovary* containing the pupa of a hymenopterous insect; style short, often dilated upwards. *Fruit* an enlarged hollow cup-shaped closed receptacle, the inner wall studded with crustaceous or fleshy achenes. *Seed* pendulous, testa membranous, albumen scanty, embryo curved, radicle ascending.—Species about 600, mostly tropical.

For full information regarding the figs of British India see Sir George King's valuable monograph published in Vol. I of the *Annals of the R. Botanic Garden, Calcutta* in 1888.

Section I. PALÆOMORPHÆ. Male flowers with 1 stamen and a rudimentary pistil in the same receptacle with gall flowers; female flowers in separate receptacles:—

A large epiphytic climbing shrub with thinly coriaceous leaves and small stalked globose receptacles

1. *F. parasitica*.

Section II. UROSTIGMA. Flowers unisexual, rarely neuter. Male gall and fem. flowers in the same receptacle. Male flowers usually monandrous. *Leaves* alternate, entire, rarely membranous (see *F. infectoria*). *Receptacles* axillary or from the scars of fallen leaves,

3-bracteate at the base.—Usually trees or powerful climbers, epiphytic at least in early life:—

Petioles $\frac{1}{2}$ in. long, rarely (in *F. bengalensis*) as much as 2 in., never jointed to the blade:—

Receptacles sessile:—

Leaves more or less hairy, at least when young, main lateral nerves much stronger than the secondary ones:—

Leaves obtuse at the apex, glabrous above, puberulous beneath when young; petioles up to 2 in. long; receptacles globose, $\frac{1}{4}$ in. in diam., red and downy when ripe.—A large wide-spreading tree with many aerial roots from the main branches

2. *F. bengalensis*.

Leaves bluntly apiculate, persistently tomentose; petioles 1 in. long; receptacles globose, $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam., grey-tomentose.—A large tree with a few aerial roots from the main branches

3. *F. tomentosa*.

Leaves small, glabrous on both surfaces; nerves close, the primary lateral ones hardly stronger than the secondary; receptacles about $\frac{1}{2}$ in. in diam., smooth, yellowish or red when ripe.—A large evergreen tree with usually a few aerial roots from the lower branches, often epiphytic

4. *F. retusa*.

Receptacles distinctly stalked; leaves elliptic-oblong or lanceolate, bluntly acuminate at the apex and narrowed to the 3-nerved base, glabrous and shining above.—A tall evergreen tree

5. *F. glaberrima*.

Petioles rarely less than 2 in. (See *F. infectoria*), sometimes jointed to the blade:—

Leaves 5—7 nerved at the base:—

Leaves terminating at the apex in a slender tail about $\frac{1}{4}$ the length of the blade; base rounded or truncate; stipules minute

6. *F. religiosa*.

Leaves narrowed at the apex into a cusp about $\frac{1}{4}$ the length of the blade; stipules $\frac{1}{2}$ —1 in. long:—

Base of leaf truncate or slightly narrowed into the petiole, usually 5-nerved; receptacles sessile, in pairs, axillary or from leaf-scars.—A medium-sized tree

7. *F. Rumphii*.

Base of leaf usually cordate, never narrowed into the petiole, always 7-nerved; receptacles usually shortly stalked, in pairs or clusters from below the leaves.—A small glabrous tree or shrub, often epiphytic

8. *F. Arnottiana*.

Leaves 3-nerved at the base, the apex abruptly acuminate.—A large spreading deciduous glabrous tree, often an epiphyte in early life

9. *F. infectoria*.

Section III. SYCIDIUM. Flowers unisexual. Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male flowers monandrous.

Leaves alternate, polymorphous, entire toothed or variously lobed, more or less scabrid on both surfaces.—A small creeping shrub, rarely an epiphyte

10. *F. heterophylla*.

Section IV. COVELLIA. Flowers unisexual. Male and gall fls. in same receptacle; female fls. in separate receptacles. Male fls. monandrous; sepals 3—4. Perianth of fem. fls. gamophyllous, short or none, rarely of 4—5 sepals. Leaves alternate or opposite. Receptacles on long leafless branches from near the base of the stem or sub-hypogean, or on tubercles of the trunk, and larger branches, rarely axillary:—

Receptacles in the leaf-axils, or in fascicles from the stem and larger branches:—

Leaves ovate-oblong or subobovate, usually opposite; receptacles axillary and from tubercles on the stem.

—A shrub or medium-sized tree with hollow branches

11. *F. hispida.*

Leaves narrowly lanceolate or oblanceolate, opposite, crowded; receptacles solitary, stalked, subglobose, axillary or on short leafless branches from the old wood; young parts densely but deciduously hirsute.

—A low shrub, usually found in rocky beds of streams

12. *F. laminosa.*

Receptacles in pairs or clusters on scaly usually leafless branches from near the base of the trunk; leaves alternate, more or less scabrid or hispid-pubescent, basal lobes very unequal.—A low tree with reddish bark

13. *F. Cunia.*

Section V. EUCYCE. Flowers unisexual. Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male fls. usually diandrous (rarely 1-andr. in *F. scandens*, or 3-andr. in *F. foveolata*). Receptacles axillary, usually small.—Scandent or erect shrubs or small trees, rarely epiphytic. Creeping or climbing shrubs:—

Leaves broadly ovate or elliptic, their length not twice the breadth; male fls. rarely 1-andr.; receptacles on long stalks.—A scandent or creeping shrub, often rooting from the nodes

14. *F. scandens.*

Leaves oblong, their length more than twice the breadth; male fls. rarely 3-andr.; receptacles sessile or nearly so.—A creeper or lofty climbing shrub

15. *F. foveolata.*

An erect shrub or small tree with more or less scabrid entire toothed or 3—5-lobed leaves; receptacles stalked

16. *F. palmata.*

Section VI. NEOMORPHE. Flowers unisexual. Male and gall fls. in one set of receptacles, fem. fls. in a separate set (except in *F. glomerata* which has male fem. and gall fls. in the same receptacle as in Sect. Urostigma). Male fls. 2-andr. (rarely 3-andr. in *F. Roxburghii*). Perianth inflated, 3—4-sepalous. Receptacles often very large, in clusters from tubercles on the stem and larger branches, or in *F. glomerata* with a few axillary pairs.—Trees with alternate leaves, never epiphytic:—

Leaves subcoriaceous, 5—15 in. long, broadly ovate or rounded, usually deeply cordate at the strongly 5—7-nerved base; receptacles 2½ in. in diam. or more, in clusters low down on the trunk

17. *F. Roxburghii.*

Leaves membranous, 4—7 in. long, ovate-oblong or elliptic-lanceolate, rounded or acute at the 3-nerved base; receptacles 1—1½ in. across, on scaly stalked paniced branchlets from the trunk and larger branches, rarely in the leaf-axils

18. *F. glomerata.*

1. *F. parasitica*, Kœn. ex Willd. in *Mém. Acad. Berol.* 1798, 102; Brandis *For. Fl.* 420. *F. gibbosa*, Blume, var. *parasitica*, King *Sp. Ficus* 6, t. 2, fig B; *F. B. I. V.*, 497; Watt *E. D.*; Kanjilal *For. Fl.* (ed. 2), 368; Prain *Beng. Pl.* 979; Cooke *Fl. Bomb.* ii, 644; Brandis *Ind. Trees* 599. *F. Ampelos*, Kœn.; Roxb. *Fl. Ind.* iii, 553. *F. sclerophylla*, Roxb. *l.c.* 546.—Vern. *Chhanchri* and *dádubanda* (Dehra Dun).

Usually an epiphytic climber; branchlets scaberulous; bark thin, smooth, greenish-yellow. *Leaves* alternate, thinly coriaceous, 3—6 in. long, more or less rhomboid, obtuse acute or acuminate, minutely hispid above, scabrid and minutely hispid beneath; base acute, often unequal-sided, 3-nerved; main lateral nerves 3—7 pairs, prominent beneath and joining within the margin; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in.; stipules about as long as the petioles, ovate-lanceolate, convolute. *Receptacles* stalked, solitary or in pairs or fascicled, axillary and from below the leaves, $\frac{1}{8}$ — $\frac{1}{4}$ in. across, depressed, globose or subpyriform, without basal bracts, scabrid and mammillate, yellow when ripe; peduncle as long as the receptacle, bracteate at the base. **MALE FLOWERS** near the mouth of the receptacles containing gall flowers. *Sepals* 4—6, linear, fleshy, hairy. *Stamen* 1, filament short, united at the base to an abortive pistil. **GALL FLOWERS**: *Perianth* as in the male. *Ovary* globose, smooth; style short, lateral. **FERTILE FLOWERS** in separate receptacles. *Sepals* 4, hyaline. *Style* elongate, lateral. *Achene* obliquely ovoid, slightly papillose.

Dehra Dun and eastwards along the Sub-Himalayan forest tracts; also in Bundelkhand; often found as an epiphyte on other species of *Ficus*, such as pipal and banyan. Receptacles ripen Jan.—March. **DISTRIB.** Throughout India and in Ceylon extending to Burma and the Andaman Islands. The rough leaves are used for polishing ivory and wood, and the root-bark is used in native medicine; the leaves are given as fodder to cattle.

2. *F. bengalensis*, Linn. *Hort. Cliff.* 471 No. 4; Brandis *For. Fl.* 412; *Ind. Trees* 600; King. *Sp. Fic.* 18, t. 13; *F. B. I. V.*, 499; Watt *E. D.*; *Comm. Prod. Ind.* 536; Collett *Fl. Siml.* 459; Kanjilal *For. Fl.* (ed. 2), 369; Gamble *Man.* 638; Prain *Beng. Pl.* 979; Cooke *Fl. Bomb.* ii, 645. *F. indica*, Linn.; Roxb. *Fl. Ind.* iii, 539; Royle *Ill.* 339.—Vern. *Bor, bar, bargat*—The Banyan tree.

A large nearly evergreen tree sometimes up to 100 ft. in height; branches horizontally spreading and throwing down at intervals a succession of aerial roots which form supports for the indefinite elongation of the main branches by which the circumference of this tree is extended. Young parts softly pubescent. *Leaves* coriaceous, 4—8 in. long, ovate or orbicular-ovate to elliptic, obtuse, entire, glabrescent above, glabrous or minutely pubescent beneath; base rounded or subcordate and with 3—7 nerves, the upper lateral nerves about 5—7 pairs and with conspicuous reticulate venation between; petioles stout $\frac{1}{2}$ —2 in. long; stipules $\frac{3}{4}$ —1 in. long, coriaceous. *Receptacles* axillary, sessile in pairs, globose, about 2 in. in diam., puberulous and red when ripe and with $\frac{3}{4}$ " broad rounded subglabrous coriaceous basal bracts. **MALE**

flowers many, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. GALL flowers: *Perianth* as in male. *Style* short. FERTILE flowers: *Perianth* shorter than in the male. *Style* elongate.

Common in the sál forests of Dehra Dun and Saharanpur and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also largely planted by Hindus near villages and in the vicinity of their temples. The new leaves appear March to May. **DISTRIB.:** Universally distributed throughout the plains of India and in Ceylon, either as a planted tree or appearing spontaneously as an epiphyte on tombs or old buildings, and also on the stems of various kinds of trees, often entirely enveloping their stems and eventually killing them. The common wild Date-palm is very often attacked, but owing to the endogenous growth of their stems they are not usually destroyed. The Banyan tree is believed to be quite wild in the Sub-Himalayan forests and on the lower slopes of the Deccan Hills, also in damp valleys of Chota Nagpur. The foliage affords excellent fodder for cattle and elephants.

3. *F. tomentosa*, Roxb. ex Willd.; Hort. Beng. 103; Fl. Ind. iii, 550; Brandis For. Fl. 414; Ind. Trees 601; King Sp. Fic. 22, t. 18; F. B. I. V, 501; Gamble Man. 640; Prain Beng. Pl. 980; Cooke Fl. Bomb. ii, 646.

A large shade-giving tree, but often an epiphyte; bark smooth, greenish-white; aerial roots from the branches thin; young parts clothed with rusty-grey tomentum. *Leaves* crowded towards the ends of the branches, coriaceous, 2—5 in. long, elliptic-ovate or obovate, obtusely acuminate, entire; upper surface glabrous or nearly so, rusty-grey-tomentose beneath; base rounded or subcordate, 3—7-nerved; main lateral nerves above the basal ones about 5 pairs, prominent beneath; midrib with a broad smooth gland at the base; petiole $\frac{3}{4}$ —1 in. long, tomentose; stipules $\frac{1}{3}$ — $\frac{1}{2}$ in., densely woolly on the back. *Receptacles* in pairs, axillary, sessile, globose, $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam., grey-tomentose; apical scales, small, glabrous; basal bracts 3, large, spreading, pubescent, sometimes 3-fid when young. **MALE FLOWERS** few, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. **GALL FLOWERS:** *Sep.* 4, shorter than the smooth ovary; style short. **FERTILE FLOWERS:** *Sep.* as in the gall flowers; style elongate. *Achenes* tuberculate.

Forests of Bundelkhand. The fruit ripens during the hot season. **DISTRIB.:** Southwards from Behar and Chota Nagpur through Central W. and S. India, also in the drier tracts of Ceylon. It is very destructive to buildings if allowed to encroach as an epiphyte. The fruit is much eaten by birds.

4. *F. retusa*, Linn. Mantiss. 129; Brandis For. Fl. 417; Ind. Trees 603; King Sp. Ficus 50, t. 61 and t. 84; F. B. I. V, 511; Watt E. D.; Gamble Man. 643; Prain Beng. Pl. 980; Cooke Fl. Bomb. ii, 647.—Vern. Nandan.

A large or moderate-sized evergreen glabrous tree, often epiphytic; aerial roots few; bark dark-grey, smooth. *Leaves* coriaceous, shortly

stalked, 2—3 in. long and nearly as broad, elliptic ovate or obovate, rounded or shortly and bluntly acuminate at the apex, polished and shining; base narrowed into the petiole, 3-nerved; main lateral nerves 5—6 pairs above the basal ones, not more prominent than the secondary ones, reticulately veined between; petiole $\frac{1}{4}$ — $\frac{1}{2}$ in., stipules lanceolate, $\frac{2}{3}$ in. *Receptacles* about $\frac{1}{3}$ in. in diam., sessile in pairs, axillary or from the scars of fallen leaves, depressed-globose, smooth, yellow or reddish when ripe; basal bracts 3, spreading broadly ovate, blunt, persistent. **MALE FLOWERS** many, scattered, sessile or shortly stalked. *Sepals* 3, subspathulate. *Stamen* 1, filament as long as the cordate apiculate anther. **GALL FLOWERS** sessile or nearly so. *Sepals* 3, oblong or broadly spathulate. *Style* short. **FERTILE FLOWERS** usually sessile. *Sepals* 3, much shorter than those of the gall flowers. *Style* short; stigma cylindrical or clavate. *Achenes* ovoid or obovoid.

Bundelkhand (Edgeworth, Duthie), often on rocks. **DISTRIB.:** Chota Nagpur and Behar and from Cent. W. and S. India to Ceylon; also in the Sundribuns and in the Andaman and Malay Islands, extending to Australia. This tree, when cultivated, affords an abundance of cool shade and might be used more generally than it now is as a roadside tree and in the formation of groves. Gamble states that the wood is moderately hard and might be used for making furniture. The small figs, are much eaten by pigeons.

VAR. nitida, King *Sp. Ficus* 51, tt. 62 and 84 fig. P.; *F. B. I. V.*, 511; *Kanjilal For. Fl.* (ed. 2), 370; *Prair Bengal. Pl.* 980. *F. nitida*, Thunb. *Fic.* 14. *F. Benjamina*, Willd.; Roxb. *Fl. Ind.* iii, 550.—Vern. *Kamrup*.—Leaves 2—5 in. long, ovate or rhomboid-elliptic; receptacles usually whitish. **DISTRIB.:** Siwalik range at about 3,000 ft. (Kanjilal), and in the forests of N. Oudh (R. Thompson; Duthie. Along the base of Himalaya from Kumaon eastwards; also in Bengal, Assam, Khasia Hills, extending to Burma and China. A very handsome evergreen tree and suitable for planting in gardens if sufficient space be allowed for the development of aerial roots from the lower branches.

5. F. glaberrima, Blume *Bijdr.* 451; King *Sp. Fic.* 37, t. 43; *F. B. I. V.*, 506; *Kanjilal For. Fl.* (ed. 2), 370; *Gamble Man.* 640; *Prair Bengal. Pl.* 980; *Brandis Ind. Trees* 600. *F. angustifolia*, Roxb. *Fl. Ind.* iii, 554.—Vern. *Kakri*, *durla* (fide Brandis).

A tall tree, glabrous except the branchlets and lower surface of leaves; bark light yellowish-brown, lenticellate. *Leaves* subcoriaceous, 5—8 in. long, elliptic oblong or ovate-lanceolate, bluntly acuminate, entire, glabrous and shining above, puberulous beneath; base acute, rarely rounded, 3-nerved; lateral nerves 8—10 pairs, nearly horizontal, not very prominent; petiole $\frac{3}{4}$ — $1\frac{1}{4}$ in., slender; stipules $\frac{1}{2}$ — $\frac{3}{4}$ in. linear-lanceolate, glabrous, fugacious. *Receptacles* stalked, in axillary pairs, $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam., smooth and orange-coloured when ripe; basal bracts 3. **MALE FLOWERS**, a few near the mouth of the receptacle, subsessile. *Sepals* 4, lanceolate. *Stamen* 1; filament short. **GALL FLOWERS** sessile or nearly so. *Perianth* 4-fid. **FERTILE FLOWERS:** *Perianth* none. *Achenes* viscid when ripe.

Swampy ground in Dehra Dun (Duthie), and in the Sub-Himalayan tract eastwards. Receptacles ripen in Feb.—March. **DISTRIB.:** Tropical Himalaya, in shady ravines from Garhwal and Kumaon to Bhutan; also in Burma, the Andamans and the Malay Islands. The leaves and young shoots afford excellent fodder.

6. *F. religiosa*, *Linn. Sp. Pl.* 1959; *Roxb. Fl. Ind.* iii, 547; *Royle Ill.* 337; *Brand. For. Fl.* 415; *Ind. Trees* 601; *King Sp. Fic.* 55, t. 67A; *F. B. I. v.* 513; *Watt E. D.; Comm. Prod. Ind.* 538; *Kanjilal For. Fl. (ed. 2),* 371; *Gamble Man.* 644; *Collett Fl. Siml.* 459; *Prair Beng. Pl.* 980; *Cooke Fl. Bomb.* ii, 649.—**Vern.** Pipal, pipli (Hind).

A large glabrous tree usually at first epiphytic; bark grey, exfoliating in roundish irregular flakes; branches without aerial roots. *Leaves* coriaceous, shining, long-petioled, drooping, 4–7 in. long, ovate-rotund, entire, narrowed upwards and with the apex produced into a linear-lanceolate tail $\frac{1}{3}$ the whole length of the blade; base broad, rounded or truncate, or sometimes in young leaves cordate; 5–7 nerved; main lateral nerves about 8 pairs, with fine reticulations between; petioles 3–4 in. long, slender, terete; stipules minute, ovate, acute. *Receptacles* in pairs, axillary, sessile, smooth, depressed-globose, $\frac{1}{4}$ in. in diam., dark-purple when ripe; basal bracts 3, broad, spreading, coriaceous. **MALE FLOWERS** few, only near the mouth of some receptacles, absent in others, sessile. *Sepals* 3, broadly ovate. *Stamen* 1, filament short. *Gall and fertile flowers* sessile or pedicelled, the gall flowers predominating, many without a perianth. *Sepals* 5, lanceolate. *Style* short, lateral, stigma rounded.

Very common within the area, but chiefly planted in villages and in the vicinity of Hindu temples. Probably wild on the Siwalik range and in the forests of the Sub-Himalayan tracts. The tree is leafless for a few weeks only, the new foliage appearing in Feb., and the receptacles ripen during April and May. **DISTRIB.:** Sub-Himalayan forests from the Punjab eastwards, also in Bengal, Orissa, the Circars and Central India. In other parts of India it has been planted or has run wild. On the Himalaya it occurs as a planted tree up to 5,000 ft. In Ceylon and Burma it was introduced by Buddhists, by whom and by all Hindus the tree is held very sacred. On this account it is often very difficult to insist upon the removal of the trees from the forests where they do very much damage as epiphytes. Buildings are also liable to serious injury by the growth of seedling plants. The trees are much lopped, chiefly by Muhammedans, in order to obtain fodder for their cattle, elephants and camels. The greyish wood is moderately hard and is sometimes used for making packing-cases or burnt for charcoal. The leaves, bark and fruit are used medicinally.

7. *F. Rumphii*, *Blume Bijdr.* 437; *King Sp. Fic.* 54, t. 67B; *F. B. I. v.* 512; *Watt E. D.; Kanjilal For. Fl. (ed. 2),* 371; *Gamble Man.* 644; *Collett Fl. Siml.* 459; *Prair Beng. Pl.* 980; *Cooke Fl. Bomb.* ii, 648; *Brandis Ind. Trees* 601 and 717. *F. cordifolia*, *Roxb. Fl. Ind.* iii, 548 (not of Blume); *Brandis For. Fl.* 416, t. 48.—**Vern.** Khabar gajium, (Hind.), pilkhan (Punj.), gamiper (Oudh), paras-pipal (Merwara).

A moderate-sized deciduous tree, usually epiphytic in early life; all parts glabrous; bark yellowish-grey, smooth. *Leaves* subcoriaceous, glabrous and shining, 3–6 in. long, broadly ovate and with an acuminate apex forming about $\frac{1}{2}$ of the blade; margins entire, sub-undulate; base broad, truncate, slightly narrowed towards the petiole, rarely subcordate, usually 5-nerved; main lateral nerves 3–6 pairs, prominent only in the young leaves; petiole $2\frac{1}{2}$ – $3\frac{1}{2}$ in., flattened or channelled above; stipules $\frac{1}{2}$ –1 in., ovate-lanceolate. *Receptacles* sessile in pairs, axillary and from the old leaf scars, $\frac{1}{2}$ in. in diam., globular and not depressed at the apex, smooth and whitish and with dark spots when young, nearly black when ripe; basal bracts 3, small, rotund. **MALE FLOWERS** few, only near the mouth of the receptacle. *Sepals* 3, spatulate. *Stamen* 1, filament about as long as the anther. *Ovary* of gall flower smooth, usually obovoid. *Achene* minutely tubercled, mucilaginous; style elongate, stigma clavate.

Forest of Dehra Dun and Saharanpur and eastwards along the Sub-Him. forest tracts of Rohilkhand N. Oudh and Gorakhpur, also in Bundelkhand and Merwára. Often planted in avenues, but a destructive epiphyte in forests. The young leaves, which are red, appear in March, and the receptacles ripen during May and June. **DISTRIB.**: Outer Himalayan ranges from the Chenab, ascending to 5,000 ft.; also in Assam Bengal and southwards through Central W. and S. India, extending to Burma and the Malay Peninsula and Islands. The fruit is eaten, and the foliage is much used as fodder for cattle and elephants. The soft spongy wood is pinkish-white. The tree is closely allied to *F. religiosa* which it much resembles.

8. F. Arnottiana, *Miq. Ann. Mus. Lugd. Bat. iii*, 287; *King Sp. Ficus* 56, t. 68 and t. 84; *F. B. I. v*, 513; *Kanjilal For. Fl. (ed. 2)*, 371; *Gamble Man.* 638; *Prair Bengal. Pl.* 980; *Cooke Fl. Bomb. ii*, 649; *Brandis Ind. Trees.* 602.

A small glabrous tree or a shrub, often epiphytic. *Leaves* subcoriaceous, 3–8 in. long, broadly ovate, narrowed upwards to the shortly caudate-acuminate apex, margins entire; base usually cordate, never narrowed into the petiole, 7-nerved; main lateral nerves 5–7 pairs with fine lucid reticulations between; petioles 2–6 in. long; stipules ovate-lanceolate, $\frac{1}{2}$ –1 in. long, caducous, reddish-brown when dried. *Receptacles* mostly from the axils of fallen leaves, in pairs or clusters from tubercles, sessile or shortly stalked, depressed-globose, smooth, $\frac{1}{4}$ – $\frac{3}{8}$ in. in diam., purple with greenish dots when ripe; basal bracts 3, brown, membranous. **MALE FLOWERS** few, near the mouth of the receptacles, sessile. *Sepals* 3, loose, inflated, broadly acuminate, larger than the small subsessile solitary anther. **GALL AND FERTILE FLOWERS** undistinguishable except by the contents of the ovary, sessile or pedicelled. *Perianth* gamophyllous, lax, toothed at the apex, completely investing the ovary. *Style* elongate, stigma flat.

Rajputana, in the neighbourhood of Ajmer, on rocky ground (Brandis). **DISTRIB.**: Outer ranges of W. Himalaya in Jaunsar Garhwal and Kumaon, up to 3,000 ft., and from Chota Nagpur through Central W.

and S. India to Ceylon. The leaves resemble those of *F. Rumphii*, but they are never narrowed at the base into the petiole.

9. *F. infectoria*, Roxb. Fl. Ind. iii, 551 (excl. syn, Rheede) (not of Willd.); Brandis For. Fl. 414 (excl. syn.); Ind. Trees 602; King Sp. Fic. 60, t. 75; F. B. I. v, 515; Watt E. D.; Comm. Prod. Ind. 538; Kanjilal For. Fl. (ed. 2), 372; Gamble Man. 645; Prain Beng. Pl. 981; Cooke Fl. Bomb. ii, 651. F. Lacor, Buch.-Ham. in Trans. Linn. Soc. XV, 150.—Vern. Khabar, pākhar, pīkhar.

A large spreading deciduous fast-growing glabrous tree, often epiphytic in early life and sometimes sending down a few aerial roots from the trunk or branches; bark greenish-grey, smooth. Leaves membranous, $3\frac{1}{2}$ —5 in. long, ovate or ovate-oblong, shortly and rather abruptly acuminate; margins entire, subundulate; base usually rounded, slightly cordate or sometimes narrowed or acute, 3-nerved, main lateral nerves 5—7 pairs, not very prominent; petioles $1\frac{1}{2}$ — $2\frac{1}{4}$ in., sometimes indistinctly jointed with the blade; stipules about $\frac{1}{2}$ in. long, broadly ovate, acute, pubescent. Receptacles axillary, in pairs sessile, globose, $\frac{1}{2}$ in. in diam., whitish flushed with red and dotted when ripe; basal bracts 3 minute, ovate-rotund. MALE FLOWERS few, sessile near the mouth of the receptacles. Sepals 4 or 5. Stamen 1; anther broadly ovate filament short. Perianth of gall and fertile flowers as in the male. Style of gall flowers short; of the fertile female flowers long, stigma elongate.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. It is not common anywhere wild, but is occasionally met with near villages as a planted tree. **DISTRIB.:** Throughout India, extending from the outer Himalayan ranges to Ceylon, Burma, Malay Peninsula and China. The wood is used chiefly for making charcoal, and the young shoots are eaten in curries. The bark yields a fairly good fibre, and the tree is much lopped to supply fodder for cattle and elephants.

VAR. 1. *Lambertiana*, King Sp. Fic. 63, t. 76; F. B. I. v, 516; Kanjilal For. Fl. (ed. 2), 373; Prain Beng. Pl. 981; Cooke Fl. Bomb. ii, 651. F. *Lambertiana*, Miq.—Leaves coriaceous; base broad, rounded emarginate or subcordate; receptacles stalked.—Dehra Dun and Siwalik range. **DISTRIB.: W., C. and S. India.**

VAR. 2. *Wightiana*, King Sp. Ficus l.c.; F. B. I. v, 516; F. *Wightiana*, Wall.—Leaves smaller, often under $2\frac{1}{2}$ in. long, narrowed to the base; receptacles stalked, $\frac{1}{2}$ in. long, large in proportion to the size of leaves, pubescent.—Southern edge of gangetic Plain. **DISTRIB.: W. and S. India.**

10. *F. heterophylla*, Linn. f. Suppl. 442; Roxb. Fl. Ind. iii, 532; Brandis For. Fl. 424; Ind. Trees 606; King Sp. Ficus 75, t. 94; F. B. I. v, 518; Watt E. D.; Kanjilal For. Fl. (ed. 2) 373; Gamble Man. 646; Prain Beng. Pl. 981; Cooke Fl. Bomb. ii, 652. F. *repens*, Willd.; Roxb. Fl. Ind. iii, 535; Brandis For. Fl. l.c.

A shrub, often creeping along the ground or over rocks; branchlets pubescent. *Leaves* alternate, polymorphous, petioled, membranous, 2—5 in. long, ovate or orbicular-ovate to lanceolate, more or less acuminate, entire or 3-many-lobed, scabrous on both surfaces; margins coarsely toothed or repand-dentate; base rounded or cordate, 3—5-nerved; main lateral nerves 4—8 pairs, arched, or in much-lobed leaves palmate; petioles $\frac{1}{2}$ — $2\frac{1}{2}$ in.; stipules 2 to each leaf, $\frac{1}{3}$ — $\frac{1}{2}$ in. long, ovate, scarious. *Receptacles* stalked, solitary, axillary, globose to pyriform, more or less hispid, scabrid or warted when young, nearly smooth and orange-yellow when ripe, always with a more or less prominent mammillate partially open umbilicus; peduncle $\frac{1}{2}$ —1 in. long; basal bracts minute, triangular glabrous. *Perianth* of all the flowers 3—4-cleft. MALE FLOWERS: *Stamen* 1. GALL FLOWERS: *Ovary* ovoid, smooth; style short, lateral. FERTILE FLOWERS: *Perianth* hyaline, viscid, tubercled. *Achenes* subglobose; style long, lateral, stigma cylindrical.

Banks of rivers and wet places in Dehra Dun, and eastwards along the Sub-Himalayan tracts to Gorakhpur, also in Bundelkhand, etc. DISTRIBUTION: Throughout the hotter parts of India and in Ceylon, extending to the Malay Peninsula and Islands.

The rough rust-coloured bark is used medicinally, and the fruit is said to be eaten. King mentions *F. scabrella* Roxb. and *F. repens* Willd. as representing the two most prevalent forms of this polymorphous shrub. In the former the leaves are shortly petioled, narrow and never lobed, and the receptacles are shortly pedicelled, globular or pyriform. The latter has broader leaves, lobed or not and with petioles over 1 in. long, and the pedicels of the pyriform receptacles are much longer.—Examples of both of the above-mentioned forms are found within the Upper Gangetic area.

11. *F. hispida*, Linn. f. *Suppl.* 442; Brandis *For. Fl.* 423; *Ind. Trees* 606; King *Sp. Fic.* 116, *tt.* 154 and 155; *F. B. I.* v, 522; *Watt E. D.*; *Kanjilál For. Fl.* (ed. 2), 374; *Gamble Man.* 647; *Collett Fl. Siml.* 460; *Prair Bengal Pl.* 981; *Cooke Fl. Bomb.* ii, 653. *F. oppositifolia*, Willd.; *Roxb. Fl. Ind.* iii, 561. *F. dæmonum*, Kæn.; *Roxb. Lc.* 562 (*dæmona*).—Vern. *Kagsha*, *gobla* (Hind.), *káksha*, *Gogsba*, *gobha* (Dehra Dun), *kat gularia* (Oudh).

A shrub or small tree; all parts more or less hispid-pubescent; bark grey, peeling off in irregular flakes; young shoots hollow. *Leaves* usually opposite, petioled, membranous, 4—12 in. long, ovate oblong or subovate, apiculate or shortly and abruptly acuminate, toothed or entire, the lower surface hispid-pubescent, the upper hispid-scabrid; base rounded subcordate or subcuneate, 3—5-nerved; main lateral nerves 3—5 pairs, finely reticulate between; petioles $\frac{1}{2}$ — $1\frac{1}{2}$ in. or those of young shoots longer densely hispid; stipules 2 to each leaf, ovate-lanceolate, pubescent outside, about $\frac{1}{2}$ in. long. *Receptacles* $\frac{1}{2}$ —1 in. across, turbinate obovoid or subpyriform, hispid and often with scattered bracts along the sides, yellowish when ripe; peduncles $\frac{1}{2}$ — $\frac{1}{2}$ in. long, in axillary pairs, or in fascicles from shortened tuberculate

branches from the old wood, or on elongate leafy branches issuing from the stem or larger branches and often reaching and even penetrating the soil; basal bracts 3. MALE FLOWERS many, near the apex of the receptacles containing galls. *Sepals* 3, concave, hyaline. *Stamen* 1, filament short. GALL FLOWERS stalked. Perianth none. *Ovary* globose, smooth; style short, subterminal, stigma dilated. FERTILE FLOWERS: *Perianth* none or obscure. *Achenes* ovoid; style lateral; stigma cylindrical, tubular.

Fairly common in the forests of Dehra Dun and Saharanpur and eastwards to N. Oudh, also in Bundelkhand and in other parts of the area. The new foliage appears in Feb. and March. **DISTRIB.:** Outer Himalayan ranges from the Chenab eastwards, ascending to 3,500 ft.; also in Bengal and from C., W. and S. India to Ceylon; extending to Burma, the Andamans and from the Malay Peninsula and Islands, extending to China and Australia. This tree is reproduced partly by root-suckers. The foliage affords fodder for cattle, and the young receptacles are eaten in curries. The bark supplies a fibre suitable for making ropes.

12. *F. laminosa*, *Hardw. in As. Res. vi, 379; ex Roxb. Hort. Beng. 103; Fl. Ind. iii, 531; Madden in Journ. As. Soc. Beng. xvii, part 1, 643; Prain Beng. Pl. 982. F. sœmocarpa, Mig.; King Sp. Fic. 116, t. 152; F. B. I. v, 523; Kanjilâl For. Fl. (ed. 2), 374; Gamble Man. 647; Brandis Ind. Trees 606 and 718. F. squamosa, Roxb. Fl. Ind. iii, 531. F. tuberculata, Wall. (not of Roxb.); Brandis For. Fl. 424 and 577. F. pyrrocarpa, Kurz.—Vern. *Chanheri* (Garhwal), *gur-timla* (Kumaon).*

A low shrub; branchlets hirsute. *Leaves* opposite, crowded at the ends of the branches, 3—9 in. long, linear-lanceolate or oblanceolate, entire, smooth, rarely scabrid on upper surface, smooth or scaberulous and rarely hispid beneath; base narrowed, 3-nerved; main lateral nerves 6—8 pairs; petioles $\frac{1}{2}$ —1 in. long, pubescent; stipules in pairs $\frac{1}{4}$ — $\frac{1}{2}$ in., ovate, acuminate, nearly glabrous, persistent. *Receptacles* shortly stalked, solitary in the axils, or in short leafless panicles from the old wood, subglobose, $\frac{1}{2}$ —1 in. in diam.; base constricted, 8—10-ribbed, warted and hispid and with scattered bracts on the sides; umbilicus large; peduncles $\frac{1}{4}$ — $\frac{1}{2}$ in., pubescent; basal bracts 3, triangular, deciduous. MALE FLOWERS: *Stamen* 1. *Perianth* of fem. flowers none or obscure. *Ovary* of gall flowers smooth; style short, lateral. *Achenes* rhomboid, style very long, hairy.

Dehra Dun and eastwards along the Sub-Himalayan tracts, usually by shady streams and often in the crevices of partially submerged rocks. The receptacles ripen during the cold season. **DISTRIB.:** Outer Himalaya from the Jumna to Bhutan, in sandy and rocky streams, also in Assam, the Khasia Hills and Burma. Closely allied to *F. hispida*, of which it may, as suggested by King, be a much modified form brought about by the peculiar conditions of its habitat. There is a coloured drawing of this shrub (plate 65) in Hardwicke's unpublished collection of drawings of Indian plants, a copy of which will be found

in the botanical library at the Natural Hist. Museum. Colonel Hardwicke mentions that the villagers in Garhwal feed their cows on the branches and leaves of this shrub.

13. *F. Cunia*, Buch.-Ham. ex Roxb. Fl. Ind. iii, 561; Brandis For. Fl. 421; Ind. Trees 606; King Sp. Fic. 101, t. 126; F. B. I. v, 523; Watt E. D.; Comm. Prod. Ind. 538; Kanjilâl For. Fl. (ed. 2), 375; Gamble Man. 648; Prain Beng. Pl. 982; Collett Fl. Siml. 460. *F. conglomerata*, Roxb. Fl. Ind. iii, 559.—Vern. Jarhphali (Hind.), khain, khetna (Dehra Dun), khenna (Bijnor), khurhur (Oudh).

A low tree with reddish-brown rough bark; branchlets scabrous. *Leaves* alternate, 6—12 in. long, elliptic to oblong-lanceolate, very unequal-sided, acuminate, entire or serrate, scabrid or smooth on upper surface, more or less pubescent beneath; base semisagittate, the larger basal lobe 3—4-nerved, the smaller 1-nerved; main lateral nerves 9—14; petioles $\frac{1}{5}$ — $\frac{2}{3}$ in., scabrid; stipules $\frac{3}{4}$ —1 in., linear-lanceolate, puberulous. *Receptacles* $\frac{1}{2}$ in. in diam., globose or pyriform, in pairs or clusters on scaly usually leafless branches, hispid, reddish-brown and ribbed when ripe; peduncle short; basal bracts 3. *Male sepals* 3. *Gall and fem. sepals* about 4, lanceolate, gamophyllous. *Ovary* of galls globose, smooth; style very short, lateral. *Achenes* broadly ovoid, emarginate on one side, tubercled, viscid; style very long, lateral; stigma large, bifid.

Forests of Dehra Dun and Saharanpur, common on the Siwalik range and extending eastwards along the Sub-Himalayan tract to N. Oudh. Usually found in ravines or on the banks of streams. The receptacles ripen mostly during Aug. and Sep. **DISTRIB.:** Outer Himalayan ranges from the Chenab eastwards to Bhutan, ascending to 4,000 ft.; also in Assam, the Khasia Hills, Chittagong, Bengal and C. India. The fruit is often eaten, but is rather insipid; the bark yields a strong fibre, and the leaves are said to be used for polishing wood.

14. *F. scandens*, Roxb. Hort. Beng. 65; Fl. Ind. iii, 536; Brandis For. Fl. 421; Ind. Trees 609; King Sp. Ficus 129, t. 162; F. B. I. v, 526; Watt E. D.; Kanjilâl For. Fl. (ed. 2), 375; Gamble Man. 648; Prain Beng. Pl. 982; Cooke Fl. Bomb. ii, 654. *F. fruticosa*, Roxb. Fl. Ind. iii, 533; *F. hederacea*, Roxb. l.c. 538.—Vern. Chhanchri (Dehra Dun).

A scandent or creeping shrub, often rooting from the stem and branches. *Leaves* 2—3½ in. long, ovate or elliptic-ovate, acute or sub-acute, entire, rugulose and scabrid above, sub-areolar beneath; base broad, rounded, strongly 3-nerved; main lateral nerves 3 pairs; petioles $\frac{1}{4}$ — $\frac{1}{2}$ in.; stipules $\frac{1}{2}$ in., ovate, acuminate. *Receptacles* axillary, long-peduncled, solitary or in pairs, $\frac{1}{2}$ in. in diam., globose, scaberulous, yellow turning to red when ripe; base sometimes constricted into a stipe; peduncle 3—5 in. long. *Sepals* of all flowers 4. *Male flowers* usually diandrous, anthers sessile. *Ovary* of gall flowers obovoid, smooth; style subterminal, short, thick, stigma hooked. *Achenes* oblong, smooth; style lateral, long; stigma subcapitate.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract, usually in damp places, often climbing and trailing on rocks or on trees. The receptacles ripen during the rainy season. **DISTRIB.:** Valleys of Outer Himalaya from the Sutlej eastwards to Bhutan; also Assam, Khasia Hills, Chittagong, Chota Nagpur, Burma, and Andaman Islands.

15. *F. foveolata*, Wall. Cat. 4493; Brandis For. Fl. 423; Ind. Trees 608; King Sp. Ficus 133, t. 166; F. B. I. v, 528; Watt E. D.; Kanjilál For. Fl. (ed. 2), 375; Gamble Man. 648; Collett Fl. Siml. 460; Prain Beng. Pl. 982; F. pubigera, Wall.; Brandis For. Fl. 424.

A creeper or a lofty climbing shrub. Shoots pubescent. Leaves of climbing stems membranous, $1\frac{1}{4}$ –6 in. ovate oblong or lanceolate, acute or acuminate, entire, glabrous above, pubescent or glabrate beneath and with prominent nerves; base rounded cordate or sub-cuneate, 3-nerved; main lateral nerves 3–6 pairs; petioles $\frac{1}{2}$ – $\frac{1}{2}$ in., pubescent; stipules in pairs, $\frac{1}{2}$ in., villous. Receptacles axillary, sessile, usually solitary, subglobose to ovoid or obovoid, $\frac{1}{3}$ –1 in. long, warted or wrinkled, downy, red or orange-coloured when ripe; basal bracts 3, ovate, acute, often reflexed; peduncle, $\frac{1}{10}$ – $\frac{1}{3}$ in. **MALE FLOWERS** stalked. Stamens 2, rarely 3; filaments connate; anthers ovate, pointed. Sepals of all flowers 4. Ovary of gall flowers obovoid; style short, stigma dilated. Achene oblong-reniform, papillose; style long, subterminal.

Dehra Dun, near the Robbers' Cave. **DISTRIB.:** Outer Himalayan ranges from Chamba (Punjab) to Bhutan; also Chitral, Khasia Hills, Chittagong and Burma, extending to Hongkong, China and Japan. Collett remarks that the receptacles are rarely, if ever, produced on the creeping branches.

16. *F. palmata*, Forsk. Fl. Ægypt.-Arab. 179; King Sp. Fic. 146, t. 185; F. B. I. v, 530; Watt E. D.; Kanjilál For. Fl. (ed. 2), 376; Gamble Man. 649; Collett Fl. Siml. 460, f. 148; Brandis Ind. Trees 607, 718. *F. caricoides*, Roxb. Fl. Ind. iii, 529. *F. virgata*, Roxb. l.c. 530; Royle Ill. 337; Brandis For. Fl. 419.—Vern. Anjiri, bedu, khemri (Dehra Dun), kembu (Merwára).

A bush or small tree, never an epiphyte; bark smooth, dull ashy grey; young shoots usually tomentose or pubescent. Leaves membranous $1\frac{1}{2}$ –5 in. long, orbicular-ovate, acute or apiculate, dentate or serrate or entire or obtusely 3–5-lobed, somewhat scabrous above, scabrid or shortly tomentose beneath; base 3-nerved; main lateral nerves 3–6 pairs; petiole 1–2 in., stipules in pairs, ovate, acute, pubescent, deciduous. Receptacles axillary, solitary, $\frac{1}{2}$ –1 in. in diam., subglobose or pyriform, pubescent, yellow when ripe; base constricted; bracts acute, deciduous; peduncle $\frac{1}{2}$ –1 in. **MALE FLOWERS** on hairy pedicels. Sepals 4–5, lanceolate, hairy. **GALL FLOWERS** sessile or stalked. Perianth deeply 5-fid. Ovary ovoid, smooth; style very short, lateral, stigma dilated. Perianth of fem. flowers as in galls. Achenes trigonous, granular; style subterminal, long, hairy, stigma bifid.

Dehra Dun, and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Merwára. The new foliage is renewed during March and April and the figs ripen from June to Oct. **DISTRIB.:** Central and N. W. India, Outer Himalaya from Nepal westwards, ascending to 5,000 ft., and from the Suliman and Salt ranges to Chitral, Egypt and Abyssinia. This species much resembles the European fig (*F. carica*), and is generally regarded as its Indian representative. It is often cultivated in N. W. India, but chiefly on the hills where the fruit produced is of better quality. The leaves are much used as cattle fodder.

17. *F. Roxburghii*, *Wall. Cat.* 4508; *Brandis For. Fl.* 422; *Ind. Trees* 609; *King Sp. Ficus* 168, t. 211 and frontispiece; *F. B. I. v.* 534; *Watt E. D.*; *Kanjilál For. Fl. (ed. 2),* 377; *Gamble Man.* 649; *Collett Fl. Siml.* 461; *Prair Beng. Pl.* 983. *F. macrophylla*, *Roxb. Fl. Ind.* iii, 556 (not of Desf.).—Vern. *Trimmal, timla*.

A low spreading tree 10—30 ft. high; trunk short, bark grey or brown, warty; branchlets few, stout, hollow. *Leaves* 5—15 in. long, broadly ovate or rounded; margins entire or toothed, mucronate, glabrous or glabrescent above, softly pubescent beneath; base usually deeply cordate, strongly 5—7-nerved; main lateral nerves 3—6 pairs, prominent on both surfaces, nervules nearly transverse; petioles 1—4 in.; stipules $\frac{1}{2}$ —1 in., ovate-lanceolate, pubescent. *Receptacles* 8—12-ribbed, turbinate, in clusters on short leafless branchlets from low down on the trunk, 2 $\frac{1}{2}$ in. across or larger, pubescent or glabrous, russet-brown or purplish and spotted when ripe; umbilicus large, triangular; peduncle pubescent, $\frac{1}{4}$ —1 $\frac{1}{4}$ in. long. **MALE flowers:** *Sepals* large, inflated, broadly imbricate. *Stamens* 2, rarely 3; filaments long, stout. **GALL flowers:** *Perianth* 2—3-lobed. *Style* short, subterminal, stigma dilated. **FEM. flowers** sessile or stalked. *Perianth* as in gall flowers. *Achenes* granulate, viscid; style long, lateral, curved, hairy, stigma cylindrical.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract. The receptacles ripen April to June. **DISTRIB.:** Outer Himalayan ranges from the Indus to Bhutan, up to 5,000 ft., rarer towards the west, also Assam, Khasia Hills, Chittagong, Chota Nagpur and Orissa, extending to Burma, China and Japan. The bark yields a coarse fibre, and the foliage is regarded as a good fodder for elephants and camels. The fruit is much eaten either raw or cooked in curries. For information regarding the development and fertilization of the flowers see D. D. Cunningham in Appendix to Vol. I of *Ann. R. Bot. Gard. Calc.*

18. *F. glomerata*, *Roxb. Cor. Pl. ii,* 13, t. 123; *Fl. Ind.* iii, 558; *Royle Ill.* 337; *Brandis For. Fl.* 422, t. 49; *Ind. Trees* 609; *King Sp. Ficus* 173, t. 218A; *F. B. I. v.* 535; *Watt E. D.*; *Comm. Prod. Ind.* 538; *Kanjilál For. Fl. (ed. 2),* 378; *Gamble Man.* 650; *Prair Beng. Pl.* 983; *Cooke Fl. Bomb. ii,* 654. *F. Goolerea*, *Roxb. Fl. Ind.* iii, 538.—Vern. *Gular* (Hind.), *umri* (Merwára).

A tree, up to 60 ft. high; bark smooth, reddish-brown; young shoots glabrous pubescent or scaberulous. *Leaves* membranous, 4—7 in. long,

ovate-oblong or elliptic-lanceolate, subacute, entire, glabrous or upper surfaces when mature, usually somewhat pubescent beneath; base rounded or acute, 3-nerved; main lateral nerves 4—6 pairs; petioles $\frac{1}{2}$ — $1\frac{1}{2}$ in., glabrous; stipules $\frac{1}{2}$ —1 in. long; ovate-lanceolate, scarious, pubescent. *Receptacles* in clusters on short thick scaly leafless paniced branchlets from the trunk and larger branches, rarely with a few axillary ones, subglobose pyriform or turbinate, smooth or downy, 1—2 in. across, reddish or orange-coloured when ripe; umbilicus depressed; base much contracted with 3 ovate-triangular bracts. The male, female and gall flowers are all found together in the same receptacle. **MALE FLOWERS** near the mouth of the receptacle, sessile. *Sepals* 3—4, membranous, inflated, enveloping the 2 anthers. *Filaments* connate. **GALL FLOWERS** stalked. *Perianth* gamophyllous, irregularly toothed. *Style* lateral, elongate, stigma clavate. **FERTILE FLOWERS** nearly sessile, forming a layer near the walls of the receptacle. *Perianth* gamophyllous, with 4 or 5 long lanceolate teeth, enveloping the small tuberculate achene. *Style* subterminal, stigma clavate.

A common tree within the area and also largely planted in villages. It is leafless during the rainy season (about Aug.), and the figs ripen between April and July. **DISTRIB.:** Throughout the greater part of India from the Outer Himalayan ranges and south to S. India and Ceylon, its western limit being Rájputana and the Salt Range of the Punjab. The fruit is much eaten by the natives, both raw and cooked, and it constitutes a valuable food supply during times of famine. The viscid milky juice is made into birdlime. The foliage is much lopped for supplying fodder for cattle and elephants, and the leaves, bark and fruit are used in native medicine. Kanjilál mentions that the wood of this tree is one of the few kinds prescribed in Hindu scriptures for sacrificial fires. It is said to last well under water.

The following non-indigenous species of *Ficus* are occasionally met with in gardens within the area of this flora:—

F. BENJAMINA, L. var. *COMOSA* Kurz; *F. B. I. v*, 508; *Prain Beng. Pl.* 979; *Brandis Ind. Trees* 604; *Gamble Man.* 641. *F. comosa*, Roxb. *Fl. Ind.* iii, 552.—A very ornamental tree with the habit of *F. retusa*, and producing from its lower branches similar aerial roots. The receptacles are yellow and much larger than those of the type. It is wild in Chota Nagpur and in the Circars and in the valleys of the E. Himalaya; also in Assam, Chittagong and throughout Burma.

F. ELASTICA, Roxb. *Fl. Ind.* iii, 541; *Brand. For. Fl.* 417; *Ind. Trees* 603; *F. B. I. v*, 508; *Kanjilál For. Fl. (ed. 2)*, 369; *Cooke Fl. Bomb.* ii, 655; *Gamble Man.* 641.—The well-known india-rubber, or caoutchouc-tree, a native of the Eastern Himalaya up to 3,000 ft.; also in Assam, the Khasia Hills and extending to Upper Burma. It is grown in many parts of India as an ornamental tree in gardens, as well as for avenues. For full particulars regarding its cultivation for rubber see Watt's *Comm. Prod. Ind.*, p. 651.

F. TSIELA, Roxb. *Fl. Ind.* iii, 549; *Brandis For. Fl.* 415; *Ind. Trees* 603; *King Sp. Ficus* 59, tt. 73, 74; *F. B. I. v*, 15; *Gamble Man.* 645:

Cooke Fl. Bomb. ii, 650.—A large spreading glabrous tree, without aerial roots; allied to *F. infectoria*. It is found in the Ajmer district of Rájputana as a planted tree, but it is truly wild in the drier parts of S. India and in Ceylon. The smooth greenish-white bark is said to yield a good fibre.

F. CARICA, Linn.; *Brandis For. Fl. 418; Ind. Trees 607; DC. L'Orig. Pl. Cult. 235; Watt Comm. Prod. Ind. 537.*—Vern. *Anjir, kimri*—Edible fig of Europe. The European fig is extensively cultivated in the plains of N. India and up to 5,000 ft. on the Outer Himalayan ranges. It is also largely grown in Kashmir, Baluchistan and Afghanistan and many excellent varieties may be found in those countries. It is said to be truly indigenous in Syria and Palestine. In S. Europe it has become naturalized, and is quite hardy in England.

BROUSSONETIA PAPIRIFERA, Vent.; *Royle Ill. 340; Brandis For. Fl. 410; Ind. Trees 613; F. B. I. v, 490; Kanjilál For. Fl. (ed. 2), 366; Gamble Man. 633; Prain Beng. Pl. 967; Watt in Comm. Prod. Ind.*—Paper Mulberry.—A small tree belonging to the mulberry tribe. Branchlets tomentose. *Leaves* membranous, 3-nerved, 3–8 in. long, obliquely ovate or oblong, acuminate, lobed (when young) and dentate, scabrid above, pubescent beneath; petioles 2–3 in. long. *Flowers* dioecious. *MALE* spikes 2–3 in. long, cylindrical, stalked pubescent. *FEM.* flowers in compact long-stalked heads. *Fruit* fleshy, red shining.—Wild on the hills of Upper Burma and in Martaban; extending to Siam, China, Japan and the Pacific Islands. The stems yield a fine fibre which is used for making paper in Japan, and in the South Sea Islands the natives prepare from it a cloth called *tapa* or *kapa*. Experiments undertaken within the area of this flora, both in Dehra Dun and at Saharanpur, clearly show that the climate of N. India is quite suitable for its cultivation. It has been suggested that it might possibly pay to grow this tree on a large scale in N. India if a paper factory were situated near enough, and if a constant supply of the fibre material of this and other fibre-yielding plants suitable for making paper were available.

CI. CASUARINACEÆ.

CASUARENA, Forst. A single genus, containing 23 species, mostly Australian and a few in New Caledonia, one only extending to India. Several other species are in cultivation in India, especially on the Nilgiri Hills.

C. EQUISETIFOLIA, Forst.; *F. B. I. v, 598; Brandis For. Fl. 435; Ind. Trees 620; Gamble Man. 665; Prain Beng. Pl. 985; Cooke Fl. Bomb. ii, 660. C. muricata, Roxb. Fl. Ind. iii, 519; Royle Ill. 346.*—A tall handsome straight-stemmed dioecious leafless tree. Branches terminating in long slender drooping deciduous 6–8 jointed branchlets, which perform the functions of leaves. The ribs of each joint terminate upwards in the teeth or scales* of a membranous sheath alternating with the

* Similar to the scale-leaves of *Equisetum*.

ribs of the next joint above. Male flowers monandrous, in terminal cylindrical spikes, and the females are arranged in small cone-like clusters which become woody when ripe. This tree is indigenous on the sandy sea-coasts of Chittagong and Burma, also in the islands of the Indian Archipelago and in N. Australia, where it is known as "Beefwood tree." It is cultivated largely all over India, and thrives well as far north as Saharanpur and Ambála. The wood is of a reddish colour and resembles in texture that of *Cedrela Toona*, but is very hard, and difficult to work. It is chiefly used for fuel. The tree is very useful in the reclamation of land near the sea and is much valued in the Madras and Bombay Presidencies for planting on sand-dunes along the coasts of Coromandel and N. Kanara.

CII. CUPULIFERÆ.

Trees or shrubs. *Leaves* simple, alternate, penninerved, serrate or entire, rarely lobed; stipules free, usually caducous. *Flowers* minute, monœcious, males in erect or pendulous catkins or spikes, rarely capitate; females in spikes or heads or solitary, bracts sometimes forming an involucre. MALE flowers: *Sepals* 1—5, free connate or obsolete. *Stamens* 2—20, on a hairy receptacle or adnate to the base of the sepals. FEM. flowers: *Sepals* connate in a perianth adnate to the ovary or none, limb minute. Ovary 2—3-, rarely 4—6-celled, styles or style-arms as many as the cells; ovules 1 or 2, collateral, pendulous, anatropous. *Fruit* a nut included within or in the axil of often greatly enlarged, sometimes involucre bracts. *Seed* usually solitary by abortion, pendulous, albumen none; cotyledons plano-convex, sometimes rugose or ruminant, radicle superior.—Species about 400, chiefly in N. temperate regions.

QUERCUS, Linn.; Fl. Brit. Ind. v, 600.

Trees or shrubs, deciduous or evergreen. *Leaves* alternate, simple, penninerved, stipules fugacious. *Flowers* small, monœcious; males in pendulous or erect spikes, bracts small; females in erect spikes, rarely androgynous, bracts involucre. MALE flowers: *Perianth* campanulate, 4—7-lobed or -partite. *Stamens* 6—12, filaments slender; anthers erect, ovate, the cells contiguous. *Pistillode* hairy or none. FEM. flowers: *Perianth* adnate to the ovary and enclosed within imbricate bracts; limb very minute, lobed or toothed. *Staminodes* minute or none. *Ovary* after fecundation more or less perfectly 3-celled, rarely 4—5-celled; styles 3—5, short, ovules 2 in each cell. *Fruit*, an ovoid globose or depressed 1-celled nut, seated on or enclosed in and attached by its broad base or by its whole surface to an involucre of imbricating hard bracts. *Seeds* 1—2, testa membranous, cotyledons plano-convex, thick, fleshy, smooth, grooved, lobed or ruminant, radicle minute.—Species about 300, in temperate and tropical regions. There are no wild oaks in S. India or Ceylon, and the genus is absent from S. America, Trop. and S. Africa and Australia.

Q. incana, Roxb. Hort. Beng. 104; Fl. Ind. iii, 642; Brandis For. Fl. 482; Ind. Trees 626; F. B. I. v, 603; Watt E. D.; Comm. Prod. Ind. 911; King in Ann. Bot. Gard. ii, 26, t. 20; Kanjilal For. Fl. (ed. 2), 402; Gamble Man. 675, Collett Fl. Siml. 475.—Vern. *Bán, banj* (N. W. Him.).—White or grey oak.

A medium-sized or large evergreen tree up to 80 ft. high; young shoots hoary or woolly. *Leaves* coriaceous, pinkish when young and woolly all over, 3–6 in. long, oblong or ovate-lanceolate, acuminate, mucronate-serrate, glabrous above, densely white-tomentose beneath; main lateral nerves 14–20 pairs, straight, parallel, prominent beneath. *MALE* flowers softly pubescent, in slender drooping catkins 2–4 in. long. *Perianth* 4–5-lobed. *Anthers* glabrous. *FEM.* flowers axillary, sessile, usually in clusters of 2–5. *Styles* linear-clavate, spreading. *Cup* axillary, solitary or clustered, $\frac{1}{2}$ in. in diam., embracing half the conico-ovoid nut when ripe. *Nut* $\frac{1}{2}$ –1 in. long, white-tomentose when young, at length glabrous and brown.

Dehra Dun, in the Mothronwala swamp, at an elevation of 1,900 ft. A few specimens of this tree planted many years ago on a shady spot in the Government Garden at Saharanpur managed to survive the tropical heat during several summers. *DISTRIB.*: W. Himalaya from the Indus to Nepal at 2–8,000 ft. It also occurs in the neighbourhood of Chitral in the N. W. Frontier Province, as well as on the Punjab Salt range and on the Shan hills of Upper Burma. The tree is very common on the outer ranges of the W. Himalaya and is often gregarious. It is frequently associated with *Rhododendron arboreum*, *Pieris ovalifolia* (ayár) and occasionally with deodar. The wood is used as fuel and for making charcoal. The bark contains a large percentage of tannin, and the leaves are much used as cattle fodder.

Q. serrata, Thunb. A handsome deciduous oak of the Central and E. Himalaya. It has been planted in Dehra Dun where it thrives. The wood closely resembles that of the English oak, and is much valued. This tree is found also in China and Japan.

CASTANEA VULGARIS, Lamk.; Brandis For. Fl. 491; Ind. Trees 635; DC. L'Orig. Pl. Cult. 283; Gamble Man. 667. *C. vesca*, Gærtn. *C. sativa*, Mill.—Sweet chestnut. Many attempts have been made to introduce this tree for cultivation on the outer ranges of the Himalaya. Gamble remarks that the most successful results have been obtained at comparatively low elevations (3–5,000 ft.) with a northern aspect, and where the rainfall is not excessive. Also a good sandy soil rather than a clayey one appears to suit the trees best. The plantations which were started many years ago in Dehra Dun have been fairly successful, but the nuts are smaller than those yielded by the European tree and are inferior in quality. It resembles more nearly the fruit of the tree as grown in Japan and N. America.

III. SALICACEÆ.

Trees or shrubs. *Leaves* deciduous, alternate, 3–5-nerved at the base, stipulate. *Flowers* in catkins, one within each bract, dioecious,

rarely monœcious or androgynous, bracteoles none. *Perianth* none. *Disk* of one or more scales or glands, or cupular. **MALE** flowers: *Stamens* 2 or more, filaments free or connate; anthers ovate-oblong, bursting longitudinally. **FEM.** flowers: *Ovary* sessile or stipitate, 1-celled, style short or none; stigmas short, notched or lobed; ovules few or many, on 2—4 subbasal or parietal placentas, erect, anatropous. *Fruit*, an ovoid or lanceolate 2—4-valved capsule. *Seeds* few or many, funicle with a pencil of long silky deciduous hairs, albumen none, cotyledons plano-convex; radicle short, inferior.—Species about 180, chiefly in N. temperate regions.

SALIX, *Linn.*; *Fl. Brit. Ind.* v, 626.

Trees or shrubs, sometimes small and prostrate. *Leaves* usually narrow or small, entire or serrulate, penninerved; stipules various. *Flowers* small, dioecious, sessile, in erect, usually dense catkins; bracts small, entire or rarely toothed. *Perianth* none. *Disk* of 2 scales, anterior or posterior, or of one posterior scale, fleshy or glandular. **MALE** flowers: *Stamens* 2, rarely 3 or more; filaments filiform, free, rarely connate; anthers usually small. **FEM.** flowers: *Ovary* sessile or stipitate; placentas 2; ovules usually 4—8; style usually short, with 2 short retuse or 2-fid arms. *Fruit*, a 2-valved capsule. *Seeds* with penicillate funicle; albumen none; cotyledons plano-convex; radicle inferior.—Species about 160, mostly in N. Temp. regions.

Stamens 4 or more; flowers appearing after the leaves:—

Leaves lanceolate, serrulate, capsule ovoid, on long pedicels

1. *S. tetrasperma*.

Leaves linear-lanceolate, entire; capsule ovoid-lanceolate, on short pedicels

2. *S. acmophylla*.

1. ***S. tetrasperma***, *Roxb. Cor. Pl.* i, 66, t. 97; *Fl. Ind.* iii, 573; *Royle Ill.* 343; *Brandis For. Fl.* 462, t. 58; *Ind. Trees* 636; *F. B. I.* v, 626; *Watt E. D.*; *Kanjilal For. Fl.* (ed 2), 387; *Gamble Man.* 685; *Collett Fl. Siml.* 478; *Prair Beng. Pl.* 989; *Cooke Fl. Bomb.* ii, 661.—*Vern. Bed, bent, baishi* (Hind.), *laila, bains* (N. W. Ind.), *bilsa, bhiusa* (Oudh), *jalmála* (Dehra Dun), *besa* (Bundelkhand), *bhynsh* (Bijnor).

A medium-sized tree or shrub. *Bark* rough with deep vertical furrows. Young parts silky, the branchlets and underside of leaves sometimes pubescent. *Leaves* 3—6 in. long, lanceolate or ovate-lanceolate, glaucous beneath, usually regularly serrulate; petioles $\frac{1}{2}$ —1 in. long. *Male catkins* 2—4 in. long. *Flowers* scented. *Stamens* 5—10. *Fem. catkins* 3—5 in. long. *Capsules* glabrous, long-stalked, style short, with two spreading, usually entire stigmas. *Seeds* 4—6.

Abundant within the area, especially on the banks of streams and on moist swampy ground. It is common in Dehra Dun and on the Siwalik range, and along the Sub-Himalayan tracts of Rohilkhand and N. Oudh to the Gorakhpur district, and it occurs also in Bundelkhand and in the Ajmer district. The new foliage appears during Feb. and March, and it flowers from Feb. to April and sometimes again in the autumn. **DISTRIB.**: More or less throughout

tropical and subtropical India from the Punjab eastwards to Manipur and Burma, ascending the Himalayan valleys up to 6,000 ft., and southwards to Travancore and to the Malay Peninsula and Java. It is not found in Ceylon nor in the more arid tracts of W. and Central India. The soft reddish porous wood is used for making gunpowder charcoal. The branches are lopped for fodder, and the twigs are much used by basket-makers. Many varieties of this polymorphous plant are mentioned in the Fl. Brit. Ind., the majority of which must be regarded merely as representing geographical forms. Thus Sir Joseph Hooker distinguishes the prevalent N. W. Indian form as compared with the southern and eastern ones. In the former the leaves are usually longer and narrower and become pale-green or yellowish when dry, and the nerves are more oblique. The pale-coloured capsules also are larger and on shorter stalks. In the southern and eastern forms the leaves are usually shorter and broader and with the upper surface shining, and they are dark-brown when dry; the nerves too are nearly horizontal, and the capsules are smaller and dark-coloured and usually with longer and more slender stalks. From my own observations I am inclined to believe that the southern form extends as far north as Mt. Abu and Bundelkhand.

2. *S. acmophylla*, Boiss. *Diagn. vii*, 98; *Fl. Or. iv*, 1183; Brandis *For. Fl. Ind. Trees* 636; *F. B. I. v*, 628; *Watt E. D.*; *Kanjilál For. Fl. (ed 2)*, 388; *Gamble Man.* 686.—Vern. *Jalmála*.

A moderate-sized glabrous tree, with the trunk up to 7 ft. in girth; branches lax, forming a rounded crown; branchlets often pendulous. *Leaves* 2—5 in. long, linear-lanceolate, the upper ones caudate-acuminate, entire or serrulate, glaucous beneath. *Catkins* short, shortly stalked; bracts scale-like, ovate or oblong, concave villous. *Male catkins* 1—2 in. long, cylindric, dense-flowered. *Stamens* 4—6. *Fem. catkins* nodding, 1 in. long, bracts deciduous. *Capsules* ovoid-oblong, on short stalks; stigmas sessile, short, entire.

Dehra Dun and Saharanpur forests, Siwalik range and Sub-Himalayan tracts from the Ganges westwards, often cultivated. Flowers after the leaves appear. **DISTRIB.**: Himalayan valleys up to 6,000 ft. and westwards to Afghanistan and Baluchistan where it is much cultivated for cattle fodder. It is also grown to some extent in gardens as an ornamental tree. Brandis regarded this tree as intermediate between *S. tetrasperma* and the W. African *S. Sufusuf*. A local form found in Dehra Dun with reddish fragile branches, gland-serrulate leaves, and male flowers always with 6 stamens may prove to be a distinct species.

S. BABYLONICA, Linn.; *Roxb. Fl. Ind. iii*, 754; *Brandis For. Fl.* 465, t. 59; *Ind. Trees* 637; *F. B. I. v*, 629; *Gamble Man.* 688.—Weeping willow.—Largely cultivated in the plains of N. W. India in gardens and on canal banks, also on the Himalaya up to 9,000 ft. It is cultivated in Afghanistan and in S. and Cent. Europe and in most subtropical countries. It may possibly be wild in Persia and Cent. Asia and in China.

CIV. CERATOPHYLLACEÆ.

Slender, fragile, branched, submerged herbs. *Leaves* whorled, dichotomously cleft into filiform minutely toothed lobes; stipules none. *Flowers* minute, monoecious, axillary, sessile. MALE-flowers solitary. *Perianth* (or involucre) of 6–12 narrow subvalvate 2-fid segments. *Stamens* 10–30; filaments very short; anthers erect, extrorse, dehiscent longitudinally, connective truncate or 2-toothed at the apex. FEM. flowers: *Perianth* of the male. *Ovary* sessile, ovoid, 1-celled; ovule solitary, pendulous, orthotropous; style subulate, stigmatic on one side. *Fruit*, a small coriaceous ovoid or ellipsoid subcompressed nutlet, terminating in a long subulate style with a spur projecting from the base on either side. *Seed* pendulous; testa membranous; albumen none; embryo straight; cotyledons thick; radicle short, inferior; plumule many-leaved.—A single genus, and one variable species distributed in all temperate and tropical countries.

CERATOPHYLLUM, *Linn.*; *Fl. Brit. Ind.* v, 639. Characters of the family.

C. demersum, *Linn. Sp. Pl.* 992; *F. B. I.* v, 639; *Prain Beng. Pl.* 990; *Cooke Fl. Bomb.* ii, 663. *C. verticillatum*, *Roxb. Fl. Ind.* iii, 624. —Vern. *Jhangi* (Beng.).

Whole plant 8 in.—3 ft. long, forming a much-branched tangle of slender branches and leaves which collapse in a tassel when taken out of the water. *Leaves* 1 in. long; segments spreading in water, variable in thickness and amount of toothing. MALE flowers solitary, in separate axils from the female but on the same plant. *Anthers* large, white. FEM. flowers. *Perianth* (or involucre) as in the male, often with an entire acute (not 2-fid) apex.

Rohilkhand near Moradabad (T. Thomson); Kheri in N. Oudh and Gorakhpur (Duthie); Saugor (Jerdon), and probably overlooked in many other localities. *DISTRIB.*: Bengal, ponds and ditches in all the provinces, and no doubt generally distributed throughout the greater part of India.

FLORA
OF
THE UPPER GANGETIC PLAIN

AND OF THE
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS

BY
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CONIFERÆ TO JUNCACEÆ.
(VOL. III PART II)

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CLASS II.

GYMNOSPERMS.

CV.—CONIFERÆ.

Trees or shrubs, wood-cells studded with disks. *Leaves* usually alternate, rigid, linear or subulate, rarely broad, solitary or fascicled in membranous sheaths. *Flowers* monoecious or dioecious; males in deciduous catkins; females solitary or in cones. *Perianth* none. **MALE** flowers: *Stamens* many, filaments connate in a globose ovoid oblong or cylindrical column; anthers 1- or more-celled, shortly stipitate or sessile round the axis of the column. **FEMALE** flowers: *Ovules* one or more, sessile, naked, usually orthotropous, seated on a scale (an open carpel) which is free or adnate to the scale (bract) of a cone. *Seeds* often winged, testa thick or thin; albumen dense, fleshy; embryo axile, straight; cotyledons 2 or more; radicle terete, often attached to a crumpled thread-like suspensor.—Species about 350, chiefly in cold regions, rare in Trop. Africa and America, absent in the W. Peninsula of India and in Ceylon.

PINUS, Linn.; Fl. Brit. Ind. 651.

Evergreen monoecious trees. *Leaves* dimorphic, the primary consisting of small membranous scales; secondary linear, in clusters of 2 or 3 or 5 in the axils of the primary, clusters girt at the base by a sheath of hyaline scales. **MALE** flowers in spikes. *Staminal column* ovoid, oblong or cylindrical; anthers in many series, shortly stipitate, 2-celled, connective produced at the apex. **FEMALE** cones globose or ovoid, bracts spirally imbricate, ovuliferous scale much larger than the bracts; ovules 2, at the base of the scale, reflexed. *Ripe cone* ovoid or oblong, bracts obsolete or small; scales persistent, formed of the enlarged thickened usually woody ovuliferous scales the tips of which are often square and with a boss. *Seeds* 2, reversed, usually winged, the wing formed by the adhesion of the hard testa to a thin separable layer of the scale, cotyledons 2 or more.—Species about 70, confined to the N. Hemisphere.

P. longifolia, Roxb. Fl. Ind. iii, 651; Royle Ill. 353, t. 85, f. 1; Brandis For. Fl. 506; Ind. Trees 690; F. B. I. v, 652; Watt Comm. Prod. Ind. 889; Kanjilal For. Fl. (ed. 2), 431; Gamble Man. 706; Collett Fl. Siml. 485, fig. 158.—Vern. *Chir, chil* (W. Him.), *dhup* (Oudh).—Long-leaved pine.

A large more or less deciduous tree with symmetrical branches high up on the trunk and forming a rounded head of light foliage. *Bark* rough, reddish-brown outside, dark-red within, cut by deep fissures

into large irregular thin plates. *Leaves* in clusters of three, 9—12 in. or longer, linear, slender, subtriquetrous. *Sheaths* persistent, fimbriate, greyish-brown. *Male-spikes* ovoid, cylindric, about $\frac{1}{2}$ in. long. *Fertile cones* on short stiff stalks, spreading or recurved, solitary or in whorls of 3—5, ovoid-conical, 4—7 in. long when mature and about 3 in. in diam. above the base. *Scales* $1\frac{1}{2}$ —2 in. long and $\frac{1}{2}$ in. broad; apex much thickened and with a 4—6-lobed tip which is beaked in the centre. *Seeds*, including wing, $\frac{1}{2}$ —1 in. long; its wing obliquely oblanceolate, obtuse; cotyledons about 12.

Wild on the Saharanpur Siwalik range at 2—3,000 ft. It is cultivated in Dehra Dun and in many other places within the northern portion of the Upper Gangetic Plain. The tree flowers February to April, and the seeds are shed during the hot weather of the following year. The cones remain on the branches long after the seeds have been shed. **DISTRIB.:** Outer Himalayan ranges and in the valleys of the principal rivers from the Indus to Bhutan at elevations between 2,000 and 7,500 ft., reaching its highest altitude in Kumaon. In Sikkim and Bhutan it rarely rises to over 3,000 ft. The tree is gregarious in the Western Himalaya, where it forms pure forests over very extensive areas. The resin obtained from the sapwood of this tree is the most important of its products, which include tar, turpentine, colophony and charcoal as bye-products. The quantity of resin obtained per individual tree is much larger as compared with that of the 'Blue pine' (*Pinus excelsa*), but the quality is somewhat inferior. The timber is largely used by the hill men for building and other purposes. It is not very durable, especially when exposed to wet, and it is very liable both to insect and fungoid attacks, and is altogether inferior to that of the 'Blue pine'. This latter tree (*P. excelsa*) occurs abundantly in the Temp. Himalaya at elevations between 6,000 and 12,500 ft., extending from Kafirstan on the west to Sikkim and Bhutan eastwards, except for certain gaps in Central and N.-W. Kumaon.—For further particulars regarding these two Himalayan pines see Gamble's "Manual of Indian Timbers" and Brandis' "Forest Flora of N.-W. and Central India."

The following non-indigenous conifers are met with in gardens within the area of the Upper Gangetic Plain:—

THUYA ORIENTALIS, L.—A small evergreen tree of China and Japan, and sometimes known as the *Chinese Arbor-Vitæ*

CUPRESSUS SEMPERVIRENS, L.—A tall evergreen tree, indigenous in Persia, Syria and Asia Minor.—Cypress. Vern.—*Sardís* (Hind.) Largely cultivated in the plains of N.-W. India, especially the fastigate variety.

JUNIPERUS MACROPODA, Boiss.—Himalayan Pencil Cedar. A small or medium sized tree of the inner dry ranges of the Western Himalaya, ascending to 14,000 ft. in Ladák, and found as low down as 5,000 ft. on the Indus. It has been cultivated in the Saharanpur Garden, where it appears to thrive.—Vern. *Dhup*.

ARAUCARIA CUNNINGHAMII, *Ait.*—A tall handsome evergreen tree, introduced from Queensland. There used to be a fine specimen of this tree in the Saharanpur Garden.

ARAUCARIA BIDWILL, *Hook.*—The *Bunya-Bunya* pine of N.-E. Australia. This tree also thrives at Saharanpur and in other gardens of North-West India.

Belonging to the allied and remarkable family of *Cycadaceæ*, some mention should be made of *Cycas revoluta*, Thunb., a Japanese species introduced into India, and often grown in gardens within the area of the Upper Gangetic Plain. It is a small palm-like evergreen tree with linear pinnately divided leaves arranged in terminal crowns.

CLASS III.

MONOCOTYLEDONS.

CVI.—HYDROCHARITACEÆ.

Aquatic usually submerged herbs. *Leaves* undivided, usually narrow and ribbon-like, rarely with a distinct lamina. *Flowers* regular, monœcious or dioecious, rarely 2 sexual, enclosed in an entire or 2-leaved spathe. MALE flowers: *Stamens* 3—12, in 1—4 series, anthers 2-celled. FEM. flowers: Solitary. *Perianth* superior. *Sepals* 3, green or petaloid. *Petals* membranous or none. *Ovary* 1-celled, inferior; placentas 3—6, parietal or intruded and sometimes almost meeting at the axis; styles or style-arms 3—12; ovules many on each placenta, anatropous or orthotropous. *Fruit* globose or ovoid, dry or pulpy, rarely deliquescent. *Seeds* few or many, albumen none, embryo smooth or lineate.—Species about 50, in tropical and temperate regions of the world, some of them marine.

Stems branching, leafy; leaves small; spathes small, sessile:—

Leaves whorled or the lower ones opposite; styles undivided; ovules anatropous

1. *Hydrilla*.

Leaves scattered, fasciated or somewhat whorled; styles notched; ovules orthotropous

2. *Lagarosiphon*.

Stems none, or with stolons only, or a creeping rootstock:—

Leaves all long, narrow and sessile; male scapes several-fld.:—

Perianth single

3. *Vallisneria*.

Perianth double

4. *Blyxa*.

Leaves mostly or all petioled:—

Ovary not beaked; fruit without wings; leaves all petioled; male scapes 2—3-fld.

5. *Hydrocharis*.

Ovary beaked; fruit winged, submerged; leaves narrow, the floating ones long-petioled; flowers solitary

6. *Ottelia*.

1. HYDRILLA, Rich.; Fl. Brit. Ind. v, 659.

A submerged leafy freshwater herb. *Leaves* short, usually opposite below, 3-4-nately whorled above. *Flowers* minute, dioecious, the males shortly pedicelled, solitary in a subglobose muricate spathe; females sessile, 1-2 in a tubular 2-toothed spathe. **MALE** flowers: *Sepals* 3, ovate or obovate, green. *Petals* 3, oblong or cuneiform. *Stamens* 3; anthers large, reniform, opening elastically. *Pistillode* minute. **FEM.** flowers: *Sepals* 3, linear, green. *Petals* 3, narrow. *Ovary* produced beyond the spathe in a filiform beak, 1-celled; styles 2-3, linear, undivided, stigmas fimbriate, ovules anatropous. *Fruit* subulate, smooth or muricate. *Seeds* 2-3, minute, oblong, testa shortly produced at each end.—A single species found throughout India and in Ceylon extending to Britain and C. Europe, Mauritius, Madagascar, Trop. Asia and Australia.

H. verticillata, Royle Ill. 376; F. B. I. v, 659; Watt E. D.; Prain Beng. Pl. 995; Cooke Fl. Bomb. ii, 668. *Serpicula verticillata*, Linn. f.; Roxb. Fl. Ind. iii, 578. *Vallisneria verticillata*, Roxb. Fl. Ind. iii, 751.

Stems slender, 1 ft. or more long, branching, flaccid, often rooting at the nodes; branches with a short sheathing leaf at the base. *Leaves* sessile, 4-8 in a whorl, the lowest often opposite, $\frac{1}{4}$ — $\frac{3}{8}$ in. long, linear or linear-oblong, apiculate, entire or serrulate, midrib prominent. *Flowers* $\frac{1}{8}$ — $\frac{1}{4}$ in. long. *Perianth-segments* very variable. *Fruit* smooth or muricate.

Abundant throughout the area of this flora in still or slowly running water; common also in all India and in Ceylon. **DISTRIB.:** See under the genus. The small membranous spathes of the male-flowers ultimately split and liberate the flowers which rise to the surface of the water, where they float, expand and scatter their pollen. Sugar-refiners in India use this plant, whilst moist, for covering the surface of their sugar in order to produce a slow percolation of moisture. (See Royle Ill. l. c.).

2. LAGAROSIPHON, Harv.; Fl. Brit. Ind. v, 659.

Submerged fresh-water herbs. *Leaves* scattered, fascicled or somewhat whorled; lower opposite, serrulate. *Flowers* dioecious. **MALE** flowers minute, many in an ovoid 2-fid axillary spathe. *Sepals* petaloid. *Petals* rather shorter. *Stamens* 2 or 3, filaments short, anthers ovate, with often 2 or 3 *staminodes*. *Pistillode* none. **FEM.** flowers: *Staminodes* none. *Ovary* oblong, produced into a filiform beak; styles 3, stout, notched; ovules many, orthotropous. *Fruit* ovoid oblong or linear, pericarp membranous. *Seeds* many, testa with a mucous coat.—Species about 12, in India, Africa and Madagascar.

L. Roxburghii, Benth. in Gen. Pl. iii, 451; F. B. I. v, 659; Prain Beng. Pl. 995; Cooke Fl. Bomb. ii, 669. *Vallisneria alternifolia*, Roxb. Fl. Ind. iii, 750.

Stems filiform, 2—3 ft. long; roots fibrous; upper branches floating. Leaves sessile, alternate and opposite, 3—4 in. long, oblong-lanceolate, acute, minutely serrulate. MALE flowers: Spathe ovoid, at length 2-valved, enclosing many minute shortly stalked flowers. Sepals shortly oblong, pink. Petals about as long as sepals, white. Stamens 2; anthers opening transversely. FEM. flowers: Spathe $\frac{1}{2}$ in. long, tubular, 2-fid. Ovary lanceolate, tipped with a filiform flexuous beak. Common within the area in tanks and streams. DISTRIB.: Throughout the plains of India and in Ceylon, extending to China and Japan.

3. VALLISNERIA, Linn.; Fl. Brit. Ind. v, 660.

Submerged tufted stemless stoloniferous herbs. Leaves very long, linear. Flowers dicecious, the males numerous, minute, in an ovoid 3-lobed shortly peduncled spathe, the females solitary in a tubular 3-toothed spathe terminal on a very long filiform spiral scape; sepals 3, petals 3, minute or none. MALE flowers: Stamens 1—3, filaments rather thick, anthers didymous. Pistillode none. FEM. flowers: Stamines 3, each 2-fid. Ovary narrow, not produced upwards; stigmas 3, broad, notched, ovules numerous. Fruit linear, included in the spathe. Seeds numerous, oblong, testa membranous.—Species about 4, in the warmer regions of both hemispheres.

V. spiralis, Linn. Sp. Pl. 1015; F. B. I. v, 660; Watt E. D.; Prain Beng. Pl. 996; Cooke Fl. Bomb. ii, 669. *V. spiraloïdes*, Roxb. Fl. Ind. iii, 750.

Leaves radical, narrowly linear, varying in length with the depth of the water, translucent, entire, or serrulate at the tips. MALE flowers many, minute, in shortly stalked spathes; when ready to open they become detached and rise to the surface of the water, the expanded perianth acting as a float. FEMALE flowers solitary within a 3-toothed spathe and borne on a long spiral stalk, the uncoiling of which brings the flower to the surface to be fertilized by the floating males, after which the female scape coils up again into a close spiral dragging the young fertilized female flower to within a small distance of the muddy bottom of the water to ripen.

Abundant within the area. DISTRIB.: More or less throughout India and in Ceylon, extending westwards to Spain, and in most warm regions of the World.

4. BLYXA, Thouars; Fl. Brit. Ind. v, 660.

Annual, submerged, tufted, scapigerous herbs. Leaves linear, acute, entire or minutely serrulate. Flowers 2-sexual or dicecious; scapes long or short; males pedicelled, several in a tubular 2-toothed spathe, long-peduncled; 2-sexual or fem. flowers solitary, sessile within a tubular 2-toothed spathe. Sepals 3, linear. Petals 3, linear, longer than the sepals. MALE flowers: Stamens normally 3-seriate, 1 or more often reduced to staminodes; anthers narrow, erect. Pistillodes 3, slender. FEM. flowers solitary. Stamines none or minute. Ovary linear,

1-celled, beaked; style very short; stigmas 3, filiform, ovules many. *Fruit* linear, included in the ribbed narrow ventricose spathe; pericarp membranous. *Seeds* many, oblong, smooth or tubercled, often tailed.—*Species* 7 or 8, in Trop. Asia, Madagascar, Australia and in Sumatra.

Leaves not serrulate; flowers dicecious; stamens 8

1. *B. Roxburghii*.

Leaves serrulate; flowers 2-sexual; stamens 3

2. *B. oryzetorum*.

1. **B. Roxburghii**, *Rich. in Mem. Inst. Fr. (1881) 77, t. 5; F. B. I. v, 660; Prain Beng. Pl. 996; Cooke Fl. Bomb. ii, 670. Vallisneria octandra, Roxb. Fl. Ind. iii, 572.*—*Vern. Syala* (Beng.).

A submerged tufted annual. *Leaves* radical, 8—24 in. long, linear, entire, broad at the base, finely acuminate at the apex. *Flowers* dicecious, white. *MALE* flowers: *Scape* straight, as long as or longer than the leaves. *Stamens* 8; filaments unequal shorter than the petals. *FEM.* flowers: *Scape* shorter and thicker than in the males. *Fruit* 2—4 in. long. *Seeds* in. long, distinctly tuberculate, shortly tailed.

I have seen no specimens from the Upper Gangetic Plains, but being widely distributed in Bengal in still water it has in all probability been overlooked. It is said to be plentiful throughout the Bombay Presidency, and is found also in Malay Peninsula and in Australia.

2. **B. oryzetorum**, *Hook. f. in F. B. I. v, 661; Prain Beng. Pl. 997. Diplosiphon oryzetorum, Dcne. in Jacquem. Voy. Bot. 167, t. 167.*

A submerged tufted annual. *Leaves* 4—6 in. long, with serrulate edges. *Scape* very short. *Flowers* 2 sexual. *Stamens* 3. *Capsule* 1—1½ in. long by ½ in. wide. *Seeds* ¼ in., sparsely tubercled; tails none or very short.

Bundelkhand (Edgeworth, No. 9002). *DISTRIB.*: Kashmir (Jacquemont), also on the Khasia Mountains.

5. HYDROCHARIS, Linn.; Fl. Brit. Ind. v, 662.

Aquatic floating herbs. *Leaves* petioled, orbicular or reniform, entire. *Flowers* monoecious; males 2—3 in a peduncled 2-foliate spathe; females solitary within a spathe. *Sepals* 3, herbaceous. *Petals* 3, white, membranous. *MALE* flowers. *Stamens* 6 or 9; staminodes 6 or 3; filaments forked, anther-cells basifixed. *FEMALE* flowers. *Staminodes* 6, in pairs. *Ovary* ovoid, 6-celled; ovules many; stigmas 6, linear, 2-fid. *Fruit* an ovoid or oblong fleshy berry, 6-celled. *Seeds* numerous; testa pulpy, filled with spiral vessels; embryo ovoid.—*Species* 2 or 3, in Europe and Asia.

H. cellulosa, *Buch.-Ham. in Wall. Cat. 5042; Prain Beng. Pl. 997. H. Morsus-Ranzæ, F. B. I. v, 662 (in part); Royle Ill. 377.*

Prain in his Beng. Plants follows Buchanan-Hamilton in considering this plant as specifically distinct from the European *H. Morsus-Ranzæ*, to which it has been referred in the Fl. Brit. Ind. The reniform leaves are much less deeply lobed at the base, and after flowering they become very much enlarged. The male flowers contain 12 antheriferous stamens, 3 of which are sterile. Within the area of

this flora specimens of this plant were collected by Buchanan-Hamilton in the Gorakhpur district, and by the present writer in the N. Oudh district of Bahraich. The plant appears to be common also in N. and Central Bengal.

6. OTTELLIA, Pers.: Fl. Brit. Ind. v. 662.

Submerged or partially floating fresh-water herbs with fibrous roots. *Leaves* radical, crowded, the submerged narrow and shortly petioled, the floating long-petioled, ovate-lanceolate oblong or cordate. *Flowers* solitary, 2-sexual, sessile within a tubular long-peduncled spathe. *Sepals* 3, linear or oblong. *Petals* 3, longer than the sepals, obovate or orbicular, with fleshy basal appendages. *Stamens* 6—15, in 2—5 series, anthers erect. *Ovary* oblong, beaked, almost 6-celled; *styles* 6, linear, 2-fid; *ovules* many, placentas diffuse. *Fruit* oblong, 6-valved, enclosed in the spathe, 3—6-winged. *Seeds* many, oblong, testa pulpy. —Species 6 or 7, in tropical or subtropical regions of the world.

O. alismoides, Pers. *Syn.* i, 400; *F. B. I.* v, 662; *Prain Beng. Pl.* 997; *Cooke Fl. Bomb.* ii, 671. *Damasonium indicum*, Willd; *Roxb. Fl. Ind.* ii, 216.

A succulent flaccid herb, submerged or partially floating. *Leaves* variable, 2—6 in. long, oblong or orbicular, cordate, membranous, undulate, 7—11-nerved; *petioles* trigonous. *Spathe* 1—1½ in. long, 1-flowered, 5—6-winged; *peduncles* varying in length with the depth of the water; *wings* of spathe unequal, undulate; *mouth* 5—6-toothed. *Sepals* small, oblong, green. *Petals* suborbicular, about 1 in. broad, white with yellow base, reticulate-veined. *Ovary* narrowly oblong; *placentas* 6—12. *Fruit* 1—1½ in. long, ellipsoid, crowned by the persistent perianth.

Abundant within the area of this flora, in tanks and slow-running water. *DISTRIB.*: Throughout India and in Ceylon, extending to Australia.

CVII.—ORCHIDACEÆ.

Herbs of various habit, rarely shrubby, of two principal forms: either (1) terrestrial tuberous-rooted herbs with annual herbaceous simple stems and solitary or spicate or racemose flowers; or (2) epiphytes with perennial stems or branches variously thickened and often forming a pseudobulb, flowering from the top sides or base of the pseudobulb; bracts usually present. *Flowers* 2-sexual, irregular, often showy. *Perianth* superior, of 6 free or variously combined segments in two series; 3 outer segments (*sepals*) more or less alike, the 2 lateral sometimes connate in a short or long sac or spur-like base (mentum); 3 inner (*petals*) dissimilar, the 2 lateral alike, the other (*lip*) usually very differently shaped. *Stamens* and style united in a column opposite the lip; fertile anthers usually one (2 in *Cypripediæ*), on the front or

top or back of the column and free or adnate to it, 2-celled or by subdivision 4-celled; top of the column sometimes produced towards the lip into a beak (*rostellum*); pollen-grains usually coherent in each cell into 1, 2, or 4 pairs of oblong globose or pyriform waxy or powdery masses (*pollinia*), which are free or attached by pairs or fours immediately, or by a stalk (*caudicle*) to a gland. Ovary inferior, 1-celled, usually linear or twisted; stigma one or two viscid spots on the top or concave face of the column, opposite the lip and below the anther, rarely discoid and above the two anthers (*in Cypripediæ*); ovules many, minute. Fruit a capsule, usually opening by 3 or 6 longitudinal fissures, rarely fleshy and subindehiscent. Seeds many, minute, with a lax hyaline testa enclosing a homogeneous nucleus.—Species about 5,000, in temperate and tropical regions, rarely arctic.

Anther single:—

Pollinia waxy:—

Pollinia free, or those of each cell held together at the base by a viscid appendage, not attached by their bases or by a caudicle to the rostellum:—

Pollinia 4:—

Leaves equitant, coriaceous or fleshy.

Epiphytic herbs

Leaves not equitant. Usually terrestrial herbs:—

Leaves membranous, rarely coriaceous:—

Lip superior, with basal auricles; column very short

Lip inferior, without basal auricles; column long

Epiphytic herbs with coriaceous leaves:—

Stems solitary or caespitose, or composed of discrete pseudo-bulbs basally attached on a long or short rhizome; column prolonged into a foot:—

Lip not articulate on the foot of the column

Lip articulate on the foot of the column and mobile

Stems jointed, composed of elongated pseudobulbs attached to a woody core; leaves solitary or in pairs, chartaceous; column without a foot

Pollinia 8

Terrestrial herbs without pseudobulbs:—

Scapes from a stout rhizome, flowering before the leaves appear

Stems leafy; flowers large, appearing with the leaves

Pseudobulbous epiphytes; column with a long foot

Pollinia attached singly or in pairs or fours through one or rarely two caudicles to a stigmatic gland:—

Pollinia 2, rarely 4 in *Cymbidium*:—

Terrestrial glabrous herbs with fleshy tubers or rhizomes, rarely pseudobulbous; flowers in peduncled racemes; leaves chartaceous or membranous, plicate:—

Lip distinctly 3-lobed, saccate or spurred at the base; inflorescence straight

1. OBERONIA.

2. MICROSTYLIS.

3. LIPARIS.

4. DENDROBIUM.

5. BULBOPHYLLUM.

6. PHOLIDOTA.

7. PACHYSTOMA.

8. THUNIA.

9. ERIA.

10. EULOPHIA.

- Lip obscurely 3-lobed, widely ventricose at the base, but not spurred; inflorescence at first decurved 11. GEODORUM.
- Epiphytic herbs, rarely terrestrial or leafless, usually with long linear coriaceous leaves sheathing on a large fleshy pseudobulb; scapes racemose, column footless or very slightly produced; lip not spurred 12. CYMBIDIUM.
- Epiphytic herbs, never terrestrial; pseudobulbs none:—
 Stem very short, leaves few, crowded, pendulous, broad, flat and softly coriaceous; flowers in long, often branching, racemes; lip with a long claw; midlobe 2-lobulate; lateral lobes fimbriate; spur bent 13. ORNITHOCHILUS.
- Stems more or less elongate; leaves coriaceous, flat, or fleshy and terete:—
 Lip not spurred; leaves terete 14. LUISIA.
 Lip spurred, adnate to the column or its foot; leaves flat, lorate:—
 Column with a long foot 15. ÆRIDES.
 Column slightly produced into a foot:—
 Spur with neither calli nor septum within:—
 Spur compressed laterally, deep, pubescent at the mouth; side-lobes of lip none 16. RHYNCHOSTYLIS.
 Spur not compressed, rarely (in *Vanda*) reduced to a gibbous swelling:—
 Side-lobes of lip usually large (small in *Vanda Roxburghii*), spur widely funnel-shaped, glabrous at the mouth; flowers usually large (small in *Vanda parviflora*) caudicle of pollinia short and broad 17. VANDA.
 Side-lobes of lip small or none; spur narrow and cylindric, or short and widely saccate; mouth naked or fimbriate; caudicle of pollinia very narrow 18. SACCOLABIUM.
- Spur within partially or completely occluded by calli:—
 Spur occluded by a dorsal scale or by calli on the anterior or posterior walls, but without a septum 19. CLEISOSTOMA.
 Spur within partially occluded by calli and divided by a vertical antero-posterior septum into two lateral chambers 20. SARCANTHUS.
- Pollinia powdery or lamellate, not waxy:—
 Anther terminal, pollinia 2 or 4; leaf solitary, radical, appearing after the flowers 21. POGONIA.
 Anther dorsal; pollinia 2, bipartite; leaves several, appearing with the flower, racemes drooping; lip with a concave or saccate much depressed hypochile jointed at a right angle to the epichile 22. EPIPACTIS.
 Stigma single, anticous; lip saccate, the sac usually setose within 23. GOODYERA.
 Stigmas two, distant, lateral; pollinia bipartite; lip saccate, the sac with calli of laminae within 24. ZEUXINE.

Anthers two, each with one perfect cell; cells sessile on the column, remote or contiguous, always separate; pollinia 2, often bipartite, adnate with or without caudicles to separate glands; leaves flat, membranous. Terrestrial herbs

25. HABENARIA.

1. OBERONIA, Lindl. ; Fl. Brit. Ind. v, 675.

Epiphytic herbs, with usually very short often tufted stems. *Leaves* coriaceous or fleshy, usually ensiform distichous and equitant, very rarely terete. *Flowers* minute, in dense sub-cylindric spikes, or racemes, expanding centrifugally. *Sepals* broadly ovate or oblong, sub-equal. *Petals* as wide as or narrower than the sepals. *Lip* larger than the sepals, 2—4-lobed, the hypochile more or less concave. *Column* very short and stout, rarely winged. *Anther* terminal or incumbent; pollinia 4, cohering in pairs, waxy.—Species about 60, Indo-Malayan region, extending to China, Australia and the Pacific Islands.

Lip without lateral lobes or basal auricles

1. *O. pachyrachis*.

Lip with lateral lobes:—

Lip oblong, with small lateral lobes

2. *O. Falconeri*.

Lip obcordate, with large broad lateral lobes

3. *O. ensiformis*.

1. ***O. pachyrachis***, Reichb. f. in *Herb. Kew. ex Hook. f. in F. B. I. v. 681*; King and Pantl. in *Ann. R. Bot. Gard. Calc. viii, 4, t. 3*; Duthie *id.*, ix, pt. 2, 85.

Stems very short, tufted. *Leaves* 3—4 in. long, narrowly ensiform and slightly falcate, acute. *Peduncle* of inflorescence, short, broad, compressed, adnate to a leaf nearly to its apex. *Spike* 4—5 in. long, equalling or a little longer than its leaf. *Flowers* minute, pale-brown, sunk singly in rather distant pits in the fleshy rhachis; bracts ovate-rotund, irregularly serrulate. *Sepals* elliptic, obtuse, glandular on the back, not reflexed. *Petals* smaller, linear-oblong, obtuse, sub-entire. *Lip* without lateral lobes or basal auricles, orbicular-elliptic, obtuse, concave, entire or slightly erose at the apex and with a deep depression at the base. *Capsule* short, turgid, often gibbous; ribs not prominent.

Dehra Dun, on trunks and branches of trees (Vicary, Falconer, Duthie, etc.). *Flowers* after the rainy season. *DISTRIB.*: Outer ranges of Himalaya from Garhwal eastwards to Sikkim, up to 4,000 ft.; also on the Khasia Hills.

2. ***O. Falconeri***, Hook. f. in *F. B. I. v, 678*; *Ic. Pl. t. 1780*; Prain *Beng. Pl. 1004*; Duthie in *Ann. R. Bot. Gard. Calc. ix, pt. 2, 86, t. 94*; Cooke *Fl. Bomb. ii, 676*. *O. iridifolia*, Wall. (*not of Lindl.*).

Stems short. *Leaves* 1—2½ in. long, broadly ensiform, straight or falcate, acute, coriaceous. *Peduncle* of inflorescence, stout, shorter than the leaves, terete, bracteate. *Racemes* erect or decurved, longer than the leaves; rhachis stout, deeply grooved in fruit. *Flowers* minute, shortly stalked; floral bract longer than ovary, ovate-lanceolate, acuminate, the margins serrulate. *Sepals* and *petals* brownish-yellow. *Sepals* ovate, acute, reflexed. *Petals* spreading, falcately lanceolate,

obtuse, longer and narrower than the sepals. *Lip* oblong or subquadrate, green, the upper surface glistening with many gland-like specks; lateral lobes small, with truncate emarginate tips; the apex with two small incurved obtuse lobes separated by a broad sinus. *Anther* obovate, its lip emarginate. *Capsule* $\frac{1}{8}$ — $\frac{1}{2}$ in. long, shortly stalked.

Dehra Dun (Wallich, Falconer, Duthie, etc.). Common as an epiphyte on mango trees. Flowers in Sept. **DISTRIB.:** Outer ranges of Himalaya from the Jumna to Sikkim, up to 3,500 ft.; also on the Khasia Hills and in Chota Nagpur and in the Konkan.

3. *O. ensiformis*, Lindl. *Fol. Orch. Oberon*. 4; *F. B. I.* v, 679; King and Pantl. in *Ann. R. Bot. Gard. Calc.* viii, 9, t. 9; Duthie *id ix*, pt. 2, 86.

Stems $2\frac{1}{4}$ — $3\frac{1}{4}$ ft. long. *Leaves* 10—18 in. long and up to $\frac{3}{4}$ in. wide, linear-ensiform, acuminate, falcate. *Inflorescence* erect, shorter than the leaves, subtruncate, its peduncle 2— $2\frac{1}{4}$ in. long, bearing many minute lanceolate appressed pale bracteoles; raceme about twice the length of the peduncle; its rhachis thick, fleshy, terete; floral bracts longer than the ovary, convolute, ovate-rotund, subacute, erose. *Flowers* $\frac{1}{10}$ in. long, not sunk in the rhachis, pale-brown. *Sepals* reflexed, subequal, broadly ovate, subacute, entire not ciliolate. *Petals* ovate, subacute, stiffly pubescent, the edges entire and ciliolate. *Lip* twice as long as the sepals, 3-lobed, with two large rounded entire basal lobes; mesochile subquadrate, smooth, slightly concave, bearing on its edges two large projecting blister-like processes; terminal lobe obreniform, with two rounded lobules separated by a broad subquadrate apical sinus, the whole surface and margins of lip, except the smooth mesochile, clothed with stiff hairs.

Dehra Dun, chiefly on sal trees (Falconer, King, Mackinnon, Duthie). Flowers during Nov. **DISTRIB.:** Up to 3,000 ft. on the adjacent Himalaya, extending eastwards to Nepal, Sikkim and the Khasia Hills; recorded also from the Nilgiris.

2. *MICROSTYLIS*, Nutt.; *Fl. Brit. Ind.* v, 686.

Terrestrial or epiphytic, rarely saprophytes, often pseudobulbous. *Leaves* one or more, membranous, plicate, continuous with their sheaths. *Flowers* small, in terminal racemes, resupinate. *Sepals* spreading or recurved, subequal. *Petals* narrower than the sepals and about as long. *Lip* adnate to base of column, usually flat, with or without basal lobes; apex emarginate or 2—3-lobed. *Column* usually very short with two short spreading arms. *Anther* subterminal, or accumbent, 2-celled; pollinia 4, ovoid or obovoid, waxy.—Species about 70, in temperate and tropical Asia and America.

***M. Mackinnoni*,** Duthie in *Journ. As Soc. Beng.* lxxi, pt. 2, 37; *Ann., R. Bot. Gard. Calc.* ix, pt. 2, 88, t. 95.

Terrestrial, whole plant up to 7 in. high. *Stem* short, swollen below, rising from the base of the previous year's pseudo-bulb. *Leaves* two

or three, horizontal, unequal, the largest $2\frac{1}{2}$ in. long by 1 in. broad, ovate, obtuse, cordate and amplexicaul at the base, fleshy; upper surface dark brownish-green; the lower surface purplish; nerves 3—7, reddish-purple, prominent beneath, the interspaces bullate. *Scape* about 3 in. long, sharply 4-angular. *Raceme* about as long as the scape; bracts subulate, longer than the ovary, reflexed, persistent. *Flowers* sessile, about $\frac{1}{2}$ in. long, dull-yellowish and reddish-purple. *Dorsal sepal* ovate-lanceolate, subacute; lateral shorter, subfalcate, edges of all reflexed. *Petals* linear, shorter than the sepals, reflexed. *Lip* with a prominent transverse rim dividing its basal and apical portions; basal lobes falcately ovate-lanceolate, often continuous or overlapping at the tips; apical portion deeply bifid and protruded, crimson-purple. *Column* with fleshy rounded arms. *Anthers* with a truncate or emarginate lip. *Ovary* clavate, not twisted.

Dehra Dun, on Kalanga hill, at 2—3,000 ft. (P. W. Mackinnon). Flowers July and Aug. **DISTRIB.:** Outer ranges of Garhwal Himalaya, up to 6,000 ft., easily distinguished from *M. Wallichii* by its leaf-coloration; also the flowers are smaller and the lip is very differently shaped.

3. LIPARIS, Rich.; Fl. Brit. Ind. v, 691.

Terrestrial or epiphytic herbs, with or without pseudobulbs. Leaves one or more, membranous or coriaceous, continuous with the sheath or thickened and jointed at the base. *Flowers* small, in terminal racemes, resupinate or not. *Sepals* spreading or recurved, the margins usually revolute. *Petals* much narrower than the sepals and about as long. *Lip* adnate to the base of the column, usually broad, flat or deflexed from the middle, sometimes concave and with calli near the base. *Column* elongate, often arched, usually winged near the apex and tumid, or dilated and compressed at the base. *Anther* terminal; pollinia 4.—Species about 120, in temperate and tropical regions.

Leaf solitary, membranous
Leaves two, coriaceous

1. *L. diodon*.
2. *L. longipes*.

1. *L. diodon*, *Reichb. f. in Linnæa xli, 43*; *Ridley in Journ. Linn. Soc. xxii, 285*; *F. B. I. v, 396*; *Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 97*.

Leaf solitary, elongate, spathulate, obtuse, membranous. *Scape* angled, naked; bracts minute. *Sepals* linear. *Petals* filiform. *Lip* cuneate, angled on both sides at the base, then dilated, subquadrate, crenulate, apiculate. *Column* slender, curved, 2-toothed at the base. *Anther* not beaked.

Dehra Dun (Hort. W. Sanders). I have seen no specimens of this plant.

2. *L. longipes*, *Lindl. in Wall. Pl. As. Rar. i, 31, t. 35*; *F. B. I. v, 703*; *K. & P. in Ann. R. Bot. Gard. Calc. viii, 29, t. 37*; *Duthie id. ix, part 3, 97*. *L. spathulata*, *Lindl.*

Epiphytic. Pseudobulbs close together in a row, cylindrical and stem like or swollen at the base, 3—6 in. long, with a few vertical striæ and with tightly clasping sheaths. *Leaves* 2, jointed at the base upon the

leaf-sheath or on pseudobulbs, 4—6 in. long, oblanceolate-oblong, subacute to acuminate, sometimes aristate. *Inflorescence* erect, shorter or longer than the leaves; peduncle slender, terete, ebracteate; raceme twice as long as the peduncle, many-flowered; floral bracts linear-lanceolate, shorter than the pedicelled ovary. *Flowers* about $\frac{1}{4}$ in. long, pale yellowish-green. *Sepals* 1-nerved, linear-oblong, subacute. *Petals* shorter than the sepals, linear, obtuse, reflexed, and with recurved margins as are the sepals. *Lip* about as long as the lateral sepals, broadly oblong, recurved from about the middle, inner margins at the base much thickened so as to form triangular processes but without true calli; margins entire, the apex broad and shortly apiculate. *Column* slightly curved and with small rounded wings.

Dehra Dun (Falconer, Mackinnon, Duthie). Flowers in Sept. **DISTRIB.:** Subtrop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan and the Khasia Hills, also on the Nilgiris and in Ceylon, extending to China and to the Malay and Pacific Islands. A widely distributed and polymorphic species. The Dehra Dun plant agrees best with Lindley's *L. spathulata*, which has shorter and thicker pseudobulbs, rather broader leaves and shorter racemes than in the type. Hooker observes that it occurs frequently in company with the form having long pseudobulbs, and that intermediates abound.

4. DENDROBIUM, Swartz; Fl. Brit. Ind. v, 710.

Epiphytic herbs. *Pseudobulbs* short and fleshy or elongate and stem-like, usually tufted. *Leaves* usually sessile and with slender bases, never plicate. *Flowers* solitary or in fascicles or racemes, often large and showy. *Sepals* subequal, the lateral pair obliquely adnate to the foot of the column and forming with it a sac or mentum. *Petals* usually similar to the sepals. *Lip* sessile or clawed at the base, adnate to and incumbent on the foot of the column; side-lobes embracing the column, or spreading, or absent; terminal lobe broad or narrow, flat convex concave or saccate, the disk sometimes lamellate. *Column* short, with a long or short foot and with usually a nectar-secreting cavity at its extremity, the apex angled or 2-toothed. *Anther* 2-celled; *pollinia* 4, equal in length, usually all slightly coherent but sometimes in free pairs, ovoid or oblong, slightly compressed, waxy.—Species 700 or more, in Temp. and Trop. regions of both hemispheres.

Flowers small, not exceeding $\frac{1}{2}$ in. across, dull-yellow with stripes of red spots

1. *D. bicameratum*.

Flowers about $1\frac{1}{2}$ in. across or larger:—

Basal portion of lip convolute:—

Apical portion of lip pale-yellow, basal portion white

2. *D. primulinum*.

Lip pale-yellow with purple veins at the base

3. *D. Pierardi*.

Lip convolute throughout its length, pale-yellow with reddish-purple veins

4. *D. Gamblei*.

1. *D. bicameratum*, Lindl. in Bot. Reg. (1839), Misc. 85; F. B. I. v, 729; K. & P. Ann. R. Bot. Gard. Calc., viii, 42, t. 56; Duthie id. ix, part 2, 95; Prain Beng. Pl. 1,009. *D. breviflorum*, Lindl.? *D. bulbiflorum*, Falc. mss. in F. B. I. l. c.; Ic. Pl. t. 2028.

Stems 12—18 in. long, clavate or fusiform. *Leaves* coriaceous, 3—4 in. long, linear-lanceolate to elliptic-oblong, obliquely and minutely 2-fid at the apex. *Flowers* about $\frac{1}{2}$ in. across, dingy-yellow speckled with stripes of red, densely crowded on a short sheathed peduncle; flowering bract sheathing the shortly stalked ovary. *Dorsal sepal* ovate-oblong, subacute; lateral pair triangular, concave, subacute. *Petals* about as long as the sepals, broadly elliptic, obtuse. *Lip* fleshy, concave, 3-lobed; side lobes small, erect, triangular, acute; midlobe very short, truncate; the disk fleshy and smooth. *Column* very short, with two large oblong nectar-secreting cells. *Mentum* urceolate. *Anther* fleshy.

Dehra Dun (Gollan, Gamble). Flowers in Aug. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft., and eastwards to Sikkim, the Khasia Hills, and Burma; it occurs also on Parasnath in Behar.

2. *D. primulinum*, Lindl. in *Gard. Chron.* (1858) 223; *Journ. Linn. Soc.* iii, 12; *F. B. I.* v, 735; *Duthie in Ann. R. Bot. Gard. Calc.* ix, pt. 2, 97, t. 98.

Stems 10—12 in. long, pendulous. *Leaves* about 4 in. long, broadly oblong, coriaceous, the upper ones smaller. *Flowers* solitary from the nodes of the leafless stems, shortly pedicelled, $2\frac{1}{2}$ in. across; floral bracts minute, emarginate. *Sepals* and *petals* white, or tinged with pink or pale-blue. *Sepals* narrowly lanceolate, acuminate, spreading or reflexed. *Petals* smaller, linear-lanceolate, acute, erect or spreading. *Lip* broadly oblong (when spread flat), very shortly clawed, about $1\frac{1}{4}$ in. long and nearly as broad, convolute towards the base, with a broad central lamellate band, margins strongly ciliate; basal portion white; apical portion pale primrose-yellow, puberulous; mentum rounded. *Column* produced into a rather long foot and with 2 horn-like processes at the apex, pale-blue. *Anther* puberulous, its lip toothed.

Dehra Dun, at Nálápáni (Gamble). Flowers in April. **DISTRIB.:** Outer Himalayan ranges of Garhwal up to about 3,000 ft. There has been some confusion in regard to the distribution of this species. Under *D. crepidatum* in the *Fl. Brit. Ind.* v, 740 Sir Joseph Hooker remarks, "A specimen in Herb. Kew, marked 'Garhwal, Falconer' is perhaps a cultivated one." This evidently refers to the two scraps of *D. crepidatum* glued down on the same sheet with Falconer's specimens of *D. primulinum*. There is also on the same sheet Falconer's original ticket referring to the specimens of *D. primulinum* and bearing the manuscript name of *D. petrocarpum*. Both *D. primulinum* and *D. crepidatum* were found by Falconer, and they were no doubt cultivated in the Saharanpur Garden and sent thence to Kew under one name. The supposition that *D. primulinum* was ever found wild in Sikkim is probably an error.

3. *D. Pierardi*, Roxb. in *Hook. Exot. Fl.* t. 9; *Fl. Ind.* iii, 483; *F. B. I.* v, 738; *Prain Beng. Pl.* 1009; *K. & P. in Ann. R. Bot. Gard. Calc.* viii, 51, t. 72; *Duthie id.* ix, pt. 2, 97.

Stems slender, pendulous, 2—3 ft. long. *Leaves* sessile, 2—5 in. long, lanceolate to ovate-lanceolate, sub-acuminate, caducous. *Flowers* about $1\frac{1}{2}$ in. across, solitary or 2—3 together, on very short minutely bracteate peduncles which proceed from the slightly swollen nodes of the leafless stems, rose-coloured or pale-purple, the lip yellow with purple radiating veins at the base. *Sepals* subequal, oblong-lanceolate, subacute. *Petals* elliptic, obtuse, as long as the sepals, but broader. *Lip* sub-orbicular (when spread out), without side-lobes, the claw very short, edges shortly ciliate on the apical half, basal portion convolute, upper surface pubescent. *Column* about equalling its foot in length the latter with a nectary at its extremity. *Anther* with a curved erose lip. *Capsule* about 2 in. long.

Dehra Dun, on the banks of the Song river and in the adjacent forests (Gamble, Mackinnon). Flowers in May. **DISTRIB.:** Outer ranges of the Kumaon Himalaya up to about 3,000 ft., extending eastwards to Nepal, Sikkim and the Khasia Hills; also in Assam, Bengal, Chota Nagpur and southwards to S. India and Tenasserim, and extending to China.

4. **D. Gamblei**, King and Pantl. in Journ. As. Soc. Beng. LXVI, part 2, 584; Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 99, t. 99.

Stems slender, pendulous, 1—2 ft. long, with short scarious sheaths at the nodes. *Leaves* sessile, up to 3 in. long, subfalcately ovate-lanceolate, subacuminate, thick, caducous; veins obscure. *Peduncles* solitary or in pairs from the nodes of the leafless stems; floral bract very small, lanceolate, acuminate. *Flowers* about $1\frac{1}{2}$ in. across, inodorous. *Sepals* and *petals* subequal, lanceolate, acuminate, with reflexed tips, pale greenish-yellow, 5-nerved. *Lip* about $\frac{3}{4}$ in. long, convolute throughout its length, broadly elliptic-oblong or subquadrate when spread out; margins fimbriate-serrate except at the cuneate and clawed base; apex obtusely cuspidate; upper surface with a broad central grooved band villous towards the apex; veins reddish-purple, bifurcating within the margin. *Column* nearly $\frac{1}{2}$ in. long, its narrow elongate foot with a small ovate laciniate nectary at its base; mentum elongate, slightly curved and spur-like. *Anther* minutely papillose outside, its lip denticulate.

Dehra Dun (Gamble) on trees. Flowers June—August. **DISTRIB.:** Garhwal Himalaya, up to 3,000 ft. Recorded also as occurring on the Nilgiri Hills. It is closely allied to *D. macrostachyum*, Lindl. a species of S. India and Ceylon.

5. BULBOPHYLLUM, Thouars; Fl. Brit. Ind. v, 752.

Epiphytic herbs. *Pseudobulbs* from a creeping rhizome, rarely none, 1 (rarely 2)-leaved. *Flowers* on scapes from the rhizome and usually close to the pseudobulbs, solitary, capitate, umbellate, or in spikes or racemes. *Sepals* subequal or the lateral pair rather longer than the dorsal one and free or connate under the lip. *Petals* usually smaller than the dorsal sepal. *Lip* jointed on the foot of column, mobile, small and usually much recurved. *Column* very short, often 2-aristate at the

apex. *Anther* 2-celled; pollinia 4, free, the two inner smaller (rarely suppressed).—Species nearly 200, chiefly in tropical and sub-tropical Asia, a few in Africa, America and Australia.

B. polyrhizum, *Lindl. Gen. and Spec. Orch.* 53; *Hk. in F. B. I.* v, 767; *Ann. R. Bot. Gard. Calc.* V, pt. 1, 15, t. 23; *K. and P. id.* viii, 70, t. 95; *Duthie id.* ix, pt. 2, 105.

Rhizome thread-like, branching; pseudobulbs crowded or distant, globular or ovoid, smooth, base broad. *Leaf* 2½ in. long, narrowly oblong, subacute, slightly narrowed to the sessile base, deciduous before the flowers open. *Scape* filiform, about 4 in. long, the sub-erect peduncle longer than the raceme, bearing 1 or 2 minute bracts; raceme inclined. *Flowers* about 6, distant, secund, pale-yellow, ¼ in. long; floral bracts minute, oblong, about as long as the short stalk of ovary. *Sepals* spreading; dorsal one ovate, concave; lateral pair longer, oblong-lanceolate, subacute, 3-nerved. *Petals* much shorter than the sepals, broadly ovate, acute, 1-nerved. *Lip* stalked, deflexed, oblong, obtuse, scaberulous. *Column* shortly toothed, its foot short and slightly curved. *Anther* papillose, its lip acute.

Dehra Dun (Gamble); flowers during June and July. **DISTRIB.:** Kumaon in the Gori Valley, up to 4,500 ft. (Duthie), and from Nepal eastwards to Sikkim and on the Khasia and Naga Hills.

6. PHOLIDOTA, Lindl.; Fl. Brit. Ind. v, 844.

Epiphytes with jointed and often branching stems, the internodes resembling pseudobulbs, or with tufted pseudobulbs. *Leaves* in pairs or solitary, membranous, many-nerved. *Flowers* small, racemose, sub-globose, expanding from above downwards, usually drooping and distichous; peduncles ebracteate, terminal or from the base of the pseudobulb; floral bracts large, persistent. *Sepals* concave. *Petals* narrower than sepals. *Lip* more or less cymbiform, usually without side-lobes. *Column* without a foot, short, hooded or winged at the apex. *Anther* subglobose; pollinia 4, waxy, subglobose or clavate, cohering in pairs to one or two membranes.—Species about 20, in India, Malaya and China.

Leaf solitary
Leaves in pairs

1. *P. imbricata*.
2. *P. articulata*, var.
Griffithii.

1. P. imbricata, *Lindl. in Hook. Fl. Exot.* t. 138; *Gen. & Spec. Orch.* 37; *F. B. I.* v, 845; *K. & P. in Ann. R. Bot. Gard. Calc.* viii, 144, t. 201; *Duthie id.* ix, pt. 2, 115; *Prairie Beng. Pl.* 1012; *Cooke Fl. Bomb.* ii, 688. *Ptilocnema bracteatum*, *Don Prod.* 33. *Cymbidium imbricatum*, *Roxb. Fl. Ind.* iii, 460.

A pendent epiphyte. *Pseudobulbs* caespitose, cylindrical, thickened at the base, 2—3 in. long, or shorter and more ovoid, usually partly enveloped in large fibrous sheaths. *Leaves* solitary, 6—12 in. long, elliptic-ob lanceolate or lanceolate, acute, tapering to the stout petiole, strongly 3—5-nerved. *Inflorescence* from the top of a pseudobulb, drooping, 8—10 in. long, lengthening in fruit; peduncle slender, as

long as or longer than the dense many-flowered distichous raceme. *Flowers* about $\frac{1}{2}$ in. long, white ringed with pink or yellow; fl. bract longer than the slender stalked ovary, convolute, subrotund, minutely apiculate, many-nerved, persistent, pale-brown. *Sepals* $\frac{1}{4}$ in. long; dorsal sepal orbicular, 3-nerved; lateral pair connate at the base, cymbiform, winged along the keel. *Petals* linear-oblong, subacute. *Lip* 3-lobed, saccate between the large rounded lateral lobes; terminal lobe divided at the apex into two small oblong lobules. *Column* broad, its upper half winged. *Pollinia* clavate, attached in pairs to two small membranes. *Capsule* about $\frac{3}{4}$ in. long, ellipsoid.

Dehra Dun (Mackinnon, Gamble, Duthie). *Flowers* June—Aug. *DISTRIB.*: Outer ranges of the Garhwal and Kumaon Himalaya up to 4,000 ft., and eastwards to Nepal, Sikkim and Bhutan; also on the Khasia Hills, in Chota Nagpur, Chittagong, Konkan and Kanara, and south to S. India and Ceylon; extending to the Andaman Islands, Burma, Malay Pen., China, Pacific Islands and Australia.

2. *P. articulata*, Lindl. in Wall. Cat. 1992, var. *Griffithii*, K. & P. in Ann. R. Bot. Gard. Calc. viii, 147, t. 204; Duthie id. ix, pt. 2, 116. *P. Griffithii*, Hook. f. Ic. Pl. t. 1881; F. B. I. v, 845.

Internodes of pointed stems terete, slightly furrowed, 3—5 in. long, the nodes bearing a few short broad scarios sheaths. *Leaves* 2, narrowly oblong-lanceolate, 3—4 in. long, tapering at each end. *Racemes* 1—2 in. long, decurved; peduncles from the top of the pseudobulbs, rhachis flexuose; floral bracts $\frac{1}{2}$ in. long, oblong, obtuse, pale-brown. *Flowers* white tinged with brown and pink. *Sepals* $\frac{1}{4}$ in. long, the dorsal one broadly ovate or suborbicular; lateral ovate-lanceolate, 5-nerved. *Petals* elliptic-lanceolate. *Lip* cymbiform, with a didymous terminal lobe; side-lobes none; base with 5 lamellate nerves. *Column* suborbicular; rostellum ovate-acuminate. *Pollinia* subglobose.

Dehra Dun, on sal trees (Mackinnon, Gamble). *DISTRIB.*: Outer ranges of Garhwal Himalaya up to 4,000 ft. and eastwards to Sikkim and the Khasia Hills. This plant is similar in most respects to the type, but smaller in all its parts, and the leaves are much narrower.

7. **PACHYSTOMA**, Blume; Fl. Brit. Ind. v, 811.

Terrestrial herbs with rather thick rhizomes. *Leaves* solitary or in pairs, usually appearing after the flowers, long, narrow, many-nerved. *Flowers* rather small, pendulous, white or pale-purple, puberulous, in racemes or on long pale scapes with clasping striate sheaths; bracts often large and scarios. *Sepals* unequal, the dorsal one blunt, lateral subacute. *Petals* narrow, spatulate. *Lip* sessile on the footless column, erect; side-lobes oblong, acute; terminal small; disk with 3—5 deeply crested and fimbriate ridges. *Column* slender, clavate above. *Anther* dorsal; *pollinia* 8, pyriform, waxy, adhering to a single membrane.—Species 6—8, in India, Malaya and Africa.

P. senile, Reichb. f. in Bonpl. iii, 251; F. B. I. v, 812; K. & P. in Ann. R. Bot. Gard. Calc. viii, 101, t. 140; Duthie id. ix, pt. 2, 108; Prain Beng. Pl. 1014.

An erect terrestrial herb, leafless when in flower. *Rhizome* rather stout, producing scapes and solitary leaves at intervals of about 2 in. *Leaf* longer than the scapes, linear, membranous, 4–5-nerved. *Scapes* about 12 in. high, clothed with many pale striate sheaths 1–2 in. long. *Racemes* many-flowered. *Flowers* about $\frac{1}{2}$ in. across, greenish-white tinged with pink or purple, gland-puberulous; floral bract longer than the curved stalked pubescent ovary, erect, lanceolate, acuminate. *Sepals* unequal; dorsal oblong, rounded at apex; lateral pair spreading oblong-lanceolate, subacute. *Petals* narrowly spatulate, re-curved puberulous as are the sepals. *Lip* sessile on the base of the column, 3-lobed, broadly oblong, gibbous at the base, pubescent; side-lobes acutely falcate; terminal one suborbicular, recurved and abruptly acuminate at the apex; upper surface of disk with 5 stout crested ridges extending from base to apex. *Column* dilated upwards, puberulous. *Anther* on the back of the column, indistinctly 8-celled.

Dehra Dun (T. Thomson, Mackinnon); also in many localities within the area of this flora from the Jumna eastwards to Moradabad and N. Oudh. Flowers in April. **DISTRIB:** Outer Himalayan ranges from Garhwal to Sikkim; also on the Khasia Hills, and eastwards to the Nicobar Islands, and the Malay Archipelago to S. China. It occurs also in N. Bengal and Chota Nagpur and extends southwards to S. India and Ceylon.

8. THUNIA, Reichb.; included under *Phaius* in Fl. Brit. Ind. v, 816.

Terrestrial, rarely epiphytic herbs. *Stems* slender or equally thickened along their entire length, elongate, leafy, with many foliaceous sheaths below. *Leaves* distichous, lanceolate, glaucous. *Flowers* appearing with leaves, large, showy, in terminal drooping racemes; bracts large, scarious. *Sepals* erecto-patent, subequal, lanceolate, acute. *Petals* like the sepals. *Lip* adnate to the base of the footless column, shortly spurred; side-lobes short, involving the column; mid-lobe fringed. *Anther* narrow, pendulous, incompletely 4-celled; pollinia 8, waxy, attached in fours to a granular membrane; rostellum 3-lobed.—Species about 9, in tropical and temperate regions of the Old World.

T. venosa, Rolfe in *Orch. Rev.* (1905) 206; Cooke *Fl. Bomb.* ii, 692. *Phaius albus*, Lindl. in *Wall. Pl. As. Rar.* ii. (1831), 85 t. 198; *Bot. Reg.* (1838), t. 33 (not of Lindl.); *Bot. Mag.* t. 3991; *Paxt. Mag. Bot.* xv, 125; *F. B. I.* v, 818 in part; K. & P. in *Ann. R. Bot. Gard. Calc.* viii, 110, t. 153; *Duthie id.* ix pt. 2, 109; *Prain Beng. Pl.* 1014. *Limodorum bracteatum*, Roxb. *Fl. Ind.* iii, 466.

Pseudobulbs none. *Stems* stout, erect, tufted, 1–3 ft. long, bearing many tubular sheaths at the base. *Leaves* many, sessile, $1\frac{1}{2}$ –3 ft. long, narrowly elliptic-lanceolate or oblong-lanceolate, acuminate, membranous, glaucous beneath, usually plicate. *Racemes* 4–6-fid, 4–6 in. long, shortly peduncled and with a single elongated sheath. *Flowers* 2–2½ in. long; bracts equalling or exceeding the long-stalked ovary, oblong, cymbiform, acute, pale-coloured. *Lip* broadly oblong-panduriform

when spread out; lower half convolute into a tube; upper portion cucullate, forming a rounded shell-like mouth slightly acuminate, the margins undulate and unequally dentate; upper surface with 7—9 crested ridges. *Spur* horizontal, slightly bifid. *Column* with a short foot, somewhat winged at the apex. *Pollinia* unequal, elongate. *Capsule* $1\frac{1}{2}$ in. long, narrowly elliptic.

Dehra Dun (Gamble, Mackinnon), sometimes found as an epiphyte on sal trees. Flowers in June. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft. It extends eastwards to Sikkim, Assam, the Khasia Hills and Burma, and occurs also in Chota Nagpur. A variety with shorter and more congested racemes is mentioned by Cooke as having been found by Dalzell on the Matheran Hill in Konkan.

9. ERIA, Lindl.; Fl. Brit. Ind. v, 785.

Epiphytic and usually pseudobulbous. *Pseudobulbs* often elongated and stem-like. *Flowers* never large, rarely showy, arranged in racemes spikes or heads or on 1—2-flowered pedicels, often pubescent or tomentose. *Sepals* free from each other, adnate to the long foot of the column and with it usually forming a spur-like or saccate mentum. *Petals* similar to the sepals. *Lip* sessile on the foot of the column and incumbent. *Column* short and straight or long and somewhat curved, prolonged below as a foot. *Anther* accumbent, imperfectly 4-celled or 8-celled; *pollinia* 8, pyriform or broadly obovoid, waxy, attached in fours by their bases to a granular membrane, or sometimes all attached together to a single viscus.—Species over 300, chiefly in Tropical Asia.

Flowers in dense spikes, glabrous or sparsely hairy,
not woolly

1. *E. convallarioides*.

Flowers distant, sessile, on scapes, densely woolly outside

2. *E. flava*.

1. *E. convallarioides*, Lindl. in Wall. Cat. 1975; Gen. & Sp. Orch. 70; F. B. I. v, 791; K. & P. in Ann. R. Bot. Gard. Calc. viii, 118, t. 161; Duthie id. ix, pt. 2, 110. *Octomeria spicata*, Don Prod. 31.

Pseudobulbs tufted, flattened, 3—7 in. long, covered when young with large loose sheaths. *Leaves* four to six, subcoriaceous, 4—7 in. long, elliptic-lanceolate or oblanceolate, acute, many-nerved, but not plicate. *Spikes* produced on the young growths, cylindrical, decurved; *peduncle* about 1 in. long, stout, naked below. *Flowers* many, white tinged with yellow, densely crowded, subglobose, about $\frac{1}{4}$ in. across, inodorous; floral bracts equalling the sessile pubescent ovary, ovate, lanceolate, concave. *Sepals* broadly ovate, obtuse; lateral pair deeply concave. *Petals* oblanceolate-oblong, spreading, nearly as long as the sepals but narrower. *Lip* obscurely 3-lobed, cuneate, concave, apex subacute, the disk without lamellæ. *Column* rather slender, with a long curved foot. *Pollinia* clavate, attached to a large translucent viscus. *Capsule* oblong, obtuse, not winged.

Dehra Dun (P. W. Mackinnon), flowering during Aug. and Sep. **DISTRIB.:** Outer Himalayan ranges from Garhwal eastwards to Nepal and Sikkim, up to 4,000 ft., also in Tenasserim.

2. E. flava, Lindl. in Wall. Cat. (in part); Gen. & Sp. Orch. 65; F. B. I. v, 801; K. & Pantl. in Ann. R. Bot. Gard. Calc. viii, 126, t. 175; Duthie id ix, pt. 2, 111; Prain Beng. Pl. 1013.

Rhizome stout, clothed with imbricating tubular sheaths. Pseudobulbs large, stem-like, or 4—6 nodes, 3—5 in. long, much compressed, sheathed at the base. Leaves 6—10 in. long, narrowly oblong, acuminate, tapering to the base, subcoriaceous. Scapes from the base of the pseudobulbs, about as long as the leaves, clothed with dense pale tomentum and with many sheaths at the base. Flowers distant, yellow, $\frac{2}{3}$ in. across, densely white-woolly outside; floral bracts lanceolate, pilose, shorter than the pinkish pilose stalked ovary, shrivelling as the flowers open. Dorsal sepal small, lanceolate; lateral pair $\frac{2}{3}$ in. long, triangular, spreading. Petals smaller than the dorsal sepal, lying parallel over the column, narrowly oblong, tapering to the base and apex. Lip oblong, 3-lobed, tumid; side-lobes narrow, truncate at the apex, puberulous and with two long tapering ridges at their junction with the disk; terminal lobe oblong, acute, recurved, slightly 2-ridged, glabrous. Column erect, its foot at right angles to and longer than its body. Ovary pinkish and densely pilose. Pollinia small, compressed, attached to two granular membranes. Capsule cylindric, $1\frac{1}{2}$ — $1\frac{3}{4}$ in. long.

Dehra Dun (Duthie, Mackinnon); flowering in April. DISTRIB.: Outer Himalayan ranges of Garhwāl up to 4,000 ft. and eastwards to Bhutan; also in Chota Nagpur. In Sikkim specimens the base of the lip, on both surfaces, and the foot of the column are often blotched with reddish-purple.

10. EULOPHIA, R. Br.; Fl. Brit. Ind. vi, 1.

Terrestrial glabrous herbs with fleshy tubers or rhizomes rarely pseudobulbous. Leaves appearing with or after the flowers, long narrow and usually plicate. Flowers in racemes, rarely paniced, on a tall erect sheathed usually lateral scape. Sepals free, spreading, subequal. Petals somewhat similar to the sepals. Lip adnate to the base of the column or to its foot, saccate or shortly spurred at the base; side-lobes erect, embracing the column, rarely suppressed; midlobe spreading or recurved; disk usually ridged or crested. Column with or without a foot, its apex entire and often oblique, the margins occasionally winged or lobed. Anther terminal, 2-celled, sometimes with two apical processes; pollinia 2, globose, attached by a caudicle to the flat gland of the rostellum.—Species over 300, in tropical or subtropical Asia and Africa.

Column not or only slightly produced into a foot:—

Leaves appearing with the flowers:—

Lip with a short bent spur; bracts as long or longer than the ovary:—

Sepals spreading, linear-lanceolate, acuminate, green

1. *E. herbacea*.

Sepals erect, ovate-obtuse, yellowish-brown.

2. *E. Mackinnoni*.

Lip saccate at the base; bracts shorter than the ovary

3. *E. explanata*.

- Leaves appearing after the flowers have opened:—
- | | |
|-----------------------------|---------------------------|
| Terminal lobe of lip yellow | 4. <i>E. Hormusjii</i> . |
| Terminal lobe of lip purple | 5. <i>E. campestris</i> . |
- Column produced into a distinct foot:—
- | | |
|--|---------------------------|
| Lateral sepals inserted on the spur; basal lobes of lip obscure | 6. <i>E. nuda</i> . |
| Lateral sepals inserted on the foot of the column; lip with distinct basal lobes:— | |
| Flowers not exceeding 1 in. diam., greenish-yellow tinged with purple | 7. <i>E. bicarinata</i> . |
| Flowers large, exceeding $1\frac{1}{2}$ in. in diam., lemon-yellow, often spotted or streaked with lilac:— | |
| Terminal lobe of lip $\frac{1}{2}$ as long as the rhomboid-oblong basal lobes; spur saccate, blunt | 8. <i>E. flava</i> . |
| Terminal lobe of lip twice as long as the rounded basal lobes; spur short, curved, acute | 9. <i>E. obtusa</i> . |

1. *E. herbacea*, Lindl. *Gen. & Spec. Orch.* 182; Royle *Ill.* 366; *F. B. I.* vi, 2; Duthie in *Ann. R. Bot. Gard. Calc.* ix, pt. 2, 123, t. 106; Cooke *Fl. Bomb.* ii, 693. *E. bicolor*, Lindl. in *Journ. Linn. Soc.* iii, 24 (not of Dalz.). *Limodorum bicolor*, Roxb. *Fl. Ind.* iii, 469.

Root tuberous, the tubers about $1\frac{1}{2}$ in. long, broadly ovate. *Pseudostem* 4–6 in. long. *Leaves* 6–10 in. long, linear-lanceolate, variable in breadth, many-nerved, plicate. *Flowering stem* stout, 2–3 ft. high, with a few sheathing bracts towards the base. *Raceme* short, 8–10-fid; floral bracts about as long as the ovary, linear-lanceolate, acuminate, scarious. *Flowers* appearing with the leaves, about 2 in. across, white, tinged with green, fragrant. *Sepals* $\frac{7}{8}$ – $1\frac{1}{2}$ in. long, spreading, linear-lanceolate, acuminate, green with pale margins; lateral pair adnate to the base of the column. *Petals* shorter than the sepals, pure white, elliptic or lanceolate, obtuse or acute. *Lip* $\frac{3}{4}$ in. long, white tinged with green at the base; side-lobes small oblong, rounded at the apex; midlobe oblong, rounded at apex, margins crenate; disk with five median fimbriate lamellæ; spur very short subgeniculate, obtuse. *Column* stout, $\frac{1}{4}$ in., curved and without a foot, slightly winged. *Pollinia* transversely oblong, attached by a short broad caudicle to a triangular gland. *Capsule* about $1\frac{1}{4}$ in., ellipsoid, slightly ribbed.

Dehra Dun (Mackinnon); Siwalik range (Vicary). Flowers during June and July. *DISTRIB.*: Outer ranges of W. Himalaya up to about 5,000 ft.; also found in the Bombay Presidency and in Mysore.

2. *E. Mackinnoni*, Duthie in *Journ. As. Soc. Beng.* lxxi, pt. 2 (1902), 40; *Ann. R. Bot. Gard. Calc.* ix, pt. 2, 124, t. 107. *E. bicolor*, *Falc. mss. in Herb. Saharanpur* (not of Lindl. nor of Dalz.).

Rhizome composed of a series of flattened triangular-shaped tubers. *Pseudostem* up to $7\frac{3}{4}$ in., proceeding from the summit of the bulb-like current year's tuber. *Leaves* usually two, appearing with the flowers, up to $2\frac{1}{2}$ ft. long and 2–3 in. wide, broadly lanceolate, acuminate, tapering into long sheaths and with a few leafless sheaths below, prominently nerved and plicate. *Flowering stem* much shorter than the leaves, rising from the side of the current year's tuber and bearing 3 or 4 loosely sheathing bracts. *Flowers* 8–10, in a lax raceme, spreading or at length deflexed, $\frac{1}{2}$ – $\frac{3}{4}$ in. long; floral bracts

equalling or exceeding the ovary, linear-lanceolate, acuminate, persistent. *Sepals* and *petals* erect, fleshy, yellow tinged with reddish-brown, the veins prominent outside; dorsal sepal $\frac{3}{4}$ in. long, ovate, obtuse, subcordate at the base, the margin inflexed at the apex; lateral pair rather longer, unequal at the base. *Petals* shorter than the sepals, oblong-obovate, obtuse, their margins overlapping and inflexed at the apex. *Lip* 3-lobed, with long erect rather shallow side-lobes; its body streaked with purple on a yellow ground and with three prominent white lamellæ which extend into a carunculate area to within the base of the terminal lobe; terminal lobe broad, yellow rounded and with undulate edges. *Spur* short, geniculate. *Column* short, broadly winged, its foot very slightly produced. *Anther* yellow, with two short purple horns at the apex, its lip bifid. *Pollinia*, transversely oval, attached by a broad caudicle to a shallow crescent shaped gland.

Dehra Dun (Mackinnon, Duthie); Siwalik range (Vicary); N. Oudh in the Bahraich district (Duthie); N. W. India Royle. Flowers in July and Aug. **DISTRIB.:** Cent. Prov. in the Raipur district (J. Marten). This plant appears to be most nearly related to *E. geniculata*, King and Pantl., a very rare Sikkim species, but differing in the shape of the rhizome, the much broader leaves and in the shape and colouring of the lip.

3. *E. explanata*, Lindl. Gen. & Sp. Orch. 180; F. B. I. vi, 3; Duthie in Ann. ix, part 2, 125, t, 108. Dipodium scariosum, Herb. Ham.; Hook. Ic. Pl. 1882.

Pseudobulb about 2 in. long, ovoid, annulated. *Pseudo-stem* $1\frac{1}{2}$ —2 in. long. *Leaves* young when the plant is flowering, attaining, when fully developed, about 10 in. in length and 4 in. in width, broadly elliptic-lanceolate, acuminate, tapering below into a short petiole 7-veined. *Flowering stem* about 10 in. long, arising from below the summit of the pseudobulb, bearing a few loose sheaths at its base. *Raceme* 5—6 in. long, laxly many-fl.; flowering bract lanceolate, acuminate, much shorter than the slender ovary. *Flowers* about 1 in. across. *Sepals* and *petals* subequal, spreading, white or yellowish streaked with reddish-purple. *Sepals* spathulate-lanceolate, acute. *Petals* broadly oblong, rounded at the apex. *Lip* a little shorter than sepals and petals, 3-lobed, subpanduriform when flattened out, adnate by its base to the lateral sepals; basal lobes rounded, erect, white with reddish-purple branching veins, forming at the base a short conical sac; terminal lobe yellow with purplish veins terminating within the margin, oblong, with a rounded emarginate apex, the margins reflexed; disk with two prominent crenate lamellæ and a shorter interposed one, all three abruptly terminating within the margin of the apex. *Column* short, its foot slightly produced. *Anther* emarginate at the apex. *Pollinia* subglobose, attached to a short broad caudicle; gland conical.

Dehra Dun (Mackinnon); N. W. India (Falconer); Sub-Himalayan tracts of Rohilkhand and of the districts of Kheri and Gonda in N. Oudh (Duthie). Flowers in May. **DISTRIB.:** Outer Himalayan ranges

of Garhwál, and in Nepal at Maghada in the Morung district (Buch-Hamilton). This plant was regarded by Sir J. Hooker as an anomalous species with the habit of an Australian *Dipodium*.

4. **E. Hormusjii**, *Duthie in Ann. R. Bot. Gard. Calc. ix, part 2, 125, t. 109.*

Tuber depressed, transversely oval, about $1\frac{1}{4}$ in. across. *Pseudo-stem* about 4 in. long, bearing two tightly fitting sulcate subacute sheaths. *Leaves* two, developing later than the flowers, narrowly elliptic, acuminate, plicate. *Flowering stem* stout, 8—12 in. long, rising from the summit of the tuber, clothed at intervals with a few loose membranous lanceolate acuminate sheathing bracts. *Flowers* 8—10 forming a rather lax raceme about 3 in. long, and about 1 in. across, at first spreading, at length deflexed; floral bracts variable in length, lanceolate, acuminate, membranous, brownish. *Sepals* and *petals* subequal in length, nearly $\frac{1}{2}$ in. long, narrowly oblong or oblanceolate, acuminate or abruptly mucronate, white with pink veins and tinged with pale-green at the apex. *Lip* including spur a little longer than the sepals and petals; side-lobes deep-purple, erect, rounded, entire; between the side-lobes are three prominent whitish lamellæ; midlobe orbicular, yellow spotted with purple, and with a coarsely fimbriate disk, the margin undulate and irregularly erose. *Spur* cylindrical, curved, obtuse, white, grooved in front. *Column* about half as long as the lip, with a very slightly produced foot. *Pollinia* oval, attached by a short stout caudicle to a shallow crescent-shaped gland.

Dehra Dun (Mackinnon); N. Oudh, in the Kheri district (Duthie). Flowers during April. **DISTRIB.:** Outer ranges of the W. Himalaya up to 5,000 ft. from Garhwal westwards to Hazara and the Chitral district, often in pine forests. This species is nearly related to *E. campestris*, differing chiefly by its shorter scapes, larger flowers and more congested racemes. The shape of the lip and the general colouring of the flowers are also very different. *E. campestris* is essentially a species of the plains, whereas *E. Hormusjii* extends up to the temperate region of the W. Himalaya where the climatic conditions are more favourable for leaf development.

5. **E. campestris**, *Wall. Cat. 7367; Royle Ill. 366; F. B. I. vi, 4; K. & P. in Ann. R. Bot. Gard. Calc. viii, 178, t. 41; Duthie id. ix, part 2, 126; Prain Beng. Pl. 1016.* *E. ramentacea* and *E. rupestris*, *Lindl.* *E. hemileuca*, *Lindl. in Journ. Linn. Soc. iii (1859), 25.* *Limodorum ramentaceum*, *Roxb. Fl. Ind. iii, 467.* *Bletia Dabia*, *Don Prod. 30.—Vern. Sang-misri (Beng.).*

Tubers irregularly oblong, often lobed. *Leaves* two, rising from the apex of a slender sheathing pseudostem, developing long after the plant has flowered, 10—16 in. long, linear, acuminate, plicate. *Scapes* 6—12 in. long, sheathed at intervals by loose membranous bracts; raceme laxly many-fl'd. *Flowers* drooping, subsecund, yellowish or green with pink or purple markings, about 1 in. across; floral bracts, membranous, linear or lanceolate, acuminate, usually longer than the slenderly stalked ovary. *Sepals* slightly attached to the base of

the lip, linear-lanceolate, acute or acuminate, 5—7-nerved. *Petals* spreading, narrower than the sepals, oblanceolate, 3—5-nerved. *Lip* as long as the sepals, cuneate-obovate or oblong; side-lobes short, rounded or subacute, incurved round the column; midlobe orbicular quadrate or oblong, crenulate, usually purple; basal portion of disk with three median lamellæ ending in a fimbriate or tubercled patch on the terminal lobe. *Spur* short, conical subclavate or subacute. *Column* as long as the lip, slender, without a foot. *Pollinia* broad; caudicle stout; gland elongate. *Capsule* $\frac{3}{4}$ in. long, ellipsoid.

Sub-Himalayan tracts of Rohilkhand and N. Oudh (Wallich, Duthie). Flowers Mar. to May. **DISTRIB.:** Nepal, Sikkim, Chittagong, Bengal and Upper Burma, extending to Baluchistan and Afghanistan.

6. *E. nuda*, *Lindl. in Wall. Cat. 7371; F. B. I. vi, 5; Hook. f. in Ann. R. Bot. Gard. Calc. v, 32, tt. 47—50; K. & P. id. viii, 180, t. 243; Duthie id. ix, pt. 2, 127; Cooke Fl. Bomb. ii, 694.*

Tuber large, spherical, smooth. *Leaves* 10—14 in. long, rising from the side of a tuber and forming by their sheaths a short pseudo-stem, elliptic-lanceolate, acute, plicate, many-nerved, narrowed at the base into a long tubular sheath. *Flowering stem* stout, erect, firm, 2—3 ft. high, rising from the base of the pseudostem, with a few loose sheaths near the base and other more distant ones higher up. *Racemes* lax, about $1\frac{1}{4}$ in. long, many-fl. *Flowers* usually pale-green or white with purple or pink or brownish markings; floral bracts lanceolate, acute, about half as long as the stalked ovary. *Sepals* about $\frac{7}{8}$ in. long, erect, greenish-purple, linear-oblong, acute, 7-nerved; lateral pair slightly falcate, inserted on the spur of the lip, the dorsal one rather narrower. *Spur* very short, conical, obtuse, purplish-green, ribbed at the mouth. *Petals* shorter than the sepals, white, obtuse, many-nerved. *Lip* as long as the sepals, white or pale yellow flushed with pink or purple, oblong; side-lobes short, rounded; midlobe, oblong, obtuse, with a crisped margin; disk with about 9 strong prominent nerves. *Column* short, with a distinct foot, dilated at the margins. *Anther* small, its apex with two small conical processes and a third depressed one in front. *Pollinia* transversely oblong, attached by a broad caudicle to a shallow gland. *Capsule* $1\frac{1}{2}$ in. long, fusiform.

N. Oudh, in the districts of Kheri and Gonda (Duthie's Collector). Flowers April—June. **DISTRIB.:** Trop. Himalaya from Nepal eastwards to Sikkim; also in Chota Nagpur, Assam, Khasia Hills, Manipur and Burma, and south to Bombay Presidency and Ceylon.

7. *E. bicarinata*, *Hook. f. in F. B. I. vi, 6; K. & P. in Ann. R. Bot. Gard. Calc. viii, 180, t. 244; Duthie id. ix, pt. 2, 127; Prain Beng. Pl. 1016. Cyrtopera bicarinata, Lindl.*

Tuber about 2 in. long, compressed, irregularly lobed. *Leaves* usually undeveloped at the time of flowering, 7—12 in. long, linear, acuminate, narrowed below into the long petiole. *Scape* erect, 10—20 in. high, with two tubular inflated sheaths at the base and a few shorter ones higher up. *Racemes* 3—5 in. long, oblong, rather densely flowered. *Flowers* pale yellowish-green tinged with purplish-brown, 1 in. in

diarn.; floral bracts shorter than the stalked ovary, membranous, lanceolate. *Sepals* linear-oblong, acute, keeled, their edges reflexed and undulate; lateral pair inserted on the foot of the column, wider than the dorsal one and free from it at their bases. *Petals* narrowly elliptic, subacute, shorter and wider than the sepals. *Lip* adnate to the foot of the column, longer than the sepals, slightly saccate at the base, 3-lobed; side-lobes shallow, obtuse; veins reddish-purple, branching within the margin; terminal lobe tinged with yellow, transversely oblong, emarginate; disk with two short smooth ridges half as long as the side-lobes and ending in a free triangular tooth, in front of which rise five unequal carunculate ridges extending to the terminal lobe. *Anther* apiculate in front. *Pollinia* broadly triangular, attached by a broad caudicle to a thin angular gland.

Sub-Himalayan tract in Pilibhit and in the Kheri district of N. Oudh (Duthie). Flowers in March and April. **DISTRIB.:** N. Bengal, Sikkim, Assam, Khasia Hills, Manipur and Upper Burma.

8. *E. flava*, Hook. f. in *F. B. I.* vi, 7; Prain. *Beng. Pl.* 1016; Duthie in *Ann. R. Bot. Gard. Calc.* ix, part 2, 128, t. 110. *Cyrtopera flava*, Lindl.; Royle *Ill.* 370, t. 88, fig. 1.

A tall robust herb with a tuberous rhizome. *Leaves* about three forming when young a short pseudostem by their sheathing base appearing later than the flowers, attaining 4 ft. in length and about 4 in. in width when fully developed. *Flowering stem* stout, unbranched, 2—5 ft. high, clothed at the base with a few distant close-fitting sheaths and rising from a tuber beside the leaf-bearing pseudostem. *Raceme* 1—2 ft. long, bracts much shorter than the ovary, $\frac{1}{2}$ — $\frac{2}{3}$ in. long, ovate-lanceolate, acuminate. *Flowers* many, large, drooping, lemon-yellow. *Sepals* 1—1 $\frac{1}{4}$ in. long, oblong-lanceolate, acuminate. *Petals* rather shorter than the sepals and much broader, obtuse or emarginate, many-nerved. *Lip* equalling the sepals in length, 3-lobed; side-lobes large, rounded or oblong, whitish towards the apex and spotted with purple at their yellow bases; midlobe oblong, yellow, the disk with two small pyriform basal calli and three crenate lamellæ; spur a short blunt sac. *Column* about $\frac{3}{4}$ in. long, produced at the base into a short foot. *Anther* emarginate at the apex and with a long anterior process. *Pollinia* obtusely angled, attached by a stout caudicle to a broad shallow gland.

Dehra Dun (Royle, Mackinnon); sub-Himalayan tracts of Rohilkhand and in the Kheri district of N. Oudh (Duthie). Flowers in June and July. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon to Nepal, up to 5,000 ft.; also in Chota Nagpur and Travancore, extending to Hongkong and China.

9. *E. obtusa*, Hook. f. in *F. B. I.* vi, 3; Duthie in *Ann. R. Bot. Gard. Calc.* ix, part 2, 129, t. 111. *E. campanulata*, Duthie in *Journ. As. Soc. Beng.* lxxi, part 2 (1902) 39. *Cyrtopera obtusa*, Lindl. *Gen. and Sp. Orch.* 190.

Height of plant 3—4 ft.; the leaves and scape rising from a horizontal oblong tuber. *Pseudostem* formed by the sheaths enclosing the bases

of the leaves and scape. *Leaves* two or three, 12—18 in. long, linear, acuminate, plicate; veins sharply prominent. *Flowering stem* exceeding the leaves, with a few long tight-fitting acuminate sheaths towards the base. *Flowers* six to ten, in a lax raceme, appearing with the leaves, $1\frac{1}{2}$ in. across, erect in bud, drooping and campanulate when open; floral bracts acuminate, less than half the length of the ovary. *Sepals* and *petals* prominently veined on the back, bright-yellow outside, pale-lemon within; dorsal sepal obovate, acute, $\frac{3}{4}$ in. long; lateral pair rather shorter, falcately oblong, obtuse or subacute, adnate to the foot of the column. *Spur* short, curved subacute. *Petals* obovate, obtuse, about as long as the lateral sepals. *Lip* 3-lobed, longer than the sepals; side-lobes suborbicular, erect, whitish or pale-yellow, with lilac-coloured streaks at the base; midlobe bent upwards, the margin undulate. *Disk* with 5—8 prominent white ridges terminating within the margin of the apical lobe in a dull-yellow oblong grooved callus and prolonged towards the base into two sets of free fimbriate projections. *Column* about $\frac{3}{4}$ in. long, oblong, narrowly winged curving forward into a distinct foot at the purple-streaked base. *Anther* with a rounded or slightly emarginate apex and a long anterior projection. *Pollinia* subglobose, attached by a cylindric caudicle to a crenulated obconical gland.

Dehra Dun, in swamps (W. Bell, Mackinnon, Duthie); Rohilkhand in the Pilibhit district, and at Chandanpur in the Gonda district of N. Oudh (Duthie's collector). Flowers during July and August. **DISTRIB.:** Warm valleys in the vicinity of Mussoorie (Royle). After examining in the Royal Herbarium at Kew the single type specimen of Lindley's *Cyrtopera obtusa*, as well as Falconer's excellent drawing of the same plant under his manuscript name of *Eulophia arundinacea*, I had no hesitation in referring to it the *E. campanulata* which was described by me in the Journ. As. Soc. Beng. l.c. as a distinct species. Lindley was correct in his description of the column and its distinctly produced foot characteristic of the *Cyrtopera* section of the genus.

11. GEDORUM, Jackson; Fl. Brit. Ind. vi, 16.

Terrestrial herbs with underground subglobose rhizomes. *Leaves* elliptic, plicate, their sheaths forming a pseudostem. *Flowers* rather crowded, narrow, forming a decurved corymbose raceme on a stout sheathed scape arising from the base of the pseudostem. *Sepals* erect, equal, oblong, subacute. *Petals* as long as the sepals but broader and blunt. *Lip* sessile on the base of the column; side-lobes suppressed; terminal lobe broad, rounded, bifid or emarginate; disk with a forked basal callus. *Column* less than half the length of the lip. *Anther* broad, 2-celled; pollinia 2, broadly ovoid, attached by a slender tapering caudicle to a small orbicular gland.—Species about 9 or 10 in India, Malaya and Australia.

G. dilatatum, R. Br. in Ait. Hort. Kew ed. 2, v, 207; Prain Beng. Pl. 1017; Cooke Fl. Bomb. ii, 695. **G. purpureum**, R. Br. l.c. F. B. I.

vi, 16 (in part)-K. and P. in *Ann. R. Bot. Gard. Calc.* viii, 181, t. 245; Duthie *id.* ix, part 2, 130. *Limodorum recurvum*, Roxb. *Fl. Ind.* iii, 469.

Tuber globose, apiculate, $1\frac{1}{2}$ in. in diam. *Pseudo-stem* 3—6 in. long. *Leaves* 6—20 in. long, broadly elliptic, tapering at the base to a long sheath. *Flowers* about $\frac{1}{2}$ in. long, pale-purple or rose-coloured, in racemes which are short corymbose and drooping when in flower, but elongate and erect in fruit; floral bract lanceolate, acute, exceeding the pedicelled ovary. *Sepals* $\frac{3}{4}$ in. long, oblong, acute, 3-nerved. *Petals* as long as the sepals, oblong, obtuse. *Lip* pale-purple with darker markings, $\frac{3}{4}$ in. long, ventricose at the base, and much thickened, subpandurate; side-lobes none; mid-lobe rounded, 2-fid or emarginate; disk with a channelled ridge ending in raised yellow calli. *Pollinia* with elongate pits on their posterior surface.

Dehra Dun (Mackinnon). Flowers during June and July. *DISTRIB.*: Eastwards to Nepal, Sikkim and Bhutan; also in Assam, Bengal, Chota Nagpur, Burma, Malay Pen., Andaman Islands, extending to W. and S. India and Ceylon.

12. CYMBIDIUM, Swartz; *Fl. Brit. Ind.* vi, 8.

Epiphytes with a short stout pseudo-stem, rarely terrestrial or with an elongated leafy stem. *Leaves* coriaceous, usually long and narrow, rarely rudimentary at the time of flowering. *Flowers* rather large, in many- or few-flowered suberect or drooping racemes, rarely 1-flowered; scape loosely sheathed; floral bracts various. *Sepals* and *petals* subequal, erect or spreading. *Lip* adnate to the base of the column and embracing it more or less by its convolute side-lobes; terminal lobe decurved; disk usually with two ridges. *Column* long, without a foot. *Anther* 1- or (imperfectly) 2-celled; pollinia 2, rarely 4, ovoid, pyriform cuneiform or subglobose, more or less partite, sessile on a small or large often strap-shaped gland.—Species about 50, in temperate subtropical and tropical Asia, a few in Africa and Australia.

A terrestrial almost leafless parasite; pollinia 4 1. *C. macrorhizum*.

An epiphyte, with long strap-shaped leaves;
pollinia 2

2. *C. aloifolium*.

1. ***C. macrorhizum***, *Lindl. Gen. and Sp. Orch.* 162; *Royle Ill.* 366; *F. B. I.* vi, 9; *Duthie in Ann. R. Bot. Gard. Calc.* ix, part 2, 134, t. 114.

A terrestrial almost leafless parasite. *Rootstock* as thick as a goose quill, creeping branched and jointed. *Scape* very short, basal sheath up to 2 in. long. *Raceme* up to 6 in. long, 6—8-flowered; floral bracts $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Flowers* $1\frac{1}{2}$ in. across; pedicel with ovary 1 in. long. *Sepals* about $\frac{3}{4}$ in. long, linear-lanceolate, acuminate, pale-yellow, tinged with pink, spreading or reflexed. *Petals* shorter and broader than the sepals, whitish streaked with pink. *Lip* about $\frac{3}{4}$ in. long, white with crimson or purple blotches along the margin; side-lobes narrow, erect, margins inflexed; midlobe oblong or subpanduriform, acute at the apex; disk with two thick whitish ridges between the side-lobes. *Column* about $\frac{3}{4}$ in. long, curved, inner surface streaked

with crimson. *Anther* papillose outside. *Pollinia* 4, sessile on the crescent-shaped gland.

N. W. India (Royle, Falconer); Dehra Dun, Kalanga Hill (Mackinnon). Flowers during July and August. *DISTRIB.*: Outer Himalayan Ranges of Garhwal and Kumaon, up to 7,000 ft.; eastwards to Sikkim (but very rare); also in Assam and on the Khasia and Naga Hills. There is also a record of its having been found in Kashmir.

2. *C. aloifolium*, Swartz in *Nov. Act. Upsal.* vi, 73; Roxb. *Fl. Ind.* iii, 458; *F. B. I.* vi, 10; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 198, t. 252; *Duthie id.* ix, part 2, 136; *Cooke Fl. Bomb.* ii, 696.

Pseudostem short. *Leaves* 12—18 in. long, linear-oblong, obtuse, fleshy, obliquely notched at the apex, slightly expanded at the sheathing base. *Inflorescence* shorter than the leaves; peduncle 3—4 in. long, bearing several tubular acute scarious sheaths near the base. *Flowers* yellowish-red, in many-flowered drooping racemes 9—15 in. long.; floral bracts ovate, $\frac{1}{8}$ — $\frac{1}{4}$ in. long; pedicels with ovary $\frac{1}{4}$ — $\frac{3}{8}$ in. *Sepals* subequal, oblanceolate-oblong, obtuse; lateral pair subfalcate. *Petals* as long as sepals, obtuse. *Lip* purplish, equalling the sepals, 3-lobed, its upper surface with two stout lamellæ broken and disconnected in the middle; lateral lobes narrow, blunt, entire; midlobe ovate-oblong, decurved. *Column* slightly thickened at the apex. *Anther* subquadrate, papillose. *Pollinia* 2, small; gland crescent-shaped.

N. Oudh, in the Bahraich district (Duthie). Flowers during April and May. *DISTRIB.*: Nepal Terai and Trop. Himalaya eastwards to Sikkim and Assam; also in W. and S. India, extending to Ceylon, Tenasserim, the Andaman Islands and Malay Peninsula.

13. **ORNITHOCHILUS**, Wall.; *Fl. Brit. Ind.* vi, 76.

Epiphytic, without pseudobulbs. *Stem* very short. *Leaves* few, crowded, broadly oblong, softly coriaceous. *Inflorescence* supra-axillary, racemose or in panicles. *Sepals* subequal, spreading, incurved at the apex, lateral ones obliquely obovate. *Petals* smaller, cuneate-oblong, blunt. *Lip* much longer than sepals, adnate to foot of the column by a long broad claw with a rectangularly bent subcylindric spur at its junction with the terminal lobe; side-lobes shallow, subquadrate; terminal with three lobules; the two lateral recurved and pectinate; the central one triangular, entire or infolded; mouth of spur closed by two calli projecting from its back and front walls, the latter hairy. *Column* short, cylindric, with a short foot; rostellum short; stigma circular, surrounded by a hairy rim. *Anther* oblong; *pollinia* 2, subglobose, caudicle broad, obcuneate; gland large.—Species 1 or 2, Indian and Chinese.

O. fuscus, Wall. in *Lindl. Gen. and Spec. Orch.* 242; *F. B. I.* vi, 76; *K. & P. in Ann. R. Bot. Gard. Calc.*, viii, 200, t. 268; *Duthie id.* ix, 2, 139.

Leaves 3—7 in. long, oblong or ovate-lanceolate, obliquely tapering to the acute apex and narrowed to the sessile sheathing base, fleshy,

shining on both surfaces when young; nerves inconspicuous. *Inflorescence* much longer than the leaves; racemes simple or sparingly branched; floral bracts lanceolate, much shorter than the long-pedicelled ovary. *Flowers* $\frac{1}{3}$ — $\frac{1}{2}$ in. across. *Sepals* and *petals* greenish-yellow and streaked with red, the former with four, and the latter with two, broad brown vertical bands. *Lip* with two pectinate lobules, brown passing into purple. *Capsule* 1 in. long, fusiform.

Dehra Dun (Mackinnon), flowering in July. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon up to 3,000 ft., extending eastwards to Sikkim, Bhutan, Khasia Hills, Burma and China.

14. LUISIA, Gaud. ; Fl. Brit. Ind. vi, 22.

Epiphytes with rigid terete sheathed usually erect stems, woody below. *Leaves* terete, fleshy, distant, spreading. *Flowers* usually small and dull-coloured, in short extra-axillary spikes; rachis stout; floral bracts short, scarious persistent. *Sepals* subequal, or the decurved dorsal one smaller. *Petals* equalling the sepals or much longer, spreading. *Lip* sessile on the base of the column, divided into two parts, basal portion (hypochile) concave or flat; apical portion (epichile) decurved, broad and ridged, entire or crenate or undulate and with a more or less blunt apex. *Column* stout, much shorter than the lip; stigma usually large. *Anther* broad, 2-celled; pollinia 2, ovoid or subglobose, attached by a broad caudicle to a subquadrate or elongate gland. *Capsule* suberect narrow, ridged.—Species about 15, chiefly in Tropical Asia, a few in Australia.

L. trichorbiza, Blume Mus. Bot. Lugd. Bat. i, 63; F. B. I. vi, 23; K. & P. in Ann. R. Bot. Calc. viii, 202, t. 270; Duthie id. ix, part 2, 140.

Stem 4—9 in. long, very stout, not branched. *Leaves* fleshy, 4—6 in. long and about $\frac{1}{2}$ in. thick, slightly tapering to the apex. *Spikes* stout, 4 or 5-flowered. *Flowers* $\frac{2}{3}$ in. long, on short thick tubercles; flowering bracts broad, acuminate, persistent. *Sepals* unequal, green with faint purple lines; dorsal sepal oblong, blunt; lateral pair shorter, obliquely ovate, acute, keeled. *Petals* longer and narrower than the lateral sepals, oblong, blunt, all spreading. *Lip* longer than sepals, dull purple on a greenish ground; basal portion (hypochile) deeply concave and with erect rounded edges; epichile broadly cordate and tapering to the subtruncate emarginate apex; upper surface with short blunt vertical ridges. *Column* stout, half as long as the lip, purple. *Anther* subquadrate, compressed. *Rostellum* broad. *Pollinia* ovoid, attached by a broad caudicle to the quadrate gland.

Dehra Dun, epiphytic chiefly on sal trees (Gamble, Mackinnon). Flowers during March and April. **DISTRIB.:** Tropical Himalayan Valleys from Garhwal to Sikkim. It occurs also in Chota Nagpur.

15. ÆRIDES, Lour. ; Fl. Brit. Ind. vi, 43.

Epiphytes with leafy stems; pseudobulbs none. *Leaves* lorate rarely terete. *Flowers* usually many and showy, in dense or lax decurved

racemes, sometimes solitary; floral bracts minute. *Sepals* broad, spreading; lateral ones adnate to the base or foot of the column. *Petals* like the sepals. *Lip* adnate to the column, spurred; side-lobes large or small or none; midlobe longer than the side-lobes or smaller and incurved between them. *Column* short with a short or long foot. *Anther* 2-celled, beaked or not; pollinia 2, globose, sulcate; caudicle long or short; gland various.—Species about 20, in E. Asia.

Terminal lobe of lip large, hastate-ovate; flowers pink with purple spots

1. *Æ. multiflorum*.

Terminal lobe of lip small, linear or narrowly oblong; flowers white, spotted with lilac, very fragrant

2. *Æ. odoratum*.

1. *Æ. multiflorum*, Roxb. *Cor. Pl.* iii, 63, t. 271; *Fl. Ind.* iii, 475; *F. B. I.* vi, 44; *K. & P. in Ann. R. Bot. Gard. Calc.* viii, 212, t. 283; *Duthie id.* ix, part 2, 142; *Prain Beng. Pl.* 1020.

Stem stout, 4—10 in. long. *Leaves* 6—8 in. long, narrowly oblong, conduplicate, recurved, slightly tapering to the oblique bifid apex, not narrowed to the base, often tinged with red. *Racemes* longer than the leaves, simple, axillary, densely many-flowered; peduncle long, clothed with short distant sheaths. *Flowers* $\frac{3}{4}$ —1 in. across, deep-pink and with darker spots. *Sepals* and *petals* about equal, oblong, blunt. *Lip* twice as long as the sepals, triangular, adnate to the base of the column, acute or obtuse at the apex, margins crose; basal portion thick and with a retrose tooth or callus across the mouth of the short rectangularly bent spur. *Column* with a short foot, its margins thickened and slightly winged near the base. *Anther* depressed and with a long curved beak in front. *Pollinia* globular, caudicle filiform, gland narrow. *Capsule* up to 2 in. long subclavate, stoutly pedicelled.

Dehra Dun and Siwalik range, common on mango trees. Flowers during June and July. **DISTRIB.:** Outer ranges of Himalaya from Kangra to Nepal and Sikkim, up to about 4,000 ft.; also found in Assam, Chota Nagpur and N. Bengal.

2. *Æ. odoratum*, *Lour. Fl. Cochin.* 525; *F. B. I.* vi, 47; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 212, t. 282; *Duthie id.* ix, part 2, 143; *Prain Beng. Pl.* 1020; *Cooke Fl. Bomb.* ii, 701. *Æ. ornatum*, Roxb.; *Fl. Ind.* iii, 272.

Stem 4—12 in. long, very stout. *Leaves* 6—12 in. long and 1—1 $\frac{1}{2}$ in. wide oblong, flat, keeled, tapering slightly to the blunt unequally bilobed apex, not contracted at the sheathing base. *Racemes* supra-axillary, deflexed, as long as or longer than the leaves, many-flowered; peduncle short, stout, with short distant sheaths. *Flowers* about 1 in. long, white, spotted with pink fragrant; floral bract broad, sheathing, blunt, much shorter than the stalked ovary. *Sepals* unequal, obtuse, spreading, the dorsal one elliptic-ovate, the lateral pair larger. *Petals* oblong, falcate, shorter than sepals. *Lip* adnate to the short foot of column; side-lobes larger than the incurved almost linear emarginate midlobe. *Anther* triangular, depressed, beaked. *Pollinia* globose, caudicle linear, gland quadrate. *Capsule* about 1 $\frac{1}{4}$ in. long, fusiform.

Dehra Dun (King; Gamble, Mackinnon); N. Oudh, in the Bahraich district (Duthie). Flowers during July and August. **DISTRIB.:** Trop. Himalaya in Garhwal and Kumaon and eastwards to Nepal and Sikkim; also in E. Bengal, Chota Nagpur and the Circars; extending to Tenasserim, Malaya and China.

16. RHYNCHOSTYLIS, Blume; Fl. Brit. Ind. vi, 32.

Epiphytes, without pseudobulbs. *Stems* elongate, stout, leafy. *Leaves* very coriaceous, linear-oblong, truncately or bluntly 2-lobed at the apex. *Flowers* in long drooping densely cylindric racemes, showy. *Sepals* spreading, broad, obtuse. *Petals* similar to the sepals but narrower. *Lip* adnate to the short foot of the column, the hypochile forming a deep wide pubescent sac without side-lobes; epichile obovate, acute, concave with erect margins. *Column* short, stout, dilated at the base and with a very short foot; stigma small. *Anther* terminal, rounded; pollinia 2, elliptic, attached by a long slender caudicle to a small oblong gland.—Species 2 or 3, Indian and Malayan.

R. retusa, Blume Bijdr. 286, t. 49; F. B. I. vi, 32; K. & P. Ann. R. Bot. Gard. Calc. viii, 213, t. 284; Duthie id. ix, part 2, 143; Prain Beng. Pl. 1020; Cooke Fl. Bomb. ii, 698. *Saccolabium guttatum*, Lindl.; Royle Ill. 366. *Ærides guttatum*, Roxb. Fl. Ind. iii, 471. *Epidendrum retusum*, Linn.

Stems stout, 3—8 in. long, clothed with the sheaths of decayed leaves and emitting many stout branching roots. *Leaves* 6—18 in. long and $\frac{1}{2}$ — $1\frac{1}{2}$ in. wide, strap-shaped, spreading and recurved, obliquely præmorse or bluntly and unequally 2-lobed at the apex. *Racemes* dense, cylindric, longer than the leaves. *Flowers* about $\frac{3}{4}$ in. across, white or pale-pink, dotted with darker-coloured spots; bracts $\frac{1}{10}$ — $\frac{1}{8}$ in. long, ovate, acute, persistent. *Sepals* veined, about $\frac{1}{2}$ in. long; lateral pair obliquely obovate-orbicular; dorsal one obovate, rounded. *Petals* as long as the sepals, elliptic-oblong, subobtuse. *Lip* dark-pink, with a saccate flattened spur; epichile variable in shape, $\frac{1}{2}$ in. long, oblong or cuneate-oblong at the base, widening towards the apex. *Capsule* 1— $1\frac{1}{2}$ in. long, acutely 3-angled and 6-ribbed, its pedicel short and stout.

Dehra Dun (King, Mackinnon, etc.); Siwalik range (Royle); N. Oudh, in the Gonda district (Duthie). Flowers during June and July. **DISTRIB.:** Trop. Himalaya from the Punjab eastwards to Nepal, Sikkim and Bhutan, up to 4,000 ft., also in Assam, the Khasia Hills, Chota Nagpur, Konkan and Kanara; extending to Burma, S. India, Ceylon and the Malay Islands.

17. VANDA, R. Br.; Fl. Brit. Ind. vi, 49.

Epiphytes with leafy stems. *Leaves* thickly coriaceous or fleshy, flat and keeled or terete. *Flowers* usually large and often showy, in simple lax or dense racemes, sometimes solitary; floral bracts much shorter than the ovary. *Sepals* and *petals* subequal, spreading or connivent, narrowed at the base. *Lip* large, usually saccate or spurred at the

base; side-lobes large or small, rarely absent, adnate to the short foot of the column or to the sides of the sac or spur; midlobe fleshy, various; disk usually ridged or amellate, sometimes carunculate. *Column* short, stout, the foot short or none. *Anther* 2-celled; rostellum small; pollinia 2, didymous, subglobose or obovoid; caudicle short and broad or long and geniculate; gland usually large. Species about 20, in Tropical Asia and Australia.

Sepals and petals spreading:—

Flowers small, less than 1 in. across, yellow except the bluish caruncles on the lip

1. *V. parviflora*.

Flowers $1\frac{1}{2}$ —2 in. across; sepals and petals greenish-yellow mottled with brown; mid lobe of lip with purple caruncles

2. *V. Roxburghii*.

Sepals and petals incurved

3. *V. cristata*.

1. ***V. parviflora***, *Lindl. in Bot. Reg. xxx (1844) Misc. 45; F. B. I. vi, 50; K. & P. Ann. R. Bot. Gard. Calc. viii, 215, t. 286; Duthie id. ix, part 2, 144; Prain Beng. Pl. 1021; Cooke Fl. Bomb. ii, 703.*

Stem stout, 3—6 in. long, enveloped in the sheathing bases of fallen leaves. *Leaves* 3—8 in. long by $\frac{3}{8}$ — $\frac{1}{2}$ in. wide (when flattened out), linear-oblong, conduplicate, keeled, unequally and obtusely 2-lobed at the apex. *Inflorescence* from below the leaves and about as long; peduncle as long as the raceme, bearing a few small scattered sheaths. *Raceme* few-flowered; floral bracts ovate, acute, deciduous. *Flowers* yellow except the blue fleshy ridges on the lip, less than $\frac{3}{4}$ in. across. *Sepals* and *petals* spreading. *Sepals* spatulate, obtuse; the lateral pair shorter than the dorsal one. *Petals* as long as the lateral sepals, falcately spatulate-oblong, falcate. *Lip* $\frac{1}{2}$ in. long, adnate to the short foot of the column, spurred; side-lobes erect, oblong, rounded, rising from the mouth of the spur; midlobe fleshy, obovoid; tip dilated, crenulated; disk with two broad bluish ridges. *Column* short, with a short thick foot. *Anther* depressed, slightly beaked in front. *Pollinia* subglobose, attached to a short broad caudicle. *Capsule* 1— $1\frac{1}{2}$ in. long, fusiform, with winged ridges.

Dehra Dun (Mackinnon). Flowers May and July. **DISTRIB.:** Outer ranges of Himalaya, up to 4,000 ft., from Garhwal eastwards to Nepal and Sikkim; extending to Assam and Burma; also in Chota Nagpur, the Konkan and S. India to Ceylon.

2. ***V. Roxburghii***, *R. Br. in Bot. Reg. t. 506; F. B. I. vi, 52; Watt. E. D.; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 145, t. 116; Prain Beng. Pl. 1021; Cooke Fl. Bomb. ii, 704. Cymbidium tessallatum, Sw.; Roxb. Fl. Ind. iii, 462. C. tessalloides, Roxb. Lc. 463.—Vern. Rasna, nai.*

Stem climbing, 1—2 ft. long, emitting many thick white fleshy roots. *Leaves* bifarious, approximate, 6—8 in. long, narrow, complicate, keeled; apex præmorse. *Racemes* longer than the leaves; peduncle 6—10 in. long. *Flowers* $1\frac{1}{2}$ —2 in. across. *Sepals* and *petals* subequal, spreading, clawed, obovate, undulate, yellowish (rarely bluish), tessellated with brown, their claws and outer surfaces white. *Lip* $\frac{3}{4}$ in. long, bluish streaked with purple; side-lobes small, acute, rising

from the mouth of the spur, $\frac{1}{4}$ in. long, ovate, acute, erect; terminal lobe panduriform, with a purple dilated truncate 2-lobed apex, the margins deflexed; disk convex, with fleshy ridges; spur conical, obtuse, straight, hairy within. *Column* very short. *Capsule* 3— $3\frac{1}{2}$ in. long, shortly stalked, clavate, sharply ridged.

Forests of Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh (R. Thompson, Duthie). Often climbing on the branches of mango trees and *Bassia latifolia* (mahua). Flowers during the rains. **DISTRIB.:** Konkan, Gujarat and Kanara in the Bombay Pres.; also in Bengal, Behar, Chota Nagpur and Central Provs., extending south to Travancore and Ceylon. The roots are used medicinally in the Chánda district of C. Provinces for rheumatism and fever, and for allaying the pain caused by the stings of scorpions.

3. *V. cristata*, *Lindl. in Wall. Cat.* 7328; *F. B. I.* vi, 53; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 216, t. 287; *Duthie id.* ix, part 2, 146.

Stem 3—6 in. long, clothed with the remains of old leaf-sheaths. *Leaves* bifarious, crowded, 3—4 in. long, conduplicate, unequally bilobed at the truncate apex, dilated at the sheathed base. *Raceme* not exceeding the leaves, axillary, 2—5-fid. *Flowers* $1\frac{1}{2}$ —2 in. across. *Sepals* and *petals* incurved, pale olive-green or yellowish. *Sepals* unequal, oblong, obtuse. *Petals* narrower than sepals, oblong. *Lip* adnate to base of column, longer than sepals, green blotched with dull purplish-brown; basal lobes erect, triangular; terminal lobe yellow streaked with purple, oblong, with two divaricate oblong lobules and a horn-like, deflexed fleshy beak; upper-surface with five carunculate ridges. *Spur* short, conical, obtuse. *Column* short, without a foot. *Pollinia* ovoid, attached by a short broad caudicle to a large quadrate gland. *Capsule* narrowly clavate, 2— $2\frac{1}{2}$ in. long.

Dehra Dun (Mackinnon). Flowers during May. **DISTRIB.:** Outer ranges of Himalaya in Garhwal and Kumaon, up to 4,000 ft.; extending eastwards to Sikkim, Bhutan and Sylhet.

18. SACCOLABIUM, Blume; Fl. Brit. Ind. vi, 54.

Epiphytes, without pseudobulbs. *Leaves* coriaceous, flat or conduplicate, often keeled. *Flowers* usually small, in leaf-opposed or supra-axillary racemes corymbs umbels or panicles; floral bracts minute. *Sepals* and *petals* adnate to the column, subequal, spreading or reflexed. *Lip* sessile on the footless column, forming a cylindrical or saccate spur; lateral lobes small or none; terminal one small, often hairy. *Anther* 1- or imperfectly 2-celled; pollinia 2, entire or bipartite.—Species 50, in E. Asia.

Spur cylindrical, straight

.. 1. *S. papillosum*.

Spur short, at right angles to the ovary, widely saccate:—

Apex of leaves not setulose; terminal lobe of lip papillose-hairy

2. *S. calceolare*.

Apex of leaves setulose; terminal lobe of lip fleshy and glabrous

3. *S. distichum*.

1. **S. papillosum**, Lindl. in Bot. Reg. t. 1552 (excl. syn.); F. B. I. vi, 63; K. & P. Ann. R. Bot. Gard. Calc. viii, 219, t. 290; Duthie id. ix, part 2, 147; Prain Beng. Pl. 1022.

Stems 2—3 ft., stout, erect, clustered, bearing many nearly horizontal leaves. Leaves coriaceous, 3—4 in. long, conduplicate, curved; apex truncate or deeply notched. Peduncle 1—2 in. long, leaf-opposed, about $\frac{1}{2}$ in. long, bearing a subcorymbose 4—8-flowered raceme. Flowers $\frac{1}{3}$ in. in diam.; bracts triangular. Sepals and petals yellow barred and blotched with brown. Sepals subequal, oblong, subacute, spreading. Petals narrower than sepals, subspathulate. Lip longer than sepals, adnate to the base of the column; side-lobes none; terminal lobe decurved, ovate-oblong, obtuse, crenate; upper surface transversely rugulose, white with transverse purple bars. Spur cylindrical, straight, half as long as the ovary and parallel to it, cylindrical or slightly tapering, pale-yellow, hairy within. Column short. Anther broadly conical. Pollinia subovoid, deeply bipartite; caudicle slender, tapering to the small oblong gland. Capsule $1\frac{1}{4}$ in. long, fusiform, ridged.

Dehra Dun, in swamps (Gamble, Mackinnon). **DISTRIB.**: Outer ranges of Himalaya in Garhwal and Kumaon and eastwards to Sikkim; also in Assam, Bengal, Circars and Burma.

2. **S. calceolare**, Lindl. in Wall. Cat. 7302; F. B. I. vi, 60; K. & P. Ann. R. Bot. Gard. Calc. viii, 225, t. 300; Duthie id. ix, part 2, 147. *Gastrochilus calceolaris*, Don Prod. 32.

Stem short, pendulous. Leaves 4—10 in. long, narrowly oblong, unequally bifid at the apex, slightly narrowed towards the base. Racemes much shorter than the leaves, corymbose, many-flowered; peduncle stout, bearing several short sheaths. Flowers crowded, $\frac{3}{4}$ in. across; floral bracts small, broad and blunt. Sepals and petals pale-green with large brownish spots. Sepals unequal, spreading, the dorsal one obovate-oblong; lateral pair falcately oblong, narrower. Petals shorter than the sepals, oblong-obovate. Lip adnate to the lower half of the column, the base forming a short wide yellow sac about half as long as the ovary; side-lobes none; terminal lobe at right-angles to the sac, semicircular; its upper surface, except a triangular yellow patch at the base, pure white and covered with hair-like papillæ. Column very short and thick. Anther depressed, shortly beaked. Pollinia broadly ovoid-elliptic, attached by a slender caudicle to a small cordate gland.

Dehra Dun (Mackinnon). Flowers in April and May. **DISTRIB.**: Outer Himalayan ranges from Garhwal eastwards to Sikkim and Bhutan; also on the Khasia Hills, extending to Burma and the Malay Peninsula.

3. **S. distichum**, Lindl. in Journ. Linn. Soc. iii, 4; F. B. I. vi, 64; K. & P. Ann. R. Bot. Gard. Calc. viii, 227, t. 303; Duthie id. ix, part 2, 148.

Stems pendulous, 5—10 in. long, branching slender, leafy. Leaves $\frac{1}{2}$ —1 in. long, narrowly lanceolate, acuminate, with two or three fine

setæ from the apex; base sessile and slightly oblique. *Peduncles* leaf-opposed, about equalling the leaves in length. *Flowers* 2—4, in a lax raceme, about $\frac{1}{2}$ in. in diam., green, irregularly spotted with brown; floral bracts oblong, subacute. *Sepals* and *petals* subequal, oblong, elliptic, obtuse. *Lip* about as long as the petals, adnate to lower half of column, the base with a wide blunt sac at right angles to the ovary, its inner surface without hairs or calli; side-lobes none; terminal lobe yellow, semicircular, entire, smooth, fleshy; margins deflexed, the base with two blunt conical calli. *Column* short, broad. *Anther* shortly beaked in front. *Pollinia* elliptic; caudicle long, slender, cylindric, the gland elongate, bifid. *Capsule* fusiform, about $\frac{3}{8}$ in. long.

Northern Oudh, in the Bahraich district (Duthie's collector). Flowers during April and May. **DISTRIB.:** Outer Himalayan ranges in Garhwal, up to 6,000 ft., and eastwards to Sikkim, the Khasia Hills and Manipur.

19. CLEISOSTOMA, Blume; included under *Saccolabium* in Fl. Brit. Ind. vi, 59.

Epiphytic herbs. *Stems* more or less elongate. *Leaves* coriaceous or fleshy, flat or semiterete. *Flowers* in leaf-opposed racemes or panicles. *Sepals* adnate to the column, subequal, spreading. *Petals* like the sepals. *Lip* sessile on the footless column, the base with a large saccate or funnel-shaped spur which is sometimes dilated at the apex; its opening more or less occluded by 2 calli, the posterior of which is frequently 2-fid, and also sometimes by a dorsal scale, but never septate; the lateral lobes small or obsolete; apical lobe thickened, concave. *Column* short, thick, footless. *Anther* depressed; pollinia 2, often 2-fid; caudicle single.—Species about 40 in E. Trop. Asia and Australia.

C. micranthum, K. & P. Ann. R. Bot. Gard. Calc. viii, 234, t. 312; Duthie id. ix, part 2, 148; Prain Beng. Pl. 1023. *Saccolabium micranthum*, Lindl.; F. B. I. vi, 59.

Stem stout, compressed, 3—8 in. long, enveloped in the leaf-sheaths. *Leaves* $2\frac{1}{2}$ — $3\frac{1}{2}$ in. long, narrowly oblong, keeled, obliquely truncate, obtusely bifid, tapering to the shortly sheathed base. *Flowering stem* equalling or longer than the leaves; racemes many-flowered; peduncle and rhachis stout. *Flowers* about $\frac{1}{2}$ in. across; bracts broad, blunt, much shorter than the short sessile ovary. *Sepals* and *petals* spreading, white with large purple spots. *Sepals* broadly ovate, obtuse. *Petals* smaller than the sepals, oblong. *Lip* fleshy, pink or purple, as long as the sepals. *Spur* addressed to and as long as the ovary, wide, blunt; lateral lobes of lip small; terminal one convex, oblong, blunt, margins thin, erose; upper surface smooth. *Column* very short and stout, with a large protuberance on either side of the rostellum. *Anther* with a long pointed beak. *Pollinia* obovoid; caudicle triangular, shallowly cordate, attached to a small orbicular gland.

Dehra Dun (Vicary, Mackinnon). Flowers during June and July.

DISTRIB.: Outer ranges of Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan, Assam, and on the Naga and Khasia Hills; also in Chota Nagpur and in Tenasserim.

20. SARCANTHUS, Lindl.; Fl. Brit. Ind. vi, 66.

Epiphytic herbs, with usually elongate stems. *Leaves* fleshy, terete or flat. *Flowers* in extra-axillary racemes or panicles. *Sepals* subequal, spreading or reflexed, or the dorsal one concave and connivent over the column. *Petals* smaller than the sepals, spreading. *Lip* adnate to the base of the column, or to its foot, rarely jointed, the base with a funnel-shaped spur sometimes dilated at its apex, the opening more or less occluded by calli on its anterior and posterior walls, and always divided into two lateral compartments by a vertical antero-posterior septum; lateral lobes small more or less triangular and acute; apical lobe small, triangular or hastate. *Column* short, stout, often with a foot as long as or longer than itself. *Anther* depressed; pollinia 2, bifid.—Species about 35, in E. Trop. Asia.

S. insectifer, Reichb. f. in *Bot. Zeit*, 159; *F. B. I.* vi, 68; *Duthie Ann. R. Bot. Gard. Calc.* ix, part 2, 149; *Prain Beng. Pl.* 1023.

Stem 1 ft. or more in length, robust, scandent, flexuous, emitting many elongate fibres. *Leaves* firmly coriaceous, crowded, almost imbricate, $\frac{1}{2}$ –2 in. long, distichously spreading, oblong, amplexicaul, apex obtusely 2-lobed. *Racemes* shorter than the leaves, subsessile, few-flowered, decurved; rhachis stout; bracts minute, deciduous. *Flowers* about $\frac{1}{2}$ in. across; sepals and petals 3-nerved, yellowish-green, striated with red. *Sepals* ovate-oblong, obtuse or subacute. *Petals* oblong. *Lip* white and pink, or purple; side-lobes short; terminal lobe larger than the sepals, triangular-ovate or cordate. *Spur* vertically septate, its mouth with a pubescent ridge. *Column* very short. *Anther* hemispheric. *Pollinia* sulcate, attached to a short caudicle broader than long; gland transverse, membranous.

N. Oudh, in the Bahraich district (Duthie). Flowers in Sept. DISTRIB.: Garhwál, in the Rámghanga valley, also in Chota Nagpur, Behar, Cachar, Chittagong, Sundribans, extending to Tenasserim.

21. POGONIA, Juss.; Fl. Brit. Ind. vi, 118.

Terrestrial unifoliolate tuberous-rooted herbs; tuber stoloniferous each stolon bearing at its tip a tuber smaller than that of the parent. *Leaf* broadly cordate or orbicular, strongly plicate, rising from the same tuber as the flowers, but usually after the appearance of the flower-scape, occasionally coctaneous. *Flowers* solitary few or several, racemose, often pendulous, on scapes rising from the tuber. *Sepals* subequal, narrow, connivent or spreading. *Petals* like the sepals. *Lip* adnate to the base of the column, sometimes slightly saccate at the base, rather narrow, the lower portion convolute round the column; lateral lobes small, usually triangular; apical lobe flat, ovate or

orbicular, entire or fimbriate. *Column* elongate, clavate upwards; stigma anticous, oblong or orbicular. *Anther* more, or less incumbent, substipitate; pollinia 2 or 4, elongate, powdery, often coherent, without caudicle or gland. Species about 80, in Trop. Asia, America and Africa.—The above characters apply only to the section *Nervilea*, to which all the Old World species of *Pogonia* belong, and which differ by flowering before the leaves appear. All the other species, except one in Japan, are found in the New World, and their flowering stems bear leaves.

Leaves many-nerved; floral bracts longer than ovary, deflexed; lip slightly saccate at the base .

1. *P. GAMMIEANA*.

Leaves 7–9-nerved; floral bracts erect; lip not saccate at the base

2. *P. CARINATA*.

1. ***P. Gammieana***, *Hook. f. in Bot. Mag. t. 6671*; *F. B. I. vi, 120*; *K. & P. Ann. R. Bot. Gard. Calc. viii, 269, t. 359*; *Duthie id. ix, part 2, 158*.

Tuber globular warted, about $1\frac{1}{4}$ in. in diam. *Leaf* glabrous, 5–6 in. across, reniform, abruptly acuminate, many-nerved, its margin much undulate; petiole about as long as the blade, sheathed at the base. *Flowering stem* stout, 3–12 in. long, peduncle bearing two or three long tubular acute and often bifid bracts. *Raceme* laxly 5–8 fld. *Flowers* about 1 in. long, drooping, pink streaked with white; floral bracts deflexed, longer than the truncate stalked ovary, linear-lanceolate, acuminate. *Sepals* and *petals* subequal, oblanceolate, connivent. *Lip* pale-green, as long as the sepals, saccate at the base, elliptic-obovate (when spread out); lower half convolute and with two short side-lobes pointing forwards; epichile spreading, the margin deeply crenulate; disk hairy, with three parallel central ridges.

Dehra Dun (Mackinnon, Duthie); Siwalik range, in the Timli Pass (Duthie). Flowers in May, and the leaves appear about two months later. **DISTRIB.**: Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft.; also in Sikkim.

2. ***P. carinata***, *Lindl. Gen. & Spec. Orch. 414*; *F. B. I. vi, 121*; *Prair Beng. Pl. 1026*; *Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 159, t. 124*; *Cooke Fl. Bomb. ii, 707*. *Epipactis carinata*, *Roxb. Fl. Ind. iii, 454*.

Tubers globose or obovate, $\frac{1}{2}$ – $\frac{3}{4}$ in. in diam., annulated and warted. *Leaf* $1\frac{1}{2}$ – $2\frac{1}{2}$ in. wide, ovate, acute or cuspidate, cordate or cuncate at the base, 7–9-nerved, glabrous; petiole 1–2 in. long, sheathed at the base. *Flowering stem* up to 1 ft. high, bearing 3 or 4 loose tubular acute or acuminate sheaths. *Raceme* laxly flowered; floral bracts twice as long as the stalked ovary, erect lanceolate, acuminate, 5-nerved. *Flowers* about 1 in. long. *Sepals* and *petals*, subequal, spreading, linear-lanceolate, acuminate, green. *Lip* $\frac{3}{4}$ in. long, straight, trough-shaped, not saccate at the base, 3-lobed above the middle, white tinged with yellowish green and with conspicuous pink-coloured veins usually bifurcating within the margin; upper surface hairy, especially on the ridges and veins; side-lobes erect, margins

entire, terminal lobe not deflexed, ovate, bluntly acuminate, its margin irregularly crenulate. *Column* $\frac{1}{2}$ in., slightly curved, dilated at the apex. *Anther* triangular, beaked in front.

Sub-Himalayan tracts of Rohilkhand and North Oudh, in the districts of Pilibhit, Bahraich and Gonda. Flowers in May, the leaves appearing about one month later. **DISTRIB.:** Ramganga valley in Kumaon (T. Thomson); common in Bengal and eastwards to Burma; also in the Bombay Pres. and southwards to S. India.

22. EPIPACTIS, Andans.; Fl. Brit. Ind. vi, 125.

Terrestrial herbs with fibrous roots and leafy stems. *Leaves* sessile, plicate. *Flowers* in racemes, drooping; floral bracts elongating and often leaf-like. *Sepals* and *petals* broadly lanceolate, acuminate, strongly nerved. *Lip* adnate to the base of column, distinctly divided into hypochile and epichile; hypochile much deflexed, concave or saccate, jointed to the epichile at a right angle, both with entire edges. *Column* short; stigma large, anticous; rostellum broad, prominent. *Anthers* erect, obtuse, its cells contiguous; pollinia 2, bipartite, very narrow. Species about 12, in the North Temp. Hemisphere.

E. consimilis, Wall. Cat. 7043 (not of Don); F. B. I. vi, 126; K. & P. Ann. R. Bot. Gard. Calc. viii, 272, t. 364; Duthie id, ix, part 2, 161; Collett Fl. Siml. 498.

Height of plant 1—2 ft. *Stem* leafy, slender, glabrous. *Leaves* 4—7 in. long, lanceolate, acuminate; uppermost shorter and much narrower; nerves prominent. *Raceme* 4—6 in. long, laxly fld., rhachis tomentose. *Flowers* 1—1 $\frac{1}{2}$ in. across; flowering bracts ovate or linear-lanceolate, varying in size. *Sepals* spreading, unequal, concave, clothed with white hairs on a deep-lavender ground, green inside as are both surfaces of the petals, and marked with broad bands of reddish-brown; dorsal sepal lanceolate, acute; lateral pair much broader. *Petals* ovate, acute, tomentose on the stout midrib beneath. *Lip* rather shorter than the sepals; hypochile purple, trough-shaped, bearing granular unequal calli inside, with two larger obtuse nectar-exuding ones near the apex; epichile pale brown, lanceolate and with erect lobes; upper surface with a median ridge terminating within the white apex. *Column* stout, curved; stigmas large, subrotund and with two glands on the lower margin. *Anther* tumid.

Dehra Dun (Gamble, Mackinnon); banks of canal near Saharanpur (Duthie). Flowers during Feb. and March. **DISTRIB.:** W. Himalaya from the Simla Hills to Kumaon, up to 3,000 ft. and eastwards to Nepal and Sikkim, extending to upper Burma and China; it is found also on the N. W. frontier of India in the districts of Gilgit and Chitral, and extends to Afghanistan and Syria.

23. GOODYERA, R. Br.; Fl. Brit. Ind. vi, 110.

Terrestrial leafy herbs; stem decumbent below. *Leaves* usually rather thick, with wide sheaths and often distinct petioles. *Flowers* small, numerous, in terminal, sometimes secund, spikes or racemes. *Sepals*

subequal, often pubescent outside; lateral pair free, subconnivent or spreading; dorsal concave. *Petals* like the dorsal sepal and forming with it a hood over the column. *Lip* adnate to base of column, entire saccate or cymbiform at the base; apical lobe small, usually acute and decurved; basal sac with setæ calli or ridges inside, rarely smooth. *Column* short, with projecting rostellum; stigma anticous, undivided. *Anther* usually pyriform, with a long erect beak; pollinia 2, clavate, sessile on a large or small gland.—Species about 25, in Europe, Temp. and Trop. Asia, North America, New Caledonia and the Mascarene Islands.

G. procera, *Hook. Exot. Flora*, t. 39; *Don Prod.* 28; *Royle Ill.* 384; *F. B. I.* vi, 111; *K. & P. Ann. R. Bot. Gard. Calc.* viii, 282, t. 378; *Duthie id.* ix, part 2, 165; *Prain Beng. Pl.* 1027.

Stem 10–30 in. in length, very leafy below, glabrous, loosely enveloped by the wide leaf-sheaths. *Leaves* many, long-petioled; blade 4–8 in. long, elliptic or ovate-elliptic, tapering at each end, acute or acuminate; petiole stout, 1½–3 in. long. *Peduncle* bearing many lanceolate acuminate bracts which are hairy above and glabrous beneath. *Spike* 3–8 in. long, many- and densely fld.; rachis pubescent. *Flowers* minute, subglobose, white tinged with green; fl. bract as long as ovary, ovate-lanceolate, acuminate, pubescent on the margin. *Sepal* glabrous, subequal, broadly ovate, obtuse. *Petals* clawed, cuneately obovate. *Lip* longer than sepals, with a large saccate base, its apex decurved, triangular, entire; interior of basal sac with two rows of long setæ on the sides and an oblong callus at the apex of each row. *Column* very short, with a transverse depression below the broad anticous stigma. *Anther* pyriform, obtuse. *Pollinia* clavate-cylindric, sessile on a small oblong gland.

Dehra Dun (Mackinnon); N. Oudh in the Bahraich district (Duthie). Flowers in May. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim and Bhutan; also in Assam and on the Khasia and Naga Hills; found also in Bengal, the C. Prov. and S. India, extending to China, Hongkong and Java.

24. ZEUXINE, Lindl.; *Fl. Brit. Ind.* vi, 106.

Terrestrial herbs with succulent glabrous stems. *Leaves* membranous, sometimes withering at the time of flowering. *Flowers* small, in racemes or spikes. *Sepals* subequal; lateral pair free, the dorsal one concave. *Petals* like the dorsal sepal, and with it forming a hood to the column. *Lip* adnate to base of column, cymbiform or saccate at the base; apical lobe shortly clawed or sessile, divided into two subquadrate more or less truncate diverging lobules or entire, or with narrow decurved lobules, the basal sac with calli or laminae within. *Column* very short, its anterior face with lamellar or conical processes; stigmas 2, lateral, distinct. *Anther* membranous, sometimes ridged, the cells contiguous; pollinia pyriform, attached by an oblong gland to the erect rostellum. Species about 30, in Trop. Asia and in Trop. and S. Africa.

Z. sulcata, Lindl. *Gen. and Sp. Orch.* 485; Royle *Ill.* 368; F. B. I. vi, 106; Watt *E. D.*; K. & P. *Ann. R. Bot. Gard. Calc.* viii, 286, t. 381; Duthie *id.* ix, part 2, 168; Prain *Beng. Pl.* 1029; Cooke *Fl. Bomb.* ii, 708. *Pterygodium sulcatum*, Roxb. *Fl. Ind.* iii, 452.

Whole plant 2—10 in. high. *Stem* and peduncle glabrous. *Leaves* 1—2 in. long, linear, acuminate, sessile on the hyaline truncate sheaths, gradually passing into linear bracts higher up. *Raceme* $\frac{1}{2}$ —2 in. long, densely-fl'd., glabrous; fl. bract $\frac{1}{3}$ in. long, ovate-lanceolate, acuminate, much longer than the ovary. *Flowers* about $\frac{1}{3}$ in. long, white or pink. *Sepals* unequal, the dorsal one ovate, concave, lateral pair obliquely lanceolate, connivent. *Petals* falcately oblong, obtuse, forming with the dorsal sepal a hood over the column. *Lip* yellow, as long as the sepals, cymbiform and saccate at the base; terminal lobe short, subquadrate, entire or bifid. *Column* very short, with two wings at its apex covering the anther; rostellum with two short stout parallel arms. *Anther* depressed, very shortly beaked. *Pollinia* attached within the tip of a linear appendage of the gland. *Capsule* ellipsoid, about $\frac{1}{2}$ in. long.

Common within the area in open turf and usually moist ground. Flowers during February and March. **DISTRIB.:** Abundant in grassy places throughout the greater portion of India, ascending to about 5,000 ft. on the outer Himalayan ranges; found also in Afghanistan, Ceylon, China, Japan and the Philippines.

25. HABENARIA, Willd.; Fl. Brit. Ind. vi, 131.

Terrestrial leafy herbs with undivided or lobed tubers or fleshy root-fibres. *Leaves* flat, with sheathing bases. *Flowers* small or large, in racemes or spikes. *Sepals* subequal, the lateral pair spreading reflexed or deflexed, or sometimes erect. *Petals* smaller or larger than the sepals, entire or 2-cleft, often connivent with the dorsal sepal to form a hood over the column. *Lip* adnate to base of column, entire, 3-lobed or 3-partite, its base spurred. *Column* short, usually broad; stigmas 2, distant or conjoined across the face. *Anther-cells* adnate to the front of the column, discrete, rarely touching, parallel or divergent below, their bases often prolonged into tubes containing the caudicles; staminodes rugulose, one on the outer side of each anther-cell, rarely filiform; pollinia 2, clavate or pyriform, usually grooved, sometimes 2-partite; caudicles long, short or obsolete; glands exposed, flat and discoid or elliptic and globular, or elongate with truncate ends. Species about 500, widely distributed in temp. subtrop. and trop. regions of the world.

Petals 2-partite, segments filiform; lateral sepals deflexed, tips filiform; flowers greenish

1. *H. graveolens*.

Petals entire; lip 3-partite or lobed—

Side-lobes of lip petaloid, truncate, much wider than the narrow linear midlobe; flowers white:—

Side-lobes of lip pectinate to the middle; petals small; spur slender, twice as long as the ovary or longer

2. *H. Susanna*.

- Side-lobes of flabelliform lip not pectinate:—
 Stem leafy upwards; spur slender, twice as long as the ovary
 Leaves all radical; spur equalling or longer than the ovary
3. *H. longifolia*.
 4. *H. plantaginea*.
- Petals entire; lip 3-partite, the side-lobes very narrow and usually filiform:—
 Spur filiform, fusiform or long-clavate, as long as or longer than the ovary:—
 Anther-tubes long:—
 Leaves distinctly pale-margined; spur usually much longer than the ovary, funnel-shaped at the mouth and clavate at the apex
 Leaves not margined; spur about as long as the ovary
5. *H. commelinifolia*.
 6. *H. pubescens*.
- Anther-tubes short:—
 Leaves three or more:—
 Leaves not margined; flowers green
 Leaves pale-margined; flowers yellow
7. *H. furcifera*.
 8. *H. marginata*.
- Leaves two, radical, orbicular, cordate, margined; spur shorter than ovary
9. *H. diphylla*.
- Spur small, globose ellipsoid or shortly clavate, much shorter than the ovary:—
 Leaves narrowly lanceolate or elliptic; flower small, white tinged with yellow and green; tubers glabrous
10. *H. Lawii*.
- Leaves ovate or ovate-elliptic; tubers hairy:—
 Flowers in lax subsecund spikes, white, fragrant
 Flowers in dense cylindric spikes, white or pale-yellow, fragrant
11. *H. goodyeroides*.
 12. *H. constricta*.

1. *H. graveolens*, Duthie, (n. sp.). *H. digitata* (not of Lindl.)
 Duthie, Ann. R. Bot. Gard. Calc. ix, part 2, 178, t. 128.

Stem 1–2 ft. high, stout, cylindric, lower portion clothed with closely fitting sheaths. *Leaves* 1½–3 in. long, broadly lanceolate or ovate-lanceolate, acuminate, 3–5-nerved; apex acuminate and with reflexed tips; margins undulate and coarsely toothed. *Raceme* laxly many-flowered, about 6 in. long, elongating in fruit; floral bracts subfoliaceous, narrowly lanceolate, acuminate, longer than the slender ovary, pale-margined. *Flowers* subsecund, about ¼ in. in diam. *Sepals* unequal, the dorsal one erect, suborbicular, its apex bluntly acuminate, green on both surfaces, minutely pustulate on the back; lateral pair longer than the dorsal one, deflexed, subfalcately lanceolate, white towards the base and tapering into short filiform tips. *Petals* deeply partite; segments filiform, fleshy, white, with slender recurved green tips. *Lip* 3-partite, lateral lobes resembling the segments of the petals, but rather longer; midlobe linear, straight, longer than lateral ones. *Spur* shorter than the ovary, laterally compressed, white towards the dilated mouth and with a green clavate apex. *Anther-cells* separate, with prominent diverging tubes. *Staminodes* herbaceous, oblong or orbicular, margins crose. *Pollinia* obliquely ovate; caudicles slender, attached by the dilated base to small brownish glands. *Stigmatic processes* subcylindric, blunt, recurved, the entrance to the spur lying between their bases.

Dehra Dun, at Kansrao, in sal forest (Duthie, Mackinnon). Flowers during July. **DISTRIB.:** W. Himalaya in Garhwal and Kumaon in warm valleys. The flowers have a peculiarly pungent odour resembling that of *Valeriana Wallichii*. This plant is, I now consider, quite distinct from *H. digitata* of Lindley, under which name it was described and figured in the second part of vol. ix of the *Annals of R. Bot. Gard. Calc.* p. 178, t. 128. In *H. graveolens* the leaves are mostly collected at about the middle of the stem; the lateral sepals are deflexed longer and with filiform tips, and the filiform segments of the 2-partite petals are recurved at the apex.

2. H. Susannæ, *R. Br. Prod.* 312; *Royle Ill.* 367; *F. B. I. vi*, 137; *Collett Fl. Siml.* 501; *Prair Beng. Pl.* 1032; *Duthie Ann. R. Bot. Gard. Calc. ix, part 2*, 178, t. 128. *H. gigantea*, *Don. Prod.* 24. *Platanthera Susannæ*, *Lindl.*; *Cooke Fl. Bomb. ii*, 713. *Orchis Susannæ*, *Linn.*

Height of plant about 2 ft. *Tubers* elongate, 3—4 in. long. *Stem* stout with many blunt funnel-shaped sheaths on its lower portion. *Leaves* 2—6 in. long, ovate-oblong, obtuse, the upper ones bract-like, acuminate, imbricate. *Raceme* 3—5-fld; floral bracts longer than the ovary, cucullate, acuminate. *Flowers* subsessile, 3—4 in. in diam. white tinged with greenish-yellow, fragrant. *Sepals* very broad, spreading, the dorsal one suborbicular, about $1\frac{1}{4}$ in. long and broad; lateral pair $1\frac{1}{2}$ in. long, obliquely oblong, obtuse. *Petals* $\frac{1}{2}$ in. long, linear falcate, acute, fleshy. *Lip* 3-lobed, about as long as the sepals, fleshy; side-lobes very broad, truncate, deeply pectinate; midlobe linear-spathulate, with recurved margins. *Spur* slender more than twice the length of the elongate ovary. *Anther* very broad, cells divergent; rubes long, adnate to the sides of the column. *Pollinia* linear, curved, yellow, about as long as their white flexuous caudicles; glands ovoid, white. *Staminodes* linear-oblong, with crisped margins. *Stigma* on the front of the column. *Capsule* with pedicel 2 in. long, ellipsoid, beaked.

Siwalik range (Royle). Flowers July—Sept. **DISTRIB.:** Outer Himalayan ranges in Garhwal and Kumaon up to 6,000 ft.; Chota Nagpur and in the hilly districts of Bombay and S. India, extending to Burma, China and the Malay Archipelago.

3. H. longifolia, *Buch.-Ham. in Lindl. Gen. & Sp. Orch.* 324; *F. B. I. vi*, 141; *Prair Beng. Pl.* 1032; *Duthie Ann. R. Bot. Gard. Calc. ix, part 2*, 181. *H. trapezoidea*, *Falc. mss.*

Stem 10—18 in. high, slender, leafy. *Leaves* 3—5 in. long, scattered erect, linear, acuminate, smaller upwards. *Spike* 2—2 $\frac{3}{4}$ in. long, few and laxly fld.; floral bracts linear, acuminate, longer than the slender beaked ovary. *Flowers* medium-sized, white. *Sepals* minute, the lateral pair $\frac{1}{2}$ in. long, oblong-lanceolate, 3-nerved, larger than the dorsal one. *Petals* gibbously ovate, as long as the dorsal sepal, 3-nerved. *Lip* flabelliform, $\frac{1}{2}$ — $\frac{3}{4}$ in. long and broad; side-lobes semi-circular, entire; midlobe linear, shorter than the side-lobes. *Spur* slender, twice as long as the ovary, green. *Anther* beaked, cells

parallel; tubes incurved. *Stigmatic processes* short, clavate, incurved towards the mouth of the spur. *Rostellum* long, erect, spatulate.

Siwalik range, on the Mohand Pass ("Portus Kheree") Royle. **DISTRIB.:** N. Bengal at Nathpur in Purnea (Buch.-Hamilton). I have seen no living or herbarium specimens of this plant.

4. *H. plantaginea*, Lindl. Gen. & Sp. Orch. 323; Hook. f. F. B. I. vi, 141; Prain. Beng. Pl. 1032; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 181, t. 132; Cooke Fl. Bomb. ii, 718. Orchis platy phyllos, Roxb. Fl. Ind. iii, 609.

Tubers ellipsoid, about $1\frac{1}{2}$ in. long. *Stem* scapigerous. *Leaves* about three or four, radical, horizontal, 3—6 in. long, elliptic-oblong, sub-obtuse, membranous. *Scape* slender, 8—12 in. high, bearing many lanceolate acuminate bracts, the lowest often larger and leaflike. *Spike* 2—5 in. long, laxly flowered. *Flowers* subsecund, white; floral bracts lanceolate, acuminate or setaceous, half as long as the curved beaked ovary. *Sepals* subequal, about $\frac{1}{2}$ in. long, strongly 3-nerved, white tinged with green; dorsal erect, ovate-oblong; the lateral pair falcately oblong, spreading. *Petals* linear-lanceolate, adpressed to and forming a hood with the dorsal sepal. *Lip* 3-lobed, flabelliform, clawed, twice as long as the lateral sepals, puberulous; side-lobes semiovate, entire or with undulate margins, often overlapping at their tips; midlobe a little shorter, linear-oblong, deflexed. *Spur* equal to or longer than the ovary, tapering to the apex, greenish-yellow. *Anther* broad, cells divergent; tubes short, upcurved. *Pollinia* globose or ellipsoid; caudicles curved, widening upwards from a narrow base; glands falcately ovate, connate when young. *Stigmatic processes*, large, fleshy, oblong; *rostellum* triangular, broad. *Staminodes* prominent with sinuate margins. *Capsule* $\frac{3}{4}$ in. long, turgid, curved.

Dehra Dun (Falconer, Duthie). Flowers Sept. and Oct. **DISTRIB.:** Outer Himalayan ranges of Garhwal and Kumaon up to 7,000 ft.; also in Sikkim and Bengal and southwards to the Konkan and Deccan to Ceylon.

5. *H. commelinifolia*, Wall. in Lindl. Gen. & Sp. Orch 325; Hook. f. F. B. I. vi, 143; Prain Beng. Pl. 1032; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 183, t. 134; Cooke Fl. Bomb. ii, 719. Orchis commelinifolia, Roxb. Fl. Ind. iii, 451.

Stem 2—3 ft. high, loosely sheathed at the base. *Tubers* ellipsoid or cylindric. *Leaves* scattered, 3—6 in. long, oblong or oblong-lanceolate, subcordate, acute and often subsperinescent at the tips, margins pale. *Spike* 4—8 in. long, many and loosely flowered; flowering bracts erect, nearly equalling the long-beaked ovary, scaberulous on both surfaces and ciliolate on the margins. *Flowers* $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., white, inodorous. *Sepals* scaberulous; dorsal small, saccate, with a short curved beak; lateral pair spreading, much shorter, hatchet-shaped, beaked, the veins deeply looped or arched. *Petals* unequally oblong, smaller than the lateral sepals. *Lip* divided into three long filiform segments, about 1 in. long from its base to the

tip of the mid-segment; lateral ones $1\frac{1}{2}$ in. long, curved downwards; mid-segment channelled above, spreading, scaberulous; spur $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, slender and curved downwards, its upper portion funnel-shaped and white, its apex clavate and green. *Anther-cells* elongate, distant, diverging at the base; tubes long, straight. *Pollinia* small, oval; caudicles very long, dilated upwards, translucent; glands minute. *Staminodes* seated on the long arms of the column and curving, round in front of the anther tubes. *Stigmatic* processes large, clavate, incurved; rostellum triangular.

Dehra Dun and Siwalik range, usually in open grassy places (Mackinnon, Duthie). Flowers during Aug. and Sept. **DISTRIB.:** Outer ranges of W. Himalaya from the Punjab to Kumaon, up to 5,000 ft., extending eastwards to Parasnath, Chota Nagpur and Upper Burma, and south to Cent. W. and S. India.

6. *H. pubescens*, *Lindl. Gen. & Sp. Orch.* 322; *Hook. f. F. B. I.* vi, 144; *Duthie Ann. R. Bot. Gard. Calc.* ix, part 2, 183, t. 135.

Tubers elongate, stout, often divided, and with a few thick fleshy fibres from their summits. *Stem* 12—18 in. high, clothed at the base with a few tight-fitting pubescent sheaths. *Leaves* crowded towards the middle or base of the stem, 4—6 in. long, lanceolate, acuminate, tapering to the base, 7—9 nerved, undulate, not margined. *Raceme* with a few empty leaflike bracts at its base, 8—10 in. long, lax, many-flid., pubescent; floral bracts longer than the long-beaked ovary, ovate lanceolate, acuminate, ciliolate. *Flowers* small, greenish-yellow. *Dorsal sepal* $\frac{3}{8}$ — $\frac{1}{4}$ in. long, broadly ovate, a little shorter than the dimidiate-ovate obtuse deflexed lateral ones. *Petals* narrowly falcate, longer than the dorsal sepal and forming with it a hood over the column. *Lip* 3-partite, longer than the sepals; segments linear with filiform tips; midlobe shorter, obtuse, keeled beneath. *Spur* slender, about as long as the curved ovary. *Anther-tubes* long, flexuous. *Pollinia* ovate, obliquely attached to the long slender flexuous caudicles; glands flat; staminodes prominent. *Stigmatic processes* globose. *Capsule* curved and with a long beak, prominently ridged.

Dehra Dun (Mackinnon). **DISTRIB.:** Outer ranges of W. Himalaya in Garhwal and Kumaon, up to 5,500 ft. (Royle, Falconer, Duthie).

7. *H. furcifera*, *Lindl. Gen. & Sp. Orch.* 319; *Hook. f. F. B. I.*, vi, 149; *K. and P. Ann. R. Bot. Gard. Calc.* viii, 313, t. 410; *Duthie id.* ix, part 2, 184.

Stem stout, 10—18 in. high, sheathed at the base, leafy below the middle bracteate above. *Leaves* 3— $4\frac{1}{2}$ in. long, elliptic, acute or acuminate. *Racemes* 5—7 in. long, laxly many-flid. *Flowers* about $\frac{1}{2}$ in. across from base to apex, green; floral bracts about as long as the ovary, lanceolate, acuminate. *Sepals* unequal; dorsal one ovate-oblong, obtuse, concave; lateral pair shorter, broadly and falcately lanceolate, acute or acuminate, spreading. *Petals* as long as the dorsal sepal and with it forming a hood over the column, oblong, retuse. *Lip* 3-partite, longer than the sepals; lateral segments fili-

form, diverging, curved, longer than the stouter blunt midlobe. *Spur* slender, longer than the ovary; laterally compressed, curved at the apex. *Anther-cells* contiguous, diverging at their bases, the tubes rather short, up-curved. *Pollinia* falcately ovoid; caudicles slender, slightly curved; glands narrowly oblong. *Staminodes* large, broadly oblong. *Stigmatic processes* short. *Capsule* fusiform, decurved, shortly beaked, prominently ribbed.

Dehra Dun and Siwalik range (Mackinnon, Duthie). Flowers during Aug. and Sept. **DISTRIB.:** Outer ranges of W. Himalaya in Gathwal, up to 6,000 ft., and eastwards to Sikkim and Bhutan; also in Bengal, Assam, Orissa, and extending to Upper Burma.

8. *H. marginata*, *Colebr. in Hook. Flor. Exot. t. 136; Hook. f. F. B. I. vi, 150; Collett Fl. Siml. 504; Prain Beng. Pl. 1033; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 184, t. 136; Cooke Fl. Bomb. ii, 721.*

Subscapigerous, glabrous. *Tubers* small, narrowly cylindrical. *Leaves* few, subradical, sessile, $\frac{1}{2}$ —5 in. long, oblong or linear-oblong, obtuse, 3—5-nerved; margins pale-yellow. *Scape* 4—10 in. long; sheaths erect, lanceolate, acuminate. *Spike* 2—6 in. long, many-fl'd.; floral bracts nearly as long as the ovary, lanceolate, acuminate, with pale ciliolate margins. *Flowers* $\frac{1}{2}$ in. across. *Sepals* green; dorsal one $\frac{1}{4}$ in. long, erect, broadly ovate; lateral longer, falcately oblong-lanceolate, spreading or deflexed, 3—5 nerved. *Petals* $\frac{1}{2}$ in. long, falcately oblong, closely adpressed to the dorsal sepal. *Lip* nearly $\frac{1}{2}$ in. long, 3-partite nearly to the base, lateral segments narrowed into filiform tips; midlobe shorter and broader, the margins inflexed. *Spur* about as long as the curved ovary, laterally compressed at the fusiform apex. *Anther-cells* distant; tubes funnel-shaped, short, spreading. *Pollinia* obovate, with short geniculate caudicles; glands triangular. *Staminodes* elongate. *Stigmatic processes* long, adnate to the base of the column. *Capsule* about $\frac{1}{2}$ in. long, fusiform, turgid.

Dehra Dun and Siwalik range (Duthie). Flowers during August. **DISTRIB.:** Western Himalaya from Kashmir to Kumaon, up to 7,000 ft.; also in Bengal, and found as a weed in the Bot. Gard. Calcutta, extending to Burma and to W. and S. India.

9. *H. diphylla*, *Dalz. in Hook. Journ. Bot. ii (1850), 262; F. B. I. vi, 151; Prain Beng. Pl. 1033; Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 185, t. 137; Cooke Fl. Bomb. ii, 722.*

Tubers small, elongate or globose. *Leaves* radical, usually two, 1—2 in. in diam.; orbicular cordate, margined, rather fleshy. *Scape* 4—10 in. high, with a few distant lanceolate acuminate bracts. *Flowers* many, distant, spreading, about $\frac{1}{2}$ in. diam., white tinged with green; floral bract much shorter than the slender curved ovary. *Sepals* about $\frac{1}{4}$ in. long; dorsal erect, ovate, concave, acute, obscurely nerved; lateral pair slightly longer, deflexed, obliquely ovate, acuminate, 3-nerved. *Petals* linear, white, as long as the dorsal sepal and forming a hood with it. *Lip* much longer than the sepals, 3-partite; segments fili-

form, white with green tips, lateral pair spreading and with spirally twisted tips; midlobe shorter, deflexed. *Spur* shorter than the ovary, inflated towards the acute inflated apex. *Anther* broad, the cells distant; tubes very short. *Pollinia* dimidiate-ovate, obliquely attached to caudicles equalling them in length; glands very small, flat, circular. *Staminodes* large, petaloid. *Stigmatic processes* elongate, clavate, adnate to the mouth of the spur. *Rostellum* obscure.

Dehra Dun (Mackinnon). Flowers during Aug. **DISTRIB.:** Outer ranges of W. Himalaya in Garhwal (Falconer); eastwards to Bengal and Chota Nagpur, and southwards from Konkan and Kanara to Malabar.

10. H. Lawii, *Hk. f. in F. B. I. vi, 162*; *Prain Beng. Pl. 1033*; *Duthie Ann. R. Bot. Gard. Calc. ix, part 2, 192, t. 143*. *Peristylus Lawii* *Wight Ic. t. 1695*; *Cooke Fl. Bomb. ii, 712*.

Tubers ellipsoid or globose. *Stem* 6—12 in. high, slender, with a few short loose sheaths below the leaves. *Leaves* 3—5, clustered above the middle of the stem, 3—4 in. long, narrowly lanceolate or elliptic, acute, membranous. *Spike* 2—3 in. long, slender, narrow, many-fl. *Flowers* small, crowded, spreading, white tinged with yellow and green; floral bracts ovate-lanceolate, acuminate, longer than the slender curved ovary. *Sepals and petals* $\frac{1}{2}$ in. long, white tinged with yellow at the base, connivent, obtuse; dorsal sepal elliptic, concave; lateral subfalcately linear-oblong. *Petals* oblong, obtuse, fleshy. *Lip* as long as the sepals, broadly and obtusely 3-lobed; lobes rounded at the apex; midlobe twice as long as the lateral pair, its claw green tinged with yellow, and with a short ciliate ridge at its base. *Spur* small, globular, dark-green. *Anther-cells* parallel, tubes none. *Pollinia* obovate; caudicles nearly as long, attached to minute globular glands. *Staminodes* large, green, with broad white margins. *Stigmatic processes* short, clavate. *Rostellum* short, triangular, acute.

Dehra Dun (Mackinnon, Duthie). Flowers during July and August. **DISTRIB.:** W. Himalaya, in Garhwal (Herb. Calc.); Bengal and Bihar; C. Prov., in the Chanda district, and extending to S. India from the Konkan.

11. H. goodyeroides, *Don Prod. Fl. Nep. 25*; *F. B. I. vi, 161 (in part)*; *K. & P. Ann. R. Bot. Gard. Calc. viii, 326, t. 430*; *Duthie id. ix, part 2, 192*; *Collett Fl. Siml. 505*; *Prain Beng. Pl. 1039*. *Peristylus goodyeroides*, *Lindl. Gen. & Sp. Orch. 299*.

Tubers ellipsoid or ovoid, hairy. *Stem* stout, 1—2 ft. high, its lower portion clothed with many loose blunt sheaths. *Leaves* clustered above the middle of the stem, but not in whorls, 6—10 in. long, ovate or ovate-elliptic, acute, narrowed to the shortly sheathed base. *Spike* 4—8 in. densely flowered, its peduncle bearing a few lanceolate acuminate bracts. *Flowers* subsecund, white, fragrant, about $\frac{1}{2}$ in. across; floral bracts narrowly lanceolate, acuminate, about as long as the slender curved ovary. *Sepals* unequal, tinged with brown the dorsal one broadly ovate-lanceolate, concave, conniving with the petals and forming a hood; lateral pair oblong, involute, apiculate. *Petals* as long as sepals, trapeziform, blunt. *Lip* longer than the petals, 3-

lobed; side lobes linear-oblong falcate, acute, slightly longer than the broad blunt midlobe. *Spur* minute, subglobose, much shorter than the sepals. *Column* short, broad. Anther-cells parallel, not contiguous, tube none. *Pollinia* pyriform, caudicles very short, the glands small, obovoid. *Staminodes* large, oblong, spreading. *Stigmatic processes* short, lying beneath and parallel to the staminodes.

Dehra Dun (Mackinnon). Flowers during July and August. **DISTRIB.:** Outer Himalayan ranges from Garhwál to Sikkim and Bhutan; also in Assam, Khasia Hills and south to Bengal, extending to China.

12. *H. constricta*, *Hook. f. in F. B. I. vi, 161; K. & P. Ann. R. Bot. Gard. Calc. viii, 325, t. 429; Duthie id. ix, part 2, 193; Prain Beng. Pl. 1033.* *H. goodyeroides*, *Lindl. in Wall. Cat. 7066 (not of Don).* *Platanthera constricta*, *Lindl. in Wall. Cat. 7043.* *Herminium constrictum*, *Lindl. in Bot. Reg. under t. 1449.* *Peristylus constrictus*, *Lindl. Gen. and Sp. Orch. 300.*

Tubers oblong, hairy. *Stem* stout, 2—3 ft. high, clothed at the base with wide blunt sheaths. *Leaves* five or six, on upper portion of stem, more or less whorled, 4—7 in. long, ovate-elliptic, acute or acuminate, narrowed towards the long sheaths; bracts on the peduncle linear-lanceolate, acuminate. *Spike* broadly cylindrical, 4—8 in. long, many- and densely-flowered. *Flowers* spreading, white or pale yellow, sweet-scented; floral bracts large, erect, lanceolate, acuminate, about as long as the ovary. *Sepals* subequal, $\frac{1}{2}$ — $\frac{3}{8}$ in. long, oblong, obtuse, ciliolate; lateral pair spreading, with involute edges. *Petals* larger than the sepals, obliquely ovate-lanceolate, somewhat gibbous on the lower side, spreading upwards in front of the dorsal sepals, but not connivent to form a hood. *Lip* as long as the petals, 3-lobed to about the middle; lateral lobes linear, acuminate, somewhat diverging at their tips; midlobe shorter, oblong, tapering to a blunt point. *Column* very short and broad. *Anther-cells* close together but not contiguous; tubes none. *Pollinia* obovoid, caudicles short, tapering to the large oblong-elliptic glands. *Staminodes* oblong, obtuse. *Stigmatic processes* clavate, spreading. *Rostellum* erect, 2-fid.

Siwalik range (Duthie); Dehra Dun, in sál forests (Mackinnon). Flowers during July and August. **DISTRIB.:** Outer Himalayan valleys in Kumaon and in Sub-tropical Sikkim; also in Assam, Chota Nagpur and Chittagong, extending to Upper and Lower Burma.

CVIII.—SCITAMINEÆ.

Herbs, often large, frequently with a pseudostem of convolute leaf-sheaths, rarely with a woody caudex. *Leaves* radical or cauline, usually membranous; sheaths generally large, clasping the stem; lamina with a strong midrib; secondary nerves close pinnate, parallel. *Flowers* 2-sexual, rarely 1-sexual (as in *Musa*), irregular, solitary or spicate; bracts

membranous or herbaceous, bracteoles membranous or none. *Perianth* 2-seriate, superior; outer segments 3, calycine, rarely petaloid, free and imbricate or connate in an entire toothed or spathaceous tube; inner segments petaloid, connate in a long or short corolla-tube, free or adnate to the petaloid staminodes; limb 3-partite, the segments free or connate. *Stamens* only 1 perfect, the rest replaced by petaloid staminodes, or 5 perfect and a sixth imperfect or obsolete; anthers linear, 2-celled, rarely of one cell on the margin of a petaloid connective. *Ovary* inferior, 3-rarely 2-or 1-celled; style usually slender, with 2 short stylodes crowning the ovary, stigma entire or subentire; ovules usually many, axile, rarely parietal, anatropous. *Fruit* a loculicidally 3-valved capsule or indehiscent and membranous or fleshy, usually crowned by the remains of the perianth. *Seeds* often arillate, albumen floury, embryo small.—Species 400—500, chiefly tropical.

Stamen only one perfect, others reduced to staminodes or wanting:—

Anther 2-celled; calyx tubular or spathaceous; style slender, embraced below the stigma by the anther:—
Ovary 1-celled; placentas 3, parietal; cor.-tube long; flowers yellow

1. GLOBBA.

Ovary 3-celled; placentas axile:—

Lateral staminodes broad:—

Connective not spurred at the base; cor.-tube long, slender:—

Filament short; connective broad, crested; stigma turbinate

* KEMPFERIA.

Filament long, narrow; connective very narrow, not crested; stigma subglobose

2. HEDYCHUM.

Connective spurred at the base; cor.-tube funnel-shaped; stigma 2-lipped, the lips ciliate; bracts forming a cone-like spike

3. CURCUMA.

Lateral staminodes small or none, rarely narrow and adnate to the lip; cor.-tube cylindrical:—

Flowers in a dense cone-like spike:—

Filament short; anther-cells contiguous, parallel; connective produced as a narrow appendage as long as the anther; stigma small, subglobose; spikes usually produced direct from the root-stock, sometimes at the top of a leafy stem

4. ZINCIBER.

Filament forming with the produced connective an oblong petaloid process, with the contiguous linear anther-cells placed in its middle; stigma with a semilunar pit ciliate round the margin; spikes usually at the top of leafy stems

5. COSTUS.

Flowers in racemes or panicles at the top of leafy stems; filament long; anther-cells divergent at apex; stigma subglobose

* ALPINIA.

Anther 1-celled, laterally adnate to a petaloid filament; calyx of free sepals:—

Staminal tube with 5 subsimilar slightly unequal petaloid segments, the 1-celled anther adnate to one of the smaller segments; ovary 3-celled; placentas many-ovuled

* CANNA.

Stamens 5 perfect, free, the 6th imperfect or absent; sepals united in a split spathe-like tube; corolla short, included and enveloping the stamens and style; fruit fleshy, indehiscent; leaves very large

* MUSA.

The genera marked with an asterisk in the above key are not truly indigenous within the area of this flora.

1. GLOBBA, Linn.; Fl. Brit. Ind. vi, 201.

Herbs with creeping rhizomes and erect stems. *Leaves* oblong or oblong-lanceolate. *Flowers* in terminal panicles, rarely in spikes, bracts usually deciduous, buds often replaced by bulbils. *Calyx* funnel-shaped, 3-lobed. *Corolla* 3-lobed, longer than calyx; lobes ovate, subequal. *Stamen* 1, filament long, incurved, with 2 dorsal appendages; anther oblong; connective simple, winged or spurred, produced beyond the cells. *Ovary* 1-celled; style filiform, placed in a groove of the filament, stigma turbinate; ovules many, on 3 parietal placentas. *Fruit* a globose capsule, tardily dehiscent. *Seeds* many, small, ovoid, with a small white lacerate aril.—Species 60 to 70, in India, Malaya, China, Philippines and New Guinea.

G. orixensis, Roxb. in *Asiat. Res.* xi, 358; *Fl. Ind.* i, 78; *F. B. I.* vi, 201; *Prain Beng. Pl.* 1037.

Herb with perennial rootstock and annual leafy stems, 1–2 ft. high. *Leaves* 8–10 in. long, glabrous beneath. *Panicle* long, narrow; lower branches 2–3-fid at tip; bulbils none; bracts small, deciduous. *Flowers* deep-orange. *Corolla* segments staminodes and lip equal in length. *Lip* spotted with reddish brown at the throat. *Capsule* warted.

Dehra Dun and on the Siwalik range. Flowers during the rains.—**DISTRIB.:** Bengal, Chota Nagpur, Bihar, Sikkim, N. Circars (Roxburgh).

2. HEDYCHIUM, Koenig; Fl. Brit. Ind. vi, 225.

Herbs with perennial horizontal tuberous rootstocks; root-fibres not much thickened; stem elongate, leafy. *Leaves* distichous, oblong or lanceolate. *Flowers* usually in terminal spikes; bracts oblong, subcoriaceous, 1-or more-flowered. *Calyx* tubular, 3-toothed. *Corolla-tube*, long, slender; lobes equal, linear, spreading. Perfect *stamen* 1; filament long, slender, anther-cells contiguous, connective not produced; lateral staminodes linear or cuncate-oblong; lip large, bifid. *Ovary* 3-celled; style long, filiform, stigma subglobose; ovules many, superposed on axile placentas. *Fruit* a globose 3-valved capsule. *Seeds* many, small, with a lacerate aril.—Species 38, chiefly Indian and Malaya.

H. coronarium, Koen. in *Retz. Obs. Bot. fasc.* iii, 173; Roxb. *Fl. Ind.* i, 10; *F. B. I.* vi, 225; *Prain Beng. Pl.* 1039; *Cooke Fl. Bomb.* ii, 728.

A tall herb with erect leafy stems, 4–6 ft. high; rootstock $\frac{1}{2}$ –2 in. in diam., fleshy, jointed. *Leaves* sessile, 9–14 in. long, lanceolate, finely acuminate, glabrous above, glabrous or sparsely pubescent beneath; base narrowed; sheath smooth; ligule membranous. *Flowers* pure white, fragrant, in dense oblong spikes 4–8 in. long; bracts closely

imbricate, 3—4-fld.; the outer ones $1\frac{1}{2}$ —2 in. long, ovate, obtuse; bracteoles 3, membranous. *Calyx* 1 — $1\frac{1}{2}$ in long, cylindric, green, shorter than the bracts. *Corolla-tube* 3 in. long; segments half as long as the tube, reflexed. *Lateral staminodes* $1\frac{1}{2}$ —2 in. long, sub-obtuse, white. *Lip* $1\frac{1}{2}$ —2 in. broad, suddenly contracted into a short claw; lobes short, rounded. *Stamen* $1\frac{3}{4}$ in. long; anther about $\frac{1}{2}$ in. *Capsule* oblong, glabrous, the valves orange-yellow within. *Seeds* with a crimson aril.

Dehra Dun (Duthie). Flowers during the rains. **DISTRIB.:** Throughout India from the Himalaya and the Khasia Hills southwards to Chittagong, Bengal, Kanara, Konkan and Ceylon, extending to Malay Pen. and Islands. See Kew Bulletin (No. 9, 1912) for an account of the fibre yielded by this and allied species of *Hedychium*, and of its value as a material for paper-making. See also Watt's "Comm. Products of India", p. 776.

3. CURCUMA, Linn.; Fl. Brit. Ind. vi, 209.

Stemless herbs with tuberous rootstocks bearing sessile and long-stipitate tubers. *Leaves* usually oblong, often very large. *Flowers* usually in dense compound spikes, vernal or æstival and preceding the leaves or autumnal and coetaneous, crowned by a coma of enlarged coloured bracts; lower bracts ovate, membranous, enclosing several bracteolate fugitive flowers which open in succession. *Calyx* short, cylindric, minutely toothed. *Corolla-tube* funnel-shaped; segments usually ovate or oblong; upper longer, somewhat concave. *Stamen* 1, perfect, filament short, anther not crested; cells contiguous, spurred at the base; lateral staminodes oblong, petaloid, connate with the filament; lip orbicular, with a deflexed tip. *Ovary* 3-celled, style filiform; stigma 2-lipped, the lips ciliate; ovules many, on axile placentas. *Fruit* a tardily dehiscent globose membranous 3-valved capsule. *Seeds* ovoid or oblong, usually arillate.—Species about 40, mostly in S. E. Asia.

C. angustifolia, Roxb. in *As. Res.* xi, 338, t. 3; *Fl. Ind.* i, 31. *Royle* III. 357, 359; *F. B. I.* vi, 210; *Watt E. D.*; *Collett Fl. Siml.* 512; *Prain Beng. Pl.* 1041. Vern. *Tikhur*.—E. Indian Arrowroot.

Rootstock small, emitting long fleshy fibres terminating in pale oblong pendulous tubers. *Leaves* (with petiole) 1— $1\frac{1}{2}$ ft.; blade lanceolate, acute $\frac{1}{2}$ —1 ft. long. *Fl. spike* lateral, apart from and usually appearing earlier than the leafy spike, crowned by several enlarged empty pink bracts. *Flowers* yellow, longer than their bracts, 3 or 4 together in the axil of each bract opening in succession and quickly fading; sheaths of pseudostem pale-green. *Calyx* 3-toothed. *Corolla-tube* $\frac{3}{4}$ in. long, somewhat gibbous; upper lobe erect, concave, ovate, longer than the two lateral ones. *Lateral staminodes* oblong, united to the filament; the lower large, broad, spreading, notched; connective produced at the base in a fork. *Capsule* ovoid, ultimately opening by 3 valves. *Seeds* many, small.

Abundant in Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowering during the rains. **DISTRIB.:** Outer

ranges of Central Himalaya, also in W. Behar and N. Bengal; extending to Bombay and S. India. A kind of starch resembling arrowroot is prepared from the tubers.

- C. *LONGA*, L. *Sp. Pl.* 2; Roxb. *Fl. Ind.* i, 32; Royle *Ill.* 358; F. B. I. vi, 214; Duthie in *Field and Gard. Crops* iii, 41, t. 77; Watt *E. D.*; *Comm. Prod. Ind.* 445; Prain *Beng. Pl.* 1042; Kanjilal *For. Fl.* (ed. 2) 405; Cooke *Fl. Bomb.* ii, 732. Vern. *Haldi*—Turmeric.—A tall herb. *Rootstock* large, ovoid, with sessile cylindrical tubers orange-coloured inside. *Leaves* very large, in tufts up to 4 ft. or more long, including the petiole which is about as long as the blade, oblong-lanceolate, tapering to the base. *Flowers* in autumnal spikes, 4–6 in. long; peduncle 6 in. or more, concealed by the sheathing petiole; flowering bracts pale-green; bracts of coma tinged with pink.—This plant is much cultivated throughout India chiefly for the yellow dye obtained from the tubers, which also used as a condiment. The plant was probably introduced originally from China, though having all the appearance of being wild in Behar and Ch. Nagpur.

4. ZINGIBER, Adans.; Fl. Brit. Ind. vi, 243.

Herbs with elongated leafy stems and horizontal tuberous rootstocks. *Leaves* oblong-lanceolate. *Flowers* in spikes, usually radical, less often terminal, rarely lateral on the leafy stems; peduncle short or long; bracts persistent, usually 1-fl'd. *Sepals* 3, connate in a cylindrical shortly 3-lobed calyx. *Petals* 3, connate in a corolla with cylindrical tube; lobes lanceolate, the upper concave. *Stamen* 1 perfect; filament short; anther 2-celled; cells contiguous, with a narrow crest as long as themselves; lateral staminodes none, or adnate to the obovate-cuneate lip. *Carpels* 3, connate in a 3-celled ovary; ovules many, superposed; placentas axile; style filiform; stigma small, subglobose. *Fruit* an oblong capsule, tardily dehiscent. *Seeds* large, globose, arillate.—Species about 30 or more, in tropical regions of the Old World.

Z. capitatum, Roxb. in *Asiat. Res.* xi, 348; *Fl. Ind.* i, 55; F. B. I. vi, 248; Prain *Beng. Pl.* 1045.—Vern. *Jangli-adrak*.

Rootstock of many long-stalked oval tubers with a spicy fragrance. *Stems* slender, leafy, 3–4 ft. high. *Leaves* 12–18 in. long, linear, acuminate, ascending, usually pubescent beneath. *Spike* terminal, sessile, or somewhat prolonged beyond the sheaths of the upper leaves, erect or oblong-cylindrical, 3–6 in. long; bracts closely imbricate, 1½ in. long, ovate, green with a narrow brown edge. *Cor-tube* as long as the bract, segments pale-yellow. *Lip* pale-yellow, not spotted; midlobe ¾ in. broad, orbicular, emarginate; basal auricles large, oblong, obtuse. *Capsule* bright-red, size of small olive, valves ovate. *Seeds* black, shining; aril large, lacerate, white.

Dehra Dun (Duthie), Banda (Edgew.), Gorakhpur (Burkill). *Flowers* in rains. *DISTRIB.*: Central Himal. from Kumaon to Sikkim; also Khasia Hills, Sylhet, Ch. Nagpur, and Chanda in Cent. Prov.

Z. OFFICINALE, *Rosc.*; *Roxb. Fl. Ind. i, 47*; *F. B. I. vi, 246*; *Watt E. D.*; *Comm. Prod. Ind. 1139*; *Duthie in Field and Gard. Crops, part iii, 47, t. 100*; *Kanjildl For. Fl. (ed. 2) 405*; *Prain Beng. Pl. 1045*; *Cooke Fl. Bomb. ii, 736*.—Vern. *Adrak* (fresh root), *sunt* (when dry)—Ginger. —A herb, with horizontal jointed tuberous rhizomes. *Stems* slender, 3–4 ft. high. *Leaves* 6–12 in. long, lanceolate, glabrous beneath. *Bracts* suborbicular, cuspidate. *Cor.-lobes* green. *Lip* and stamen purplish-black.—The ginger plant is much cultivated in Dehra Dun and throughout the Sub-Himalayan tracts of Rohilkhand and N. Oudh, and elsewhere in India. It has also been extensively introduced in the tropics of both hemispheres. The plant is known to have been grown in India and China for many centuries, but there is no record of its having been found in a truly wild condition. The usual vegetative mode of cultivating the ginger plant has brought about a tendency to cause sterility as in *Musa* and *Citrus*.

5. **COSTUS**, *Linn.*; *Fl. Brit. Ind. vi, 249*.

Herbs with long leafy stems; rootstock tuberous, horizontal. *Leaves* oblong, with broad sheaths. *Flowers* in dense globose or ovoid usually terminal spikes. *Calyx* short, funnel-shaped; teeth 3, ovate. *Corolla-tube* not longer than the calyx; segments large, oblong, subequal. *Lip* large, obovate with incurved margins. *Stamen* 1 perfect, filament forming with the connective an oblong petaloid process with the contiguous linear anther-cells situated in its middle; lateral staminodes minute or obsolete. *Ovary* 3-celled, style filiform, stigma with a semi-lunar marginally ciliate foveola; ovules many, superposed. *Fruit* a globose or ovoid capsule, finally dehiscent on one side between the ribs. *Seeds* obovoid or subglobose, aril short.—Species nearly 100, in the tropics of both hemispheres. Many of them are cultivated for their handsome flowers.

C. speciosus, *Smith in Trans. Linn. Soc. i, 249*; *Roxb. Fl. Ind. i, 8*; *F. B. I. vi, 250*; *Watt E. D.*; *Prain Beng. Pl. 1045*; *Cooke Fl. Bomb. ii, 736*; *Kanjildl For. Fl. (ed. 2) 406*.—Vern. *Kust*.

An erect herbaceous plant, 4–6 ft. high. *Stem* somewhat woody at the base. *Leaves* subsessile, arranged spirally, 6–12 in. long, oblong or oblanceolate, acute or acuminate, often cuspidate, glabrous above, silky-pubescent beneath, base rounded; sheaths coriaceous; ligule none. *Flowers* many, in dense terminal spikes 2–5 in. long; bracts bright red, $\frac{3}{4}$ – $1\frac{1}{4}$ in. ovate, acuminate or pungently mucronate; bracteole solitary, $\frac{1}{2}$ in. long. *Calyx* $1\frac{1}{4}$ in. long, deltoid-ovate, cuspidate. *Corolla-tube* as long as calyx; lobes ovate-oblong, apiculate, lateral lobes about $1\frac{1}{2}$ in. long, dorsal one rather shorter; lip suborbicular, white with a yellow centre, 2 in. or more in diam.; concave, plicate, crisped; disk pubescent and with a tuft of hairs at the base. *Stamen* $1\frac{1}{2}$ – $1\frac{3}{4}$ in. long, with a tuft of hairs at the base of the filament; connective petaloid, $\frac{1}{2}$ in. broad, pubescent, produced into two glabrous appendages about as long as the linear anther-cells. *Style*

slender, $1\frac{1}{2}$ in. long; stigma with a semilunar ciliate mouth. *Capsule* $\frac{3}{4}$ in. in diam., globose trigonous, red. *Seeds* black, with a white aril.

Dehra Dun and Siwalik range, common in sál forest, and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in moist shady places. Flowers during the rainy season. **DISTRIB.:** Outer ranges of Himalaya, up to 4,000 ft., and more or less throughout India; also in Ceylon, Malay Pen. and Islands and in China.

The following non-indigenous plants belonging to this family are occasionally cultivated within the area of this flora:—

KÆMPFERIA GALANGA, *Linn. Sp. Pl. 3, Roxb. Fl. Ind. 15; F. B. I. vi, 219; Watt E. D.; Prain Beng. Pl. 1038; Cooke Fl. Bomb. ii, 726.*—Vern. *Chandra-mula*.—A stemless herb. *Leaves* appearing with the flowers, sessile, suborbicular, 3–6 in. long, spreading flat on the ground. *Corolla-segments* lanceolate; lip white with lilac throat. *Lateral staminodes* cuneate-obovate. More or less throughout India, wild or cultivated, extending to the Malay Pen. and Islands, also in China. It is often grown in gardens within the area of this flora. The tubers are employed in perfumery and in Hindu medicine.

K. ROTUNDA, *Linn. Sp. Pl. 3; Roxb. Fl. Ind. i, 16; F. B. I. vi, 222; Watt E. D.; Prain Beng. Pl. 1038; Cooke Fl. Bomb. ii, 727.*—Vern. *Bhui-Champa*.—A stemless herb. *Leaves* petioled, erect, oblong, 12 by 3 in., appearing after the flowers. *Corolla-segments* long, linear. *Lip* lilac or reddish. *Staminodes* oblong, acute.—Wild or cultivated throughout India, extending to Malay Pen. and Islands. Flowers very fragrant.

ALPINIA NUTANS, *Roscoe; Roxb. Fl. Ind. i, 65; F. B. I. vi, 256; Watt E. D.; Gamble Man. 723; Cooke Fl. Bomb. ii, 738.*—*Stems* up to 10 ft. high. *Leaves* 1–2 ft. long by 3–6 in., oblong-lanceolate. *Flowers* very handsome, in panicles 6–12 in. long, the rhachis very hairy; bracts large, concave, ivory-white tinged with pink and variegated with red and yellow.—Mr. Gamble states that this planted in Dehra Dun at Rájawala, where it affords good fodder for elephants. It is also much grown as an ornamental plant in gardens. It is a native of the E. Himalaya and Burma, extending to the Malay Pen. and Islands.

CANNA INDICA, *Linn.*; var. **ORIENTALIS** *Rosc; F. B. I. vi, 260. Prain Beng. Pl. 1047. C. indica. Linn.; Roxb. Fl. Ind. i, 1; Watt E. D.; Cooke Fl. Bomb. ii, 744.*—*Rootstock* tuberous, with many fibres. *Stems* 3–4 ft. high. *Leaves* 6–18 in. long, oblong or elliptic-lanceolate, caudate-acuminate. *Flowers* distant, $2\frac{1}{2}$ in. long, scarlet or yellow. The seeds are black and shining and are known under the name of *Indian shot*. This species is much grown in Indian gardens for its handsome flowers.

MUSA, *Linn.*—Tree-like herbs with stout stems composed of convolute leaf-sheaths. *Leaves* very large, oblong, spirally arranged. *Flowers* in an erect or decurved subterminal spike, practically 1-sexual, the lower female, the upper male; bracts large, spathaceous, ovate or orbicular. *Calyx* tubular, spathaceous, 3–5-lobed, slit to the base

on one side. *Petals* connate, forming a unilateral corolla as long as the calyx or shorter, convolute round the stamens and style. *Stamens* 5, perfect, the 6th rudimentary or obsolete; filaments stout filiform; anthers linear, erect, 2-celled. *Carpels* 3, connate in a 3-celled ovary; ovules many; style filiform from a thickened base; stigma 6-lobed, subglobose. *Fruit* oblong or fusiform, 3-gonous, fleshy, indehiscent. *Seeds* subglobose or angled by pressure, in cultivated forms often obsolete.—Species about 40, in tropical regions mostly of the Old World. As a cultivated plant *Musa* has spread extensively throughout the warmer regions of both hemispheres, and more especially the kinds which yield the well-known and highly valued *banána* and *plantain* fruit (*M. paradisiaca* and its subspecies *sapientum*).

M. PARADISIACA, L. *Sp. Pl.* (1753) 1043; K. Schum in *Engl. Pflanzenreich* iv, pt. 45 (1900), 19; Cooke *Fl. Bomb.* ii, 742; Rendle *Fl. Pl.*, part 1, 331. *M. paradisiaca*, var. *normalis*, O. Kuntze *Revis. Gen.* ii, (1891) 692. *M. sapientum* var. *paradisiaca*, Baker in *F. B. I.* vi (1893) 262; Watt *E. D. and in Comm. Prod. Ind.* 786; Prain *Beng. Pl.* 1050; Kanjilál *For. Fl.* (ed. 2) 405; Gamble *Man.* 723.—Vern. *Kach-kela*. The Plantain.—*Male fls. and bracts* subpersistent. *Fruit* cylindrical, up to 12 in. long, usually yellowish-green when ripe, pulp hardly sweet and rather firm, only edible when cooked.—A variety of the above (var. *sylvestris* of Prain) is found apparently wild in Dehra Dun in the Khairi swamp and in shady ravines of Nágsidh Hill, also at Sahánsra-dhára. It is frequently met with at low elevations on the outer ranges of the Himalaya, and has been recorded also from Chota Nagpur and Chittagong. The fruit of this plant contains many seeds and is not edible.

M. PARADISIACA, subsp. *SAPIENTUM*, K. Schum in *Engl. Pflanzenreich* iv, pt. 45 (1900) 20; Cooke *Fl. Bomb.* ii, 742; Rendle *Fl. Pl.* part 1, 331. *M. paradisiaca*, var. *sapientum*, O. Kuntze, *Rev. Gen.* ii, 692. *M. sapientum* (sp.), L.; Baker in *F. B. I.* vi, 262; Watt *E. D.*; *Comm. Prod. Ind.* 786; Prain *Beng. Pl.* 1050.—Vern. *Kela*. The Banana.—*Male fls. and bracts* deciduous. *Fruit* oblong, usually 3-gonous, yellowish or reddish when ripe, the pulp is soft and sweet and is edible uncooked.—Numerous forms or varieties of this subspecies are cultivated throughout the warmer parts of India, the quality of the fruit differing according to the climate. For further particulars see Watt's *Comm. Prod. India*.

MUSA CHINENSIS. Sweet in *Hort. Brit.* ed. 2 (1830) 596; Cooke *Fl. Bomb.* ii, 742. *M. Cavindishii*, Lambert.—Chinese or Dwarf banána.—Whole plant 4–6 ft. *Leaves* 6–8, forming a dense-rosette, 2–3 ft. long and about 1 ft. broad, spreading, oblong; petioles short, stout, deeply channelled, with broad crisped green edges. *Spikes* dense, 1–2 ft. long; bracts reddish-brown. *Male fls.* persistent. *Fruit* 4–5 in. long, 6-angled, yellow, with a thick skin, the flavour insipid until dead ripe. A native of S. China and much cultivated in India and other tropical countries. In the Saharanpur district the fruit is ripened underground in earthenware vessels.

CIX.—AMARYLLIDACEÆ.

Perennial herbs, rarely shrubs or undershrubs; rootstock a bulb tuber or corm, rarely an erect stock. *Leaves* radical, few or many. *Flowers* few or solitary, on terminal leafless scapes, often umbellate; bracts membranous or coloured, rarely herbaceous, the outer under the umbel 1—3, rarely many, the inflorescence occasionally racemose or paniced with scattered bracts. *Perianth* regular or irregular, 2-seriate, 6-lobed or partite, sometimes with a corona on the limb. *Stamens* 6, adnate to the base of the perianth-segments, rarely epigynous; filaments free or connate, anthers erect or versatile. *Ovary* inferior, 3-celled, style slender, stigma simple or 3-cleft; ovules many, 2-seriate on the inner angles of the cells, anatropous. *Fruit* inferior, usually a loculicidal capsule, rarely fleshy and bursting irregularly. *Seeds* few or many; albumen fleshy, enclosing the small embryo.—Species about 650, in temperate and tropical regions.

Leaves large, thick and fleshy, densely clustered at the top of a rootstock or a simple stem, spiny at the tip and usually armed along the edges; scape long, terminal, simple or branching towards the apex:—

Inflorescence simple and spicate or compound and thyrsoid; stamens in bud inflexed under the tips of the per-segments, much longer than the perianth; filaments filiform or flattened at the base; style filiform

1. AGAVE.

Inflorescence loosely paniced; stamens about equalling the perianth; filaments thickened at the base; style thickened in the middle

2. FURCRAEA.

Leaves thin and flat or, if somewhat fleshy, unarmed:—

Rootstock tuberous; leaves strongly nerved flat or plicate; flowers in spikes or racemes; perianth yellow not showy:—

Fruit opening by 3 valves or circumscissile

3. HYPOXIS.

Fruit a succulent berry

4. CURCULIGO.

Rootstock a tunicate bulb; leaves not strongly nerved, flat, smooth; flowers usually umbellate at the apex of a scape; perianth white or pink, large and showy:—

Filaments attached to the perianth-lobes, but not connate

5. CRINUM.

Filaments united towards their base by an intervening petaloid membrane

6. PANCRATIUM.

1. AGAVE, *Linn.*—The following key to the species of *Agave* which are cultivated or have become naturalized in N. India is based on a paper in the Agricultural Ledger of 1906, No. 7, by Mr. J. R. Drummond and Sir David Prain:—

Leaves in section flat to concave, but never channelled throughout:—

Teeth minute, close set

Agave species under letter A in D. & P. page 83.

Teeth larger, more or less remote:—

Leaves in a lax rosette or tufted, never less than 3 ft. long:—

Perianth-segments not constricted towards the tips:—

Leaves broadest in the middle, tapering to both ends:—

Leaves oblong-lanceolate, neck sharply constricted

Agave americana,
L. under letter B.
in D. & P. page 84.

Leaves linear-oblong, neck not constricted:—

Marginal prickles of upper portion of leaf pointing upwards, leaf deeply trough-shaped in upper fourth

Agave species, under
letter C. in D. & P.
page 85.

Marginal prickles pointing uniformly downwards; leaf flattish throughout

Agave Vera-Cruz,
Miller, under letter
D in D. & P. page
86.

Leaves hardly widened in the middle, very narrow in proportion to length:—

Leaves linear-lanceolate, curving outwards throughout their length, terminal spine acicular

Agave Cantala,
Roxb. under letter
E in D. & P. page
87.

Leaves narrowly oblong, not curving, stiff, erect; terminal spine conical from a stout base.

Agave species under
letter F in D. & P.
page 88.

Perianth-segments narrowed from the middle to the ligulate tip:—

Leaves straight

Agave sisalana,
Per. under letter G
in D. & P. page 89.
Agave species under
letter H in D. & P.
page 90.

Leaves drooping from their upper $\frac{1}{4}$ or less.

Leaves in a close globose rosette, never exceeding 3 ft.

Agave Wightii D.
& P. under letter
J. page 91.

Leaves in section channelled throughout

Agave decipiens,
Baker under letter
K in D. & P. page
92.

1. AGAVE.

Agave sp. (A) D. & P. in *Agril. Ledger No. 7* (1906), p. 84.

This is supposed to be the same as a plant cultivated in the Saharanpur Bot. Garden under the erroneous name of "*A. Ixtilli*." A plant reported to be naturalized in Burma seems to be very near to this, and is perhaps allied to *A. Keratto*, Miller. No information regarding the fibre is available, nor is the native country known.—Leaves deep-

green with a glaucous bloom; marginal prickles minute, sharp, ruby-coloured when young, pointing both upwards and downwards; terminal spine brown, subulate.

A. americana, *Linn. Sp. Pl. (ed. 1), i, 323; Bot. Mag. t. 3654; D. & P. l.c. under B. page 84; Cooke Fl. Bomb. ii, 754.*

The American Aloe. Planted in parks and large gardens throughout India, but not naturalized, nor grown for its fibre. Outside India it is cultivated as an ornamental plant in gardens in N. Europe and N. America. Its native country is not known. The plant widely naturalized and commonly termed *A. americana* in S. Europe, is believed by D. & P. to be *A. Vera-Cruz* of Miller.—Trunk prostrate or ascending; leaves deep-green often variegated with white or pale-yellow stripes or borders, sometimes rather glaucous; marginal prickles mostly pointing downwards; terminal spine dull-brown, 1–2 in. long; perianth-lobes obtuse, amber-coloured.

A. sp. (c), *D. & P. l.c. page 85.*—

Considered to be closely allied to *A. Vera-Cruz*, Miller. It was formerly cultivated in the Saharanpur Bot. Gard. under the erroneous name of *A. Jacquiniiana*. The plant was sent to Saharanpur from Europe but its native country is not known. The freshly cut leaves smell like rhubarb stalks, and their juice soon ferments.—Leaves oblong-linear from a very thick caudex, dark-green, glaucous; tips stiffly recurved; blade 6 ft. long or more and 8–12 in. at the widest part some way above the middle and there forming a deep trough by the bending of the leaf and the inward rolling of the margins; prickles very stout and black, those above the trough-like portion of the leaf spreading or ascending, the rest pointing downwards; terminal spine about $\frac{3}{4}$ in. long, dark-coloured.

A. vera-cruz, *Miller Gard. Dict. (ed. 8), No. 7; D. & P. l.c. (under D) p. 86. A. lurida, Zucc.; Baher in Gard. Chron. N. S. viii (1.877), 264 excl. var. Jacquiniiana and ref. A. Vera-Cruis, Haw, A. Cantula, Prain Beng. Pl. 1057 (not of Roxb).*—

The common Grey Aloe of India.—Cultivated in Bot. Gardens from Calcutta as far as Lahore, also planted in hedges throughout the greater portion of India, and sometimes on the sides of railways, and it is said to be naturalized in Mysore. **DISTRIB.:** Naturalized throughout S. Europe, in S. France and Mediterranean Islands, also in N. W. Africa and the Atlantic Islands (not recorded from S. E. Europe or the Orient). Extending to S. Africa, Mauritius and Ceylon. Its native country is probably Mexico.—Leaves linear-oblong, many from a short stout trunk which is hidden by their thickened bases, sage-green and often very glaucous, early curving upwards, the ends usually more or less recurved or drooping, 4–6 ft. long, often rather concave at the widest part which is above the middle, neck hardly constricted; marginal prickless broad, stout, blackish, spreading or decurved; terminal spine $\frac{1}{2}$ –1 in. long, dark-brown.

A. Cantala, *Roxb. Hort. Beng.* 25; *D. and P.* (under *E.*), page 87. *A. Cantula*, *Roxb. Fl. Ind.* ii, 167; not of *Dalz. and Gibs.* which is *A. Wightii*, nor of Prain which is *A. Vera-Cruz*, Miller.

Naturalized in many parts of India, extending from C. India to both E. and W. coasts to the N. W. Gangetic Plain and to the Sub-Siwalik tracts as far as the Ravi, absent in the arid strip between Gwalior and Delhi, where another species, the so-called *A. mexicana*, has found its way. (See under letter F in *D. & P.* I. c. p. 88.) It is also found in Burma. Its native country is not known for certain. This appears to be the first *Agave* to reach India, and it came probably from the Pacific coast of C. America. The fibre exported from Bombay with that of other species is often wrongly named *A. vivipara*. The freshly cut leaves smell like rhubarb.—Leaves linear-lanceolate in a lax but even tuft from a short ascending rootstock, pale-green or sometimes glaucous, very narrow in proportion to their length (4 ft. or more), the greatest width just above the middle being about 3 in., curving outwards gradually from their bases or bent over almost from their origin; upper surface more or less concave, sometimes trough-shaped in lower portions; marginal prickles large, alcate, always ascending $\frac{1}{4}$ in. or more long, very sharp, pale-brown or garnet-coloured, from a small light-coloured cushion; terminal spine, acicular, cylindrical, reddish or dark brown $\frac{1}{2}$ in. long.

A. sp. (F) *D. and P. l.c.* pages 88 and 101.

According to *D. and P.* this species seems to be intermediate between *A. Cantala* and the *Sisalana* series. It differs from the former species by its stiff upright leaves which are never involute and hardly concave, do not bend outwards and are seldom recurved, even at the tips; also the flowers are more delicate in texture. Specimens were sent by Mr. Gamble to the Calcutta Bot. Gard. from Dehra Dun under the name of *A. mexicana*. It is planted and has become naturalized in many places within the Upper Gangetic Pl., and is often found in railway hedges in N. W. India. Its native country is not known. Further information is required regarding the quality of its fibre. Leaves tufted on a very short caudex, never forming a rosette, stiff erect, 4—5 ft. long, of uniform breadth and ending in the suddenly acuminate tip; marginal prickles distant, chestnut or garnet-coloured, their hooks sharp and ascending; terminal spine stout, conical, $\frac{1}{2}$ in. long or more, brown.

A. sisalana, *Perrine*; *D. and P. l.c.* (under letter G), p. 89. True Sisal.—

The sisal-hemp was first known as a cultivated plant in Yucatan in 1834, whence it was introduced to Florida and there naturalized. From Florida it was brought to the W. India Islands and thence to India during the years 1885—1892. Its native country is not known for certain. It is cultivated in many parts of India as far north as Lahore, also in C. India, Bombay, Bengal, Mysore and Madras, also in Burma. Outside India it is grown in Australia, Fiji, Hawai and E. Africa. Leaves 20—35, oblong-lanceolate, deep-green or some-

times glaucous, up to 6 ft. long, never forming a rosette, but closely tufted on the rhizome or on a short ascending caudex, neck not at all constricted; margins with or without prickles which, if present, are weak scattered and pale-coloured; terminal spine not channelled, glossy, purple or dark-brown.

A. sp. *D. and P. l.c. page 90 (under letter H).*

The finest of the naturalized Indian species of *Agave*. It is the large species which was wrongly named *A. lurida* at Saharanpur. Vern. *Rambanskeora*. It is regarded by *D. and P.* as closely allied to the *Sisalana* group. It occurs in many parts of Bengal and in the Gangetic Plain as far north as Saharanpur where it has run wild in the Botanical Gardens. It flourishes under the same condition as *A. Wightii* and is often found with it in the same hedge. It is cultivated also in Dehra Dun, Lucknow, Madras and Burma and often becomes naturalized in hedges. Its native country is not known. The freshly cut leaves have the scent of rhubarb. More information is required as to the quality of the fibre. Leaves oblong-lanceolate, not forming a rosette, the inner ascending from the stout caudex, the ends recurved for about $\frac{1}{4}$ of the total length and drooping, dull dark-green, often glaucous, reaching 7 ft. in length and 10 in. in breadth at the widest part; marginal prickles distant, stout, falcate, yellow-brown from a broad pale cushion; terminal spine not decurrent, stout, slightly recurved.

A. Wightii, *D. and P. l.c. page 91 (under letter J) A. vivipara, Wight l.c. 2024; Baker Gard. Chron. N. S. VIII (1877), 780 excl. all syn. except Wight, not of Linn. nor of others). Agave Cantula, Dalz. & Gibs. Bomb. Fl. (not of Roxb.).—*

Vern. *Bánskeora* (Saharanpur). Small Aloe of India. Cultivated and naturalized in the Upper Gang. Pl. at Moradabad, in Dehra Dun, Saharanpur Bot. Gard., and from Delhi northwards to Ludhiana. It is the only *Agave* in N. India which develops a conspicuous trunk. Its native country is not known. A variegated form is often cultivated in gardens. *D. and P.* say that *A. Wightii* will doubtless hold its own as a hedge plant, especially in the drier provinces. The fibre is reported as good, but shorter than that of *A. sisalana*.—Leaves ensiform, linear-lanceolate, very many, 2 $\frac{1}{4}$ –3 ft. long, and up to 3 $\frac{1}{2}$ in. at its widest part, inserted in a compact series on a stout usually conspicuous trunk which is partly procumbent or throughout ascending, forming a stiff even rosette 3–5 ft. in diam., pale green or often tinged with ashy grey; base thin, broadly ample-axicaul; marginal prickles rather weak, about $\frac{1}{4}$ in. apart, usually consisting of a small brown cushion carrying a semi-transparent garnet-coloured spine which is often sharply recurved parallel to the leaf edge, but ending in a finely barbed hook pointing upwards; terminal spine about $\frac{1}{2}$ in. long, pale, slightly decurrent.

A. decipiens, *Baker in Kew Bull. July–Aug. 1893, No. cclvii, D. & P. l.c. under letter K, p. 92.*

False Sisal. Cultivated only in Bot. and Horticultural Gardens at Calcutta, Saharanpur and Lahore; naturalized in Florida with *A. sisalana*, Perrine; native country not known. Very near to *A. Ixthi*, Karwinski, a native of Yucatan.—Leaves fleshy, linear, stiff, in section canaliculate, glossy apple-green, 2—4 ft. long, widest just below the middle, forming a compact radiating tuft, of which the outer leaves are nearly at right angles with the axis, the inner ones making gradually an acuter angle; marginal prickles reddish brown small but sharp; terminal spine $\frac{1}{2}$ in. long or more, not decurrent, blackish, very sharp, including backwards.

2. FURCRÆA, Vent.

Only one species of this genus has shown any tendency to become naturalized in India. This has usually been identified with *F. gigantea*, Vent. but its exact identification with that species has not been satisfactorily determined by Drummond and Prain for want of specimens of the inflorescence. It is planted and has become naturalized within the area of this flora and in most of the public gardens of India. It is often grown as a hedge plant and sometimes on the sides of railway lines. In Southern India it is known as the "Mauritius Hemp." The fibre is much used in N. India, but it is not known to what extent it is in cultivation for this purpose. (D. and P. l.c. pages 105 and 147.)

3. HYPOXIS, Linn.; Fl. Brit. Ind. vi, 277.

Herbs with a tuberous rootstock, or a tunicate membranous or fibrous corm. *Leaves* radical, narrow, strongly nerved. *Flowers* solitary, or racemed, or in umbels. *Perianth* rotate, 6-partite, sessile on the top of the ovary and persistent. *Stamens* 6, adnate to the base of and shorter than the perianth-segments, filaments short; anthers erect, dorsifixed. *Ovary* 3-celled; style short, columnar; stigmas 3, erect, stout, distinct or connate; ovules 2-seriate in each cell. *Fruit* a globose or oblong capsule, opening by 3 valves or circumscissilely. *Seeds* subglobose; testa crustaceous, shining, beaked at the tip.—Species about 50, chiefly in S. Africa.

H. aurea, Lour. *Fl. Cochinch.* 200; *F. B. I.* vi, 277; *Prain Beng. Pl.* 1058; *Collett Fl. Siml.* 516; *Cooke Fl. Bomb.* ii, 747. *H. minor*, Don. *Prod.* 53; *Royle Ill. t.* 91, f. 3.

A small dioecious herb. *Rootstock* subglobose or elongate, crowned with the fibrous remains of the old leaves. *Leaves* 6—12, subcoriaceous, keeled, 4—14 in. long, narrowly linear. *Scapes* 1—4, filiform, or 2-flowered, subglabrous or thinly clothed with pale-brown hairs; bracts setaceous. *Perianth-segments* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, slightly hairy and yellow, the outer ones green outside. *Anthers* sagittate. *Ovary* clavate, $\frac{1}{8}$ — $\frac{1}{4}$ in. long, clothed with short shining golden-brown hairs. *Capsules* with thin walls, ultimately 3-valved, crowned with the erect per-segments. *Seeds* black, finely tuberculate.

Abundant within the area of this flora along the Sub-Himalayan tracts of Pilibhit and N. Oudh; also in Bundelkhand.—**DISTRIB.:** Outer Himalaya from Kashmir to Sikkim up to 7,000 ft., and southwards through the hilly parts of Peninsular India; extending to Java, China, Japan and the Philippines.

4. CURCULIGO, Gærtn; Fl. Brit. Ind. vi, 278.

Herbs with a tuberous rootstock, or a tunicate fibrous corm. *Leaves* often large, lanceolate and plicate or linear and flat. *Flowers* often 1-sexual, the lower flowers usually 2-sexual, spicate racemose or subcapitate. *Perianth* 6-partite, usually produced above the ovary as a solid stipe and bearing the rotate limb. *Stamens* 6, adnate to the base of the perianth-lobes, filaments short; anthers linear, erect. *Fruit* a berry. *Seeds* subglobose, testa crustaceous, black often beaked. Species about 12, in tropical and sub-tropical regions.

C. orchoides, Gærtn. *Fruct.* i, 63, t. 13; Roxb. *Fl. Ind.* ii, 144; *F. B. I.* vi, 279; *Watt E. D.*; *Prain Beng. Pl.* 1059; *Cooke Fl. Bomb.* ii, 748.—Vern. *Musali-kand* (Oudh), *Mushali* (Hind).

Rootstock tuberous, stout, with many fleshy root-fibres. *Leaves* membranous, sessile or stalked, 6—18 in. long, linear or linear-lanceolate plicate, glabrous or sparsely and softly hairy, the tips sometimes rooting when reaching the ground. *Scape* very short, clavate, flattened the pedicels bracts and ovary hidden by the leaf and sheaths. *Flowers* bright yellow, distichous. *Per-segments* $\frac{1}{4}$ — $\frac{2}{3}$ in. long, elliptic-oblong, acute, hairy on the back. *Ovary* lanceolate; cells 6—8-ovuled. *Berry* $\frac{1}{2}$ in. long, hypogenous. *Seeds* $\frac{1}{8}$ in. long; testa deeply grooved, black, shining.

Abundant in the Sub-Himalayan tracts of Pilibhit and N. Oudh, also in Merwara (Duthie, Burkill, etc.). **DISTRIB.:** Outer Him. ranges from Kumaon eastwards, Khasia Hills, Manipur, south to Bengal. W. Ghats, Konkon and Nilgiri Hills extending to Java, China and the Philippines. The black root, a kind of *musali* is ground and eaten like flour at Balrampur in N. Oudh (Burkill). The roots are also much used medicinally:

5. CRINUM, Linn.; Fl. Brit. Ind. vi, 280.

Herbs with large tunicate bulbs. *Leaves* long, ensiform or lorate. *Flowers* large, umbellate, sessile or nearly so, with 2 spathe-like bracts at the top of a long solid scape; bracteoles linear. *Perianth* funnel-shaped or almost salver-shaped; tube long, straight or incurved, cylindrical or with a wide mouth; lobes 6, recurved or spreading or conniving. *Stamens* 6, adnate to the throat of perianth-tube; filaments free. *Ovary* 3-celled; ovules 2—many in each cell; style filiform; stigma small. *Fruit* a subglobose membranous or coriaceous capsule, bursting irregularly. *Seeds* few, large, testa thick; albumen copious. Species about 75, in Trop. Asia, Africa, Australia, and America, mostly on sea-coasts, and in India often found wild in rocky beds of rivers.

Perianth-tube straight, erect; lobes stellately patent; stamens spreading:—

Leaves 5 in. wide or wider; umbels 15–50 fld.; per-tube 3–4 in. long, equalling the linear lobes; neck of the very large bulb 4 in. or more across

1. *C. ASIATICUM.*

Leaves 2 in. wide or less; umbels 6–12 fld.; neck of bulb 2.5 in. or less across:—

Bulb. with a fusiform stoloniferous base; per-tube 2½–3 in. long, equalling the linear lobes, which much exceed the stamens

2. *C. DEFIXUM.*

Bulb not stoloniferous; per-tube 3.5–4 in.; lobes lanceolate, about as long as the stamens.

Leaves obtuse or subacute; per-lobes 3.5–4 in. long, about as long as the tube.

3. *C. PRATENSE.*

Per-tube curved, declinate; lobes ascending; stamens declinate:—

Leaves 3–5 in. wide, margin scabrous, hardly waved; per-lobes oblong, almost white; anthers grey

4. *C. LATIFOLIUM.*

Leaves 1.5–2 in. wide; linear lanceolate, margin smooth, distinctly undulate; per-lobes lanceolate, pinkish; anthers brown

C. LATIFOLIUM var. *ZEYLANICA.*

Leaves ¾–1 in. wide; umbels 6–12-fld.; perianth 2½–3 in. long

2 *C. defixum.*

Perianth-lobes lanceolate; leaves 1–2 in. wide; flowers subsessile; bracts 2–3 in. long

3 *C. pratense.*

Perianth funnel-shaped; tube curved; lobes ascending, oblong or lanceolate; stamens declinate; style longer than the filaments

4 *C. latifolium.*

1. *C. ASIATICUM*, *L.*; *F. B. I.*, vi, 280; *Prain Beng. Pl.* 1061; *Cooke Fl. Bomb. ii*, 749. *C. toxicarium*, *Roxb. Fl. Ind. ii*, 134.—Cult. within the area of this flora and throughout trop. India. Wild on the Chittagong coast and in the Sundribuns.

2. *C. DEFIXUM*, *Ker. Gawl.*, *F. B. I.* vi, 281; *Prain Beng. Pl.* 1061; *Cooke l.c.* 749. *C. asiaticum*, *Roxb. l.c.* 127 (not of *Linn.*).—Cultivated within the area of this flora and in other parts of India. Probably wild in Bengal and in the Central Prov. in swamps and rocky beds of rivers.

3. *C. PRATENSE*, *Herbert*; *F. B. I.* vi, 282; *Prain l.c.* 1061; *Cooke l.c.* 750. *C. longifolium*, *Roxb. l.c.* 130.—Plains of India and in Burma. Cult. only in Upp. Gang. Plain.

4. *C. LATIFOLIUM*, *Linn.*; *Roxb.*; *l.c.* 137; *F. B. I.* vi, 283; *Prain l.c.* 1061.—Gardens generally in India, perhaps wild in Orissa and Chota Nagpur. VAR. *zeylanica*, *Herb.*; *C. zeylanicum*, *Roxb. l.c.* 138.—In gardens in India, perhaps wild in Orissa.

6. PANCRATIUM, *Linn.*; *Fl. Brit. Ind.* vi, 285.

Herbs with tunicate bulbs. *Leaves* linear or lanceolate, often 2-farious. *Flowers* large, solitary or umbellate, sessile or stalked within 1 or 2 membranous spathes; bracteoles linear, hyaline. *Perianth* funnel-shaped; tube usually long, widened at the mouth; lobes 6, narrow, suberect, subequal. *Stamens* 6, shorter than perianth, adnate to the throat; filaments, connate below in a petaloid membranous cup; anthers dorsifixed. *Ovary* 3-celled; ovules many, 2-seriate in each cell; style long, filiform; stigma small. *Fruit* a large subglobose 3-cornered

loculicidally 3-valved capsule. *Seeds* many, angular; testa thick, lax, black.—Species about 12, in S. Europe, Africa, and a few are cultivated in Indian gardens, and are often apparently wild within the area of this flora.

Zephyranthes tubispatha Herbert; F. B. I. vi, 277; Prain Beng. Pl. 1060. A bulbous plant with white flowers. It was introduced into India from Peru, and is much grown in gardens, and has become naturalized as an escape in many parts of India. Another species, *Z. rosea* Lindl., is also met with in Indian gardens, and in Dehra Dun it occurs as an escape from cultivation. It is wild in Cuba, and the flowers are red.

Polygonum-tuberosa, Linn.; Watt, E. D.; Cooke Fl. Bomb. ii, 753. A well-known garden plant within the area of this flora and in other parts of India. Roots tuberous; flowering stems 3—4 ft. high; flowers white and fragrant, in terminal racemes. Introduced from Mexico and known in India as the *Tube rose*.

CX.—DIOSCOREACEÆ.

Large usually climbing herbs and generally with a thick fleshy tuberous underground rootstock, rarely a cluster of tuberous roots, or with sometimes an epigæal and often woody tuber. *Leaves* alternate or opposite, simple or compound, costate and reticulate; petioles often angular and twisted at the base, sometimes articulate. *Flowers* small, usually 1-sexual, arranged in spikes or racemes, diœcious or monœcious in separate spikes, regular; bracts often minute, sometimes obsolete; male spikes or racemes simple or paniced; female simple, sometimes reduced to 1—2 flowers; perianth superior. **MALE** flowers: *Perianth* campanulate or rotate, deeply 6-fid or urceolate with narrow mouth and short spreading lobes. *Stamens* 6, inserted at the base of the perianth, all perfect or 3 reduced to staminodes, or only 3 and no staminodes, filaments incurved or recurved; anthers small, 2-celled, globose, oblong or didymous, or with the cells discrete on branches of the filament. *Pistillode* thick, columnar, 3-fid or entire or obsolete. **FEM.** flowers: *Perianth* smaller than in male, 6-fid or partite, persistent. *Staminodes* 3, 6 or none. *Ovary* inferior, 3-quetrous, usually 3-celled; styles 3, very short; stigmas entire or 2-fid, recurved; *Ovules* 2 in each cell, superposed, pendulous. *Fruit* a berry or a 3-valved capsule. *Seeds* flat or globose; embryo small, enclosed in the fleshy and rather hard albumen.—Species about 160, in tropical and subtropical regions.—*Tamus communis*, L., the Black bryony, is a climbing plant with tuberous roots, and is frequently met with in hedges in many parts of Britain.

DIOSCOREA, Linn.; Fl. Brit. Ind. vi, 288.

Herbs with slender climbing, rarely procumbent, stems; tuber solitary, often large, underground or rarely epigæal, very rarely with

clustered long-peduncled tubers at the base of stem. *Leaves* alternate or sometimes opposite, entire or lobed or digitately 3—9-foliolate. *Flowers* 1-sexual and usually dioecious. *MALE* flowers: *Perianth* campanulate rotate or urceolate; lobes short, spreading. *Stamens* 6, free round a pistillode, or connate in a central column, or 3 alternating with 3 staminodes, or 3 without staminodes; anthers small, the cells contiguous or discrete. *Pistillode* thick and fleshy or none. *FEM.* flowers: *Perianth-segments* 6, small, free. *Staminodes* 6, 3 or none. *Ovary* 3-celled, stigmas reflexed above the style. *Fruit* a 3-cornered loculicidal capsule, the angles laterally flattened and almost winged. *Seeds* compressed, often with a large membranous wing; albumen fleshy or hard, 2-laminæ, embryo between the laminæ with a suborbicular cotyledon. —Species about 150, in tropical and subtropical regions.—The tubers of *Dioscorea*, known as yams, contain much starch, and are largely cultivated in India and in other tropical countries.

The following key to the species of *Dioscorea* which occur either wild or cultivated within the area of this flora is based on Prain and Burkill's Synopsis of the Dioscoreas of the Old World (Africa excluded) and was published in Journ. and Proc. As. Soc. Beng. (N. S.), Vol. X No. 1, 1914.

Stems twining to the left:—

Section COMBILUM. Tubers produced in a bunch, spreading, edible. Leaves simple, cordate. Male flowers 1—2 together on a long spike-like raceme (when the 2nd flower is present it is placed cymosely on the pedicel of the 1st); perianth saucer-shaped, the stamens inserted near the margin. Seeds unknown:—

1. *D. aculeata*.

Section LASIOPHYTON. Tubers vertical. Leaves generally compound. Male flowers in spikes or spike-like racemes which are generally compound; perianth-lobes just united at the base, with the stamens inserted on them; filaments simple. Seeds winged on one side only, in elongated, reflexed or horizontal capsules:—
Male flowers not densely packed; stamens 3; leaflets 3 or 5

2. *D. pentaphylla*.

Male flowers densely packed; stamens 6; leaflets 3

3. *D. triphylla*.

Section OPSOPHYTON. Tubers vertical. Leaves simple, cordate. Male flowers in characteristic dependent spikes; perianth-lobes with the stamens inserted at their bases; filaments free. Seeds with the wing developed on one side only, in elongated reflexed capsules:—

Leaves alternate, ovate-cordate, drying green; flower-spikes long; tubers sometimes slightly elongating

4. *D. bulbifera*.

Stems twining to the right; seeds with the wing developed all round:—

Section ENANTIOPHYLLUM. Tubers vertical, usually edible. Leaves simple. Male flowers sessile, on short axes, opening but a little way; perianth-lobes free, with the stamens inserted at their bases; filaments simple. Seeds in capsules which are not reflexed but face forwards:—

Male flowers in spikes arranged on elongate leafless branches:—

Flowers of male plant on axes which are never zigzag alive or dry; buds usually flattened at the base:—

Special flowering branches conspicuously shorter than the leaves; capsules often rather glaucous

5. *D. Wallichii*.

Special flowering branches, when well-grown, longer than the leaves:—

Pubescence abundant on the leafless axes which bear the spikes of the closely packed male flowers which are covered with hairs, stamens 6

6. *D. anguina*.

Pubescence absent entirely:—

Leaves hastate, network conspicuous below

7. *D. belophylla*.

Leaves cordate or ovate-cordate, thin, curling up on the midrib when drying; the first lateral pair of nerves rather close to the midrib

8. *D. glabra*.

Flowers of male plant on axes which become zigzag either in life or when dry; stems acutely angled or winged

9. *D. alata*.

Section COMBILIUM.

1. *D. aculeata*, Linn. *Amoen. Acad. iv* (1754), 131; Prain and Burkill in *Journ. As. Soc. Beng. (N. S.), Vol. x* (1914); *D. fasciculata*, Roxb. *Fl. Ind. iii*, 801; *F. B. I. vi*, 296. *D. sativa*, Linn. *Sp. Pl.* (1753), 1033 (in small part). *D. spinosa*, Roxb. ex Wall. *Cat.* (1832) 5103, letters A, D, E.

VAR. *spinosa*, P. and B. *Syn. Diosc.*, page 20.

Leaves more or less hairy; flowers rarely produced; tubers few, unequal, mixed with many fibrous roots, the uppermost of which are armed with spines which protect the tubers from the ravages of pigs and other animals.—This variety is widely cultivated within the area of this flora, and is often found wild.

VAR. *fasciculata*, P. and B. *l.c.* p. 20.

Leaves almost glabrous; flowers not developed; tubers ellipsoid, crowded, without spines.—Cultivated in the districts of Lucknow, Allahabad, Fyzabad, Jaunpur, Azamgarh, Ballia, Ghazipur and Benares. It is also grown in Java and in other of the Malay Islands.

Section LASIOPHYTON.

2. *D. pentaphylla*, Linn. *Sp. Pl.* (1753), 1032; Prain *Beng. Pl.* 1066; Cooke *Fl. Bomb. ii*, 757; Prain and Burkill *l.c.* p. 23. *D. Jacquemontii*, *F. B. I. vi* (1892), 290. *D. triphylla*, Linn. *Sp. Pl.* (1753), 1032.

From Western India to the remotest parts of the Pacific, from the Himalaya and Yunnan southwards to Ceylon and to the islands in the Torres Strait

VAR. *Suli*, Prain and Burkill *l.c.* page 23.

Leaves grey, not shining.—Dehra Dun, Siwalik range, N. Oudh, Bundelkhand. DISTRIBUTION: Himalaya in Garhwal and Kumaon at low elevations, extending to the Khasia and Naga Hills.

VAR. **Cardonii**, P. and B. l.c. page 23.

Leaves sparsely clothed with reddish hairs; flowers small.—N. Oudh, Gorakhpur, Mirzapur. DISTRIB.: Ch. Nagpur, in the hilly portions.

VAR. **communis**, P. and B. l.c. page 23.—Vern. *Kánta-álu* (Hind).

Tubers short, stiff, armed; flesh insipid, firm; leaflets 3 or 5, clothed with reddish hairs.—Common within the area of this flora, also in Burma.

3. **D. triphylla**, Linn. *Amœn. Acad. iv* (1754), 131; *Lamk-Encycl. Method. iii* (1789), 234; *Prain and Burkill l.c. p. 25*. *D. dæmona*, Roxb. *Fl. Ind. iii*, (1832) 805; *F. B. I. vi*, 289; *Watt, E. D.*; *Prain Beng. Pl. 1066*; *Cooke Fl. Bomb. ii*, 756.

From India to New Guinea, occurring just within S. W. China and in Formosa. Linnæus in 1853 applied the name "triphylla" to a form of *D. pentaphylla*; in 1754 he applied it as Prain and Burkill use it here.

VAR. **dæmona**, P. and B. l.c. p. 26.

A pubescent plant, common in India. Within the area of this flora it has been recorded by Burkill from Saharanpur Government Garden, Siwalik range in the Mohand Pass, N. Oudh, Gorakhpur, Mirzapur, Gwalior and Bundelkhand. DISTRIB.: Central India and C. Provinces, extending to the less rainy portions of Java. Roxburgh says of *D. dæmona* that the roots are dreadfully nauseous, even after being boiled.

Section OPSOPHYTON.

4. **D. bulbifera**, Linn *Sp. Pl.* (1753), 1033; *Prain Beng. Pl. 1066*; *Cooke Fl. Bomb. ii*, 758; *Prain and Burkill l.c. p. 26*. *D. crispata*, Roxb. *Fl. Ind. iii*, 802. *D. heterophylla*, Roxb. *Fl. Ind. iii*, 804. *D. oppositifolia*, *Campbell Econ. Prod. Chuta Nagpur* (1886) p. 7. *D. pulchella*, Roxb. *Fl. Ind. iii*, 801. *D. sativa*, *Thunb. Fl. Jap.* 191; *F. B. I. vi*, 295; *Duthie in F. and G. Crops pt. iii*, 11. *Plate lxxx*.

From India to the remotest parts of the Pacific, ascending the Himalaya to 5,000 ft., and in S. China, in S. Japan, and in N. Australia. Introduced into Trop. America and Africa.

VAR. **vera**, P. and B. l.c. page 26; *D. pulchella*, Roxb. l.c. 801.

Tuber and bulbils short, acid; leaves shining on upper surface.—very common in Upper Gang. Plain.—Vern. *Rát-álu*.

VAR. **sativa**, P. and B. l.c.—Vern. *Rát-álu* (Hind).—

Tuber very small; bulbils large, nearly smooth, greenish-brown; leaves large, broadly ovate.—Cult. in India and on the shores of Pacific.—(Otaheite Potato).

VAR. **suavior**, P. and B. l.c. p. 26.

Tuber and bulbils scarcely acrid.—Cult. in India, and recorded from Jhansi.

VAR. **crispata**, *Prain Beng. Pl.* 1066; *Roxb. l.c.*, 802; *F. B. I.* vi, 296; *Watt E. D.*—Vern. *Zamin-kand.*—Cultivated in N. India and on Himalaya up to 5,000 ft.

Section **ENANTIOPHYLLUM.**

5. D. Wallichii, *Hook. f. F. B. I.* vi, 295; *Prain and Burkill l.c.* p. 31. *D. aculeata*, *Linn. Sp. Pl.* (1753), 1033 in small part; *Prain Beng. Pl.* 1067. *D. sativa*, *Wall. Cat.* (1832) 5108, letters A, B, and F.

India in hilly parts of Malabar Coast; thence inland to Tapti river and through Bundelkhand and Ch. Nagpur to the Circars, extending to Burma.

VAR. **vera**, P. and B. l.c. page 31.

Capsule slightly glaucous.—Bundelkhand at Lalitpur (Duthie No. 15245).
DISTRIB.: See above, and exclude Burma.

6. D. anguina, *Roxb. Fl. Ind.* iii, 803; *Prain and Burkill l.c.* p. 32. *D. spinosa*, *Wall. Cat.* (1832), 5103, letters G and H.

India, in the Himalaya from C. Nepal eastwards; general where the moisture is sufficient on the south of the Ganges as far as Travancore (but not in Ceylon); Assam, northern Burma, Sumatra and Java.—I am indebted to Mr. Burkill for the following localities within the area of the Upper Gang. Plain: Gorakhpur dist.; N. Oudh; in the Bahraich dist.; Bundelkhand: in the Jhansi and Banda districts; C. India: in the Bhopal and Indore districts.

7. D. belophylla, *Voigt Hort. Suburb. Calc.* (1845) 652; *Prain Beng. Pl.* 1067; *Prain and Burkill l.c.* p. 36. *D. deltoides*, *Baden-Powell Punj. Prod.* i, 259 (in part). *D. glabra*, *Hk. f. in F. B. I.* vi, 294 (in part); *Collett Fl. Siml.* 519. *D. sagittata*, *Royle ex Voigt l.c.* 653. *D. sp.* *Aitch. Cat. Punj. and Sind Pl.* 148.

A species demanding less rain than most of the others; met with along the Himalaya towards the west as far as the Kashmir Valley, and found also on the Salt Range; eastwards, as far as is known, its distribution terminates in Sikkim; southwards it occurs on hill crests as far as the Nilgiri Range; and it has once been recorded from the Khasia Hills. It is common within the area of this flora, especially in Dehra Dun and on the Siwalik range, also in N. Oudh, Bundelkhand and in the Mirzapur district.—Vern. *Turhur, torce.* The tubers are much eaten.

8. D. glabra, *Roxb. Fl. Ind.* iii, 803; *F. B. I.* vi, 294 (in chief part); *Prain and Burkill l.c.* p. 37. *D. nummularia*, *Roxb. Fl. Ind.* iii, 803. *D. Wallichii*, *Hk. f. in F. B. I.* vi, 295 (in small part).—

India, south of the Ganges in the moister parts, the Himalaya from C. Nepal eastwards, the plains of Bengal and Assam, also in Burma and Siam, extending to the Malay Pen. and Islands eastwards to Java.

VAR. **vera**, B. and P. l.c. page 38.

Leaves ovate, thin, very glaucous on lower surface, tinged with red in drying.—Recorded from Dehra Dun (Duthie), and from the Kheri district of N. Oudh (Duthie's collector No. 22827 (a), and from the Gorakhpur district (Duthie's collector No. 22827).

9. *D. alata*, *Linn. Sp. Pl.* (1753), 1033; *F. B. I. vi*, 296, *Watt E. D.*; *Prain Beng. Pl.* 1067; *Prain and Burkill l.c. p.* 39. *D. atropurpurea*, *globosa*, *purpurea*, and *rubella*, *Roxb. Fl. Ind. iii*, pp. 797—800.

Cultivated throughout the Tropics, wherever the rainfall is sufficient. It is certainly of eastern origin and was perhaps derived from *D. Hamiltonii*. In the W. Himalaya races exist, here classed under var. *Tarri*, which appear as if *D. belophylla* may possibly enter their composition. A plant widely cultivated is commonly polymorphic as regards the parts subjected to man's influence, and *D. alata* is no exception; it shows a great variety of forms of tuber * * * * * *D. alata* sometimes flowers and very rarely fruits (Prain and Burkill). Vern. *Khám* (Beng.).

VAR. **Tarri**, *P. and B. l.c. p.* 39.

Veins on lower surface of leaves conspicuous. Cult. in Kumaon and in the adjacent parts of the Himalaya.

VAR. **vera**, *P. & B. l.c.*

Veins less conspicuous.

CXI.—LILIACEÆ.

Herbs, rarely shrubs or small trees, with fibrous roots, or with a creeping rootstock or a bulb or corm. *Leaves* cauline or radical, sometimes none. *Flowers* usually 2-sexual axillary or terminal, solitary or geminate or arranged in umbels, spikes, racemes, panicles or fascicles; bracts usually small and scarious, or spathe-like when the flowers are in umbels. *Perianth* herbaceous or petaloid, usually 6-merous in 2 series, rarely, 4- or 8- or 10-merous, imbricate or rarely valvate in bud. *Stamens* 6, rarely 3 or fewer, hypogynous or adnate to the perianth, filaments free or connate; anthers oblong or linear, often dorsifixed. *Ovary* 3-celled, usually simple, often long, rarely short on none or with 3 styles; ovules 2 or more, on the inner angles of the cells, anatropous rarely orthotropous. *Fruit* a capsule or berry, usually 3-celled. *Seeds* 1 or more, globose or flattened; embryo small, terete, surrounded by the horny or fleshy albumen.—Species about 2,500, in all climates and countries.

Shrubs with perennial stems above ground; fruit berry-like:—

Stems climbing or straggling; leaves replaced by linear or needle-shaped scales (cladodes)

Stems leafy, usually climbing; leaves 3—5-nerved, reticulate-veined

1. ASPARAGUS.

2. SMILAX.

Herbs with annual stems or scapes rising usually from underground perennial rootstocks corms or bulbs, rarely (in *Asphodelus*) the plant wholly annual:—

Underground perennial stems large in proportion to the roots:—

Aerial annual stem climbing, leafy; leaves broad, with tendril-like tips; perianth large, showy; rootstock tuber-like, naked

3. GLORIOSA.

Aerial annual stems or scapes erect; leaves narrow; rootstock a globose coated corm or bulb:—

Perennial stem a solid corm covered with brown sheaths; annual stem leafy; flowers solitary or corymbose

4. IPHIGENIA.

Perennial stem a tunicated bulb; annual scape simple, naked; leaves radical; flowers racemose:—

Seeds sub-globose; perianth stellate

5. SCILLA.

Seeds flattened; perianth campanulate

6. URGINEA.

Underground perennial stem very small or (in *Asphodelus*) sometimes none; rootfibres large, many, usually some or all fleshy or tuberous; leaves radical; capsule loculicidal:—

Ovules 2 in each cell; capsule 3-quetrous; leaves $\frac{1}{2}$ -terete or terete and fistular

7. ASPHODELUS.

Ovules 4 or more in each cell; capsule deeply 3-winged; leaves flat

8. CHLOROPHYTUM.

1. ASPARAGUS, Linn.; Fl. Brit. Ind. vi, 314.

Undershrubs with a stout creeping rootstock. *Stems* erect, straggling or climbing, terete, grooved. *Leaves* minute, scale-like, bearing in their axils tufts of needle-like or flattened axillary cladodes. *Flowers* usually 2-sexual, small or minute, axillary, solitary fascicled or in racemes, pendulous; pedicels jointed, bracts minute or obsolete. *Perianth* petaloid, 6-partite, campanulate or funnel-shaped. *Stamens* 6, adnate to the base of the perianth-segments, filaments free, anthers oblong. *Ovary* 3-gonous; style columnar; stigmas 3, recurved; ovules 2 or more in each cell. *Fruit* a globose pulpy berry. *Seeds* few or solitary by abortion; testa black, brittle, embryo dorsal, albumen hard.—Species about 100, in Europe, Temp. and Trop. Asia and in Africa.

Branches 3-quetrous, smooth; spines suberect or sub-recurved, $\frac{1}{4}$ — $\frac{1}{2}$ in. long; cladodes $\frac{1}{2}$ —1 in. long, in tufts of 2—6, slender falcate, acuminate, channelled beneath; ovules 6—8 in each cell.—A tall climbing much branched undershrub

1. *A. racemosus*.

Stem tall, stout, smooth; branches ashy-white, grooved and angled, the angles minutely scabrid; spines stout, straight, $\frac{1}{2}$ — $\frac{3}{4}$ in. long; cladodes in dense tufts of 6—20, slender, terete, filiform, soft; ovules many in each cell.—A suberect shrub

2. *A. adscendens*.

1. *A. racemosa*, Willd. *Sp. Pl.* ii, 152; Roxb. *Fl. Ind.* ii, 151; *F. B. I.* vi, 316; Watt *E. D.*; Collett *Fl. Siml.* 523; Prain *Beng. Pl.* 1070; Kanjilal *For. Fl.* (ed. 2) 409; Gamble *Man.* 724; Brandis *Ind. Trees* 642.—Vern. *Satmuli* (Hind.), *Satrawal* (Dehra Dun), *Chatawal* (Rohilkhand), *Sahasmur* (N. Oudh).—Wild Asparagus.

A tall much-branched scandant spinous undershrub with tuberous roots. *Stem* woody, terete; branches 3-quetrous, smooth, striate; spines suberect or subrecurved, $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Cladodes* $\frac{1}{2}$ —1 in. long, in tufts of 2—6, spreading, falcate, acuminate, channelled beneath. *Racemes* solitary or in fascicles, 1—2 in. long, simple or branched; pedicels very slender, $\frac{1}{2}$ in. long, jointed at the middle. *Perianth* $\frac{1}{2}$ — $\frac{1}{4}$ in. in diam.; lobes spreading. *Anthers* minute, purplish. *Ovules* 6—8 in each cell. *Berry* $\frac{1}{8}$ — $\frac{1}{4}$ in. in diam.

Very common within the area of this flora, flowering after the rains, when it becomes conspicuous by its masses of white fragrant flowers. **DISTRIB.:** Throughout trop. and subtrop. India, and in Ceylon, and up to 4,000 ft. on the Himalaya from Kashmir eastwards. It occurs also in Trop. Africa, Java and Australia. The white tuberous roots of this plant are collected for food and constitute a kind of white *musali*. They are also used medicinally.

2. A. adscendens, Roxb. *Fl. Ind.* ii, 153; *Royle Ill.*, 393; *F. B. I.* vi, 317; *Watt E. D.*; *Collett Fl. Siml.* 523; *Kanjilal For. Fl.* (ed. 2) 409. Vern.—*Satāwa*, *sat-muli*.

A suberect prickly shrub, with white tuberous roots. *Stems* tall, stout, suberect, terete, smooth, white, much branched; branchlets ascending, ashy-white grooved and angled, the angles minutely scabrid; *spines* $\frac{1}{2}$ — $\frac{1}{4}$ in. long, stout, straight. *Cladodes* in dense tufts of 6—20, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, slender, filiform, terete, soft, suberect or curved. *Racemes* 1—2 in. long, many-flid.; pedicels jointed above or below the middle; bracts minute. *Flowers* 1 in. in diam. *Perianth*—segments spreading. *Ovules* many in each cell. *Berry* $\frac{1}{4}$ — $\frac{1}{2}$ in. in diam. 1-seeded.

Dehra Dun, in Sal forests; Rohilkhand (T. Thomson) N. Oudh, in the districts of Kheri and Gonda (Duthie). **DISTRIB.:** Western Himalaya from Kumaon eastwards to Hazara, extending to Afghanistan. The tuberous roots are pickled, and the young shoots are eaten as a vegetable.

2. SMILAX, Linn.; *Fl. Brit. Ind.* vi, 302.

Climbing shrubs rarely erect herbs. *Leaves* alternate, rarely opposite, persistent, 3—5-nerved and reticulate; petiole with usually 2 tendrils above its base. *Flowers* small, dicecious, umbellate. *Perianth* of 6 free segments, incurved or recurved. **MALE** flowers: *Stamens* 6 or more, free, from the base of the perianth; anthers oblong, 2-celled, didymous, cells contiguous or separated on a forked connective. *Pistillode* none. **FEM.** flowers: *Staminodes* 6 or 3. *Ovary* 3-gonous, style short or none; stigmas 3, stout, recurved; ovules 1 or 2 in each cell, orthotropous, pendulous. *Fruit* a globose berry. *Seeds* solitary, globose, oftener 2 and hemispheric, rarely 3; albumen horny, embryo small.—Species about 180, in temperate and tropical regions.

Umbels 2—3, very rarely more, alternate on a common peduncle:—

Petiole stout, always narrowly sheathing but not auriculate below the middle

1. *S. macrophylla*.

Petiole rather slender, with 2 large, thickly coriaceous, indistinctly reticulate auricles below the middle
 Umbels 7—20, ternate or whorled on a common peduncle; petiole stout, with, in all except the uppermost leaves, 2 large leaf-like distinctly reticulate auricles below the middle

2. *S. Roxburghiana*.

3. *S. prolifera*.

1. *S. macrophylla*, Roxb. *Fl. Ind.* iii, 793 (not of Willd.); *F. B. I.* vi, 310; *Watt E. D.*; *Prair. Beng. Pl.* 1071; *Kanjilal For. Fl.* (ed. 2) 407; *Brandis Ind. Trees* 641; *Cooke Fl., Bomb.* ii, 763. *S. retusa*, Roxb. *Fl. Ind.* iii, 793. *S. ovalifolia*, Roxb. *l.c.* 794.—Vern. *Ramdatun*.

A large more or less prickly climber. *Stems* smooth, striate, armed with a few small distant prickles or almost unarmed. *Leaves* alternate, 3—8 in. long or sometimes much larger, broadly ovate or sub-orbicular, acuminate or cuspidate, glabrous, shining; main nerves usually 5, with reticulate venation between; petioles $\frac{1}{2}$ —1 in. long, stout, narrowly sheathing, but not auriculate below the middle, tendrils very long and slender. *Umbels* 2—3, rarely more, alternate on a common peduncle, many fld.; peduncles $\frac{1}{2}$ — $\frac{3}{4}$ in. long; bracts below the peduncles ovate, acute, $\frac{1}{10}$ — $\frac{1}{8}$ in. long; pedicels of both male and female flowers arising from a mass of numerous minute bracts. *MALE flowers*: Pedicels $\frac{1}{2}$ in. *Perianth* $\frac{1}{4}$ — $\frac{1}{3}$ in. long; segments linear, obtuse, erect when young, afterwards reflexed, the 3 outer ones broader. *Stamens* about as long as the perianth. *FEM. flowers*: *Perianth* as in male; pedicels elongating in fruit. *Berry* about the size of a large pea, smooth, green and turning to red when ripe.

Sub-Himalayan tracts from Dehra Dun eastwards to Rohilkhand and N. Oudh and Gorakhpur; also in Sal forests on the Siwalik range. Flowers in the rainy season. *DISTRIB.*: Trop. Him. eastwards from Kumaon to Assam, Bengal and Burma, and south to Central Provinces and Konkan, extending to Java. The root of this plant is pounded and the flour is made into bread at Bulrampur in N. Oudh (Burkill). The stem yields a strong fibre suitable for making brushes, and the thinner stems are much used as tooth-sticks (Kanjilal).

2. *S. Roxburghiana*, *Wall. Cat.* 5115; *F. B. I.* vi, 311; *Prair. Beng. Pl.* 1071.

A large prickly climber with smooth terete branches, branchlets 4-angled. *Leaves* 5—8 in. long, oblong ovate or ovate-lanceolate, rounded cordate or cuneate at the base and with a bluntly acuminate tip, 3—5-costate from above the base; petiole rather slender, with 2 large coriaceous broad indistinctly reticulate auricles below the middle; the auricles of the old leaves 1—1 $\frac{1}{2}$ in., produced behind into rounded lobes embracing the branch. *Umbels* many-flowered, 2—3, on a common peduncle, which is bracteate at the base. *Pedicels* of female flowers $\frac{1}{2}$ in. long, slender. *Staminodes* 3. *Stigmas* long, recurved. *Berries* $\frac{1}{2}$ in. in diam. *Seeds* 2, hemispheric, or solitary and globose.

Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). *DISTRIB.*: Trop. Himalaya from Garhwal eastwards; also in Bengal on Paras-náth, in Chota Nagpur, Chittagong and on the Khasia Hills.

3. S. prolifera, Roxb. *Fl. Ind.* iii, 795; *F. B. I.* vi, 312; *Watt E. D.*; *Prair Beng. Pl.* 1071; *Kanjilal For. Fl.* (ed. 2), 407; *Gamble Man.* 724; *Brandis Ind. Trees* 641. *S. laurifolia*, Roxb. *l.c.* 793. *S. ovalifolia*, *A. DC. Mon.* i, 199 (not of Roxb.).—Vern. *Rámdatoun* (Dehra Dun), *Kumári* (Behar).

A stout climbing shrub with prickly stem. *Leaves* variable, 4—5 in. long, oblong ovate or orbicular, coriaceous, nerves 3—7 from above the rounded or subcordate base; petiole 1—2 in. long, its sheath auricled at the base and amplexicaul round the stem; tendrils 2—4 in. long. *Umbels* 10 or more, many-flowered; peduncles $\frac{3}{4}$ —1½ in. long; pedicels about $\frac{1}{2}$ in. long. *Sepals* $\frac{1}{8}$ in. long, oblong-lanceolate. *Petals* as long but narrower. *Stamens* as long as sepals. *Staminodes* of female flower 3. *Ovary* oblong; stigmas deciduous. *Berry* oblong or globose, red when ripe.

Common on the Siwalik range in the Dehra Dun and Saharanpur divisions and abundant in the Sub-Himalayan tracts eastwards chiefly in *sal* forests. Flowers in September and October, and the fruit ripens from December to February.—*DISTRIB.*: Outer ranges of Himalaya in Kumaon; also in Bengal, Behar, Central India, Ceylon and Burma. The stems yield a strong fibre sometimes used for making brushes, and the thinner stems as tooth-sticks.

3. GLORIOSA, Linn.; *Fl. Brit. Ind.* vi, 358.

Climbing herbs with leafy stems springing from a naked tuberous rootstock. *Leaves* alternate opposite or 3-nately whorled, lanceolate, strongly nerved and with a long spiral tendril-like apex. *Flowers* large, showy, solitary, axillary, pedicels reflexed. *Perianth* petaloid, persistent; segments 6, subequal, spreading or reflexed, margins undulate or crisped. *Stamens* 6, hypogynous; filaments filiform; anthers linear, dorsifixed, versatile extrorse. *Ovary* 3-celled; style filiform, deflexed, with 3 subulate arms. *Fruit* a large coriaceous septicidal capsule. *Seeds* few, subglobose; testa spongy, wing-like, embryo cylindrical.—Species 3 or 4, in Trop. Asia and Africa.

G. superba, Linn. *Sp. Pl.* 305; *Roxb. Fl. Ind.* ii, 143; *F. B. I.* vi, 358; *Watt E. D.*; *Prair Beng. Pl.* 1073; *Collett Fl. Siml.* 530; *Cooke Fl. Bomb.* ii, 766.—Vern. *Kulhári*, *languli*, *rájah-rar* (Ajmir).

A tall branching glabrous herbaceous climber. *Rootstock* a chain of arched fleshy cylindrical tubers, 6—12 in. long, budding from the convex upper side; roots fibrous. *Stem* annual, leafy, 10—20 ft. long. *Leaves* sessile or nearly so, scattered or opposite, or sometimes ternately whorled, 3—8 in. long, ovate-lanceolate, acuminate, tip spirally twisted to form a tendril, base cordate. *Flowers* solitary or subcorymbose towards the ends of the branches, 3—4 in. across, persistent; pedicels 3—6 in. long, deflexed from the tip; perianth segments up to 2½ in. long, linear-lanceolate with crisply undulate margins, at first erect and greenish, afterwards becoming reflexed and turning to yellow or orange and finally scarlet. *Filaments* golden-yellow,

$1\frac{1}{2}$ — $1\frac{3}{4}$ in., spreading; anthers nearly $\frac{1}{2}$ in. long. Style up to 2 in. long, the arms $\frac{1}{4}$ in. Capsule linear-oblong, about $1\frac{1}{4}$ in. long.

Common in Dehra Dun among bushes and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in the outskirts of forests, also in Bundelkhand and Marwāra. Flowers June to October. **DISTRIB.:** Throughout Trop. India and in Ceylon, ascending to 5,000 ft. on the W. Himalaya, and extending to Malaya, Cochin China and Trop. Africa.

4. IPHIGENIA, Kunth.; Fl. Brit. Ind. vi, 357.

Herbs with small tunicate corms and erect leafy slender stems. Leaves few, scattered, linear, the upper bract-like. Flowers small, erect, solitary or corymbose. Perianth petaloid, 6-partite, stellately spreading, deciduous; segments equal, narrow, clawed. Stamens 6, hypogynous; filaments short, flat; anthers oblong, versatile, introrse. Ovary sessile, 3-celled; styles 3, shortly connate below, linear, recurved, stigmatic within; ovules many in each cell. Fruit a loculicidal capsule. Seeds subglobose; testa thin; albumen fleshy; embryo small—species 4, in India, Africa, Australia and the Philippines.

I. indica, A. Gray in Kunth. Enum. iv, 213; F. B. I. vi, 357; Watt E. D.; Collett Fl. Siml. 529; Prain Beng. Pl. 1074; Cooke Fl. Bomb. ii, 766.

Corm $\frac{1}{2}$ — $\frac{3}{8}$ in. in diam., narrowed into a short neck, tunicate with pale-brown sheaths. Stems up to 10 in. high. Leaves sessile, alternate, few, coriaceous, the lower ones 6—8 in. long, becoming smaller upwards, all linear, sheathing at the base; nerves obscure. Flowers appearing before the leaves, purple, few or many, in a terminal erect raceme; pedicels $\frac{1}{2}$ —1 in. long; bracts linear or subulate, the lower leaf-like. Perianth-segments $\frac{3}{8}$ in. long, narrow, clawed, spreading, at length reflexed. Stamens $\frac{1}{2}$ in. long. Ovary oblong, about as long as stamens. Capsule oblong or subovoid, $\frac{3}{8}$ — $\frac{1}{2}$ in. long, obtuse, 3-grooved. Seeds $\frac{1}{16}$ in. in diam., brown.

Siwalik range (Duthie). **DISTRIB.:** Throughout India from the N.-W. Frontier to Burma, ascending Himalaya up to 7,000 ft. and to 4—5,000 ft. on Khasia hills; also in Ceylon and extending to Australia and the Philippines.

5. SCILLA, Linn.; Fl. Brit. Ind. vi, 348.

Herbs with tunicate bulbs. Leaves radical, linear, lorate or oblong. Flowers racemose, on a simple leafless scape; bracts small. Perianth petaloid, persistent, stellate or campanulate; segments 6, subequal, often recurved. Stamens 6, adnate at or near the base of the perianth-segments; filaments usually filiform; anthers ovate or oblong, introrse. Ovary 3-celled; ovules few in each cell; style filiform, stigma small, capitate. Fruit a globose 3-lobed loculicidal capsule; cells 1—2-seeded. Seeds obovoid or subglobose; testa thin, black; embryo shorter than the firm albumen.—Species about 80, in Europe and Temp. Asia.

S. indica, Baker in Saund. Ref. Bot. iii, App. 12; F. B. I. vi, 348; Watt E. D.; Prain Beng. Pl. 1074; Cooke Fl. Bomb. ii, 767. Ledebouria hyacinthina, Roth; Bot. Mag. 3226.

Bulb ovoid or subglobose, 1—1½ in. in diam. *Leaves* appearing with the flowers, 3—6 in. long, oblong to lanceolate or oblanceolate, subacute, narrowed into a sheathing petiole, rather fleshy, undulate, obtusely keeled, sometimes rooting at the tips, dull-green above and often with darker blotches, paler and glaucous beneath. *Scape* 2—5 in. long, rather stout. *Flowers* greenish-purple, in cylindric many-flowered racemes 2—4 in. long, bracts minute, scarious; pedicels filiform, ¼ to ⅓ in. *Perianth-segments* ⅓—½ in. long, linear-oblong, obtuse. *Filaments* ⅓ in., purple; anthers ⅙ in. long, ellipsoid; style ⅓—½ in. long. *Capsule* ⅓ in. long, membranous.

Bundelkhand (Royle); Gwalior (Maries). **DISTRIB.:** Behar, Chota Nagpur, Bombay Presidency and S. India to Ceylon; extending to Abyssinia.

6. URGINEA, Steinh.; Fl. Brit. Ind. vi, 347.

Herbs with tunicate bulbs. *Leaves* radical, linear or lorate. *Flowers* racemose or on a long leafless scape, often appearing before the leaves; pedicels short or long, articulate, bracts small. *Perianth* petaloid, campanulate; segments 6, subequal. *Stamens* 6, adnate at or near the base of the perianth-lobes, included; filaments filiform or thickened at the base; anthers oblong or linear, introrse. *Ovary* 3-celled, often, 3-gonous, style tapering towards the base, ovules many in each cell. *Fruit* an oblong 3-quetrous loculicidal capsule. *Seeds* usually many in each cell, compressed; testa black, marginally winged, embryo rather large, albumen fleshy.—Species about 24, in S. Europe, W. Asia and Africa.

U. indica, Kunth. Enum. iv, 333; F. B. I. vi, 347; Watt E. D.; Prain Beng. Pl. 1075; Collett Fl. Siml. 526. Kanjilal For. Fl. (ed. 2) 410; Cooke Fl. Bomb. ii, 768. Scilla indica, Roxb. ii, 147.—Vern. Kanda (Saharanpur), jangh-piyáj, uskil.—Indian Squill.

Bulb 2—4 in. long, ovoid. *Leaves* appearing after the flowers, 6—18 in. long, linear, acute, nearly flat. *Scape* erect, 12—18 in. long, brittle. *Flowers* distant, drooping or spreading, greenish-white; or dingy-brown; bracts minute, soon falling. *Perianth* campanulate; segments ⅓ in. long, oblong-lanceolate, obtuse, with 2 or 3 strong approximate median nerves. *Stamens* ¼ in. or longer; filaments flattened.

7. ASPHODELUS, Linn.; Fl. Brit. Ind. vi, 332.

Style obconic. *Capsule* ellipsoid, ½—¾ in. long; cells 6—9 seeded. *Seeds* ¼ in. long flattened, elliptic, black.

Siwalik range (Stewart), also plentiful eastwards in the Sub-Himalayan tracts of Pilibhit and N. Oudh. **DISTRIB.:** W. Himalaya up to 7,000 ft.; salt range of Punjab, and south to Konkan; also in Burma, and Behar and in Chota Nagpur, extending to Trop. Africa. The bitter

and nauseous bulbs are used as a substitute for the true *squill* (*U. maritima*), also by weavers in N. India to give substance to their thread.

Annual or perennial herbs with slender fleshy root-fibres. *Leaves* radical, linear, 3-quetrous or terete, fistular. *Flowers* racemose on a simple or branched leafless scape. *Perianth* petaloid, marcescent; segments 6, free or shortly connate below. *Stamens* 6, hypogynous, shorter than the perianth-lobes; filaments dilated at the base and embracing the ovary, the summit of the filament inserted in a pit on the back of the connective, anthers versatile. *Ovary* 3-celled, style filiform, stigma somewhat 3-lobed; ovules 2, collateral in each cell. *Fruit* a globose loculicidal capsule with rugose partitions. *Seeds* usually solitary in each cell; testa black, rugose, albumen cartilaginous, embryo rather large.—Species 6 or 7, in S. Europe and eastward to India.

A. tenuifolius, Cav. in *Anal. Cienc. Nat.* iii, 46, t. 27, fig. 2; *F. B. I.* vi, 332; *Watt E. D.*; *Collett Fl. Siml.* 524; *Prain Beng. Pl.* 1076; *Cooke Fl. Bomb.* ii, 770. *A. clavatus*, *Roxb. Fl. Ind.* ii, 148. *A. fistulosus*, *Linn.*—Vern. *Bokat-piâzi*.

Annual. *Leaves* 6—12 in. long, terete, acute, sheathing at the base finely puberulous. *Scapes* several from the root, much branched above, 1—2 ft. *Flowers* white, laxly racemose, solitary in each bract; pedicels $\frac{1}{8}$ — $\frac{1}{4}$ in., jointed below the middle; bracts $\frac{1}{8}$ in., broadly ovate, boat-shaped, scarious, with a strong brownish-keel. *Perianth* $\frac{1}{8}$ — $\frac{1}{4}$ in. long; segments oblong, obtuse, with a brownish costa. *Stamens* $\frac{1}{8}$ in. long, acutely 3-gonous black.

Abundant within the area as a weed of cultivation and often becoming a pest. Flowers during the cold season. **DISTRIB.:** Plains of India in fields, and extending westwards to the Canary Islands and the Mediterranean region. The plant and seeds are sometimes eaten in India by famine-stricken people. (See *Agricultural Ledger*, No. 7, cf. 1902, p. 155.)

8. CHLOROPHYTUM, Ker.; *Fl. Brit. Ind.* vi, 333.

Herbs with a short hard rootstock emitting many fascicled roots, often thick and fleshy or tuber-like. *Leaves* radical, clustered, often broad, rarely linear or lorate. *Flowers* laxly racemed on a simple or branching leafless scape; pedicels usually fascicled in the axils of small scarious or large membranous bracts. *Perianth* petaloid, marcescent or persistent, rarely deciduous; lobes free, rotate. *Stamens* 6, hypogynous, free or the 3 inner adnate to the perianth-lobes, included; filaments filiform, often widened above the middle, anthers oblong or linear, introrse, the filament inserted in a pit on the back of the connective. *Ovary* 3-quetrous, style filiform, stigma small, ovules 4 or more in each cell. *Fruit* a coriaceous truncate 3-quetrous loculicidal capsule. *Seeds* broad, usually compressed, rugose, testa black, albumen rather hard; embryo often curved and rather large.—Species about 40, in tropical and sub-tropical regions.

C. tuberosum, Baker in Journ. Linn. Soc. xv, (1876), 332; F. B. I. vi, 334; Prain Beng. Pl. 1077; Cooke Fl. Bomb. ii, 772. Anthericum tuberosum, Roxb. Fl. Ind. ii, 149.

Root-fibres cylindrical, with ellipsoid tubers hanging from them. Leaves sessile, membranous, usually ensiform, falcate, acuminate, recurved, 8 in. long or more; margins crisped or undulate. Scape terete, naked, usually longer than the leaves. Flowers white, in simple or shortly branched racemes 2—4 in. long, bracts lanceolate, acuminate, the lower ones $\frac{1}{2}$ — $\frac{3}{4}$ in. long; pedicels ascending, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, jointed below the middle. Per-segments less than $\frac{1}{2}$ in. long, oblong-lanceolate subacute, 7—9-nerved. Stamens shorter than the perianth; anthers narrowly linear, afterwards twisted. Capsule $\frac{3}{8}$ in. long, obovoid, emarginate, shining, transversely veined; cells 4—6-seeded. Seeds black.

Gorakhpur (Vicary): N. Oudh, in the districts of Gonda and Bahraich (Duthie). DISTRIB.: Behar and W. Bengal; Central India and from the Konkan and N. Circars to Travancore, also in Burma and extending to Abyssinia.

ALLIUM, Linn.; Fl. Brit. Ind. vi, 337.

This genus contains over 250 species and is distributed in northern temperate regions. The 27 species recorded in the F. B. I. as growing wild in India are nearly all confined to the Himalayan ranges. The cultivated kinds about 5, are briefly mentioned below.

Leaves fistular:—

Leaves basal only; heads dense with flowers only *A. ascalonicum*.

Leaves subdistichous; heads dense, with flowers and bulbils *A. Ceba*.

Leaves flat:—

Heads bearing flowers only; bulb long, cylindrical, simple:—

Heads lax; filaments simple, linear *A. tuberosum*.

Heads dense; filaments 2-toothed *A. ampeloprasum*.

Head lax, bearing both flowers and bulbils; bulb short, compound *A. sativum*.

1. **A. ascalonicum**, Linn.; Roxb. Fl. Ind. ii, 142, F. B. I. vi, 337; Watt E. D.; A. DC. L'Orig. Pl. Cult. 55; Prain Beng. Pl. 1075; Cooke Fl. Bomb. ii, 775.—Vern. Piyáj, Palandu (The Shallot). Root consisting of a fascicle of several small ovate-oblong bulbs. Leaves basal only, fistular, shorter than the scapes. Scapes 1—2 ft. long, tapering from the swollen base. Umbels globular, dense, with flowers only.

2. **A. Ceba**, Linn.; Roxb. l.c. ii, 142; F. B. I. vi, 337; Watt E. D.; A. DC. l.c. 52; Duthie in F. and G. Crops Pt. iii, p. 5; Prain Beng. Pl. 1075; Cooke Fl. Bomb. ii, 775.—Vern. Piyáj (Onion).—Leaves fistular, bifarious. Umbels dense, with both flowers and bulbils.—An important cold-season crop of Northern India.

3. **A. tuberosum**, Roxb. l.c. 141; F. B. I. vi, 343; Watt E. D.; Prain Beng. Pl. 1076.—Vern. Banga gandina (Hind.) (Indian Leek). Bulb long, cylindrical, simple. Leaves flat. Umbels lax, bearing flowers only. Filaments simple, linear. The plant is much cultivated in Bengal.

Roxburgh states that the Hindus use it as an article of diet as leeks are in Europe.—Regel cites *A. tuberosum* as a synonym of *A. odorum*, L. and Sir Joseph Hooker has suggested that it might possibly be the cultivated form of that plant.

4. *A. ampeloprasum*, Linn.; *F. B. I. vi*, 337; *Prain Beng. Pl.* 1076; *Cooke Fl. Bomb. ii*, 775. *A. Porrum*, L.; *Roxb. l.c.* 141; *Watt E. D.*; *A. ampeloprasum*, var. *Porrum*, A. DC. *L'Orig. Pl. Cult.* 81.—Vern. *Gandina*—(The Leek). Leaves flat. Umbels dense, bearing flowers only. Filaments 2-toothed. Bulb long, cylindric, simple.

5. *A. sativum*, Linn.; *Roxb. l.c.* 142; *F. B. I. vi*, 337; *Watt E. D.*; *Duthie in F. and G. Crops Pt. iii*, 34, t. 66; *Prain Beng. Pl.* 1076; *Cooke Fl. Bomb. ii*, 775.—Vern. *Lasun* or *rasun* (Garlic). Leaves flat. Bulb short, compound. Umbels lax, bearing both flowers and bulbils.

CXII.—PONTEDERIACEÆ.

Fresh-water and marsh herbs, erect or floating. Leafy stems 1-foliate, springing from the buried rootstock or from the joints of the floating stem; basal leaves long-petioled, blade floating or upraised. *Flowers* 2-sexual, slightly irregular, arranged in racemes or spikes, rarely fascicled or in panicles at the ends of 1-leaved stems or branches; bract under the inflorescence spathe-like, bracts under the flowers minute or obsolete. *Perianth* inferior, petaloid, marcescent, usually tubular; lobes 6, sub-2-seriate, similar or the 3 inner smaller. *Stamens* 6 or 3, unequally adnate to the perianth tube or to the base of the perianth-lobes, usually declinate, the upper shorter, filaments free; anthers usually oblong, with 2 parallel distinct cells, dehiscence introrse, longitudinal or porous. *Ovary* free, 3-celled and with axile placentas, or 1-celled and with 3 parietal placentas, each placenta with many 2-seriate ovules, sometimes with only one fertile ovule in each cell, anatropous, pendulous or suspended, style filiform or columnar; stigma terminal, entire or lobed. *Fruit* a dry membranous loculicidally 3-valved capsule. *Seeds* ovoid or ellipsoid, small, testa longitudinally ribbed, albumen horny or floury; embryo central, cylindric.—Species about 36, found chiefly in Trop. Africa and America.

MONOCHORIA, Presl.; *Fl. Brit. Ind.* vi, 362.

Aquatic herbs. *Rootstock* short or long, clothed with leaf-sheaths. *Leaves* radical and solitary at the top of the emerging stem or branches; radical long-petioled, all cordate-ovate, sagittate or lanceolate. *Flowers* in a raceme, sessile within the axil of the cauline leaf and fasciculately long-pedicelled, or pedunculate and subsPICATELY short-pedicelled; spathe complicate below the raceme. *Perianth* campanulate, tube none; lobes 6, distinct, sub-equal. *Stamens* 6, adnate to the base of the perianth-lobes or hypogynous, one normally larger than the others and with its filament toothed on one side; anthers basifixed, dehiscing

by a terminal ultimately elongated slit. *Ovary* ovoid, sessile, 3-celled, with many ovules in each cell, style filiform, stigma minutely 3-lobed. *Fruit* an oblong membranous loculicidal capsule. *Seeds* many, ovoid, obtuse, many-ribbed, embryo cylindric in the centre of floury albumen.—Species about 6, in the tropics of the Old World.

Rootstock elongate, creeping; leaves hastate, sagittate or cordate; flowers on long stalks, subumbellate or racemose; inflorescence centrifugal

1. *M. hastæfolia*.

Rootstock short, suberect; flowers on short stalks subspicate; inflorescence centripetal:—

Leaves ovate or ovate-cordate; flowers rather numerous

2. *M. vaginalis*.

Leaves linear or narrowly ovate; flowers few

M. vaginalis, var. *plantaginea*.

1. *M. hastæfolia*, *Presl. Reliq. Hoenk. i, 128, F. B. I. vi, 362; Prain Beng. Pl. 1079; Cooke Fl. Bomb. ii, 777. Pontederia hastata, Linn.; Roxb. Fl. Ind. ii, 121. P. sagitata, Roxb. l.c. 124. P. dilatata, Andr.; Roxb. l.c. 123. Vern. Laukia.*

Rootstock stout, creeping and rooting below, spongy, clothed with the remains of the old leaf-sheaths. *Leaves* 4—8 in. long, sagittate, hastate or cordate, smooth and glossy many-nerved; petioles of floral leaves tumid above and embracing the short stout peduncle; petioles of radical leaves $1\frac{1}{2}$ —2 ft. long with a broad sheathing base. *Inflorescence* centrifugal. *Flowers* in racemes or subumbellate, crowded, bright purplish-blue; pedicels up to 1 in. long. *Perianth-segments* $\frac{3}{8}$ in. long, becoming twisted round the fruit when withering; the 3 inner ones obovate and wider than the 3 oblong outer ones, all with 3 strong parallel median nerves and reticulately veined between them and towards the margins. Filament of large anther $\frac{1}{2}$ in. long, with an acute horn at one side; anthers linear-oblong, the large one blue, the others yellow. *Ovary* ovoid, $\frac{1}{2}$ in. long; stigma obscurely 3-lobed. *Capsule* $\frac{1}{2}$ in. long, ellipsoid. *Seeds* $\frac{1}{8}$ in. long, rounded at each end, pale, with many fine brown ribs.

Abundant within the area in streams and tanks. **DISTRIB.:** Throughout India and in Ceylon, extending to the Malay Islands and China.

2. *M. vaginalis*, *Presl. Reliq. Hoenk. i, 128, F. B. I. vi, 363; Prain Beng. Pl. 1079; Cooke Fl. Bomb. ii, 777. Pontederia vaginalis, Burm.; Roxb. Fl. Ind. ii, 121.*

Rootstock short, suberect, spongy. *Leaves* very variable, 2—4 in. long, from linear to ovate or ovate-cordate, usually acuminate; petioles of lower leaves long, stout, terete; the peduncles emerging from the sheaths of the uppermost leaves. *Flowers* blue, usually spotted with red, in sub-spicate racemes globose in bud and then elongating as the flowers expand, the terminal flower opening first; pedicels $\frac{1}{2}$ — $\frac{3}{4}$ in. *Perianth* campanulate; segments about $\frac{3}{8}$ in. long, three of them narrowly obovate, the other three much narrower. Filament of large anther $\frac{1}{2}$ in. long, with an acute horn on one side, those of the smaller anthers filiform. *Ovary* $\frac{1}{10}$ in. long, ellipsoid, glandular; stigma 3-lobed. *Fruit* less than $\frac{1}{2}$ in. long, glandular outside. *Seeds* rounded at each end, pale and with many brown ribs.

Abundant within the area in rice-fields, and on the margins of tanks.

DISTRIB.: Throughout India from Kashmir to Assam and south to Travancore; also in Ceylon and extending to the Malay Islands, China, Japan and Trop. Africa.

VAR. *plantaginea*, Solms-Laub.; F. B. I. vi, 363; Prain Beng. Pl. 1079. *Pontederia plantaginea*, Roxb. Fl. Ind. ii, 123. A much smaller plant with narrower leaves and fewer flowers on the racemes. Found at Moradabad by T. Thomson and by Mrs. Bell at Banda, but is probably plentiful within the area and in other parts of India. Outside India it occurs in Java and China.

CXIII.—COMMELINACEÆ.

Herbs, prostrate or erect, rarely climbing or shrubby. *Leaves* costate, with sheathing bases, nerves parallel. *Flowers* more or less irregular, usually 2-sexual, often cymose; cymes scorpioid, straight or reduced to one flower, sometimes paniced, often enclosed in spathe-like bracts; floral bracts usually small, opposite the pedicels or obsolete, sometimes herbaceous and distichously imbricate. *Perianth* inferior, 6-partite; the 3 outer segments herbaceous, often persistent, the inner petaloid, free or united below in a tube, spreading above, marcescent. *Stamens* 6, adnate to the base of the perianth-segments, all perfect or 2 or more reduced to staminodes; filaments often bearded with jointed hairs; anthers oblong or globose, often dissimilar. *Ovary* free 3- or 2-celled, style terminal, stigma small; ovules solitary or few, orthotropous, on the inner angles of the cells. *Fruit* a loculicidal capsule or indehiscent. *Seeds* angled, testa smooth or rugose, albumen floury; embryo minute, far from hilum.—Species about 300, in tropical and subtropical regions.

Stamens 2 or 3, perfect, with 1—3 staminodes:—

Cymes enclosed in spathaceous bracts

Cymes paniced; bracts not spathaceous

Stamens 6, perfect:—

Petals united below into a tube; cymes scorpioid

Petals free; cymes secund, in thyrsoid panicles

1. COMMELINA.

2. ANEILEMA.

3. CYANOTIS.

4. FLOSCOPA.

1. COMMELINA, Linn.; Fl. Brit. Ind. vi, 368.

Herbs, usually slender or creeping below. *Leaves* ovate-lanceolate, or linear, with lax sheaths, petioled or not. *Flowers* in usually 2-fid cymes emerging one at a time from a terminal complicate or funnel-shaped or hooded spathe; flowers of the upper cyme-branch small, deciduous, of the lower fertile; fruiting pedicel and capsule retracted within the spathe. *Sepals* 3, membranous, the 2 inner often connate at the base. *Petals* 3, longer than the sepals, one larger than the others and often clawed. *Stamens* 3, perfect, with 2—3 imperfect; anthers oblong, one usually longer than the others. *Ovary* 3-rarely

2-celled, two of the cells 1- or 2-ovuled, third cell, if present, 1-ovuled or empty. *Fruit* a loculicidal capsule hidden in the spathe by the decurving of the pedicel after flowering, the posticous cell indehiscent or obsolete, or the 2 anticous cells empty indehiscent and connate as a ligulate body, from which the posterior cell falls away. *Seeds* ellipsoid or angled; testa reticulate pitted or rugose. Species about 100, in tropical and subtropical regions.

Anterior pair of cells of ovary 2-ovuled; posterior cell 1-ovuled or obsolete:—

Capsule 3-celled, the two anterior cells loculicidally dehiscent and each usually 2-seeded; posterior cell keeled, 1-seeded and deciduous at length dehiscent:—

Leaves lanceolate; spathes complicate, the margins free, or connate only at the very base:—

Seeds reticulate, cylindric; branches of cyme 1—3-fld.; spathe sometimes cordate at base .

1. *C. nudiflora*.

Seeds smooth, truncate at one end; spathe always rounded at base:—

Branches of cyme equal, 1—2 fld.; seeds appendaged, globose at the unflattened end .

2. *C. salicifolia*.

Branches of cyme unequal, upper 2—4 fld., lower 1—2 fld.; seeds without appendages, subacute at the unflattened end

3. *C. Hasskarlii*.

Leaves elliptic-ovate; spathe turbinate; capsule always 5-seeded; seeds rugose

4. *C. bengalensis*.

Capsule 1-celled, with 2 superposed seeds truncate and appendaged at both ends, or with one subglobose seed; leaves linear; spathes deeply cordate at base

5. *C. attenuata*.

All the cells of the ovary 1-ovuled; capsule 3-celled, subequally 3-valved; seeds free in the cells; spathe sessile or nearly so; capsule 3-gonous-obovoid

6. *C. obliqua*.

1. *C. nudiflora*, Linn. *Sp. Pl.* 41; Clarke in DC. *Mon.* iii, 144; F. B. I. v, 369; Watt *E. D.*; Prain *Beng. Pl.* 1082; Cooke *Fl. Bomb.* ii, 781. *C. cæspitosa*, Roxb. *Fl. Ind.* i, 174.

Diffuse, nearly glabrous; root fibrous. *Stems* 2—3 ft. or more long-branching from the base; branches prostrate or subcandent, often rooting at the rather distant nodes. *Leaves* sessile, $1\frac{1}{2}$ —3 in. lanceolate or ovate-lanceolate, acute or acuminate; sheaths loose, glabrous, usually with ciliate margins. *Peduncles* $\frac{1}{2}$ — $\frac{3}{8}$ in. long, spreading or erect. *Spathes* $\frac{3}{4}$ or $1\frac{1}{4}$ long; base rounded or cordate, with rounded lobes. *Cymes* usually two, 1—3 fld. *Flowers* $\frac{1}{4}$ — $\frac{3}{8}$ in. across, the two interior petals obovate with long claws, dark blue; the exterior one subsessile, orbicular, pale blue or white, sometimes obsolete. *Ovary* 3-celled, of which two cells are 2-ovuled and the third 1-ovuled. *Capsule* $\frac{1}{2}$ in. long, broadly oblong, acuminate, coriaceous, 5-seeded. *Seeds* oblong-cylindric, brown, tubercled and reticulate.

Abundant within the area. *DISTRIB.*: Throughout the hotter parts of India from the Punjab to Ceylon, extending to China, S. Africa and other tropical and subtropical countries.

2. *C. salicifolia*, Roxb. *Fl. Ind.* i, 172; Clarke in DC. *Mon.* iii, 157; F. B. I. vi, 370; Watt *E. D.*; Prain *Beng. Pl.* 1082; Cooke *Fl. Bomb.* ii, 781.

Stems slender, glabrous, decumbent, sometimes rooting from the nodes. *Leaves* 3—6 in. long, linear-lanceolate, glabrous or nearly so; sheaths $\frac{5}{8}$ in. to 1 in., ciliolate. *Spathes* 1—2 in., axillary ovate-lanceolate, acute or acuminate, rounded at base. *Peduncles* $\frac{1}{2}$ — $1\frac{1}{4}$ in. long, slender. *Flowers* polygamous; branches of cyme equal, usually 1—2-fld. *Sepals* free, ovate, obtuse, the two inner connate below, larger than the outer. *Petals* dark blue, the two larger ovate with undulate margins and long claws, the smaller one broadly ovate, entire, subsessile or with a very short claw. *Staminodes* 3, clavate. *Capsule* $\frac{1}{4}$ in. long, quadrate, membranous. *Seeds* $\frac{1}{8}$ in. long, black, powdered with white, smooth, ovoid or subglobose, with a whitish membranous appendage at one end.

Dehra Dun, on the Siwalik range; Sub-Himalayan tracts of N. Oudh; Merwára in Rajputana; Bundelkhand. **DISTRIB.:** Eastwards to Assam, Burma and Bengal and southwards to the Konkan and S. India, extending to Java.

3. C. Hasskarlii, *Clarke Comm. and Cyrt. Beng. 13, t. 3; in DC. Mon. iii, 157; F. B. I. vi, 370; Prain Beng. Pl. 1082; Cooke Fl. Bomb, ii, 781.*

Stem much branched, glabrous or pubescent, sometimes scaberulous. *Leaves* 1—3 in. long, narrowly lanceolate, subacute; sheaths $\frac{1}{2}$ in. long, with a broad base, ciliate. *Spathes* $\frac{1}{2}$ in. long, axillary, ovate-lanceolate, cordate at the base and with rounded lobes, glabrous scabrid or hispid; peduncles $\frac{1}{2}$ —1 in. long. *Flowers* in pubescent unequal cymes, the uppermost branch 2—4-fld. the lower 1—2-fld., *Capsule* $\frac{1}{4}$ in. long, quadrate, apiculate, membranous. *Seeds* $\frac{1}{8}$ — $\frac{1}{4}$ in. long, cylindric, truncate at one end, subacute or rounded at the other, without an appendage.

From Delhi to N. Oudh, apparently not common. **DISTRIB.:** Kumaon, Bengal, Assam; and from Mt. Abu south to Konkan and Poona.

4. C. benghalensis, *Linn. Sp. Pl. 41; Clarke in DC. Mon. iii, 159; Roxb. Fl. Ind. 1,171; F. B. I. vi, 370; Watt E. D.; Collett Fl. Siml. 532; Prain Beng. Pl. 1082; Cooke Fl. Bomb. ii, 782.*

Stems 2—3 ft. long, slender, dichotomously branched from the base, branches diffuse, glabrous or pubescent, creeping and rooting below. *Leaves* 1—3 in. long, ovate or oblong, obtuse, sessile or shortly stalked, pubescent or villous on both surfaces; base unequal-sided, rounded cuneate or cordate; nerves 7—11 pairs; sheaths hairy; margins ciliate with rufous hairs. *Spathes* 1—3 together, funnel-shaped or turbinate, auricled on one side. *Sepals* small, oblong, hairy. *Petals* blue, the larger one orbicular or transversely oblong. *Ovary* 3-celled, two of the cells 2-ovuled, the third cell 1-ovuled. *Capsule* $\frac{1}{4}$ in. long, pyriform, membranous, 5-seeded. *Seeds* closely pitted.

Moradabad (T. Thomson), Pilibhit (Duthie); Bundelkhand (Edgeworth). **DISTRIB.:** Throughout India, and up to 6,000 ft. on the Himalaya, extending to China and Trop. Africa. In this species ripe seeds are sometimes matured underground from abnormal flowers borne on leafless branches coming from the lower nodes of the stems. These

flowers are white and smaller than the blue aerial ones, which often fail to produce fertile seeds.

5. *C. attenuata*, *Kœn. ex Vahl Enum. ii, 168*; *Clarke in DC. Mon. iii, 172*; *F. B. I. vi, 372*; *Prain Beng. Pl. 1083*; *Cooke Fl. Bomb. ii, 784*.

Stem 1—3 ft. long, slender, much branched, glabrous or sparsely hairy. *Leaves* $1\frac{1}{4}$ —3 in. long, linear or linear-lanceolate, acute or subobtusely; sheaths ciliate, often hardly distinct from the leaf-blade, spathes 1— $1\frac{1}{2}$ in., narrowly ovate-lanceolate, acute or caudate-acuminate, glabrous; base deeply sagittately cordate and with large auricles. *Peduncles* $\frac{3}{8}$ — $1\frac{1}{2}$ in., glabrous or pubescent. *Flowers* small, blue. *Capsule* $\frac{1}{4}$ in. long, 1-celled, with 2 superposed seeds truncate and appendaged at both ends, or with one subglobose seed.

Bundelkhand (Mrs. Bell) and probably in other localities within the area. **DISTRIB.:** Chota Nagpur, Behar, Central India and South to Ceylon.

6. *C. obliqua*, *Buch.-Ham. in Don. Prod. 45* (not of Vahl), *Clarke in DC. Mon. iii, 178*; *F. B. I., vi, 372*; *Watt E. D.*; *Collett Fl. Siml. 532*; *Prain Beng. Pl. 1083*; *Cooke Fl. Bomb. ii, 784*. *C. communis*, *Roxb. Fl. Ind. i, 171?* *C. gelatinosa*, *Edgew.*

A tall branching herb. *Stems* 2—3 ft. high, stout. *Leaves* 4—7 in. long, very variable, sessile or stalked, lanceolate or elliptic-lanceolate, acute or caudate-acuminate, membranous, glabrous scabrous or villous; sheaths about 1 in. long, the mouth bearded with long hairs. *Spathes* sessile or nearly so, $\frac{1}{4}$ —1 in. long and as broad as long, solitary or crowded in terminal heads, acute, funnel-shaped, glabrous or somewhat scabrous, usually filled with a clear, glutinous liquid. *Flowers* blue, about $\frac{3}{8}$ in. across, in simple racemes; large petal orbicular, clawed. *Ovary* 3-celled, the cells 1-ovuled. *Capsule* $\frac{3}{8}$ in. long, 3-celled and subsequently 3-valved, 3-gonous-obovoid. *Seeds* $\frac{1}{4}$ in. long, oblong or ellipsoid, smooth, puberulous, lead-coloured.

Very common within the area. **DISTRIB.:** Throughout India and in Ceylon, and up to 6,000 ft. on the Himalaya; it extends also to the Malay Islands.

2. ANEILEMA, R. Br.; Fl. Brit. Ind. vi, 374.

Herbs with simple or branched stems; roots often tuberous. *Leaves* usually alternate, sometimes all radical, occasionally clustered under the inflorescence, usually narrow and sessile. *Flowers* in axillary and terminal panicles; bracts not spathaceous; bracteoles small. *Sepals* 3, free, membranous. *Petals* 3, obovate, equal. *Stamens* 2 or 3, filaments naked or bearded; anthers oblong, one usually smaller or longer than the others. *Staminodes* 2—4; rarely with minute anthers. *Ovary* sessile, 2—3-celled. *Fruit* a loculicidal capsule. *Seeds* 1 or more in each cell, with a thick hard rugose or pitted testa.—Species about 60, in tropical and subtropical regions, chiefly in Asia.

Cells of ovary containing 2 or more ovules, of the capsule 2-or more-seeded:—

Seeds 1-seriate in each cell; flowers in terminal or subterminal panicles:—

Cells of the ovary with 3 or more ovules, of the capsule 3—7-seeded:—

Panicles terminating an erect leafless scape with large sheathing bracts; leaves all radical, narrowly ensiform; root tuberous

1. *A. scapiflorum*.

Panicles terminating leafy stems; root fibrous; stem slender; leaves sessile, small, oblong, auricled; panicle small, leafy below

2. *A. spiratum*.

Cells of ovary with 2 ovules, of capsule usually 2-seeded; panicles subterminal rarely axillary; leaves linear or lanceolate

3. *A. nudiflorum*.

Seeds 2-seriate (16 or more in each cell); pedicels axillary or terminal; stem stout, sparingly branched, creeping and rooting at the nodes, leafy; leaves linear-oblong

4. *A. Hamiltonianum*.

Cells of ovary 1-ovuled, those of capsule 1-seeded; pedicels 1—3 in the axils of distant lanceolate bracts; stem slender, decumbent and rooting at the lower nodes; leaves long, linear; roots fibrous

5. *A. vaginatum*.

1. *A. scapiflorum*, *Wight Ic. t. 2075*; *F. B. I. vi, 375*; *Clarke in DC. Mon. iii, 207*; *Watt E. D.*; *Prain Beng. Pl. 1084*; *Cooke Fl. Bomb. ii, 786*. *Commelina scapiflora*, *Roxb. Fl. Ind. i, 175*. *Murdannia tuberosa*, *Royle Ill. 403, t. 95*.—*Vern. Siyah musli* (Hind.).

A tufted herb, with elongate fusiform tubers. *Leaves* all radical, erect, 4—8 in. long, narrowly ensiform, finely acuminate and slightly narrowed to the base. *Flowers* in erect elongate panicles on terminal leafless scapes; scape with panicle 8—18 in. long; sheaths on scape below the panicle $\frac{3}{4}$ —2 $\frac{1}{4}$ in. embracing the scape, finely acuminate with an oblique mouth; upper bracts amplexicaul, often spotted. *Sepals* $\frac{1}{4}$ in. long, elliptic-oblong, subacute, purple-green. *Petals* blue, $\frac{3}{8}$ in. long, obovate. *Stamens* 3, perfect, all bearded with blue hairs. *Capsule* $\frac{1}{4}$ in. long, obovoid. *Seeds* 5 or 6 in each cell, superposed, sharply 3-gonous.

Siwalik range, on the Mohand Pass and in Sub-Himalayan tracts from Rohilkhand to Gorakhpur (Duthie). *DISTRIB.*: Temp. and Trop. Himalaya from the Ganges eastwards to Bhutan; also in Bengal and southwards to Travancore and Ceylon, extending to Burma and China.

2. *A. spiratum*, *R. Br. Prod. 271*; *Clarke in DC. Mon. 207*; *F. B. I. vi, 377*; *Prain Beng. Pl. 1084* *Cooke Fl. Bomb. ii, 787*. *A. nanum*, *Kunth.*; *Clarke Comm. and Cyrt. Beng. t. 18*. *Commelina nana*, *Roxb. Fl. Ind. i, 173*. *C. pumila* *Herb Royle*.

A dwarf annual, with fibrous roots, branching from the base; branches 6—10 in., decumbent and rooting below. *Leaves* sessile, the lower ones broadly linear-lanceolate; the upper oblong; cordate, amplexicant, $\frac{1}{2}$ —1 in. long, acute; sheaths very short. *Flowers* about $\frac{1}{4}$ in. across, in dichotomously branched few-fl. panicles; peduncles

terminal and from the upper axils; pedicels longer than the capsules; bracts minute, ovate, amplexicaul, persistent. *Stamens* 3, perfect; anthers blue, filaments bearded; staminodes 3, shorter than stamens, usually naked. *Ovary* 3-celled, cells many-ovuled. *Capsule* 3-gonous, the cells 3—7-seeded. *Seeds* 1-seriate, minute, pale.

Banda (Edgeworth, under *Commelina nana*). *DISTRIB.*: Throughout India and in Ceylon, extending to Malaya and China, flowering during the rains. This plant will probably be found in other localities within the area of this flora. It appears to be common in Bengal as a field weed.

3. *A. nudiflorum*, *R. Br. Prod.* 271 (in note); *Clarke in DC. Mon.* iii, 210; *F. B. I. vi*, 378; *Collett Fl. Siml.* 538; *Prain Beng. Pl.* 1084; *Cooke Fl. Bomb. ii*, 788. *A. radicans*, *Don Prod.* 45 (in part). *Commelina nudiflora*, *L. Mant.* 177 (not of *Sp. Pl.*); *Roxb. Fl. Ind. i*, 173.

Roots fibrous. *Stem* simple or branched from the base; branches 6—12 in., procumbent and often rooting at the nodes. *Leaves* 2—5 in. long, linear-oblong or lanceolate, acute or acuminate, flat, glabrous or sparingly villous, base cordate rounded or narrowed into the sheath; sheaths hairy, the margins and mouth strongly ciliate. *Flowers* in subglobose or subcorymbose cymes at the ends of the branches of a terminal (rarely axillary) panicle; pedicels $\frac{1}{8}$ — $\frac{1}{4}$ in. long; bracts boat-shaped, caducous. *Sepals* $\frac{1}{2}$ in. long, oblong, obtuse. *Petals* equal, suborbicular, blue or purple. *Stamens* 2 perfect, 2—4 sterile, filaments or perfect stamens only or all bearded with moniliform blue hairs. *Ovary* 3-celled; cells 2-ovuled. *Capsule* $\frac{1}{2}$ in. long, subglobose, mucronate, 3-celled, with 3 seeds in each cell. *Seeds* 1-seriate, tuberculate, dark brown, truncate at one end, rounded at the other; inner face angular, outer face convex.

Dehra Dun and Saharanpur districts; Bundelkhand (Edgeworth), flowering during the rains. *DISTRIB.*: Throughout India and on the W. Himalaya up to 6,000 ft.; Khasia Hills and Burma, and from Bengal and Bombay southwards to Ceylon, extending to China and the Malay Islands.

4. *A. Hamiltoniana*, *Wall. Cat.* 5222; *F. B. I. vi*, 380; *Prain Beng. Pl.* 1084; *Dichæospermum Blumei*, *Hassk*; *Clarke Comm. and Cyrt. Beng. i*, 27.

Stem 6—12 in. long, creeping and rooting at the nodes, leafy, sparingly branched. *Leaves* sessile, flat, $1\frac{1}{2}$ —2 in. long, linear-oblong, acute or subacute, glabrate, base cuneate. *Peduncles* $\frac{1}{8}$ — $\frac{1}{4}$ in., rigid; pedicels axillary or terminal. *Petals* white or pink. *Filaments* all naked. *Capsule* linear-oblong, acute, $\frac{1}{4}$ — $\frac{1}{2}$ in. long. *Seeds* 2-seriate about 16 or more in each cell, scabrid or flocculent.

Upper Gangetic Plain, usually in wet ground; Moradabad (T. Thomson). *DISTRIB.*: Eastwards to Bengal and Assam and extending to Java.

5. *A. vaginatum*, *R. Br. Prod.* 271; *Clarke in DC. Mon.* iii, 216; *F. B. I. vi*, 381; *Prain Beng. Pl.* 1084; *Cooke Fl. Bomb. ii*, 79.

Root fibrous, the fibres stout and almost fleshy. *Stem* decumbent, 6—18 in. long, rooting at the lower nodes, very slender, flaccid; branches suberect, ending in filiform peduncles with distant bracts. *Leaves* 3—8 in. long, linear, acuminate, flat; sheaths short, open, ciliate. *Flowers* small, 1—3, fascicled in the axils of distant bracts along the filiform terminations of the branches; bracts $\frac{1}{3}$ — $\frac{1}{2}$ in. long, strongly ribbed; pedicels very slender, puberulous, usually twice-jointed. *Sepals* $\frac{1}{2}$ in. long, obtuse. *Petals* orbicular, blue. *Stamens* 2, perfect, and with bearded filaments; sterile stamens 3—4, usually naked and shorter. *Ovary* 2-celled; cells 1-ovuled. *Capsule* globose, cuspidate; cells 1-seeded or empty. *Seeds* 3-gonously conic, truncate at one end narrowed at the other, slightly rugose, black.

Common in rice fields and wet places. **DISTRIB.:** Throughout Trop. India and in Ceylon, extending to China.

3. CYANOTIS, Don.; Fl. Brit. Ind. vi, 384.

Herbs, prostrate or creeping. *Leaves* small. *Flowers* in axillary and terminal scorpioid cymes, formed of large imbricate 2-seriate secund foliaceous falcate bracteoles, the petals and stamens alone exerted, rarely with the corolla-tube exerted; flowers sometimes in exposed racemes or fascicled in the ochreate leaf-sheath. *Sepals* 3, subequal, free or connate below. *Petals* 3, subequal, often united in a tube below, limb orbicular. *Stamens* 6, all perfect, subequal, hypogynous or epigynous; filaments usually bearded, often inflated towards the apex, anthers oblong. *Ovary* 3-celled; ovules 2 in each cell, collateral, one erect the other pendulous. *Fruit* a 3-celled loculicidal capsule. *Seeds* usually 2 in each cell, superposed, cubical or pyramidal, usually rugose.—Species 35, in the warmer regions of the Old World, from Africa and through India to S. China and N. Australia.

Flowers in cymes, enclosed in 2-seriate falcate imbricating bracteoles:—

Roots fibrous; stem and branches slender; leaves ovate-oblong, glabrous or with spreading hairs

1. *C. cristata*.

Roots tuberous; stem and branches stout; radical leaves ensiform; cauline lanceolate, hirsute

2. *C. tuberosa*, VAR. *adscendens*.

Flowers axillary, enclosed in the sheaths of the leaves; bracteoles small, slender, not imbricating

3. *C. axillaris*.

1. *C. cristata*, *Schult*, f. *Syst.* vii, 1150; *Clarke in DC. Mon.* iii, 247; *F. B. I.* vi, 365; *Collett Fl. Siml.* 534; *Prair Beng. Pl.* 1085; *Cooke Fl. Bomb.* ii, 794. *Tradescantia imbricata*, *Roxb. Fl. Ind.* ii, 120.

A slender branching herb with fibrous roots. *Stem* branched from the base; branches 6—18 in. long, creeping and rooting below, glabrous or with spreading hairs. *Leaves* sessile, ovate-oblong, flat, glabrous or sparsely hairy, the margins softly ciliate, base rounded or cordate; sheaths short, hairy. *Flowers* in scorpioid recurved cymes which are longer than the bracteoles; peduncles $\frac{1}{2}$ — $\frac{1}{4}$ in. long; bracts

leaflike, $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, ovate, cordate, acuminate, ciliate; bracteoles $\frac{1}{2}$ in. long, glabrous or ciliate with long hairs. *Sepals* lanceolate, acuminate. *Filaments* bearded above. *Style* naked. *Capsule* $\frac{1}{10}$ — $\frac{1}{8}$ in. oblong, 3-gonous, truncate, nearly glabrous. *Seeds* $\frac{1}{10}$ in. long, striate and with 2 large pits on two of the faces, black.

Bundelkhand (Edgeworth under *C. imbricata*). **DISTRIB.:** Throughout Trop. India, in hilly districts, and up to 4,000 ft. on the W. Himalaya; also in Burma, Ceylon, and Malay Islands, extending to Trop. Africa.

2. *C. tuberosa*, Schult. f. Syst. vii, 1153, VAR. *adscendens*, Clarke in DC. Mon. iii, 249; F. B. I. vi, 386; Watt E. D.; Prain Beng. Pl. 1085; Cooke Fl. Bomb. ii, 793. *Tradescantia tuberosa*, Roxb. Fl. Ind. ii, 119.

A creeping herb, with proliferous rooting nodes. *Root* of fusiform tubers. *Stem* up to 3 ft. long, swollen and hairy at the base. *Leaves* sessile, the radical and lower cauline 6—10 in. long, linear or ensiform villous, often purple beneath; upper cauline leaves much shorter; sheaths of radical leaves about 1 in. long, glabrous, those of cauline leaves shortly silky. *Cymes* $\frac{1}{2}$ —1 in. densely hairy, in the axils of short falcately decurved ovate acute bracts; bracteoles many, imbricate in 2 series. *Sepals* $\frac{1}{4}$ in. long, linear-lanceolate, acute, densely villous and ciliate. *Corolla* $\frac{1}{3}$ in. long, bluish-purple; lobes $\frac{1}{10}$ — $\frac{1}{8}$ in. ovate, subacute. *Filaments*—spirally twisted, densely bearded with blue hairs. *Style* thickened and with a tuft of hairs at the tip. *Capsule* $\frac{1}{4}$ in. long, ellipsoid, hairy on its upper half. *Seeds* brown, obscurely rugose.

Agra (Jacquemont). **DISTRIB.:** Chota Nagpur; Bombay Pres. to S. India and Ceylon. A smaller and more glabrous plant than the type; flowers blue. The type occurs in W. India from the Konkan and southwards to Travancore.

3. *C. axillaris*, Schult. f. Syst. vii, 1154; Clarke in DC. Mon. iii, 244; F. B. I. vi, 388; Watt E. D.; Prain Beng. Pl. 1085; Cooke Fl. Bomb. ii, 795. *Tradescantia axillaris*, Linn.; Roxb. Fl. Ind. ii, 118.

Roots fibrous. *Stem* annual, 6—18 in. long, stout or slender, diffusely branched, leafy, glabrous; branches suberect or creeping below or prostrate, glabrous or sparsely hairy, often coloured. *Leaves* sessile, 2—6 in. long, narrowly linear or linear-lanceolate, acute or acuminate, flat, more or less hairy; sheaths $\frac{1}{4}$ to $\frac{3}{8}$ in., inflated, ciliate. *Cymes* reduced to axillary fascicles of violet-blue flowers clustered in the inflated sheaths; bracteoles small, almost concealed in the leaf-sheaths. *Sepals* $\frac{3}{8}$ in. long, lanceolate, acuminate. *Corolla-lobes* broadly ovate, subacute. *Filaments* fusiform below the tip, bearded. *Capsule*, about $\frac{1}{4}$ in. long, oblong-ellipsoid, beaked, glabrous except the beak. *Seeds* $\frac{1}{10}$ in. long, oblong, compressed, truncate at base rounded at the apex and with a very short conical tip, mottled with dark-brown and shining.

Bundelkhand, in marshy ground (Edgeworth); Agra (Munro); Rohilkhand, Cawnpore and N. Oudh (Duthie), etc. **DISTRIB.:** Throughout India, in the plains, and in Ceylon, extending to Trop. Australia.

4. **FLOSCOPA**, Lour.; Fl. Brit. Ind. vi, 390.

Erect or subscandent herbs. *Leaves* lanceolate. *Flowers* in terminal or axillary panicles of secund but not scorpioid cymes bracts minute. *Sepals* 3, oblong, free. *Petals* 3, obovate, free. *Stamens* 6, all perfect or 1 imperfect; filaments filiform, glabrous. *Ovary* 2-celled, style simple, ovules solitary in each cell. *Fruit* a compressed or didymous loculicidal 2-celled capsule. *Seeds* solitary in each cell, hemispheric.—Species about 12, in the warmer regions of the world.

F. scandens, Lour. Fl. Cochinch. 193; Clarke in DC. Mon. 265; F. B. I. vi, 390; Prain Beng. Pl. 1086; Cooke Fl. Bomb. ii, 796. *Tradescantia paniculata*, Roxb. Fl. Ind. ii, 119. *Ancilema hispidum*. Don. Prod. 45.

Root fibrous. *Stem* rather slender; erect or subscandent, often creeping and rooting below; internodes long; branches ascending leafy below, glabrous or hairy. *Leaves* subsessile, 2—4 in. long, elliptic-lanceolate, acuminate, much narrowed at the base, scaberulous above; sheaths loose, short, glabrous or villous, the mouth fringed with long hairs. *Panicles* shortly stalked, pyramidal, with long erect or ascending many-fl. branches. *Flowers* small, pedicelled, subglobose, the lower ones bracteate, the upper without bracts. *Sepals* $\frac{1}{10}$ — $\frac{1}{8}$ in. long, rotund-ellipsoid, villous. *Petals* longer than sepals, broadly obovate, white lilac or pink. *Filaments* equal, longer than petals, purplish; anthers yellow. *Ovary* glabrous. *Capsule* $\frac{1}{10}$ — $\frac{1}{8}$ in. in diam., rather broader than long, abruptly acute at both ends, shining. *Seeds* transversely wrinkled on the back.

Dehra Dun, at Nala Páni, and probably elsewhere in marshy ground, within the area of this flora. **DISTRIB.:** Throughout Trop. India and in Ceylon, extending to China and Trop. Australia.

CXIV.—JUNCACEÆ.

Erect usually perennial herbs. *Stems* tufted or with a creeping root-stock. *Leaves* flat, terete or reduced to sheaths. *Flowers* small, in axillary cymes, 2-sexual, green or whitish and membranous, or brown and coriaceous, bracts small. *Perianth* inferior, segments or lobes 6, more or less 2-seriate, persistent, imbricate. *Stamens* 6, rarely 3, hypogynous or on the bases of the perianth segments, occasionally those of the inner series obsolete, filaments filiform, anthers basifixcd. *Ovary* superior, 3 or 1-celled; style simple, with 3 brush-like stigmas; ovules 3, basilar in the 1-celled ovaries or many on the inner angles of the 3-celled ovaries, anatropous. *Fruit* a 1—3-celled capsule, loculicidally 3-valved. *Seeds* erect; testa membranous, often produced at each end, albumen dense; embryo small, near the hilum.—Species about 200, cosmopolitan, but chiefly in damp cold regions.

JUNCUS, Linn.; Fl. Brit. Ind. vi, 392.

Perennial, rarely annual, glabrous herbs. *Stems* simple under the inflorescence. *Leaves* radical or few near the base of the stem, linear or terete or reduced to sheaths. *Flowers* small, usually clustered in fascicles or 2-fid cymes, either sessile or capitate or unequally peduncled and paniculate, the whole inflorescence terminal or sub-terminal on the scape-like stems, with 1—3 leafy bracts. *Perianth* with 6 free lanceolate or oblong glume-like segments, often with scarious edges, the 3 outer keeled or with a thickened midrib. *Stamens* 6, rarely 3, hypogynous or nearly so, anthers oblong or linear, erect, with longitudinal introrse dehiscence. *Ovary* free, 3 or 1-celled, style filiform; stigmatic arms 3, often spirally twisted. *Fruit* a capsule, dehiscing by 3 valves with mesial placentas, rarely by 3 valves leaving the placentas persistent or connate in a central column. *Seeds* small, ovoid; testa striate reticulate or transversely lineate; embryo small, near the base of fleshy albumen.—Species about 160; in temp. or arctic regions, rarely tropical.

Annual, leaves not septate; stems much branched; cymes scattered, few-flowered; lateral flowers 6-androus, terminal 3-androus

1. *J. bufonius*.

Perennial, leaves indistinctly and distantly septate; cymes terminal; flowers densely clustered in small heads, flowers all 3-androus

2. *J. prismatocarpus*.

1. *J. bufonius*. Linn. *Sp. Pl.* 328; Royle *Ill.* 401; F. B. I. i, 392; Collett *Fl. Siml.* 535; Prain *Beng. Pl.* 1088.

A small pale-green tufted annual, up to 12 in. high. *Stems* erect or ascending, slender, much dichotomously branched from the base. *Leaves* few, chiefly radical, not septate, channelled above. *Cymes* many, scattered on the stem; bracts scarious. *Flowers* solitary or clustered, $\frac{1}{8}$ — $\frac{1}{4}$ in. long; the lateral ones open, 6-androus, terminal closed, 3-androus. *Sepals* and *petals* unequal lanceolate, acuminate, the margins broadly membranous. *Stamens* half as long as the petals. *Capsule* shorter than and closely embraced by the perianth, obovoid, mucronate. *Seeds* very minute, finely reticulate.

Dehra Dun, Saharanpur, Etáwah, and Merwáta (Duthie); Agra (Munro); Moradabad (T. Thomson); Bundelkhand (Mrs. Bell).
DISTRIB.: Plains of N. India and up to 13,000 ft. on the Himalayan ranges; extending to China, S. Africa, Europe (including Britain) to the Arctic regions.

2. *J. prismatocarpus*, R. Brown *Prod.* 259; F. B. I. vi, 395; Collett *Fl. Siml.* 536; Prain *Beng. Pl.* 1088. *J. indicus*, Royle *ex Don in Trans. Linn. Soc.* xviii, 323.

A perennial cæspitose herb; rootstock very short. *Stem* erect, 18—24 in. long, terete or compressed, sometimes decumbent and rooting at the nodes. *Leaves* few, 2—10 in. long, shorter than the stem, soft, terete or flat or sometimes tubular and indistinctly externally septate.

Cymes erect, irregularly compound; heads hemispheric, densely 6—10-fld; lower bract leaflike, erect, shorter than the cyme; floral bracts hyaline, lanceolate-acuminate. *Flowers* green or brown, in small sessile clusters in the axils and at the ends of the unequal branches of an erect terminal panicle. *Sepals* glume-like, $\frac{1}{8}$ — $\frac{1}{6}$ in. long. *Stamens* 3, much shorter than the perianth. *Style* short, stigmas long. *Capsule* equalling or longer than the perianth, prismatic or conical. *Seeds* minute, reticulate.

N. Oudh, in the Kheri district, Merwára, in tanks (Duthie); also probably in many other localities within the area of this flora, in wet ground. **DISTRIB.:** Common in the plains of Bengal and the Punjab and up to 10,000 ft. on the Himalaya; also on the Bombay Gháts and the Khasia Hills and extending to Ceylon, Burma and Australia.

FLORA
OF
THE UPPER GANGETIC PLAIN

AND OF THE
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS

VOL. III.

Part III.

PALMÆ TO CYPERACEÆ.

REPRINTED UNDER THE AUTHORITY
OF THE GOVERNMENT OF INDIA.

BOTANICAL SURVEY OF INDIA
CALCUTTA

Introduction to Vol. III Part III.

The families Palmæ to Aroideæ and Alismaceæ were completed by Mr. J. F. Duthie before his death on 23rd February 1922. The rest of the work has been written at Dehra Dun by Mr. R. N. Parker except for some of the descriptions in Cyperaceæ amounting to about one-third of the species included which are the work of Mr. W. B. Turrill at Kew.

1. *P. sylvestris*, Roxb.; *Fl. Ind. iii*, 787; *Brandis For. Fl.* 554; *Ind. Trees* 645; *F. B. I. vi*, 425; *Watt E. D. vol. VI, Pt. 1-A.*, 200; *Kanjilal For. Fl. (ed. 2)* 345; *Gamble Man.* 731; *Prain Beng. Pl.* 1096; *Cooke Fl. Bomb. ii*, 801.—Vern. *Khajur* (Hind.)—Wild Date-palm.

A tall graceful palm 30—50 ft. high, with a large thick hemispherical crown. *Trunk* solitary, clothed with the persistent bases of the petioles. *Leaves* pinnate, greyish-green, 7—12 ft. long, glabrous; leaflets 1—2 ft. by $\frac{3}{4}$ —1 in. fascicled, 2—4-farious, rigid; petioles short compressed towards the apex, bearing at the base a few channelled triangular spines up to 4 in. long. *MALE* flowers white, scented. *Spadix* 2—3 ft. long, erect; branches filiform; peduncles much compressed. *Spathes* 12—16 in. long, scurfy, separating into 2 boat-shaped valves. *FEM.* flowers: *Spadix* and *spathe* as in male; fruiting peduncles about 6 in. long; fruiting *spadix* 3 ft. long, nodding much compressed, of a golden-orange colour. *Fruit* oblong-ellipsoid, orange-yellow to reddish-brown, edible. *Seeds* $\frac{3}{8}$ in. long, rounded at ends, grooved to the centre on one face, pale brown.

Cultivated and wild in many parts of India and in Burma. It is undoubtedly indigenous in the Indus basin (Aitchison) and probably so in the Bombay Presidency, where it is commonly found growing gregariously on moist soil in the drier districts. It is abundant in Bundelkhand, especially near Jhānsi and Lalitpur, and in the Sub-Himalayan tracts of Pilibhit and of Northern Oudh. The tree is much tapped both in Bengal and Madras, and the liquid obtained thereby is either drunk fresh or after fermentation, or it is boiled down into sugar. The constant tapping of these trees very much spoils their graceful appearance, and also injures the quality of the fruit. The tree flowers in December and January, and the fruit ripens April-June. The wood is used in the building of native huts, or for water-pipes, and from the leaves matting, ropes and baskets are made. See also page 175 in Vol. ii of this work under *Loranthus longiflorus*.

2. *P. acaulis*, Roxb. Hort. Beng.; 73; *Buch.-Ham. ex Roxb. Fl. Ind. iii*, 783; *Brand. For. Fl.* 555; *Ind. Trees* 645; *F. B. I. vi*, 426; *Watt E. D. vol. VI, Pt. 1-A.*, 199; *Comm. Prod. Ind.*; *Gamble Man.* 730; *Prain Beng. Pl.* 1096; *Cooke Fl. Bomb. ii*, 802; *Kanjilal For. Fl. (ed. 2)* 411.—Vern. *Khajur*, *Khajuri* (Hind.)—Dwarf-Date Palm.

Stem very short, more or less bulb-like, 6—10 in. in diam., clothed with the sheaths and bases of the petioles. *Leaves* 2—6 ft. long; leaflets 10—20 by $\frac{3}{4}$ — $\frac{5}{8}$ in., stiff, fascicled; the base thickened and decurrent; petioles 1 ft. or more long, with spines 2—6 in. long. *Spadix* 6—10 in. long, compressed, rather longer than the *spathe*; branches very stout, yellow. *Spathes* about 6 in. long, with their bases rather below the surface of the ground. *MALE* flowers $\frac{1}{4}$ — $\frac{1}{2}$ in. long, alternate, solitary, pale-yellow. *FEM.* flowers: *Spadix* and *spathe* as in the male. *Calyx* cup-shaped, truncate with 3 obscure teeth on the margin. *Petals* thick, fleshy. *Fruiting peduncle* short, usually concealed

among the leaves. *Fruit* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, oblong-ellipsoid, black when ripe, edible. *Seed* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, deeply grooved.

Common in the Dehra Dun and Saharanpur forests, and generally in open grassy spaces, extending eastwards along the Sub-Himalayan tracts of Pilibhit and N. Oudh up to 2,500 ft. and accompanying Sál and the long-leaved pine (*Pinus longifolia*). It flowers during Dec. and Jan., and the fruit ripens during April and May. **DISTRIB.** Outer Himalayan ranges from Garhwal and Kumaon eastwards to the Khasia Hills and Upper Burma. It is found also in Behar and in the hilly parts of C. India, and in the district of N. Kanara in the Bombay Presidency. The leaves are made into matting, and the fruit is eaten; also a kind of sago is sometimes obtained from the pith.

3. *P. humilis*, *Royle Ill.* 394, 397, 399; *F. B. I.* vi, 426; *Brandis For. Fl.* 555; *Ind. Trees* 645; *Gamble Man.* 731; *Kanjilál For. Fl.* (ed. 2) 412.—Vern. *Khajur*; *Chota Khajur* (Bijnor); *Thákil* (Kumaon).

Stem slender, sometimes short or up to 10 or 12 ft. high. *Leaves* 3—8 ft. long; rhachis laterally compressed; leaflets 12—18 in. long, thin, smooth, faintly nerved, always folded, generally scattered, sometimes in opposite pairs; base only slightly raised on the side of the rhachis or not at all. *Male spadix* 1 ft. long; female a little shorter (excluding peduncle); spikes often paniculately subdivided; peduncles flat, of the fruiting spadix 2—2 $\frac{1}{2}$ ft. long and $\frac{1}{2}$ — $\frac{3}{4}$ in. broad. *Fruit* almost horizontal, $\frac{1}{2}$ — $\frac{3}{4}$ long, ovoid, usually mucronate, red when ripe.

Abundant on the Siwalik range within the Saharanpur district, especially near the crest, and in the vicinity of the Rámpur bungalow, where the stems of some of the trees rise to 10 or 12 ft. high. It is also mentioned by Stewart as occurring in the forests of the Bijnor district. The trees are in flower during Dec. and Jan., and the fruit ripens April-June. **DISTRIB.:** Common in the *chir* forests of the outer Himalayan ranges of Garhwal and Kumaon, up to 5,000 ft., and eastwards to Assam and the Khasia Hills. It is said also to occur in Cent. India. Economic uses as of *P. acaulis*.

2. CALAMUS, Linn.; *Fl. Brit. Ind.* vi, 436.

Armed, erect or scandent, tufted palms. *Leaves* alternate pinnatisect; segments acuminate, nerves parallel, rhachis often produced as an armed flagellum; sheath armed, produced into a ligule or ochrea, with or without a lateral armed flagellum. *Flowers* polygamo-dioecious, in usually distichous often scorpioid spikelets, solitary (either male or fem. or both) in the axils of the bracteoles of axillary usually much-elongated and much-branched spadices which are sometimes produced as a flagellum; spathes tubular or open, persistent, sheathing the peduncle and branches of the spadix and passing into bracts and bracteoles. **MALE** flowers: *Calyx* cupular, 3-toothed. *Petals* 3, acute, coriaceous, valvate. *Stamens* 6, filaments short, anthers dorsifixed. **FEM.** flowers slightly accrescent,

fruiting pedicelliform or explanate. *Calyx* tubular, 3-toothed. *Corolla* tubular, 3-fid., lobes valvate. *Staminodes* forming a cup. *Ovary* incompletely 3-celled, clothed with retrorse scales, style short or long, stigmas 3; ovules basilar, erect. *Fruit* globose or ellipsoid, style terminal; pericarp thin, clothed with adpressed deflexed closely imbricate shining scales. *Seed* subglobose or oblong, smooth or pitted; albumen equable or ruminant, embryo ventral or basal.—Species about 165; in India and Malaya to S. China and N. Australia, a few also in Trop. Africa.

C. tenuis, Roxb.; *Fl. Ind.* iii, 780; *Brandis For. Fl.* 559 (in part); *Ind. Trees* 652; *F. B. I.* vi, 447; *Watt E. D.* vol. II, Pt. 1, 23; *Gamb. Man.* 735; *Kanjilâl* (ed. 2) 412; *Prain Beng. Pl.* 1099; *Beccari in Rec. Bot. Surv. Ind.* ii, 206; *Ann. R. Bot. Gard. Calc.* xi, part 1, 262, t. 94.—*Vern. Bet, bent.*

Stems very long, scandent; internodes not thicker than a goose-quill. *Leaves* 1½–2 ft. long; leaflets very many, equidistant; lower ones 8–12 in. long by ¼–½ in. wide; margins minutely setulose or spinulose; uppermost leaflets gradually smaller, linear-lanceolate, acuminate, the 3 costæ all setose above, the median one only below; petiole short, stout, margined with straight spines, and rhachis armed with one row of short recurved spines; sheaths flagelliferous, sparingly armed with short flat spines. *Spadix* very long, decompound, flagelliferous. *Spathes* elongate, tubular, the lower ones with a short limb and scattered recurved spines. *Lower spikes* paniced, 1½–4 in. long. *Flowers* very small; the males ⅛ in. long, secund in 3–4 series, imbricating, suberect. *Fruit* subglobose, ½ in. in diam., mucronate; scales pale, with a shallow median channel and very narrow discoloured margins.

Plentiful in Dehra Dun in swampy ground; also in the Sub-Himalayan tracts eastwards to Gorakhpur. Flowers during July and Aug., and the fruit ripens in the cold season. **DISTRIB.:** Trop. Himalaya from Garhwâl and Kumaon eastwards to Assam, Chittagong, Burma and Cochin. This is the common *rattan* of N. India, largely used for mats screens and baskets. The leaves are largely eaten by buffaloes, and the scaly fruits are often made into rosaries.

The two following palms require some special mention here for the reasons given under each:—1. *WALLICHIA DENSIFLORA*, Mart.; *F. B. I.* vi, 419; *Kurz For. Fl.* ii, 532; *Watt E. D.*; *Brand. For. Fl.* 549; *Ind. Trees* 655; *Gamble Man.* 728; *Prain Beng. Pl.* 1094; *Bot. Mag.* 4584; *W. oblongifolia*, Griff. *Vern. Kâla aunsa.*

The genus **Wallichia** of Roxburgh consists of 3 species, one of which (*W. densiflora*) was found many years ago by the late Sir D. Brandis in the subtrop forests) of the Gonda district, N. Oudh—a locality which is strictly within the area of this flora. It occurs also on the borders of Nepal where it was collected by myself. It was met with also by T. Thomson, and by Strachey and Winterbotham in Kumaon in similar forests up to 6,000 ft., and it extends eastwards to Assam and Chittagong. (See Prain in Beng. Pl. 1094). The following

more; ovules solitary and suberect or many and parietal; stigmas subsessile, papillose. *Fruit* a globose or oblong mass of free or connate, 1- or more-celled, woody or fleshy angular drupes. *Seeds* minute; testa striate; albumen hard; embryo minute.—Species about 80, in Tropical Asia and Africa, growing mostly near the sea-coast in a wild state.

PANDANUS, Linn. f.; Fl. Brit. Ind. vi, 483.

Characters those of the family.

P. fascicularis, Lamk.; F. B. I. vi, 485; Prain Beng. Pl. 1101. *P. odoratissimus*, Roxb. Fl. Ind. iii, 738; Gamble Man. 740. Watt E. D. vol. 6, Pt. 1-A. 4—Vern. Keora. (Screw Pine).

A much-branched bush or a small tree, 10–12 ft. high. Often planted in village thickets within the area of this flora, and especially near temples. The very fragrant flowers are much appreciated by the natives. The soft floral leaves are eaten as a vegetable, and the pulp of the fruit is often eaten.

CXVI.—TYPHACEÆ.

Aquatic or palustrine perennial herbs. *Leaves* linear, erect or floating, sheathing below, nerves parallel. *Flowers* monoœcious or diœcious, small, crowded in globose or cylindric bracteate spikes of which the upper are males; bracteoles none. *Perianth* of membranous green scales or fine hairs. **MALE** flowers: *Stamens* 1–7; filaments free or connate; anthers basi-fixed, erect, cuneate or linear-oblong, dehiscing longitudinally; connective sometimes produced. *Pistillode* none. **FEM.** flowers: *Ovary* superior, 1- or 2-celled; styles free, persistent; stigmas laterally papillose; ovules 1 in each cell, pendulous from apex of cell. *Fruit* membranous or drupaceous. *Seeds* pendulous; albumen fleshy or floury; embryo axile, cylindric, the radical end thickened, plumule in a lateral slit.—Species about 15, cosmopolitan.

Perianth of slender hairs
Perianth of green scales

1. TYPHA.
2. SPARGANIUM.

1. TYPHA, Linn.; Fl. Brit. Ind. vi, 488.

Marsh herbs. *Leaves* erect spongy. *Flowers* small, in very dense superposed cylindric spikes, often intermixed with hairs dilated at tip. *Perianth* of capillary hairs, or obsolete in the male. *Stamens* 1 or more, connective thickened at the tip. *Ovary* often reduced to a clavate-tipped hair, long-stalked, narrowed into a capillary style with a clavate or filiform stigma. *Fruit* very minute; pericarp membranous, indehiscent or follicular. *Seed* with striate testa, albumen floury.—Species about 10, in temp. and tropical regions.

Leaves 3-gonous above the sheath; pollen 4-globate.
Leaves semi-cylindric above the sheath; pollen simple

1. *T. elephantina*,
2. *T. angustata*.

1. *T. elephantina*, Roxb. *Fl. Ind.* iii, 566; *F. B. I.* vi, 489; *Watt E. D.* see vol. 6, pt. 4, p. 207; *Prair Bengal. Pl.* 1102; *Cooke Fl. Bomb.* ii, 816; *Kanjilál For. Fl.* (ed. 2), 413. *T. latifolia*, Edgew. in *Proc. Linn. Soc. vi* (1862), 194.—Vern. *Pater.*—Elephant grass.

A tall bulrush, 8—12 ft. high. *Leaves* 1—1½ in. broad 3-gonous above the sheath; margins often undulate above the middle. *Male spike* 10—12 in. long; rhachis clothed with short often forked hairs. *Flowers* bracteolate; bracts 3 or more. *Anthers* 1—5, $\frac{1}{16}$ in. long; pollen 4-globate. *Fem. spike* much stouter than that of the male, 6—10 in. long by $\frac{1}{3}$ —1 in. diam.; the flowers mixed with clavate pistillodes; bracteoles with fasciate tips, much longer than the hairs which are shorter than the lanceolate stigmas.

Dehra Dun, and Patri forest in swamps (Kanjilál); Moradabad (*T. T.*); Bijnor (Stewart); Merwára (Lowric). *DISTRIB.*: Marshes in N. W. India and eastwards to Assam, Bengal and Burma, extending beyond India to N. Africa. The leaves are often used within the area of this flora for making mats and screens.

2. *T. angustata*, *Chaub. & Bory.*; *F. B. I.* vi, 489; *Watt E. D.* vol. VI, Pt. 4, 207; *Prair Bengal. Pl.* 1102; *Cooke Flor. Bomb.* ii, 815. *T. angustifolia*, Sibth. and Sm. (not of Linn.). Roxb. *Fl. Ind.* iii, 567.—Vern. *Pater.*

A tall bulrush. *Stems* 5—10 ft. high. *Leaves* usually exceeding the flowering stems, $\frac{3}{4}$ —1 in. broad, semi-cylindric above the sheath. *Spikes* cylindric, the male and female spikes often separated by a long interval. (See Aitchison in *Trans. Linn. Soc. (N. S.)* iii, 20 regarding the sometimes dicecious condition of this species). *Fem. spikes* pale-brown, $\frac{1}{3}$ — $\frac{1}{2}$ in. in diam.; the male flowers mixed with clavate-tipped pistillodes; bracteoles subspathulate, equalling the linear stigmas, both longer than the hairs. *Pollen* simple.

More or less distributed through Northern India from Kashmir to Manipur and southwards to Sind and the Bombay Pres. and also in Bengal and Coromandel. According to Roxburgh this species is found in similar ground as the former, and flowers at the same time, but it is a smaller plant and much less plentiful. It closely resembles the common European *T. angustifolia* Linn., but differs by the bracteoles equalling the stigmas. In Sind the pollen is said to be collected from the flowers and made into cakes and eaten by all classes of natives.

2. SPARGANIUM, Linn.; *Fl. Brit. Ind.* vi, 489.

Flowers in globose unisexual heads, subtended by leafy bracts. *Perianth* of 3—6 membranous scales. *Stamens* 2—3, connective hardly produced at the tip. *Ovary* 1- rarely 2-celled; style very short, persistent; stigma unilateral; cells 1-seeded. *Drupe* obovoid, spongy; endocarp tip perforated. *Seed* adherent to the endocarp.—Species about 6.

S. ramosum, *Huds. Fl. Angl.* 401; *F. B. I.* vi, 490. *S. carinatum*, *Buch.-Ham. ex Royle Ill.* 408.—Bur-weed.

Stems erect, 1—4 ft. high. *Leaves* linear, triquetrous at the base, 2—5 ft. long, 1 in. broad or less. *Heads* sessile on the branches of a panicle; male heads olive-brown $\frac{1}{2}$ — $\frac{3}{4}$ in. in diam., deciduous; fem. heads 1 in. in diam., in fruit; scales linear, tips spatulate. *Drupe*s sessile, shortly beaked, $\frac{1}{4}$ in. long, angled; stigma linear.

N. Oudh, in the Bahraich district (Duthie). **DISTRIB.:** Punjab (F. Thomson), and in Kashmir up to 5,200 ft. also in Afghanistan (Griff.) and in Tibet (Watton); also in Burma and in N. Temp. regions.

CXVII.—AROIDEÆ.

Herbs with watery acid or milky juice, usually glabrous, rarely armed, stemless or with a short stock or corn or tuber; or shrubs with sympodial branches climbing by ærial roots. *Leaves* of shrubby species alternate, distichous or spiral; of herbaceous species few, clustered or solitary, radical, sometimes appearing without or after the flowers; petiole with a sheathing base; lamina entire or lobed or pinnate or perforate, often with cataphyllaries at the base of the leaf-sheaths. *Flowers* 1- or 2-sexual, sessile on a spadix which is more or less completely enclosed in a green or coloured spathe; when 1-sexual usually monœcious with the males towards the apex of the spadix, often with neuters between them as well as above the males. *Perianth* none or of scales, rarely cupular or urceolate. *Stamens* in the 2-sexual flowers 4—8, in the males 1 or more, distinct or confluent; anthers 2—4-celled, free or (in confluent stamens) connate by means of the thickened connective, the cells discrete or contiguous, free or buried in the connective and opening usually by a terminal pore; rarely by a longitudinal slit; pollen globose or ellipsoid, powdery or conglomerate. *Ovary* sessile, 1—3-celled, style short or long, stigma discoid or lobed; ovules 1 or more in each cell, variously inserted. *Fruit* of many small free or connate berries or drupes adnate to the spadix. *Seeds* in each drupe or berry 1 or few, usually embedded in pulp; albumen copious scanty or none, embryo axile, or in exalbuminous genera thick and with the plumule in a lateral slit.—Species about 1,000, mostly in tropical regions of both hemispheres.

Flowers 1-sexual, monœcious, rarely (*Arisæma* often) dioecious:—

Water or marsh plants; leaves entire; barren appendage none; ovules orthotropous:—

Floating, stemless, aquatic herbs; leaves sessile, obovate-cuneate, in a rosettelike tuft; base stoloniferous

Submerged or marsh plants; leaves tufted from a buried creeping rootstock

Terrestrial herbs:—

Leaves and scapes rising directly from a tuber-like hypogæal corm, the leaves usually more or less lobed.

Spadix with a barren terminal appendage:—

Male flowers stipitate; flowers often dioecious; leaves variously lobed; ovules orthotropous

1. PISTIA.

2. CRYPTOORYNÆ.

3. ARISÆMA.

- Male flowers sessile or nearly so; flowers always monœcious:—
 Flowers preceding the solitary leaf; males and females remote; fluters present above the females; leaves pedatipartite; edges of spathe connate below; ovules orthotropous 4. SAUROMATUM.
 Males and females contiguous or nearly so; neuters wanting; leaves 3-sect.; segments pinnatifid; edges of spathe free; ovules anatropous 5. AMORPHOPHALLUS.
 Spadix without a barren terminal appendage; males and females separated by a belt of fusiform pearly-white neuters; flowers appearing without the leaves; leaves 3-sect; segments pinnatifid; ovules anatropous 6. PLESMONIUM.
 Leaves and scapes rising from a short caudex prolonging a hypogeal rhizome; connective wider than the anther cells; flowers and leaves present together. Leaves peltate;
 Spadix with a barren appendage, not adnate at its base to the spathe; ovules many, parietal 7. COLOCASIA.
 Spadix without an appendage; ovules many, parietal; spadix quite free from spathe 8. REMUSATIA.
 Flowers hermaphrodite, rarely a few 1-sexual; spadix without an appendage; perianth wanting; epiphytic climbing herbs; ovules solitary, basal; berries free 9. SCINDAPSUS.

1. **PISTIA**, Linn.; Fl. Brit. Ind. vi, 496.

A floating gregarious stemless stoloniferous herb. *Leaves* sessile, obovate-cuneate, together forming an erect cup. *Spathe* small, shortly stalked, tubular below, open above. *Spadix* adnate to the back of the tube of the spathe, free above. MALE inflor. of a few sessile connate stamens beneath the apex of the spadix; cells opening by vertical slits, with a ring of minute confluent neuters below them. FEM. inflor. a solitary ovoid-conic 1-celled ovary, style conical, stigma discoid; ovules many, basal or sub-parietal, orthotropous. *Fruit* membranous, few-seeded. *Seeds* oblong or obovoid, testa at length rugose; albumen copious, floury, embryo minute, apical, cuneiform.—A single species, distributed widely in most tropical and subtrop. countries. *Pistia* is a link to Lemnaceæ from Aroideæ.

P. Stratiotes, Linn. *Sp. Pl.* 963; Roxb. *Fl. Ind.* iii, 131; F. B. I. vi, 497; Watt *E. D.*; Prain *Beng. Pl.* 1105; Cooke *Fl. Bomb.* ii, 817.—Vern. *Jal-Khumbi* (Hind).

Roots of tufted simple white fibres clothed with fibrillæ. *Leaves* obovate-cuneate, rounded or retuse at the apex, variable in breadth 1½—4 in. long, densely pubescent on both surfaces; nerves flabellate, converging within the margin. *Spathe* about ½ in. long, obliquely campanulate, white gibbous and closed below, contracted about the middle, dilated and suborbicular above.

Abundant within the area of this flora, floating on the surface of fresh water-pools and tanks. **DISTRIB.:** Throughout India and in Ceylon; extending to most tropical and sub-tropical countries. It flowers in India in the hot season, and the seeds ripen during the rains.

2. CRYPTOCORYNE, Fisch.; Fl. Brit. Ind. vi, 492.

Aquatic or marsh herbs; stem short or none or with a creeping root-stock. *Leaves* broad or narrow. *Spathe* tubular, the margins connate and with a transverse septum within below. *Spadix* very slender, its tip adnate to the septum of spathe. **MALE** inflor. cylindric. *Stamens* 1 or 2, distinct; anthers short, sessile, truncate; cells 2, with conical perforate tips, pollen vermiform. **FEM.** inflor. a single whorl of connate 1-celled many-ovuled ovaries with a few neuters; styles short, recurved; ovules erect, orthotropous. *Fruit* a fleshy syncarpium of connate coriaceous 2-valved many-seeded carpels, the valves stellately spreading. *Seeds* oblong, testa rugose; albumen copious; embryo axile; plumule sometimes germinating in the fruit.—Species 26, in Trop. Asia.

C. retrospiralis, Kunth, *Enum.* iii, 12; *F. B. I.* vi, 493; *Prain Beng. Pl.* 1106; *Cooke Fl. Bomb.* ii, 818. *Ambrosinia retrospiralis*, Roxb. *Fl. Ind.* iii, 492.

An aquatic herb, usually submerged. *Root* of fleshy fibres. *Stem* short or none. *Leaves* many, radical, 3—18 in. long, sessile, or with a short stout petiole narrowly linear or linear-lanceolate, acute or finely acuminate; midrib slender. *Spathe* subsessile, about as long as the leaves, deep green striped with purple; tube narrow, longer than the limb, not or scarcely twisted; limb glabrous closely twisted. *Ovaries* 5—6, 3 or more ovuled; stigmas orbicular.

Agra (Munro), and probably plentiful within the area of this flora. **DISTRIB.:** Bengal, Behar and mostly throughout India extending to Burma.

3. ARISÆMA, Mart.; Fl. Brit. Ind. vi, 497.

Tuberous herbs, with leaves and flowers usually contemporaneous. *Leaves* 1—3, trisect or pedate or verticillately 5- or more-sect. *Flowers* 1-sexual, usually diœcious. *Spathe* deciduous; tube convolute; limb acuminate or caudate, usually incurved. *Spadix* included or exerted, always with a barren appendage, usually long and filiform. **MALE** flowers many, stipitate; anthers 2—5; cells distinct or confluent. **FEM.** flowers densely crowded. *Ovary* 1-celled; ovules 2 or more, basilar, orthotropous; style short or none; stigma discoid. **NEUTER** flowers none, or few and subulate. *Fruit* a 1- or few-seeded berry. *Seeds* ovoid or globose; testa rather thick; albumen copious; embryo axile.—Species about 50 in Temp. and Trop. Asia and in N. Amer.

A. tortuosum, Schott.; *F. B. I.* vi, 520; *Watt E. D.*; *Prain Beng. Pl.* 1106; *Collett Fl. Siml.* 540. *Arum curvatum*, Roxb. *Fl. Ind.* iii, 506; *Wight Ic.* 788.

The specimens collected by Mr. P. W. Mackinnon in Dehra Dun at about 3,000 ft. differ very considerably from the typical *A. tortuosum* of Schott, which is found abundantly on the Simla Hills at a much higher-elevation. The tubers of the Dehra Dun plant are usually much smaller, and the leaflets are very different, and much more like those of *A. helliborifolium* as depicted on p. 541 of Collett's *Flora Simlensis*.

4. SAUROMATUM, Schott; Fl. Brit. Ind. vi, 508.

Tuberous herbs. *Leaf* solitary, pedatipartite, long-petioled. *Flowers* monœcious preceding the leaves. *Spathe* shortly peduncled; tube cylindrical, short, margins connate below; limb very long, narrow, open, reflexed. *Spadix* sessile, very long, with a slender barren appendage as long as the spathe. *Male* and *fem.* inflorescences short and widely distant, dense-flowered and with a few large clavate neuters close above the fem. flowers. **MALE** flowers: *Anthers* sessile, subcompressed, 4-lobed, contiguous opposite, obovate-oblong, opening by terminal pores; connective prominent. **FEM.** flowers: *Ovary* oblong, 1-celled, rounded at the apex; ovules 1—2, erect, basal; style very short or none. *Fruit* of obpyramidal 1-seeded substipitate berries. *Seed* globose, with an obconic strophiole; albumen copious; embryo axile.—Species about 8, in trop. and subtrop. Asia and in Trop. Africa.

S. guttatum, Schott; *F. B. I.* vi, 508; *Watt E. D.*; *Collett Fl. Siml.* 542; *Prain Beng. Pl.* 1109; *Cooke Fl. Bomb.* ii, 824. *Arum sessiliflorum*, *Roxb. Fl. Ind.* iii, 507.—Vern. *Dhey* (Rohilkhand), *Nim-Kerowly* (Fatehghar).

Tuber large. *Leaf* 6—12 in. broad; segments 7—15, variable, 2—15 in. long by 1—3 in. broad, elliptic; acuminate, deep-green; midrib and veins impressed above, prominent beneath; petiole stout often spotted. *Peduncle* short stout. *Spathe* 12—28 in.; tube ovoid or sub-globose; limb linear-lanceolate, thick, green or yellowish, usually with dark purple spots; margins usually purple and undulate. *Spadix* about as long as the spathe, with an appendage 2—8 in. long. *Male inflor.* $\frac{1}{2}$ in. long, about 3 in. above the fem. inflor. *Anthers* densely packed. *Fem. inflor.* $\frac{1}{2}$ in. long. *Neuter flowers* spreading, close above the females.

Dehra Dun (Edgeworth); Fatehgarh (T. Hardwicke); Bundelkhand (Burkill). Flowers during the hot weather, very foetid. **DISTRIB.:** Punjab Plain and up to 5,000 ft. on the Himalaya and eastwards to Nepal; also in Bengal and in the Konkan and Deccan.

5. AMORPHOPHALLUS, Blume; Fl. Brit. Ind. vi, 513.

Tuberous herbs. *Leaves* appearing after the flowers, solitary, 3-partite, segments pinnatisect. *Spathe* with an open or convolute funnel-shaped or campanulate limb. *Spadix* exerted or included; appendage large, short or long. *Inflorescence* cylindrical, dense-flowered, males and females contiguous, neuters none. **MALE** flowers. *Stamens* 2—4, anthers sessile, cells oblong, pores apical. **FEM.** flowers. *Ovaries* globose, 1—4-celled, style, short or long, stigma entire or 2—4-lobed; ovules solitary in each cell, subbasal, anatropous. *Fruit* of subglobose or obovoid berries in clusters. *Seeds* exalbuminous, embryo macropodous.—Species 30—40, in the tropics of the Old World.

A. campanulatus, Blume; *F. B. I.* vi, 513; *Watt E. D.*; *Duthie and Fuller in Field and Garden Crops* iii, 6 t. 69; *Prain in Beng. Pl.* 1109; *Cooke Fl. Bomb.* ii, 825. *Arum campanulatum*, *Roxb. Fl. Ind.*

iii, 509.—Vern. *Ol* (of native cultivators), *Zaminqand*; *Nághphanni-qand* (Punjab).

Tuber depressed-globose, much warted, 8—10 in. in diam. dark brown. *Leaves* appearing long after the flowers, 1—3 ft. broad; segment spreading, simple or forked; petioles 2—3 ft. long, stout, warted, dark-green with pale blotches; leaflets 2—5 in. long, obovate or oblong, acute, veins prominent. *Peduncle* stout, elongating in fruit sheaths linear-oblong. *Spathe* 6—10 in. broad, pointed, strongly and closely veined; margins recurved, undulate and crisped, greenish-pink externally and with pale blotches; base within purple. *Spadix* about as long as the spathe; appendage, variable in shape and in length up to 8 in., dark reddish purple. *Male inflor.* Sub-turbinate, about 3 in. long; anthers densely crowded. *Fem. inflor.* 3 in. long or more. *Ovaries* sessile, densely crowded, depressed-globose; style $\frac{1}{2}$ in. long, stout, purple; stigma large, 2—3-lobed. *Berries* obovoid red, 2—3-seeded.

Largely cultivated within the Upper Gangetic Plain and often occurring as wild. It flowers early in the rainy season. **DISTRIB.:** Plains of the Punjab and Bengal, both wild and cultivated; also in the Bombay Pres. and southwards to Ceylon. The tuberous roots of this plant are much esteemed by the natives of India for their nutritious and wholesome properties. The small tuberosities which are found on the larger tubers are what they employ for sets, and are planted in the same manner as potatoes are in England. (See Roxburgh in *Fl. Ind.* iii, 510).

6. PLESMONIUM, Schott; *Fl. Brit. Ind.* vi, 518.

Tuberous herbs. *Leaves* solitary, appearing long after the flowers, 3-partite, segments pinnatisect. *Flowers* monoecious. *Spathe* with an open funnel-shaped limb. *Spadix* included, appendage very small or none. *Inflorescence* cylindric, rather lax-flowered; males and females distant, with large obovoid pearl-like or turbinate neuters interposed, and with small slender neuters scattered over the appendage (when present). **MALE** flowers: *Stamens* 2—4, anthers sessile; cells oblong; pores apical, confluent. **FEM.** flowers: *Ovaries* globose, 1—3-celled, style short, stigma 2—3-lobed; ovules solitary in each cell, subbasilar, anatropous. *Fruit* of red ovoid berries in clusters. *Seeds* exalbuminous, embryo macropodous.

P. margaritiferum, Schott *Syn. Aroid.* 34; *F. B. I.* vi, 518; *Prair Beng. Pl.* 1110. *Arum margaritifer*, Roxb. *Fl. Ind.* iii, 512.—Vern. *Kharhar* (N. Oudh).

Tubers up to 6 in. in diam., white and covered with warts. *Leaves* $1\frac{1}{2}$ ft. in diam.; leaflets few, 4—6 in. long, linear, acuminate; petiole $1\frac{1}{2}$ —2 ft., green. *Peduncle* 12—18 in., stout, pale-green streaked with dark-green. *Spathe* 5—6 in. long by 4 in. broad, erect, broadly ovate, obtuse, concave, loosely convolute below the middle, pale yellowish green flushed with pink within, dark-purple at the base. *Spadix* stout, stipitate, obtuse, as long as the spathe. *Male inflor.* occupy-

ing the largest portion of spadix. *Anthers* very short pores confluent. *Neuter flowers* solid, obovate, smooth pearly-white, occupying about $\frac{1}{4}$ of spadix between the anthers and the ovaries. *Fem. fls.*: *Ovaries* 2—3-celled, with one ovule in each; stigmas large, round.

Dehra Dun (Mackinnon); Siwalik range (Lowrie); Rohilkhand (Duthie) and eastwards through N. Oudh to Balrampur (Duthie and Burkill); also in Bundelkhand (Duthie). *DISTRIB.*: Bengal at Dacca (C. B. Clarke); recorded also by Prain as occurring at Chota Nagpur and in C. and E. Bengal. Roxburgh mentions it under his *Arum margaritifera* (in Fl. Ind. iii, 512) as a native of Hindustan, whence it was introduced into the Calcutta Botanic Garden.

7. COLOCASIA, Linn.; Fl. Brit. Ind. vi, 523.

Herbs, usually tall and coarse, tuberous or with a stout short caudex; leaves and flowers appearing simultaneously. *Leaves* peltate, ovate-cordate; petioles stout, sheathing below. *Flowers* monoecious. *Spathe* on a stout axillary peduncle; tube thick, accrescent, persistent, the mouth constricted; limb erect, deciduous. *Spadix* shorter than the spathe, stout or slender; male and fem. inflorescence with usually interposed flat neuters, appendage cylindrical or subulate. *MALE flowers.* *Stamens* 3—8, connate in an obpyramidal column with an angular flattened apex; anthers linear-oblong, dehiscing by terminal pores. *FEM. flowers.* *Ovary* ovoid, 1-celled, stigma sessile, discoid. *Fruit* of small obconic or oblong berries. *Seeds* oblong, sulcate, albumen copious, embryo axile.—

Leaves with a bronze margin; spathe dark yellow
Leaves not bronze margined

1. *c. nymphæifolia.*
2. *c. Antiquorum.*

1. **C. nymphæifolia**, Kunth Enum. iii, 37; F. B. I. vi, 523 (in part); Watt E. D. and in Comm. Prod. Ind. 398; Prain Beng. Pl. 1112. *Arum nymphæifolium*, Roxb. Fl. Ind. iii, 495; DC. L'Orig. Pl. Cult. 58.—Vern. *Sar Kachhu* (Beng.).

2. **C. Antiquorum**, Schott.; F. B. I. vi, 523 (in part); Watt E. D. and in Comm. Prod. of India, p. 398; Prain Beng. Pl. 1112; Cooke Fl. Bomb. ii, 829; DC. L'Orig. Pl. Cult. 58; Duthie and Fuller Field and Gard. Crops, part iii, page 8, plate 75; Royle Ill. Him. 406; Wight Ic. t. 786; *Arum Colocasia*, Linn.; Roxb. Fl. Ind. iii, 494.—Vern. *Ghuian*, *gagli*, *Kachalu*.

A tall coarse herb, tuberous or with a short stout caudex. *Leaves* large, ovate, with a broad triangular basal sinus. *Spathe* 8—18 in. long, caudate-acuminate, erect, pale-yellow. Roxburgh distinguishes 3 varieties besides *C. nymphæifolia*. They are 1, a dark one from wet places, in which the roots never swell, but send out many suckers and the leaves and petioles are more or less purple, it is much eaten; 2, one which grows on dry ground with dark purple or bluish clouds; 3, one like the last but all green. Of *nymphæifolia* which he describes as having repand leaves. He says that he doubts if it

is anything but a large aquatic state abundantly wild on borders of lakes, with the subterraneous stem often as long and thick as a man's arm, reddish petioles peduncles and leaves, narrower leaves, and a shorter appendage; all the parts are eaten (Fl. Brit. Ind. vi, l.c. 523). Under the name of *Táro* or *Tania* this plant, *Colocasia Antiquorum* is well-known in most tropical countries, and is much valued for its starchy tuberous rhizomes. It is best known in the United Provinces as *Ghuiyan*, and is much grown on the plains of the United Provinces, and up to 6,000 ft. on the outer Himalayan ranges.

8. REMUSATIA, Schott; Fl. Brit. Ind. vi, 521.

Herbs with tuberous rhizomes, emitting long radical slender shoots clothed with small bulbils. *Leaf* solitary, appearing after the flowers; lamina entire, peltate, petiole rather short. *Spathe* coriaceous, short-stalked; tube convolute, ovoid, accrescent over the fruit; limb broad or narrow, erect or spreading and reflexed, deciduous. *Spadix* very short, sessile; male and fem. inflorescence separated by neutrals, appendage none. **MALE** inflorescence forming a clavate mass of densely packed angular flat-topped florets. *Stamens* each with a fleshy connective bearing 2—3 small anther-cells opening by terminal slits. **FEM.** florets forming a short cylindrical inflorescence. *Ovary* ovoid, 1-celled; stigma sessile discoid; ovules many on parietal placentas, orthotropous. *Fruit* of small clustered berries. *Seeds* small, albuminous, embryo axile.—Species 2, in India and Java.

R. vivipara, Schott; F. B. I. vi, 521; Prain Beng. Pl. 1113; Cooke Fl. Bomb. ii, 828. *Arum viviparum*, Roxb. Fl. Ind. iii, 496.

Tubers 1—1½ in. in diam., in clusters from the crown; bulbiferous shoots 6—12 in. long, simple or shortly branched, ascending, flexuous, bearing at the nodes clusters of oblong squarrosely scaly bulbils ¼—½ in. long. *Leaves* peltate, 5 by 3½ to 18 by 12 in., membranous, orbicular-ovate or -cordate, acute or acuminate, with strong main nerves and fine venation between them; petiole 6—12 in. long, the sheath short. *Spathe* 4—5 in. long, coriaceous; tube 1—2 in. long, oblong or ovoid, green; limb 2—3 in. long, broadly orbicular-ovate or ovate-cordate, golden-yellow. *Spadix* 1—1½ in. long. **MALE** inflor. ¼ in. long.

Dehra Dun, in shady ravines (Duthie). Eastwards along the Sub-Himalayan tracts in Rohilkhand and Northern Oudh (Duthie). **DISTRIB.:** Subtrop. Him. from Kumaon to Sikkim, up to 3,500 ft.; also on the Khasia Hills, and on Parasnath Hill in Chota Nagpur; Konkan and South to Ceylon and Java. The plant rarely flowers, but sends up long bulbiferous shoots from the crown of the tuber.

9. SCINDAPSUS, Schott; Fl. Brit. Ind. vi, 541.

Robust climbing shrubs, tissues abounding in acicular needles. *Stems* rooting at the nodes. *Leaves* ovate oblong or oblong-lanceolate, petiole

3—6 in. long, sheathing, geniculate, the sheath often accrescent. *Flowers* 2-sexual, all fertile. *Spathe* boat-shaped, thick caducous. *Spadix* shorter than the spathe, sessile, cylindric, dense-flowered. *Perianth* none. *Stamens* 4, filaments flattened and thicker upwards, anthers terminal; cells oblong, parallel or divaricate, dehiscing by lateral slits. *Ovary* prismatic or obpyramidal, 1-celled, flat on the top; stigma sessile. *Fruit* of fleshy obpyramidal berries in clusters, the apex coriaceous and ultimately separating. *Seed* more or less reniform, arillate at the base, testa hard, albumen none, embryo horse-shoe-shaped.—Species about 10, in Trop. Asia, Australia and Polynesia.

S. officinalis, Schott.; *F. B. I. vi*, 541; *Watt E. D.*; *Prain Beng. Pl.* 1114; *Kanjilál For. Fl. (ed. 2)*, 414. *Pothos officinalis*, Roxb. *Fl. Ind. I.* 431.—Vern. *Poriabel* (Dehra Dun); *Gaj-pipal*.

Common in the sál forests of Dehra Dun and Saháranpur (*Kanjilál, Vicary, Duthie*), N. Oudh in the Kheri and Bahraich districts (*Duthie*). The leaves are eaten as a vegetable, the stems yield a fibre, and the berries are used medicinally. **DISTRIB.**: Trop. Himalaya, eastwards to Sikkim and Bengal, also in Burma and the Andamans.

CXVIII.—LEMNACEÆ.

Minute or small, gregarious, floating, aquatic herbs. *Fronde*s with or without capillary roots. *Flowers* monœcious, 1—3, naked or enclosed in a membranous spathe, perianth wanting. *Stamens* 1—2, anthers 1—2-celled. *Ovary* 1-celled; style short; stigma truncate or funnel-shaped; ovules 1—6, basal, anatropous, semianatropous or orthotropous. *Fruit* 1-several-seeded, indehiscent or opening transversely. *Seeds* minute, albuminous, embryo cylindric, axile. *Species* 19 in 3 genera, in still water throughout the world excluding the arctic regions.

Fronde with roots; inflorescence with spathe of 2 male and 1 female flower.

Fronde with several roots

Fronde with one root

Fronde without roots; inflorescence without spathe, of one male and one female flower

1. SPIRODELA.

2. LEMNA.

3. WOLFFIA.

1. SPIRODELA, Schleid. Under *Lemna Fl. Brit. Ind. vi*, 556.

Fronde with several roots, the basal portion with two lateral pockets from one or both of which daughter shoots arise, these remaining united with the parent or becoming detached. *Flowers* appearing on the less vigorously growing side of the shoot, starting with a delicate ventral leaf (spathe) followed by a pair of anthers and a pistil. *Anthers* in an early stage 4-celled but soon appearing 2-celled. *Ovary* with 2 anatropous ovules. *Species* 2, one Indo-Malayan, the other widely distributed.

S. polyrrhiza, Schleid. *Lemna polyrrhiza*, Linn., *Fl. Brit. Ind.* vi, 557; *Prain Beng. Pl.* 1117; *Cooke, Fl. Bomb.* ii, 832. *L. orbiculata*, Roxb. *Fl. Ind.* iii, 565.

Fronde $\frac{1}{4}$ — $\frac{1}{2}$ in. long, broadly obovate or orbicular, rather thick, dark green above usually purplish beneath, roots several, up to 16, in a fascicle towards the basal end of the fronds. Spathe 2-lipped.

Dehra Dun (Parker) growing with *Azolla pinnata*, R. Br.

DISTRIB.: Temperate and tropical regions.

S. oligorrhiza, Hegelm. *Lemna oligorrhiza*, Kurz, with thinner narrower fronds and 2—5 roots may also occur. It is common in Bengal.

2. LEMNA, Linn.; *Fl. Brit. Ind.* vi, 556, *ex parte*.

Fronde with a single root. Ovary with 1—6 anatropous, semi-anatropous or orthotropous ovules. Otherwise as for *Spirodela*. Species 5 in tropical and temperate regions.

Fronde entire, branches soon detached	1. <i>L. paucicostata</i> .
Fronde serrulate at the tip, branches hastate persistent	2. <i>L. trisulca</i> .

1. **L. paucicostata**, Hegelm. *Fl. Brit. Ind.* vi, 556; *Prain Beng. Pl.* 1117.

Fronde about $\frac{1}{2}$ in. long, oblong or obovate-oblong, somewhat oblique at the basal end, rather thin, nearly flat on both sides. Root-sheath with a minute wing on either side at the base, root-cap acute. Ovule solitary, orthotropous.

Dehra Dun (Parker). Moradabad (Thomson). Merwara (Duthie 4899). Haldwani (Parker). Common on ponds and in shallow sluggish streams. Flowers October. DISTRIB.: Cosmopolitan, tropical.

2. **L. trisulca**, Linn. *Fl. Brit. Ind.* vi, 557; *Prain Beng. Pl.* 1117; *Cooke, Fl. Bomb.* ii, 831.

Fronde $\frac{1}{2}$ — $\frac{3}{4}$ in. long, oblanceolate, the tip serrulate, daughter fronds hastately attached to the parent shoot. Root-cap acute. Ovule solitary, semianatropous.

Has not yet been collected in this area. DISTRIB.: Persia, Manipur, China, etc.

Lemna gibba, Linn. is mentioned in the *Fl. Brit. Ind.* as occurring throughout India but there seem to be no Indian specimens in herbaria. Fronde suborbicular, very convex and greenish-white beneath. Root-sheath elongate, cylindric, root-cap acute. Ovules 2—6, anatropous. *Cooke, Fl. Bomb.* ii, 832, records it for the Deccan.

3. WOLFFIA, Horkel.; *Fl. Brit. Ind.* vi, 557.

The smallest of the flowering plants consisting of minute fronds producing a daughter shoot in the median line at the hinder end. Flowers breaking through the upper surface of the frond consisting of a single male flower or stamen and one female flower or pistil.

Anthers in an early stage 2-celled but soon appearing one-celled. *Ovary* with one orthotropous ovule. *Species* 12, mainly tropical.

Fronds subglobose beneath 1. *W. arrhiza*.
Fronds conical or subcylindric beneath 2. *W. microscopica*.

1. *W. arrhiza*, *Wimm. Fl. Brit. Ind. vi, 557*; *Prain Beng. Pl. 1117*.
W. Michellii, *Schleid. Cooke Fl. Bomb. ii, 832*.

Fronds $\frac{1}{20}$ in. long, subglobose or somewhat oblong, convex above, globose beneath.

Dehra Dun (Parker). *DISTRIB.*: Europe, Bengal common, *Kurz*.
Bombay Tanks throughout the presidency common, covering the water like a green scum, *Cooke*.

2. *W. microscopica*, *Kurz. Fl. Brit. Ind. vi, 558*; *Prain Beng. Pl. 1117*.

Fronds $\frac{1}{80}$ inch long, flat above with a more or less conical rootlike process beneath usually twice as long as the frond.

Dehra Dun (Parker) common, usually associated with *Lemna paucicostata* appearing earlier but ultimately replaced by *Lemna*. Flowers September. *DISTRIB.*: Punjab, Bengal.

CXIX.—ALISMACEÆ.

Aquatic or marsh herbs, usually erect. *Leaves* radical or clustered at the nodes of floating stems, entire, petioled, sometimes pellucid-dotted or lineolate. *Flowers* pedicelled, 1- or 2-sexual or polygamous, rarely dioecious, arranged in umbelled or paniced whorls, usually white or pink; bracts 3 or more, membranous, bracteoles small. *Perianth-segments* 6, in 2 series; outer 3 herbaceous; inner petaloid, rarely absent. *Stamens* 6 or more, rarely 3, hypogynous or perigynous; anthers erect, basifixed, 2-celled, dehiscence by lateral or dorsal slits. *Carpels* 3—6 or more, free, 1-celled, sessile or stipitate on a flat or raised receptacle; style short or long, rarely none, subterminal or ventral, stigma simple; ovules 1 or more in each carpel, placentas on the inner angle or with a solitary basilar ovule. *Fruit* of small achenes or follicles. *Seeds* small or minute, exalbuminous, embryo straight or conduplicate.—*Species* about 60, in temperate and tropical regions.

Fruit indehiscent, of 3 or more achenes; ovules and seeds solitary:—

Stamens few, 6—9; receptacle flat; flowers 2-sex 1. ALISMA.
Stamens usually many, rarely as few as 6; receptacle globose or oblong; flowers 1-sex or polygamous 2. SAGITTARIA.
Fruit dehiscent, of 6—7 follicles; stamens 8—12; fls. 2-sexual; ovules and seeds many 3. BUTOMOPSIS.

1. **ALISMA**, *Linn.; Fl. Brit. Ind. vi, 559*.

Scapigerous stemless palustrine perennial herbs. *Leaves* lanceolate, cordate or sagittate. *Flowers* 2-sexual, in umbelled or paniced whorls,

white or pink. *Sepals* 3, herbaceous persistent. *Petals* 3, membranous, deciduous. *Stamens* 6 or 9, in two or three series; filaments filiform. *Carpels* few or many, receptacle small; stigma small, terminal; ovule solitary, anatropous, basilar. *Fruit* of few or many compressed or turgid coriaceous or hard achenes. *Seeds* erect, basilar, testa membranous, embryo horse-shoe-shaped.—Species 6, cosmopolitan.

Leaves linear-ovate-lanceolate or subcordate, 5—7-nerved; achenes membranous, compressed

1. *A. Plantago*.

Leaves 11—17-nerved; achenes hard, turgid:—

Leaves coriaceous, orb.-cordate or reniform with rounded lobes and rounded or emarginate apex.

2. *A. reniforme*.

Leaves membr., broadly ovate-cordate, with acute lobes and a narrow sinus

3. *A. oligococcum*.

1. ***A. Plantago***, *Linn. Sp. Pl.* 342; *F. B. I. vi*, 559; *Watt E. D.*; *Collett Fl. Siml.* 545; *Prain Beng. Pl.* 1119.—Water Plantain.

Rootstock fleshy, swollen. *Leaves* radical, 6—8 in. long, erect or spreading, linear ovate-lanceolate or subcordate, 5—7-nerved; petioles up to 10 in. long. *Scape* 1—4 ft. high, swollen and fleshy below. *Flowers* in paniced whorls, $\frac{1}{2}$ in. in diam. *Sepals* oblong, spreading in fruit. *Petals* white or pink, the claws yellow. *Stamens* 6. *Achenes* 20—30 in a single whorl, membranous, compressed; style ventral, twice as long as the ovary, slender, deciduous.

Dehra Dun (Wallich). *DISTRIB.*: Outer Himalayan ranges in marshy ground from Kashmir eastwards, up to 7,000 ft.; also in N. Bengal, Manipur and Burma, extending to N. & S. Temp. regions.

2. ***A. reniforme***, *Don Prod.* 22; *F. B. I. vi*, 560; *Prain Beng. Pl.* 1119; *Collett Fl. Siml.* 546 (*in note*).

Leaves coriaceous, $1\frac{1}{2}$ —4 in. long, often broader than long, orb.-cordate or reniform, 13—17-nerved; tip rounded or emarginate; nervules very fine and close. *Scape* 1—3 ft. *Flowers* white, $\frac{1}{2}$ in. in diam. in large whorled panicles, branches and pedicels long. *Sepals* as long as the petals, persistent, at length reflexed in fruit. *Achenes* 5—8, turgid, dorsally ribbed; endocarp thick, hard; style subterminal, slender, persistent.

Rohilkhand near Pilibhit, and in the Bahraich district of N. Oudh (Duthie). *DISTRIB.*: Marshes in N. C. & E. Bengal; also in the Punjab Plain, ascending to 5,000 ft. in Kashmir and Kumaon; extending to the Khasia Hills and Australia, but not in Ceylon.

3. ***A. oligococcum***, *F. Muell. Fragm. Phyt. Austral* i, 123; *F. B. I. vi*, 560; *Prain Beng. Pl.* 1119.

Leaves membranous, punctate, 3—6 in. long by 2—3 in. broad, broadly ovate-cordate, with acute lobes and a narrow sinus, 11—17 nerved; nervules distant. *Panicle* 6—9 in. long and broad; bracts herbaceous, very large, lanceolate, the lower ones 1—3 in. long. *Flowers* as in *A. Plantago*. *Fruiting sepals* reflexed. *Achenes* 2—6, turgid, dorsally keeled, keels tubercled; endocarp thick, hard; style very short, terminal, deciduous.

Moradabad (T. Thomson). **DISTRIB.**: Marshes, in the plains of Bengal and the Punjab, extending to the Swat Valley in the N. W. Frontier Province; also in Ceylon, Trop. Africa and Australia.

2. SAGITTARIA, Linn.; Fl. Brit. Ind. vi, 561.

Erect stemless aquatic herbs, usually perennial. *Leaves* long-petioled, elliptic cordate or sagittate. *Flowers* 1-sexual or polygamous, in paniced or spicate whorls. *Sepals* 3, herbaceous, persistent. *Petals* 3, membranous, deciduous, white. *Stamens* in male flowers about 24, with only staminodes in the female flowers, or 6—10 in the male flowers, with 9—12 in the hermaphrodite flowers; filaments filiform, compressed. *Carpels* very many, crowded on a large globose or oblong receptacle, laterally flattened, style ventral or apical, stigma papillose; ovules solitary, basilar. *Fruit* a globose or oblong head of flattened crested or winged achenes. *Seeds* erect or basilar, testa thin, embryo horseshoe-shaped.—Species about 15, in temperate and tropical regions.

Leaves rising above the surface of the water, hastate or sagittate; stamens about 24 in the male fls., reduced to staminodes in the fem. fls.

1. *S. sagittifolia*.

Leaves floating, broadly ovate, deeply cordate, obtuse; stamens 6--10 in the male fls., 9--12 in the 2-sex. fls.

2. *S. guayanensis*.

1. *S. sagittifolia*, Linn. *Sp. Pl.* 993; Roxb. *Fl. Ind.* iii, 645; F. B. I. vi, 561; Watt *E. D.*; Prain *Beng. Pl.* 1120; Cooke *Fl. Bomb.* ii, 834. *S. hastata*, Don *Prod.* 22. Buchenau in *Engl. and Prantl. Pflanzenf.* Vol. 2, p. 231, fig. 176.

Rhizome thick, stoloniferous. *Leaves* radical, 2—8 in. long, very variable, the first leaves of the young plants slender and very acute, the next one or two simply cordate-oblong, the rest sagittate, acute, smooth, with more or less divergent basal lobes which are 2—3-nerved and narrower than the upper part of the blade, which latter is oblong or lanceolate, 5-nerved, the nerves extending from the top of petiole to the apex of the leaf; petioles sometimes reaching nearly 2 ft. long, 3-gonous. *Scape* 6—18 in. long. *Flowers* $\frac{1}{2}$ — $\frac{3}{4}$ in. diam., white, often with a purple claw, in 3—5 whorls along the scape, with usually 3 flowers in each whorl, the lower whorls female, the upper male, with longer pedicels; hermaphrodite flowers occur, but rarely; bracts narrowly ovate, membranous. *Sepals* ovate, acute, much smaller than the petals. *Petals* large, broadly obovate. *Filaments* in male flowers many; anthers sagittate. *Achenes* obliquely obovate, flattened, apiculate, winged, the wings broad, entire or subcrenate.

Ajmir (*Lourie*); Agra (*Monro*); Moradabad (*T. Thomson*); N. Oudh, Pilibhit and Gorakhpur (*Duthie*); Banda (*Edgew.*). **DISTRIB.**: In the Swat Valley and other localities of the N. W. Frontier Province. Plains of Punjab and Bengal; extending to Europe, N. Asia and N. America. The tuberous rhizomes are eaten in China, and the plant is often cultivated as a food-plant.

2. *S. guayanensis*, *H. B. K.*; *F. B. I. vi*, 561. *Prain Beng. Pl.* 1120. *S. cordifolia*, *Roxb. iii*, 647. *S. Lappula*, *Don Prod.* 22.

Petioles, scapes and pedicels often more or less hairy. *Leaves* membranous, floating, 1—2 in. long, broadly ovate, deeply cordate, obtuse; lobes broad, acute or obtuse; sinus broad or narrow; nerves radiating, obscure; petioles long or short. *Scape* 6—18 in. long. *Flowers* $\frac{3}{4}$ in. in diam., white, in approximate irregular whorls; pedicels short, very stout; flowers of lower whorls usually ternate, 2-sexual, 9—12-androus; of the upper numerous and male and 6—10-androus. *Petals* obovate, crose. *Anthers* cordate at base. *Achenes* many, flat, surrounded by a broad toothed wing.

Moradabad (T. Thomson); D. Dun (P. W. M.); Banda (Edgew.).
DISTRIB.: From the Punjab Plain to Bengal and Burma, but not in Ceylon; found in the Pen. and Malay Islands, also in China and in Trop. Australia.

3. BUTOMOPSIS, *Kunth*; *Fl. Brit. Ind. vi*, 562.

Annual erect scapigerous marsh herbs with milky juice. *Leaves* radical, elliptic-acute. *Flowers* 2-sexual, umbelled on a scape exceeding the leaves; whorls bracteate, sometimes superposed. *Perianth segments* 6, in two series. *Sepals* 3, herbaceous, persistent. *Petals* 3, larger than sepals, membranous, white, fugacious. *Stamens* usually 9, hypogynous, 6 outer in pairs opposite the sepals, sometimes one of a pair absent; 3 inner single, opposite petals, sometimes 1 or more replaced by a pair, filaments filiform, anthers oblong. *Carpels* 6—9, whorled on a flat receptacle, sessile and shortly connate below, 1-celled, style short, stigma somewhat external at apex of style; ovules many, small, on reticulate parietal placentas, ascending, anatropous. *Fruit* of 6—7 erect membranous follicles. *Seeds* many, minute, smooth; embryo conduplicate, horseshoe-shaped.—Species 2, in Asia, Africa and Tropical Australia.

***B. lanceolata*,** *Kunth Enum. Pl. iii*, 165; *F. B. I. vi*, 562; *Prain Beng. Pl.* 1120; *Cooke Fl. Bomb. ii*, 835. *Butomus lanceolatus*, *Roxb. Fl. Ind. ii*, 315.

Rhizome small, emitting leaves above and fibrous roots below. *Leaves* membranous, 2—6 in. long, elliptic lanceolate, acute, entire, narrowed into the petiole; main nerves 5—7; petioles dilated at base, up to 8 in. long. *Scape* usually longer than the leaves, stout, bearing an umbel of 3—20 flowers at its apex; bracts scarious, ovate, acute; pedicels very variable in length, 1—6 in. long. *Sepals* 3, herbaceous, elliptic, obtuse, reticulately veined, persistent. *Petals* white fugacious. *Follicles* 6—7, reticulately veined, tapering into short beaks. *Seeds* many, oblong, with rounded ends, dark brown, shining.

Merwara (A. E. Lourie), Moradabad (T. Thomson). **DISTRIB.:** Plains of India and South to Bombay Presidency; also common in Bengal rice-fields; extending to Australia.

CXX.—NAIADACEÆ.

Marsh herbs, stemless, scapigerous, rootstock tuberos or creeping or aquatic submerged or floating. *Leaves* sheathing at the base. *Flowers* 1-or 2-sexual, usually green and inconspicuous, in spikes, racemes or terminal or axillary peduncled spadices; bracts small or 0. *Perianth* 0 or of 3—4 inferior, valvate segments or tubular and very delicate. *Stamens* 1—6, hypogynous, free in 2-sexual, solitary or connate in male flowers; anthers 1—2-celled. *Carpels* 1—6; ovules 1 or more in each carpel, erect or pendulous; style long or short; stigmas 2—3 capillary or more often simple. *Fruit* of utricles, achenes, follicles or small drupes. *Seed* erect, pendulous or laterally peltate, testa coriaceous or somewhat fleshy, albumen 0, embryo fleshy, straight. *Species* about 150, temperate and tropical.

Flowers 2-sexual, perianth of 1—4 sepals.

Sepals 1—3, white or coloured; stamens 6 or more

Sepals 4, green; anthers 4, sessile

1. APONOGETON.

2. POTAMOGETON.

Flowers 1-sexual, perianth 0 or hyaline.

Style long with oblique peltate stigma, achenes 2—9

Style 0, stigmas 2—4, achene solitary

3. ZANNICHELLIA.

4. NAIAS.

1. APONOGETON, Thunb.; Fl. Brit. Ind. vi, 564.

Scapigerous, aquatic herbs, rootstock tuberos crowned by numerous root fibres. *Leaves* oblong or linear-lanceolate, floating or submerged. *Flowers* bisexual on long scapes bearing solitary or geminate often unilateral spikes which when young are enclosed in a conical fugacious sheath. *Perianth* of 1—3 equal or unequal white or coloured segments or obsolete. *Stamens* 6 or more; filaments subulate, unequal, persistent; anthers didymous. *Carpels* 3—6, each 2 or more ovuled; style short or 0; stigma discoid or decurrent, persistent; ovules basal, anatropous. *Fruit* of coriaceous follicles. *Seeds* oblong or cylindrical, sometimes ribbed. *Species* about 22, Africa, Madagascar, tropical Asia and Australia.

Leaves floating, spikes dense, carpels 4—8-seeded 1. *A. monostachyon*.

Leaves mostly submerged, spikes not dense, carpels 1—2-seeded

2. *A. crispum*.

1. *A. monostachyon*, Linn. f. *Suppl.* (1781) 214; Roxb. *Fl. Ind.* ii, 210; F. B. I. vi, 564; Watt E. D.; *Prain Beng. Pl.* 1122; Cooke *Fl. Bomb.* ii, 837. *A. natans* (L.) Engl. and Krause, *Pflanzenr.* iv, 13, p. 11. Vern. Jechu.

Rootstock $\frac{3}{4}$ — $\frac{1}{2}$ in. diam. stoloniferous, edible. *Leaves* 2 $\frac{1}{2}$ —8 in. long by $\frac{3}{4}$ —1 $\frac{1}{2}$ in. floating, oblong or linear-oblong, base cordate, acute or rounded at the apex, with 3—5 nerves on either side of the midrib and distinct cross nerves, petiole slender, subtrigonus much longer than the blade. *Spike* solitary densely flowered. *Sepals* obovate, $\frac{1}{16}$ in. long about as long as the stamens. *Stamens* 6, anthers bluish-purple. *Carpels* 3. *Follicles* exceeding the sepals, seeds 4—8, longitudinally ribbed.

Throughout the plains (Royle.) Like most water plants this has been seldom collected, I have seen none from the Gangetic Plain. **DISTRIB.:** Behar (Hope), S. India (Weight), N. Australia.

2. A. crispum, *Thunb. Nov. Gen. iv* (1781) 78; *F. B. I. vi*, 564; *Prain Beng. Pl.* 1122. *A. undulatum*, *Roxb. Fl. Ind. ii*, 211.

Rootstock $\frac{1}{2}$ — $\frac{1}{4}$ in. diam. stoloniferous, edible. *Leaves* mostly submerged, blade linear-lanceolate or oblong, 4—6 inches long or longer, 3—7 longitudinal nerves and numerous fine cross nerves, petiole compressed, shorter than the blade. *Spike* solitary, the flowers dense at first but ultimately rather lax. *Sepals* oblong, $\frac{1}{2}$ inch long, about twice as long as the stamens. *Stamens* 6. *Carpels* usually 3. *Seeds* oblong usually 1, sometimes 2, smooth.

The plains, Saharanpur. **DISTRIB.:** Bengal, Burma.

2. POTAMOGETON, Linn.; Fl. Brit. Ind. vi, 565;

P. Ascherson and P. Græbner, *Pflanzenreich*, IV II.

Annual or perennial aquatic herbs, rootstock creeping. *Leaves* submerged or the upper floating, opposite or alternate, stipules intrapetiolar. *Flowers* bisexual, small, greenish, in spikes on an axillary or leaf-opposed peduncle arising from a membranous sheath, bracts 0. *Perianth* of 4 concave green valvate segments (sometimes regarded as outgrowths of the connectives). *Stamens* 4, anthers sessile at the base of the perianth-segments, didymous. *Carpels* 4, free, sessile; ovule one, campylotropous from the inner angle of the carpel; stigma subsessile or decurrent, persistent. *Fruit* of 4 coriaceous or spongy drupelets, seed subreniform. *Species* about 85 with very numerous hybrids, cosmopolitan.

Upper or all leaves floating.

Floating leaves 3—4 inches long

Floating leaves $\frac{1}{2}$ — $1\frac{1}{2}$ inches long

Leaves all submerged.

Leaves ovate, cordate, amplexicaul

Leaves linear-oblong, semiamplexicaul, translucent 3-nerved

Leaves filiform, opaque

1. *P. indicus*.

2. *P. javanicus*.

3. *P. perfoliatus*.

4. *P. crispus*.

5. *P. pectinatus*.

1. P. indicus, *Roxb. Fl. Ind. I* (1820) 452; *F. B. I. vi*, 565; *Prain Beng. Pl.* 1123; *Cooke Fl. Bomb. ii*, 837.

Stem terete. *Leaves* submerged up to 6 in. by $1\frac{1}{2}$ in. lanceolate, very thin, with about 7 nerves on either side of the midrib, acute, narrowed into a rather stout petiole about 1 in. long, floating $2\frac{1}{2}$ —4 by 1— $1\frac{1}{2}$ in. oblong, elliptic or elliptic-lanceolate, rounded or acute at both ends, rather thick, opaque with many slender longitudinal nerves; petioles 1—5 in. long, rather stout; stipules 1— $1\frac{1}{2}$ in. long. *Spikes* $1\frac{1}{2}$ —2 in. long, dense. *Sepals* $\frac{1}{2}$ in. long including the claw, limb suborbicular, concave. *Drupelets* scarcely $\frac{1}{4}$ in. long, oblique, shortly beaked, 3-ribbed on the back.

Throughout the area, common, Dehra Dun, Agra, Merwára, Pilibhit, Kheri, Bahraich, etc. Flrs. Jan.—June. DISTRIB.: Throughout India, Baluchistan, Ceylon, etc.

2. *P. javanicus*, Hassk. in *Act. Soc. Ind.-Nedrl.* 1 (1856) 26; *F. B. I.* vi, 566; *Prain Beng. Pl.* 1123; *Collett, Fl. Siml.* fig. 179.

Stems very slender. Leaves submerged very narrowly linear $\frac{1}{8}$ in. wide, floating $\frac{1}{4}$ — $1\frac{1}{2}$ in. long, elliptic-oblong or elliptic-lanceolate, acute at both ends or subobtusate, 2—3-nerved on either side of the midrib; petiole about $\frac{1}{2}$ — $\frac{1}{2}$ in. long; stipules about $\frac{1}{2}$ —1 in. long. *Spikes* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, not very dense. *Sepals* $\frac{1}{10}$ in. long, orbicular-obovate. *Drupelets* $\frac{1}{2}$ in. long including the short slightly hooked beak (style), 3-ribbed on the back, the ribs often denticulate.

Dehra Dun (Mackinnon). DISTRIB.: Africa, S. & E. Asia, Australia.

3. *P. perfoliatus*, Linn. *Sp. Pl.* (1753) 126; *F. B. I.* vi, 566; *Cooke Fl. Bomb.* ii, 838.

Stem terete, sparingly branched. Leaves usually 1— $1\frac{1}{2}$ in. long, sessile, amplexicaul, ovate or ovate-lanceolate, cordate, obtuse, membranous translucent, 5—7-nerved on either side of the midrib; stipules small, caducous. *Spikes* dense at first becoming laxer, up to 1 in. long. *Sepals* $\frac{1}{10}$ in. long including the distinct claw, limb elliptic-obovate. *Drupelets* $\frac{1}{8}$ in. long, obliquely ovoid, scarcely keeled, with a distinct usually hooked beak.

Throughout the area, common. Dehra Dun, Bundelkhand (Duthie). Flowers apparently all the year round. DISTRIB.: N. Hemisphere and Australia.

4. *P. crispus*, Linn. *Sp. Pl.* (1753) 126; *F. B. I.* vi, 566; *Prain Beng. Pl.* 1123; *Cooke Fl. Bomb.* ii, 838.

Stems slender, compressed, branched. Leaves 1— $2\frac{1}{2}$ by $\frac{1}{8}$ — $\frac{3}{8}$ in. linear or linear-oblong, crisped and finely serrulate, translucent, sessile, 3-nerved; stipules small caducous. *Spikes* up to $\frac{1}{2}$ in. long, few-flowered, lax. *Sepals* $\frac{1}{2}$ in. long including the claw, limb suborbicular. *Drupelets* $\frac{1}{2}$ in. long, obliquely ovoid, tipped with a compressed curved beak.

Throughout the area. Dehra Dun, Moradabad, Agra, Kheri. Flrs. March, April. DISTRIB.: Cosmopolitan except S. America.

5. *P. pectinatus*, Linn. *Sp. Pl.* (1753) 127; *F. B. I.* vi, 567; *Prain Beng. Pl.* 1123; *Cooke Fl. Bomb.* ii, 838. *P. pusillus*, *subsp. flabellatus*, Hook. f. *F. B. I.* vi, 567.

Stems filiform, usually much dichotomously branched. Leaves 1—4 by $\frac{1}{10}$ in. or much narrower usually 3-nerved with the lateral nerves close to the recurved margins; stipules sheathing with short free points, 2 in. long or less. *Spikes* about an inch long, flowers few in distant whorls. *Sepals* $\frac{1}{10}$ in. long, limb broadly obovate. *Drupelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, oblique, broadly ovate or almost semicircular with a very short beak, scarcely keeled.

Throughout the area. Saharanpur, Agra, Merwára. Flrs. October, March (probably all the year round). **DISTRIB.:** As for *P. crispus*.

P. filiformis, Pers. Synops. I (1805), 152; A. Bennett, Journ. Bot. XXXIII (1895), 372.

Closely resembles *P. pectinatus*. Leaves filiform 1-nerved. Drupelets $\frac{1}{2}$ in. long.

Gwalior (Maries in Herb. Mus. Brit.) fide Bennett, l. c. I have not seen this species from our area.

3. ZANNICHELLIA, Linn.; Fl. Brit. Ind. vi, 568. Græbner, Pflanzenreich IV, 11, p. 153.

Aquatic slender herbs of brackish or fresh water. *Leaves* submerged, linear, pseudoverticillate at the flowering nodes; stipules amplexicaul or sheathing. *Flowers* monœcious, minute. *Male flowers* pedunculate, perianth 0, anthers adnate to the excurrent connectives. *Female flowers* with a hyaline cupular perianth, carpels 1—8 usually 4, style short or long, stigma peltate, ovule solitary, pendulous. Fruit of compressed coriaceous carpels, seed oblong. *Species* 2; absent only in Australia.

Z. palustris, Linn. Sp. Pl. (1753) 969. F. B. I. vi, 568; Prain Beng. Pl. 1124; Cooke Fl. Bomb. ii, 840.

Stem filiform, rooting. *Leaves* $\frac{1}{2}$ —3 in. long $\frac{1}{8}$ — $\frac{1}{2}$ in. wide. *Peduncle* $\frac{1}{16}$ in. long. *Fruits* distinctly stipitate, tipped with a long style.

Dehra Dun (Parker). Punjab: Central Provinces: Behar (Hooker).

4. NAIAS, Linn.; Fl. Brit. Ind. vi, 568.

Submerged annual aquatic herbs. *Leaves* opposite or whorled, sessile. *Flowers* minute, usually monœcious. *Male flowers* perianth double, outer tubular or inflated, entire or 4-fid or wanting, inner hyaline. *Stamen* 1, adnate to the inner perianth, anther 4-, rarely 1-celled. *Female flowers* perianth 0 or hyaline and adnate to the solitary sessile carpel, style cylindrical, stigmas 2 or 3, ovule basal erect anatropous. *Fruit* an oblong achene. *Seed* hard, embryo straight. *Species* 32, cosmopolitan.

Leaves coarsely toothed, almost pinnatifid.

Flowers dioecious

1. *N. marina*.

Leaves finely toothed. Flowers monoœcious.

Leaves with 6—10 teeth on each side. Anthers 1-celled

2. *N. minor*.

Leaves with 30—50 minute spinules on either side.

Anthers 4-celled

3. *N. graminea*.

1. *N. marina*, Linn. Sp. Pl. (1753) 1015; Rendle, Pflanzenr. IV, 12, 7. *N. major*, Allione. F. B. I. vi, 569; Prain Beng. Pl. 1125.

Stem rather stout (for the genus), toothed, fragile. *Leaves* $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, subternately whorled, linear, almost pinnatifidly toothed, teeth 4—8 on either side and a few on the back; sheath with rounded sides

entire or minutely denticulate. *Outer perianth* (or spathe) present in the male flowers. *Anthers* 4-celled.

There are no specimens from the area but as it is found in Kashmir, Afghanistan, Sind, Central Provinces, Bengal, etc., it is certain to occur. **DISTRIB.:** Cosmopolitan.

2. *N. minor*, *Allione, Fl. Pedem. ii* (1785) 221; *F. B. I. vi*, 569; *Prain Beng. Pl.* 1125; *Cooke, Fl. Bomb. ii*, 840; *Rendle, l. c.* 14.

Stem very slender, much-branched, fragile. *Leaves* $\frac{1}{3}$ — $\frac{3}{4}$ in. long, very narrowly linear, teeth small 6—10 or in vigorous examples 12—15 on either side; sheath rounded or truncate, toothed. *Outer perianth* present in the male flowers. *Anthers* 1-celled.

Bundelkhand (Duthie 7092). Haldwani (Parker). **DISTRIB.:** C. & S. Europe and N. Africa to Japan.

3. *N. graminea*, *Del. Fl. Egypte* (1812) 282, t. 50, fig. 3; *F. B. I. vi*, 569; *Prain Beng. Pl.* 1125; *Rendle, l. c.* 18.

Stem slender, fragile, internodes short towards the apex of the stem making the plant plumose. *Leaves* $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, ternately whorled or fascicled, very narrowly linear or subulate, teeth very minute 30—50 on either side; sheath with prominent erect linear, denticulate auricles. *Outer perianth* wanting on both sexes. *Anthers* 4-celled.

Dehra Dun (Parker) common. Flrs. Aug.—Sept. **DISTRIB.:** most parts of the old world.

CXXI.—ERIOCAULACEÆ.

Marsh or aquatic scapigerous herbs. *Leaves* narrow with sheathing bases, grass-like, rosulate when the stems are short. *Flowers* very minute, in involucrate heads, bracteate, unisexual, usually monœcious, perianth inferior. *Male flowers:* sepals 2—3, free, or connate and equally or spathaceously divided; petals 2—3, equal or unequal, often very obscure, inserted on the top of a clavate elongate stipes or corollatube; stamens 6 or fewer, some often reduced to filaments, anthers dorsifixed; pistillode minute or 0. *Female flowers:* sepals 2—3, usually free, caducous; petals 3, rarely 2 or 0, persistent, spatulate or oblanceolate, usually ciliate or villous and with a black gland; ovary free 3-, rarely 2-celled, ovules solitary in the cells, pendulous, orthotropous, style 1, stigmas 3—2, slender, with sometimes interposed lobes or appendages. *Fruit* a membranous loculicidal capsule, testa coriaceous, striolate and often papillose, embryo outside the floury albumen. *Genera* 9, *species* 550, mainly tropical.

ERIOCAULON, Linn.; *Fl. Brit. Ind.* vi, 571.

Petals free in both sexes. Stamens twice as many as petals (or fewer by abortion). *Species* over 200, tropical and subtropical.

Anthers white; heads glabrous

Anthers black.

Heads more or less villous.

Involucral bracts obtuse.

Heads $\frac{1}{8}$ — $\frac{1}{4}$ in. diam. floral bracts not acuminate; female sepals boat-shaped

Heads $\frac{1}{4}$ — $\frac{1}{2}$ in. diam. floral bracts long acuminate; female sepals very narrow

Involucral bracts acute

Heads glabrous

1. *E. Sieboldianum*.

2. *E. trilobum*.

3. *E. quinquangulare*.

4. *E. pseudoquinquangulare*.

5. *E. Hamiltonianum*.

1. *E. Sieboldianum*, *Sieb. et Zucc. ex Steud. Syn. Pl. Cyp. II* (1855) 272; *F. B. I. vi*, 577; *Prair Bengal. Pl.* 1127; *Cooke Fl. Bomb. ii*, 845; *Collett, Fl. Siml.* 549, t. 180. *Ruhland in Pflanzenr. IV*, 30, p. 111, fig. 15 A-G.; *Fyson Journ. Ind. Bot. III*, 15 t. 50, 51.

Annual. *Leaves* $\frac{1}{2}$ —2 in. long, narrowly linear, subulate or setaceous. *Scapes* $1\frac{1}{2}$ —5 in. high, slender; heads $\frac{1}{10}$ — $\frac{1}{8}$ in. diam. globose or ovoid, glabrous, pale or sometimes purplish; bracts glabrous, scarious, obtuse, shorter than the heads; receptacle columnar, glabrous or nearly so. *Floral bracts* similar to the involucral but narrower and subacute, pale or dark, usually with a dark central band and narrow scarious margins. *Male calyx* spathaceous, limb ovate, acute, irregularly tridentate; petals very minute; anthers white. *Female sepals* 3, 2 or 0, narrow; petals 0; style long, stigmas 3, filiform.

Dehra Dun (Duthie, etc.) abundant in rice fields, Saharanpur, Moradabad (Thomson), Dholpur (Jameson), Shahjahanpur (Duthie). **DISTRIB.:** Throughout India, China, Japan.

2. *E. trilobum*, *Buch. Ham. ex Koern. in Linnæa XXVII* (1856) 645; *F. B. I. vi*, 583; *Prair Bengal. Pl.* 1127; *Cooke Fl. Bomb. ii*, 848; *Ruhland, l.c.* 74; *Fyson, Journ. Ind. Bot. II*, 206, t. 10. *E. Sollyanum*, *Royle, Ill. Bot. Himal.* (1839) 409, t. 97. f. 1.

Stem 0. *Leaves* 1—3 by $\frac{1}{10}$ — $\frac{1}{8}$ in. linear ensiform, not red when dry. *Scapes* 3—8 in. high; heads $\frac{1}{8}$ — $\frac{1}{4}$ in. diam. globose, blackish grey, somewhat white villous; bracts oblong, obtuse, glabrous, pale brown, at first radiating beyond the head ultimately reflexed; receptacle columnar, villous. *Floral bracts* narrowly obovate-cuneate, obtuse or acute but not acuminate, blackish-green with short white hairs on the back. *Male calyx* with the 3 sepals connate to about the middle in a spathe; petals stipitate, minute; anthers black. *Female sepals* obovate-oblong, boat-shaped, more or less keeled, with white hairs on the back; petals narrowly linear-spathulate; style divided half way down into 3 filiform branches.

Shahjahanpur (Duthie 4476, mixed with *E. Sieboldianum*) Lalitpur (Duthie 7049). Throughout India from Dharamsala to Bengal and south to Malabar; Madagascar, Zanzibar.

NOTE.—Under the Vienna Conference rules the name for this plant should be *E. Sollyanum*, Royle, but I have thought it better to adhere to the name used in Ruhland's Monograph and all Indian floras.

3. *E. quinquangulare*, Linn. Fl. Zeyl. (1747) 48; F. B. I. vi, 582; Prain Beng. Pl. 1127; Cooke Fl. Bomb. ii, 849; Ruhland, l.c. 85; Fyson, Journ. Ind. Bot. ii, 204, t. 9.

Stem short or 0. *Leaves* 1—4 by $\frac{1}{16}$ — $\frac{1}{4}$ in. linear ensiform, usually reddish when dry. *Scapes* numerous 3—8 in. high; heads $\frac{1}{2}$ — $\frac{1}{4}$ in. diam. globose or somewhat ovoid, densely white villous; bracts obovate or cuneate, obtuse, glabrous, pale straw-coloured, ultimately reflexed; receptacle globose or columnar, villous. *Floral bracts* similar to the involucre but narrower and long acuminate, light or dark brown. *Male calyx* spathaceous, oblong-spathulate, obtuse, tip penicillate; petals stipitate, minute, pilose; anthers black. *Female sepals* narrowly oblanceolate-spathulate, hairy; petals similar but narrower; style short, branches 3, long, filiform.

Bundelkhand (Duthie 7048). **DISTRIB.:** Throughout India except the arid N. W. and in Ceylon.

4. *E. pseudoquinquangulare*, Ruhl. Pflanzenr. IV, 30 (1903); 73.

Stemless. *Leaves* 2—3 by $\frac{1}{4}$ in. linear, acute. *Scapes* 4—9 in. high, numerous; heads $\frac{1}{4}$ in. diam. globose, densely white villous; bracts oblong-lanceolate, acute, glabrous, reflexed, yellowish-grey; receptacle pilose. *Floral bracts* obovate-oblong, acuminate, black, hairy on the back. *Male sepals* connate high up in a spathe, acute, ciliate, greenish black; petals ciliate; anthers black. *Female sepals* obovate acute, boat-shaped, crested; petals linear-oblong, ciliate; style short, branches 3.

Saharanpur (Botanic Gardens, Lehmann) fide Ruhland, I have not seen this species the description being taken from Ruhland.

5. *E. Hamiltonianum*, Mart. in Wall. Pl. As. Rar. III (1832) 29; Ruhland, l.c. 107; Fyson Journ. Ind. Bot. II, 313, t. 33.

Stemless. *Leaves* 3—3½ in. long; linear-lanceolate. *Scapes* 4—10 in. high, numerous; heads $\frac{1}{8}$ — $\frac{1}{4}$ in. diam. conical, glabrous, yellowish brown; bracts obovate, obtuse, glabrous; receptacle pilose. *Floral bracts* cuneate-obovate, more or less acuminate, yellowish. *Male sepals* 2, falcate-oblong, acute, glabrous; petals 0; anthers black. *Female sepals* 2, free, similar to the male; petals 3, linear, obtuse; style with 3 short filiform branches.

Dehra Dun (King) fide Fyson l.c. III, p. 106. I have seen no specimens from our area. **DISTRIB.:** Assam.

CXXII.—CYPERACEÆ.

Grass or rush-like herbs. *Stems* solid, very rarely with nodes, usually triquetrous. *Leaves* 3-farious or wanting, usually near the base of the stem; sheaths tubular usually closed; ligule 0 or a short prolongation of the mouth of the sheath opposite the blade. *Flowers* minute, 1—2-sexual, solitary in the axils of scales ("glumes") forming "spikelets" that

are solitary or variously arranged. *Perianth* 0 or of hypogynous bristles or scales. *Stamens* 1—3, anthers linear, basifixed, filaments flattened. *Ovary* 1-celled, superior, style with 2—3 stigmatic branches. *Fruit* a compressed or trigonous nut. *Seed* erect, embryo small, basal, median, enclosed in the floury albumen. Plants of wet or marshy situations universally distributed.

Nut not enclosed in a utricle.

Flowers 2-sexual.

Flowering glumes distichous.

Glumes usually many, rachilla of spikelet persistent.

Stigmas 3, nut triquetrous

Stigmas 2, nut flattened.

Nut laterally compressed i.e., its greatest width radial to the rachis .

Nut dorsally compressed i.e., its greatest width tangential to the rachis .

Glumes few, rachilla of spikelet deciduous.

Stigmas 2, nut compressed

Stigmas 3, nut triquetrous.

Fertile glumes 1—3, winged

Fertile glumes 1—12 not winged

Flowering glumes spirally arranged or sometimes the lowest subdistichous.

Style-base constricted or articulated above the nut.

Leaves 0, hypogynous bristles almost always present

Leaves usually present, hypogynous bristles 0.

Leaf-sheaths usually glabrous, style persistent or if deciduous not leaving a button on the nut

Leaf-sheaths with long fine hairs, style glabrous deciduous leaving a button on the nut .

Style-base passing gradually into the nut, sometimes deciduous and leaving a small apiculus.

Bristles linear, filiform or 0 .

Bristles 2-seriate, the inner scale-like or 0

Bristles 6, cut into narrow segments

Bristles 2, scale-like enclosing the nut

Flowers 1-sexual, nut bony usually white or pale, polished

Nut enclosed in a utricle

1. *Cyperus*.

2. *Pycneus*.

3. *Juncellus*.

4. *Kyllinga*.

5. *Courtoisia*.

6. *Mariscus*.

7. *Heleocharis*.

8. *Fimbristylis*.

9. *Bulbostylis*.

10. *Scirpus*.

11. *Fuirena*.

12. *Eriophorum*.

13. *Lipocarpha*.

14. *Scleria*.

15. *Carex*.

1. CYPERUS, Linn.; Fl. Brit. Ind. vi, 597.

Perennial or annual herbs, tufted or with creeping root-stocks. *Leaves* usually only at the base of the stem, occasionally reduced to sheaths. *Spikelets* in solitary globose or umbellate heads or spikes, bracts one or more, leafy, immediately below the inflorescence, bracteoles usually similar but smaller below the secondary divisions of the inflorescence. The spikelets composed of several or many distichous glumes the two lowest being empty and differing in size and shape from the rest which are equal and deciduous from below upwards, the uppermost 1—3 sterile or empty. Hypogynous bristles 0. *Stamens* 1—3; anthers linear or oblong, sometimes apiculate or crested. *Ovary* usually trigonous; style short or long or 0, branches 3. Nut trigonous, rarely compressed or globose. Species about 300 in all warm and temperate regions.

The following key cannot be used for depauperated specimens which can only be identified by comparison with normally developed ones.

- I. Spikelets digitate or clustered not spicate or racemose.
 Annuals, slender or cæspitose.
 Flowering glumes mucronate 1. *C. uncinatus*.
 Flowering glumes obtuse.
 Spikelets in dense compact heads . 2. *C. difformis*.
 Spikelets in twice compound umbels.
 Nut globose, white 3. *C. flavidus*.
 Nut triquetrous, brown 4. *C. amabilis*.
- Perennials.
 Spikelets white or pale straw-colour in heads 5. *C. niveus*.
 Spikelets in compound umbels, leaves broad 6. *C. diffusus*.
- II. Spikelets spicate (sometimes very shortly) rarely sub-racemose.
- A. Annuals.
 Spikelets very shortly spicate.
 Spikelets $\frac{1}{2}$ — $\frac{3}{4}$ in. long; stamens 3 . 7. *C. compressus*.
 Spikelets usually $\frac{1}{2}$ — $\frac{3}{4}$ in. long; Stamens 1. 8. *C. aristatus*.
 Spikelets in an elongate subracemose spike . 9. *C. Iria*.
- B. Perennials.
 Inflorescence a large compound umbel.
 Bracts (the longest) usually much exceeding the inflorescence.
1. Spikelets $\frac{1}{2}$ in. long or less Rachis of the spikes glabrous.
 (a) Spikelets numerous in an elongate spike.
 Rachilla of spikelets narrowly winged. 10. *C. eleusinoides*.
 Rachilla of spikelets conspicuously winged.
 Wings of rachilla persistent.
 Spikes digitate 11. *C. radiatus*.
 Spikes at least some peduncled 12. *C. exaltatus*.
 Wings of rachilla deciduous . 13. *C. digitatus*.
- (b) Spikelets 3—8 in short spikes.
 Stem at base nodosely thickened, spikelets usually dark coloured. 14. *C. rotundus*.
 Stem at base not nodose, spikelets usually pale yellowish-brown 15. *C. esculentus*.
 Rachis of the spikes scabrid pilose 16. *C. pilosus*.
2. Spikelets $\frac{1}{2}$ in. long and over.
 Spikelets numerous in elongated spikes.
 Spikelets $\frac{1}{10}$ — $\frac{1}{4}$ in. broad, glumes distinctly overlapping.
 Rachilla not winged, spikelets rather remote . 17. *C. procerus*.
 Rachilla winged, spikelets crowded 18. *C. tegetum*.
 Spikelets very slender, glumes $\frac{1}{2}$ in. long, not or only slightly overlapping . 19. *C. distans*.
 Spikelets 3—8 in. short spikes 14. *C. rotundus*.
 Bracts of the inflorescence half as long as the rays or less . 20. *C. corymbosus*.
 Inflorescence congested rays if present short. 21. *C. bulbosus*.
 (See also *C. rotundus*)

1. *C. uncinatus*, Poir, *Encyc. Method.* v, 7, 247. (1806) Cooke, *Fl. Bomb.* ii, 862; Collet, *Fl. Siml.* 554. *C. cuspidatus*, H. B. K. *Nov. Gen et Sp.* i, 204 (1815); F. B. I. vi, 598; Prain *Beng. Pl.* 1141.

A slender annual glabrous plant, $1\frac{1}{2}$ ins. to 6 ins. in height with several to many flowering stems. *Leaves* all arising from near the base narrowly linear, apex tapering above to an acute or acuminate apex, $1\frac{1}{2}$ ins. or less in length, $\frac{1}{8}$ in. broad, sheaths pale or reddish brown, soon split down one side but not becoming fibrous. Each stem ending in a compact nearly globose head $\frac{1}{4}$ to $\frac{3}{8}$ in. in diameter of 5 to 23 sessile spikelets, or, most often, several of the spikelets are replaced by branches which themselves end in heads of spikelets; bracts of the principal head 3 to 6, leaf-like but usually longer. *Spikelets* 8 to 20 flowered, up to $\frac{3}{8}$ in. long. *Glumes*, when spread open, ovate, $\frac{1}{10}$ in. long, chestnut brown, keel with 3 nerves of which the middle one is much the most pronounced, all three unite in the upper part of the glume and pass into a strong outwardly curved mucro $\frac{1}{2}$ in. long. *Stamens* 3. *Nut* obovoid, sharply 3-angled and with 3 flat faces. *Style* with 3 slender branches $\frac{3}{8}$ in. long.

Dehra Dun (Gamble); Saharanpur; Shahjahanpur (Duthie); Moradabad (Thompson). *DISTRIB.*: Throughout India and in most warm regions of the world.

2. *C. difformis*, L. *Sp. Pl.* 67; *F. B. I.* vi, 599; *Prain Beng. Pl.* 1142; *Collett Fl. Siml.* 554. *Cooke, Fl. Bomb.* ii, 862.

An erect annual glabrous herb, usually 10 to 12 ins. high but up to 20 ins. roots numerous, fibrous, tufted. Stem-bases covered with loose membranous, not fibrous sheaths. Stems finely striated longitudinally, smooth. *Leaves* usually shorter than the stem, about $\frac{1}{2}$ in. broad, smooth, flaccid. *Inflorescence* consisting of about 3 to 6 compact heads of spikelets nearly globose, $\frac{1}{3}$ to $\frac{1}{2}$ in. diam. one or more of the heads sessile the rest rayed, rays up to $1\frac{1}{2}$ ins. long, often shorter; primary bracts 3 to 4, leaf-like but frequently broader. *Spikelets* about $\frac{1}{2}$ in. long or less, and $\frac{1}{10}$ in. broad, 10—30 flowered those with fewer flowers turgid in appearance, axis much flattened laterally, without wings. *Glumes* closely imbricate, very concave, about $\frac{1}{10}$ in. long, more or less red on the sides, with a very obtuse or almost rounded apex. *Stamens* 1 or 2. *Nut* trigonous, obovoid, pale-brown, not much shorter than the glume; style shorter than the nut, branches short.

Dehra Dun (Duthie); Bundelkhand (Duthie); Moradabad (Thomson); Merwara (Duthie); Ajmer (Lowrie); Gwalior (Maries); Shahjahanpur (Duthie); Saharanpur. *DISTRIB.*: Throughout India and the warmer parts of the E. Hemisphere.

3. *C. flavidus*, Retz. *Obs. Fasc. v.* (1789) 13; *F. B. I.* vi, 600; *Prain Beng. Pl.* 1142; *Cooke, Fl. Bomb.* ii, 862.

An erect annual glabrous plant. Roots fibrous, tufted. Stem bases covered with close-fitting not fibrous pale-brown sheaths. Stems tufted, longitudinally striated, 6 to 8 ins. high. *Leaves* linear, acute, often longer than the stems, about $\frac{1}{2}$ in. broad or broader. *Inflorescence* a twice compound umbel; primary rays up to $3\frac{1}{2}$ ins. long; primary bracts leaf-like but often broader, generally much over-topping

the inflorescence and up to 7 ins. long. *Spikelets* linear, up to $\frac{1}{2}$ in. long but usually shorter, $\frac{1}{4}$ in. broad. The two lowest glumes smaller and empty; flowering glumes oblong-ovate, rounded at the apex, $\frac{1}{8}$ in. long and slightly less broad, with a green obscurely nerved black and broad hyaline margins. *Stamens* 1 or 2. *Nut* ovoid-globose, white, about $\frac{1}{10}$ in. long, trigonous, shortly stipitate, style with its three branches $\frac{1}{4}$ in. long, divided about half-way down.

Moradabad (Thomson); Bundelkhand (Duthie); Abundant in rice fields throughout India and generally distributed in the warmer regions of the Old World.

4. C. amabilis, Vahl. Enum. ii (1806) p. 318; F. B. I. vi, 598; Prain Beng. Pl. 1141.

Annual, slender, tufted, stems 2—10 in. high, striate. *Leaves* all arising from near the base, one half the length of the stem or less, $\frac{1}{2}$ in. broad with narrow filiform curved tips, sheaths dark brown or purplish, the older fibrous. *Inflorescence* usually a large compound umbel, rarely reduced to a single head, rays up to 4 in. long, primary bracts about 4, the longest as long as the rays, leaf-like. *Spikelets* $\frac{2}{3}$ — $\frac{3}{4}$ in. long $\frac{1}{8}$ — $\frac{1}{2}$ in. broad in clusters of 3—10, each about 30 flowered, rachilla not winged. *Glumes* closely imbricate in flower, laxer and spreading in fruit, $\frac{1}{10}$ in. long, narrowly boat-shaped, keel 3-nerved, excurrent as a very small mucro, sides thin smooth golden-brown or chestnut. *Stamen* 1. *Nut* $\frac{3}{8}$ in. long, ellipsoid or obovoid, triquetrous, brown, style scarcely longer than the nut, branches short.

Moradabad (Thomson) fide Clarke. *DISTRIB.*: Tehri-Garhwal (Gamble); Kumaon (Davidson), most tropical countries.

5. C. niveus, Retz. Obs. Fasc. 5 (1789) 12; F. B. I. vi, 601; Prain Beng. Pl. 1142; Collett Fl. Siml. 555; Cooke Fl. Bomb. ii, 864.

A perennial erect glabrous herb. Rhizome horizontal short woody, almost entirely composed of the bulb-like stem bases and giving off long slender fibrous roots below. Stem-bases nodose and covered with dark-brown non-fibrous leaf sheaths the lowest of which are devoid of blades; each nodose stem-base gives rise to a tuft of leaves and a single simple slender smooth longitudinally striated stem up to 20 ins. long but generally shorter and terminating in a single head of spikelets. *Leaves* narrowly linear, tapering to an acutely triangular apex, nearly as long as or decidedly shorter than the stem, $\frac{1}{2}$ in. broad, margins finely serrulated. Head of 3 to 13 spikelets, simple, more or less spheroidal, up to $1\frac{1}{2}$ ins. in diameter, usually less; primary bracts 2—3 leaf-like, narrow, unequal, up to $2\frac{1}{2}$ ins. long. *Spikelets* linear, or linear-lanceolate, much compressed, up to 1 in. long and $\frac{1}{2}$ in. broad, white or pale straw coloured. The lowest glume generally empty and somewhat reduced; flowering glumes 16 to 40 in each spikelet, ovate-lanceolate, subobtuse, $\frac{1}{2}$ in. long and $\frac{1}{2}$ in. broad when spread out, markedly compressed with a sharp keel right to the apex, 5 to 6 parallel nerves on each side of the keeled midrib. *Stamens* 3, filaments $\frac{1}{2}$ in. long, anthers linear,

muticous. *Nut* obovoid-ellipsoid $\frac{1}{16}$ in. long, triquetrous. *Style* with its branches $\frac{1}{8}$ in. long, divided about half way down.

Moradabad (Thomson); Saharanpur (Lowric); Kheri (Inayat); Bahraich (Inayat); Gonda (Inayat); Gorakhpur (Harsukh); Pilibhit (Inayat); Agra; Ajmere (Lowric). Northern India south to Hyderabad and Eastwards to China.

6. *C. diffusus*, *Vahl Enum. ii* (1806) p. 321; *F. B. I. vi*, 603; *Prain Beng. Pl.* 1142.

Perennial, rhizome short roots wiry. Stems 8—30 in. high, sharply triquetrous, clothed at the base with fibrous sheaths. *Leaves* about as long as the stem $\frac{1}{3}$ — $\frac{2}{3}$ in. wide, thin, dark green above paler beneath, somewhat scabrid on the margins and on the prominent vein on either side of the midrib. *Inflorescence* a usually decomposed umbel 4—12 in. diam, bracts several, broad, leaflike, the longest exceeding the rays. *Spikelets* $\frac{1}{3}$ — $\frac{1}{2}$ in. long in digitate clusters of 2—9 with some solitary on slender pedicels; rachilla with narrow persistent wings. *Glumes* $\frac{1}{16}$ in. long and broad, boat-shaped, prominently mucronate, keel green 3—5-nerved, margins brown or white. *Stamens* 2—3. *Nut* $\frac{1}{16}$ in. long, ellipsoid, triquetrous, black, style with its branches $\frac{1}{10}$ in. long, divided almost to the base.

Haldwani (Parker). *DISTRIB.*: Bengal, Assam and all moist tropical regions.

7. *C. compressus*, *L. Sp. Pl.* 68; *F. B. I. vi*, 605; *Prain Beng. Pl.* 1143; *Cooke Fl. Bomb. ii*, 866; *Collett Fl. Siml.* 555.

An erect glabrous caespitose herb up to 14 ins. high. Roots tufted numerous fine. The stem bases are covered with red-purple usually entire and not fibrous leaf-sheaths. Leaf-blades often as long as the stems, narrowly linear $\frac{1}{2}$ in. wide, gradually tapering in the upper part to a fine acuminate apex. *Inflorescence* umbellate, some of the rays, usually 3 or 4, developed up to 3½ ins. long, occasionally all the spikelets grouped as a sessile umbel; bracts leaf-like, unequal 3 or 4 longer than or as long as the primary rays of the umbel. *Spikelets* strongly compressed laterally, 4 to 7 in each ultimate condensed umbellate spike, $\frac{2}{3}$ — $\frac{3}{4}$ in. long, $\frac{4}{7}$ in. wide, grey-green streaked with crimson, the rachis very much flattened and with hyaline wings. The 2 or 3 lowest glumes small hyaline empty, the flowering glumes broadly ovate when spread out, $\frac{8}{16}$ in. long, $\frac{4}{7}$ in. broad at widest part, strongly keeled in upper part the keel running out into a stiff straight mucro, the wings with several obscure nerves. *Stamens* 3. *Nut* broadly triquetrous, obovoid, with 3 prominent angles and 3 concave sides, dark brown, $\frac{1}{8}$ in. long, style with branches $\frac{3}{10}$ in. long, divided about halfway down.

Moradabad (Thomson); Dehra Dun (Duthie); Cawnpore (Duthie); Saharanpur (Royle); Bundelkhand (Duthie). *DISTRIB.*: Throughout India and most warm countries.

NOTE.—According to Clarke, the rachilla is not winged but in fresh specimens I find the glumes continuing down the rachilla as distinct

and rather broad wings. This plant is a common rains weed in Dehra Dun.

8. *C. aristatus*, *Rottb. Descr. et Ic. 23, t. 6, fig. 1; F. B. 1. vi, 606; Prain Beng. Pl. 1143; Cooke Fl. Bomb. ii, 866; Collett Fl. Siml. 556.*

A small annual herb up to 8 ins. high. Numerous tufted fibrous roots. The lower parts of the flowering stems clothed with generally red glabrous not fibrous sheaths. Stems several to numerous, erect glabrous with fine longitudinal striations. *Leaves* all arising near the bases of the stems; sheaths with transversely truncate mouths; blades linear, tapering towards an acute apex, up to 2 ins. in length, smooth. *Inflorescence* primarily umbellate with usually one sessile head and 2 or 3 rays ending in head-like spikes of spikelets, occasionally very much reduced so as to consist of a single sessile spike, primary bracts 3 to 4, leaf-like, unequal in length. Spikes dense of 6 to 25 spikelets, about $\frac{1}{2}$ in. or less in length and $\frac{1}{4}$ in. or less in diam. *Spikelets* linear-oblong each with about 12 flowers; the 2 lowest glumes empty and somewhat smaller than the flowering ones; flowering glumes oblong-ovate, suddenly narrowing into a recurved acuminate apex which is from $\frac{1}{2}$ to $\frac{2}{3}$ the length of the rest of the glume, whose total length is $\frac{1}{2}$ in. *Stamen* 1 (always?). *Nut* narrowly obovoid, $\frac{1}{2}$ in. long, brown, smooth, style with its 3 branches about as long as the nut.

Cawnpore (Duthie); Dehra Dun (Duthie); Moradabad (Thomson); Agra; Saharanpur. **DISTRIB.:** Most tropical countries including most of India.

NOTE—This plant has been often mistaken for *C. uncinatus*, Poir. but in that species the glumes are keeled and have smooth hyaline margins. It also has 3 stamens. The glumes in *C. aristatus* are not keeled though the midrib is prominent and the hyaline margins are longitudinally striate in dry specimens (not in fresh ones).

9. *C. Iria*, *L. Sp. Pl. 45; F. B. 1. vi, 606; Prain Beng. Pl. 1143; Collett Fl. Siml. 556; Cooke Fl. Bomb. ii, 867.*

An erect glabrous annual up to 20 ins. or more in height, each plant producing 1 to 6 flowering stems which are sharply triangular and longitudinally striated. *Leaves* arising from near the base of the stem with long pale brown to reddish brown entire sheaths, blades linear varying considerably in length and breadth according to habitat, up to 14 ins. long and $\frac{1}{2}$ in. broad but usually very much less, gradually tapering to an acuminate apex, rather flaccid. *Inflorescence* primary a compound umbel 2—20 ins. in diameter, primary rays up to 8 ins. in length and often branched again in an umbellate manner; primary bracts up to 6, leaf-like, often very long and broad, more or less unequal. *Spikelets*, in typical plant, 8—15 flowered arranged along the ultimate rhachis in a spicate manner, the rhachis of the spikelets furnished between the glumes with narrow hyaline wings. The two lowest glumes empty small hyaline except for the midrib. Flowering glumes broadly boat-shaped, blunt or shortly

apiculate $\frac{1}{8}$ — $\frac{1}{2}$ in. long, midrib of 3—5 nerves, wings nerveless. *Stamens* generally 2. *Nut* triquetrous, ellipsoid in outline, black $\frac{1}{10}$ in. long. *Style* and branches short.

Saharanpur (Duthie); Moradabad (Thomson); Dehra Dun (Duthie, Gamble); Cawnpore (Duthie); Jhansi (Duthie); Aligarh (Duthie). *DISTRIB.*: In many parts of India, especially in rice fields and in the warmer parts of the Old World.

var. PANICIFORMIS C. B. Cl. in F. B. I. vi, p. 607.

Spikelets short reduced to 2—4 nut-bearing flowers and arranged on the ultimate inflorescence branch in a narrow drawn out spike.

Aligarh (Duthie); Moradabad (Thomson); Saugor C. P. (Witt.).

10. C. eleusinoides, *Kunth Enum. ii, 39; F. B. I. vi, 608; Cooke Fl. Bomb. ii, 868.*

An erect glabrous perennial with a short horizontal rhizome covered with scale sheaths which tend to break up into fibres. Stem bases covered with leaf-sheaths of which the outermost tend to become fibrous at the base; sheaths closed with truncate mouth; blades linear tapering in the upper part to an acuminate apex, up to 2 ft. long and $\frac{1}{8}$ in. broad but usually much less, midrib conspicuous and sharply keeled below, 2 lateral veins prominent on the upper surface. Flowering stem sharply triangular. *Inflorescence* a compound umbel with primary rays up to 7 ins. long (very unequal); primary bracts numerous leaf-like, very various in length and breadth, 3 or 4 usually longer than the inflorescence; ultimately the spikelets arranged in a spicate manner. *Spikelets* linear about $\frac{2}{3}$ in. long and $\frac{1}{2}$ in. broad, pale brown in colour; each internode of the rachis laterally flattened with a broad hollow which holds the nut and is surrounded on two sides by hyaline wings. The two lowest glumes usually empty and reduced flowering glumes elliptic when spread out, acuminate, with a broad keel. *Stamens* 3. *Nut* ellipsoid-trigonous, $\frac{1}{8}$ in. long; style divided into 3 branches almost to the base.

Dehra Dun (Duthie); Moradabad (Thomson); Merwara (Duthie, Lowrie); Saharanpur (Royle). *DISTRIB.*: Most of India south of the Himalaya, Ceylon; tropical and warmer parts of Asia, Africa and Australia.

11. C. radiatus, *Vahl. Enum. ii, 369; F. B. I. vi, 617; Prain Beng. Pl. 1145.*

An erect glabrous herb 1—6 ft. high. Stem-bases covered with dark red-brown not fibrous leaf-sheaths, stems triquetrous striated smooth. *Leaves* linear tapering to an acuminate apex up to $\frac{2}{3}$ the length of the stem $\frac{1}{8}$ — $\frac{1}{4}$ in. wide smooth or with a slight asperity on the margins, midrib and two chief lateral veins. *Inflorescence* a compound umbel with the spikelets ultimately arranged in sessile spikes; primary rays 1 to 3 ins. long; primary bracts 4 to 6, leaf-like but rougher, unequal in length; bracts of secondary umbel narrowly linear, acuminate; spikelets cylindrical averaging $\frac{1}{2}$ in. long, rachilla with

hyaline wings. The two lowest glumes empty hyaline broadly sub-orbicular; flowering glumes suborbicular in outline when spread open $\frac{1}{2}$ in. long, apex rounded, the keel running out into an acute apiculus, nerves very obscure. *Stamens* 3. *Nut* ellipsoid in outline, acutely trigonous about $\frac{1}{2}$ the length of the glume; style divided more than half way down, with the 3 branches about $\frac{1}{2}$ in. long.

Agra (Munro). *DISTRIB.*: Gangetic Plain to Malay Peninsula, Africa, America.

12. *C. exaltatus*, Retz. Obs. v. 11; F. B. I. vi, 617; Prain Beng. Pl. 1145; Collett Fl. Siml. 558; Cooke Fl. Bomb. ii, 872.

A tall glabrous herb up to 3 ft. in height, with numerous adventitious roots; stem bases covered with dark brown not fibrous sheaths, triquetrous, smooth, striated. Leaf-blades linear, tapering to an acuminate apex, up to as long as the stems or shorter, $\frac{1}{4}$ — $\frac{1}{2}$ in. broad, slightly rough on the margins. *Inflorescence* a once or twice compound umbel of spikes, primary rays up to 6 ins. long; spikes usually 1 to 2 ins. long; primary bracts up to 6 in number, leaf-like, unequal, secondary bracts much shorter and narrower. *Spikelets* linear, from $\frac{1}{8}$ — $\frac{1}{2}$ in. long, rachilla with narrow persistent wings. The two lowest glumes in each spikelet narrow, linear, and empty, usually persistent. *Glumes* broadly ovate when spread out, with a prominent mucro, $\frac{1}{2}$ in. long, chestnut-brown with a green keel, obscurely 3 nerved. *Stamens* 3. *Nut* ellipsoid in outline, less than $\frac{1}{2}$ the length of the flowering glume, with 3 prominent angles; style divided about $\frac{1}{2}$ way down, with the 3 branches $\frac{1}{2}$ in. long.

Moradabad (Thomson); Agra; Shahjahanpur (Duthie); Bundelkhand (Duthie); Aligarh (Duthie); Merwara (Duthie). *DISTRIB.*: Most parts of India and general in trop. and sub-trop. regions.

13. *C. digitatus*, Roxb. Fl. Ind. i, 205; F. B. I. vi, 618; Prain Beng. Pl. 1145; Cooke Fl. Bomb. ii, 873.

A tall glabrous herb, $1\frac{1}{2}$ to 4 ft. high. Rhizome short horizontal. Stem triquetrous above, smooth, striated, covered at the base with coarse not fibrous usually dark leaf-sheaths. Leaf-blades linear tapering above to an acuminate apex, variable in length and width, sometimes as long as the stem, often shorter, up to $\frac{1}{2}$ in. broad, smooth, midrib well marked and keeled below, numerous lateral veins. *Inflorescence* a compound umbel of spikes, primary rays $\frac{1}{2}$ to 7 ins. long very unequal in the same inflorescence; primary bracts 6 to 8, leaf-like often broad at the base, unequal in length and width the largest much longer than the rays; secondary bracts narrower. Spikes 1 to 2 ins. long composed of numerous spikelets which for the most part do not overlap but spread at right angles. *Spikelets* linear usually about $\frac{1}{4}$ in. long rarely much longer, narrow hyaline wings are decurrent down the rachilla from the flowering glumes. Lowest glumes empty, narrower and more hyaline than the rest; flowering glumes oblong-elliptic when spread out, apex obtuse with the rounded nerved reddish green keel running out into a short apiculus, sides hyaline. *Stamens* 3, anthers narrowly linear-oblong,

scarcely crested. *Nut* oblong-obovoid, about half the length of the glume; style divided to about the middle, with the 3 branches about $\frac{1}{8}$ in. long.

Moradabad (Thomson); Dehra Dun (Royle); Pilibhit (Inayat).
DISTRIB.: From Punjab to Assam, Ceylon and most tropical regions.

14. *C. rotundus*, L. Sp. Pl. 45; F. B. I. vi, 614; Prain Beng. Pl. 1145; Cooke Fl. Bomb. ii, 871; Collett Fl. Siml. 557.

An erect glabrous very variable herb from a few inches to 2 or 3 feet in height. Stem bases usually thickened in a nodose manner and passing below abruptly into a stiff rhizome and covered with the more or less fibrous remains of the leaf-sheaths; stolons slender 3 to 4 ins. or more in length covered with usually loose fitting brown cataphylls which are many nerved and split right down one side; subterranean tubers ovoid about $\frac{1}{2}$ in. long and hard. *Leaves* usually shorter than the stem, linear, tapering in the upper part to a slender acuminate apex, from $\frac{1}{12}$ to $\frac{1}{2}$ in. broad. *Inflorescence* an umbel of more or less condensed spikes, the primary rays mostly developed but varying considerably, from $\frac{1}{2}$ to 4 ins. in length; bracts leaf-like, unequal, about three usually exceeding the umbel. *Spikelets* from $\frac{1}{4}$ to $1\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad, most often dark chestnut brown in colour sometimes pale straw-colour, the glumes decurrent down the rachis of the spikelets as hyaline wings. *Glumes* boat-shaped, obtuse or subacute with a slight mucro, $\frac{3}{8}$ in. long, keel rounded with several nerves. *Stamens* 3. *Nut* obovoid-ellipsoid in outline, with 3 flat or very slightly concave sides, $\frac{1}{18}$ in. long, style with its 3 branches $\frac{1}{2}$ in. long, divided more than half-way down.

Bahraich (Harsukh); Meerut (Thomson); Dehra Dun (Duthie, Gamble and others); Etawah; Pilibhit (Inayat); Kheri, Saharanpur, Agra, Ajmer (Lowrie). **DISTRIB.:** Throughout India and all warm regions.

15. *C. esculentus*, L. Sp. Pl. 67; F. B. I. vi, 616.

An erect glabrous herb up to 20 ins. in height with slender subterranean stolons more or less covered with acute rather hard strongly veined scales and ending in ovoid to cylindrical edible tubers up to $\frac{1}{2}$ in. in length. Stem-base pale brown, leaf-sheaths not fibrous, stems triquetrous, smooth, finely striated. Leaf-blades shorter than the stems, linear and gradually tapering in the upper part to a fine acuminate apex, $\frac{1}{8}$ to $\frac{1}{2}$ in. in width. *Inflorescence* primarily umbellate, of sessile and peduncled spikes the rays up to 3 ins. in length, primary bracts about 4, unequal, leaf-like, the longest up to 4 ins. or more. Spikes rarely exceeding 1 in. and most often simple, the first glumes (or secondary bracts) of the lowest spikelets sometimes with a short narrow leafy blade. *Spikelets* linear, about $\frac{1}{2}$ in. long or shorter, $\frac{1}{8}$ in. wide; rachis slender with narrow hyaline wings. The two lowest glumes of each spikelet linear-lanceolate, acuminate. Flowering glumes boat-shaped, with a rounded or slightly emarginate apex, $\frac{1}{8}$ in. long, $\frac{1}{8}$ in. in breadth when spread out, 3 lateral nerves on each side of the keel nerve. *Stamens* 3. *Style* divided

to below the middle, with its three branches $\frac{1}{2}$ in. long. Nut obovoid-ellipsoid in outline with 3 sharp angles, $\frac{1}{8}$ in. long.

Moradabad (Thomson); Dehra Dun (Duthie). **DISTRIB.:** From the Ganges Plain to the Nilgiri Mountains. S. Europe, Africa, America.

16. C. pilosus, Vahl, *Enum. ii* (1806) p. 354; *F. B. I. vi*, 609; *Prair Beng. Pl.* 1143.

Perennial, stolons long with distant nodes and scales. Stems 2—3 ft. high, acutely triquetrous, clothed at the base with the loose membranous sheaths. *Leaves* $\frac{3}{4}$ of the length of the stem or sometimes exceeding it, $\frac{1}{4}$ — $\frac{1}{2}$ in. wide, scabrid on the margins. *Inflorescence* a simple or once compound umbel, primary rays usually about 2 in. long but variable sometimes 9 in. long, primary bracts 3—5, unequal, the longest up to 15 in. leaf-like, rachis of the spikes hispid-pilose. *Spikelets* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, $\frac{1}{16}$ in. broad, crowded, straw-colored or reddish, spreading at right angles to the rachis. The lowest glume usually converted into a setaceous bract of variable length. Flowering glumes scarcely $\frac{1}{2}$ in. long broadly ovate when spread flat, tip rounded but the obscure keel minutely excurrent, 3—7-nerved on the back. *Stamens* 3. *Nut* $\frac{1}{10}$ in. long, acutely trigonous, black, apiculate, style with its branches $\frac{1}{2}$ in. long, divided more than half way down.

Dehra Dun (Parker) fairly common. Haldwani (Parker). **DISTRIB.:** Old World tropics.

17. C. procerus, Rottb. *Desc. et Icon.* (1773) p. 29, t. 5; *F. B. I. vi*, 610; *Prair Beng. Pl.* 1143.

Perennial, stolons elongate, clothed with long acuminate scales. Stems 2—3 ft. long, acutely triquetrous, clothed at the base with the membranous somewhat fibrous sheaths. *Leaves* often exceeding the stem, thick coriaceous or somewhat spongy $\frac{1}{4}$ — $\frac{1}{2}$ in. wide. *Inflorescence* a simple or once compound umbel of spikes, primary rays 1—4 in. long, primary bracts about 3 very unequal, the longest up to 15 in. leaf-like. *Spikelets* $\frac{1}{2}$ —1 in. long, $\frac{1}{8}$ in. broad, not crowded, straw-colored or reddish, spreading at right angles to the rachis, rachilla flattened, not winged. *Glumes* broadly elliptic in outline when spread flat, boat-shaped, sides and tip with a narrow hyaline margin, 2—3 nerved on either side of the closely 3-nerved keel, $\frac{1}{10}$ — $\frac{1}{8}$ in. long. *Stamens* 3. *Nut* obovoid, trigonous, $\frac{1}{16}$ in. long, yellowish-brown, style with its branches $\frac{1}{2}$ in. long, divided more than half way down.

Dehra Dun (Parker). The only specimen from our area has the rachis of the spikes scabrous-pilose (var. *lasiorrhachis*, C. B. Clarke). **DISTRIB.:** Eastwards to Indo-China and south to Java.

18. C. tegetum, Roxb. *Fl. Ind. i*, 208; *F. B. I. vi*, 613; *Prair Beng. Pl.* 1144; *Collett Fl. Siml.* 557; *Cooke Fl. Bomb. ii*, 870.

An erect glabrous plant. Rhizome short horizontal, covered with dark-brown cataphyllary sheaths which may later become somewhat fibrous; the main adventitious roots wiry and bearing numerous much branched lateral roots. Stem-bases covered with pale-brown,

membranous, often rather long, not fibrous sheaths with very oblique mouths; stems solitary leafless except at the base, up to 5 ft. high but generally shorter, with fine longitudinal striations. *Leaves* with the blades generally much reduced giving a rush-like appearance to the plant, when present the blades vary considerably in length and in breadth according to the luxuriance of the plant, margins serrulated, midrib conspicuous glabrous. Rays of the primary umbel 1 to 6 ins. long, ending in spikes or panicles of spikelets, the secondary rays often with a tubular cladoprophyll at the base. *Spikelets* up to $\frac{5}{8}$ in. long, $\frac{1}{10}$ in. broad, up to 30 flowered; the flowering glumes are produced laterally beyond their central point of insertion as 2 well marked, deciduous, reddish brown subhyaline wings. *Glumes* oblong-ellipsoid obtuse, $\frac{1}{2}$ in. long, $\frac{1}{10}$ in. broad, keel rounded, green with 3 to 5 nerves, sides chestnut brown without nerves and with narrow scarious margins. *Stamens* 3; anthers linear up to $\frac{1}{2}$ in. long often shorter, slightly crested. *Nut* oblong-ellipsoid $\frac{1}{10}$ in. long, trigonous; style with its 3 branches $\frac{1}{2}$ in. long divided low down.

Bundelkhand (Duthie No. 6488, 6488a, 6487, 7050); Jhansi (Duthie); Gwalior (Maries); Haldwani (Parker). Throughout India, Burma and Ceylon.

19. *C. distans*, L. f. Suppl. 103; F. B. I. vi, 607; Prain Beng. Pl. 1143; Collett, Fl. Siml. 557.

An erect glabrous plant averaging 2 ft. in height with a usually short and horizontal rhizome and stolons with dark brown elliptic acute imbricating scales. Stem bases covered with pale brown persistent leaf-sheaths which have the truncate or slightly oblique mouths closed. *Leaves* varying considerably in length and breadth and texture according to habitat, usually shorter than the flowering stem and from $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, the midrib prominent on the lower surface and two lateral veins on the upper. The inflorescence usually large, much branched, and up to 13 ins. in diameter but frequently more reduced; the primary and secondary rays are arranged in an umbellate manner and are of unequal lengths in the same inflorescence, the primary being up to 8 ins. long; the spikelets arranged in a loose spicate manner on the ultimate branches; primary and secondary bracts leaf-like, unequal, about 6, the primary often much longer than the inflorescence and correspondingly broad. *Spikelets* $\frac{2}{3}$ to 1 in. long, $\frac{1}{8}$ in. broad, spreading nearly at right angles when mature, glumes scarcely overlapping, rachis slender glabrous with hyaline wings on the sides of the internodes opposite the glumes. *Glumes* broadly elliptic in outline when spread open rounded at the apex $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. in breadth, red in colour, keel rounded with 3 nerves. *Stamens* 3. *Nut* narrowly ellipsoid trigonous, $\frac{1}{10}$ in. long, dark brown to black; style with branches $\frac{1}{10}$ in. long, the undivided part short.

Moradabad (Duthie); Dehra Dun (Duthie); Saharanpur (Royle); Merwára; Haldwani (Parker). **DISTRIB.:** Throughout most of India and the warmer parts of the world.

20. C. corymbosus, Rottb. *Descr. et Ic.* 42, t. 7, fig. 4. *F. B. I.* vi, 612; *Prain Beng. Pl.* 1144; *Cooke Fl. Bomb.* ii, 870.

A tall glabrous rush-like plant. Rhizome more or less horizontal, completely covered with broad, brown, loose, sheathing scales which are generally not fibrous, from below rather stout adventitious roots arise. Stem-bases covered with brown to straw-coloured generally not fibrous sheaths with oblique mouths, the upper ones long and often ending in a more or less developed blade; stems up to 5 ft. in height, smooth, longitudinally striated, trigonous, with sharper edges towards the apex. Leaf-blades usually much reduced but sometimes well developed and linear, acute with serrated margins. *Inflorescence* primarily umbellate, the primary rays up to 8 in. long and some very short, the primary rays again sometimes branch in a subumbellate manner and sometimes end in spikes of spikelets; primary bracts 2 to 3 leaf-like up to $\frac{1}{2}$ the length of the inflorescence but usually markedly shorter than it, the secondary bracts are usually tubular sheaths. *Spikelets* up to 1 in. long but generally shorter, linear, pale-brown or straw-coloured, from 10 to 40 flowered. The two lowest glumes smaller, flowering glumes ovate when spread out, sub-obtuse, $\frac{1}{2}$ in. long, $\frac{1}{12}$ in. broad, keel broad, rather rounded with several nerves, sides scarious. *Stamens* 3, anthers linear, mucous. *Nut* $\frac{1}{16}$ in. long narrowly obovoid, trigonous; style with its 3 branches $\frac{1}{8}$ in. long divided about half way down.

Bundelkhand, Jhansi (Duthie), Gonda (Inayat). *DISTRIB.*: Northern India, Ceylon and most of tropical Asia, Africa and America.

21. C. bulbosus, Vahl, *Enum.* ii, 342; *F. B. I.* vi, 611; *Cooke Fl. Bomb.* ii, 871. *C. jeminicus*, Retz. *Obs.* iv, 11, non Rottb.

An erect perennial glabrous herb; slender thread-like stolons up to 3 ins. long; bulbs when mature covered with black sharply acuminate scale-leaves. *Leaves* arising all in the lower part of the stem, about $\frac{1}{2}$ to 2 ins. above the bulb covered with smooth closed leaf-sheaths, blades narrowly linear, gradually tapering to a slender acuminate apex, shorter than the flowering stem. *Inflorescence* sometimes with short primary rays arranged in an umbellate manner, most often with tufts of 2—3 sessile spikelets arranged as a spike. *Spikelets* linear about $\frac{1}{2}$ in. long, chestnut-brown, the glumes continued down the internodes of the rachis as hyaline wings. *Glumes* elliptic when spread out, $\frac{1}{8}$ in. long, obtuse. *Stamens* 2—3. *Nut* obovoid, trigonous, black, about half as long as the glume; style divided into 3 rather long branches nearly to the base.

Cawnpore (Duthie); Aligarh (Duthie); Agra. *DISTRIB.*: Central and S. India, Ceylon, tropical Asia, Africa and Australia.

2. PYCREUS, Beauv.; *Fl. Brit. Ind.* vi, 589.

Perennial or annual herbs, tufted or with decumbent stems or horizontally running rhizomes. Stem bases covered with leaf-sheaths many of which have no fully developed blades. The inflorescence

consists usually of numerous spikelets arranged more or less in a simple or compound umbellate manner. The spikelets are each composed of numerous glumes arranged in 2 ranks on the rhachis. The lowest two glumes are usually empty and often somewhat different in shape and size from the upper (flowering) glumes. Each flower consists of 2 or 3 stamens and an ovary tipped by a bifid style. The nut is compressed laterally, the 2 sides being practically equal, both convex and placed right to left in relation to the rhachis of the spikelet. Species about 85 in most hot and temperate regions.

Glumes obtuse.

Stems erect, cæspitose; leaves arising near the base of the stems; nut elliptic in outline when viewed laterally

1. *P. globosus*.

Stems often decumbent at base; leaves arising from the stems up to $\frac{1}{2}$ of their length; nut broadly obovate in outline when viewed laterally

2. *P. sanguinolentus*.

Glumes mucronate

3. *P. pumilus*.

1. *P. globosus*, Reich. *Fl. Germ. Excurs.* 140-10 (1830-2). *P. capilaris*, Nees in *Linnaea*, IX, 283 (1834); *F. B. I.* vi, 591; *Prain Beng. Pl.* 1137; *Collett, Fl. Siml.* 553. *Cyperus globosus*, *All. Auct. Fl. Pedem.* 49 (1789); *Cooke Fl. Bomb. ii*, 857.

A cæspitose, erect growing, glabrous plant up to 16 ins. high. Roots fibrous. Stem-bases covered with 1 or 2 brown sheathing cataphylls without blades or with short ones. *Leaves* all arising near the base of the stem; blades narrow linear, up to 6 ins. long but usually much shorter, slender almost filiform; sheaths about 1 in. long, closed, with a truncate mouth. *Spikelets* often numerous, arranged in a simple or compound nearly umbellate inflorescence, many-flowered, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad; bracts 2—3, often very unequal, up to 7 ins. in length. *Glumes* ovate, with a green keel, obtuse, $\frac{1}{10}$ in. long, nearly $\frac{1}{10}$ in. broad. *Stamens* 2. *Style* with arms $\frac{1}{12}$ in. long. *Nut* ellipsoid when viewed laterally, strongly compressed, $\frac{1}{12}$ in. long, pale brown in colour.

Moradabad (T. Thomson), Gonda (Harsukh), Shikohabad (Duthie), Pilibhit (Inayat), Dehra Dun (Duthie), Meerut (Duthie), Kheri (Inayat), Saharanpore.

There is a considerable variety in the size, shape and colour of the spikelets, but I have not been able to follow C. B. Clarke in limiting the varieties as he does in the *Flora of British India*. The variety *nilagiricus*, which I have not seen from our area but which probably occurs there, may usually be recognised by the dark colour of the spikelets. The variety *strictus*, to which Clarke has referred the Moradabad plant, appears to be connected with the type by all grades of intermediates. It is said to be characterised by having narrower, straw-coloured or yellow spikelets, less compressed, frequently short, 6—12-flowered, sometimes curved or twisted and the glumes closely packed but loosely imbricate.

DISTRIB.: Throughout India, Ceylon and most of the temperate and tropical regions of the old world.

2. *P. sanguinolentus*, *Nees in Linnæa IX*, 283; *F. B. I. vi*, 590; *Prair Beng. Pl.* 1137; *Cooke Fl. Bomb. ii*, 856; *Collett, Fl. Siml.* 553.

An erect glabrous annual or perennial herb up to 14 ins. high. Roots fibrous and usually tufted. Rhizome very short or none or elongated and covered by brown leaf-sheaths, sometimes the stem is decumbent and roots at the nodes. *Leaves* all arising from the lower third of the stems, blades linear, up to $3\frac{1}{2}$ ins. long, usually less, sheaths closed, with a truncate mouth. *Spikelets* 8 to 30 in an apparently simple to obviously compound head, each 10 to 20 flowered, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, about $\frac{1}{8}$ in. broad; bracts 3 to 4, unequal, leaf-like and up to $3\frac{1}{2}$ ins. long. *Glumes* light brown, broadly boat-shaped, obtuse, $\frac{1}{10}$ in. long, $\frac{1}{10}$ in. wide when spread out, keel rounded below, sharp above, with three green nerves converging to the apex. *Stamens* 3. *Style* including arms $\frac{1}{10}$ in. long. *Nut* broadly obovate in outline when viewed laterally in which plane it is strongly compressed, dark dull brown, $\frac{1}{10}$ in. long and $\frac{1}{8}$ in. diameter measured from front to back.

Dehra Dun (Duthie), Saharanpur (Parker). **DISTRIB.:** Throughout India and the warmer parts of the Old World.

3. *P. pumilus*, *Turrill, in Kew Bull.* 1922, p. 124; *Cyperus pumilus*. *L. Amœn. Acad. iv.* (1788) 302, et *Sp. Pl. ed. 2*, 69 et *herb. propr.* *Cyperus pulvinatus*, *Nees et Meyon in Wight Contrib.* (1834) 74; *Pycrus pulvinatus*, *Nees in Linnæa IX* (1834) 283; *Pycrus nitens*, *Nees, l. c.* and *C. B. Clarke in F. B. I. vi*, 591.

A small annual glabrous plant, 1–10 ins. high. Stems tufted often numerous, slender, bases covered with not fibrous, rather close-fitting often reddish sheaths. *Leaves* tapering to a fine acuminate apex, linear, variable in length, $\frac{1}{10}$ — $\frac{1}{2}$ in. broad, with a prominent midrib. *Inflorescence* an umbel of spikes, primary rays up to 3 ins. long but usually much shorter, ending in spikes of 3 to 30 spikelets; primary bracts about 3, leaf-like, unequal, generally much overtopping the inflorescence and up to $4\frac{1}{2}$ in. long. *Spikelets* linear, compressed, 6 to 40 flowered, up to $\frac{7}{8}$ in. long, about $\frac{1}{10}$ in. broad, rachilla not winged. Lowest glumes empty, smaller; flowering glumes $\frac{1}{8}$ to $\frac{1}{2}$ in. broad, ovate in outline, keel herbaceous, well-marked, prolonged at the apex into a more or less prominent, slightly curved mucro, wings hyaline without nerves. *Stamen* generally 1. *Nut* $\frac{1}{10}$ in. long, obovoid or ellipsoid, laterally compressed, brown; style slightly longer than the nut, divided into 2 arms to just below the middle.

Moradabad (Thomson); Dehra Dun (Gamble, Duthie); Saharanpur (Parker); Shahjahanpur (Duthie); Shikohabad (Duthie); Haldwani (Parker).

3. JUNCELLUS, C. B. Clarke; Fl. Brit. Ind. vi, 594.

Perennial erect herbs, tufted or with horizontally running rhizomes. Stems erect, simple and leafy below. The inflorescence is very varied

and consists of usually many (sometimes reduced to 1) spikelets arranged in compact terminal or unilateral heads or more or less in compound umbellate manner or sometimes the primary and secondary branches are in umbels and the spikelets themselves in spikes. The spikelets are each composed of numerous glumes arranged in 2 ranks on the rachis. The lowest 2 glumes are usually empty and often different in shape and size and from the upper (flowering) ones. Each flower consists of 2 or 3 stamens and an ovary surrounded by a bifid or nearly entire style. The nut compressed back to front in relation to the axis, the adaxial side being flat, the abaxial more or less convex.

Species about 15 in most hot and temperate regions.

I have followed C. B. Clarke in retaining this genus although I do not consider it a phylogenetic unit but rather an agglomeration of species related to different groups of species in the genus *Cyperus*. Its characters, however, are definite and even if they are artificial accepting them as generic helps to make the large genus *Cyperus* less unwieldy.

Leaf-blades flat, with well developed, long, broad blades; inflorescence of numerous spikelets arranged in spikes which in turn form a compound umbel

1. *J. alopecuroides*.

Leaf-blades narrow, flat or more or less trigonous; inflorescence a head of spikelets (rarely reduced to a solitary one).

Leaf-blades trigonous or subcylindrical often much reduced; inflorescence a one-sided head of spikelets or sometimes a solitary one

2. *J. lævigatus*.

Leaf-blades flat and narrow, well developed; inflorescence a dense head of small spikelets surrounded by leaf-like bracts

3. *J. pygmaeus*.

1. *J. alopecuroides*, C. B. Cl. in F. B. I. vi, 595; *Cyperus alopecuroides*, Rottb. *Descrip. et Icon.* (1773) 38.

An erect-growing, glabrous, marsh plant, about 25 ins. high. Roots forming a dense fibrous mass. Stems covered at the base with broad, brown leaf-sheaths. Leaves linear, gradually acuminate, up to $\frac{1}{2}$ in. broad, with 3 prominent and many secondary parallel nerves, smooth; leaf-sheaths usually split down one side by the growing stem. Spikelets pale brown, ultimately in compact spikes 1—1 $\frac{1}{2}$ ins. long which are arranged in a compound inflorescence, primary and often secondary branches arranged in an umbellate manner, primary rays up to 5 ins. long; primary bracts 3, leaf-like and over-topping the inflorescence, more or less unequal in length; secondary bracts narrowly linear, sometimes much reduced. First glume empty, linear-lanceolate, acuminate. Second glume suborbicular, with a rounded apex. Flowering glumes boat-shaped with a rounded keel, suborbicular in outline when spread open, acute or slightly apiculate, $\frac{1}{2}$ in. long and broad. Stamens 2. Style including the 2 long arms $\frac{1}{8}$ in. long. Nut broadly obovate, $\frac{1}{3}$ in. long, and $\frac{1}{10}$ in. broad, flat on the adaxial side and slightly rounded on the abaxial.

Saharanpur (Royle), Moradabad (Thomson), Ajmer (Lowrie), Bundelkhand (Duthie). **DISTRIB.:** Most of India, Ceylon, Africa and Tropical Australia.

2. J. lævigatus, *C. B. Cl. in F. B. I. vi, 596.* *Cyperus lævigatus, L., Mant. 179; Cooke Fl. Bomb. ii, 860.*

An erect-growing, glabrous plant up to 16 ins. high. Rhizome sometimes short when the plant has a caespitose habit, sometimes horizontally extended and then covered with dark-brown sheathing, entire cataphylls. Stems usually arising 2—4 together from the rhizome, covered at the base with entirely closed leaf-sheaths which have truncate mouths and often undeveloped or only slightly developed blades, when these are present they are of various lengths and usually stiff and triangular or subcylindrical, acute or sub-acute. *Spikelets* up to 12 in a compact, one sided head, sometimes solitary, in our specimens up to nearly $\frac{1}{2}$ in. long, often much shorter, about $\frac{1}{10}$ in. broad, pale-straw coloured; bracts 2, with broad open sheathing bases, one about $\frac{1}{2}$ in. long with a slightly developed blade, the other up to $1\frac{1}{2}$ ins. long. *Glumes* broadly ovate with a rounded keel, acute, about $\frac{1}{10}$ in. long and $\frac{1}{2}$ in. broad. *Stamens* 3, anthers with an apiculus. *Style* $\frac{1}{12}$ in. long, simple or slightly bifid at apex. *Nut* broadly ellipsoid in outline, flattened on the adaxial side, convex on the abaxial, $\frac{1}{10}$ in. long, brown, smooth.

Saharanpur (Royle, 5, 59), Meerut (Thomson), Moradabad (Thomson), Gwalior (Maries), Merwára (Duthie), Bundelkhand (Duthie). **DISTRIB.:** Throughout Western India and in most warm regions.

3. J. pygmæus, *C. B. Cl. in F. B. I. vi, 596; Prain Beng. Pl. 1138.* *Cyperus pygmæus, Rottb. Descrip. et Icon. p. 20, t. 14, f. 5 (1773); Cooke Fl. Bomb. ii, 859.*

An erect annual plant with numerous stems close together in tufts up to 8 ins. high, but usually shorter. Each stem-base is covered by entire broad sheathing often reddish leaf-bases. Leaf-sheaths loose-fitting with oblique mouths, blades narrowly linear, acuminate, up to $4\frac{1}{2}$ ins. long, $\frac{1}{12}$ in. broad. *Inflorescence* a dense solitary terminal head $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter and composed of numerous spikelets surrounded by 3 to 5 long unequal bracts which are leaf-like but broader towards the base, more reduced very narrow bracts frequently arise from among the spikelets. Each spikelet about $\frac{1}{2}$ in. long of about 18 glumes arranged in two ranks. *Glumes* $\frac{1}{12}$ in. long, narrowly boat-shaped with rounded keels, acute or with a thickened slightly acuminate apex. *Stamens* 1—2. *Nut* ellipsoid $\frac{1}{8}$ in. in length, surmounted by a 2-armed style $\frac{1}{10}$ in. long.

Delhi (Royle), Agra (Jameson), Ajmer (Lowrie), Bundelkhand (Duthie), Etawa (Duthie), Moradabad (Thomson), Kheri (Inayat), Pilibhit (Inayat), Haldwani (Parker). **DISTRIB.:** Kashmir to Burma and Ceylon, and most warm regions except S. Europe.

This plant is exceedingly like *Scirpus Michelianus*, Linn. but the flowers are distichous, in *S. Michelianus* the flowers are spirally arranged and the nut oblong or fusiform.

Quite glabrous, except the glume keels, generally with long, slender, horizontally running rhizomes which are covered with brown not fibrous, acute scale-leaves. Stems $3\frac{1}{2}$ to 12 ins. high, covered towards the base with leaf-sheaths which are usually brown, shiny and not fibrous. *Leaves* linear, about $\frac{1}{16}$ in. in breadth and generally shorter than the stem, acuminate. Bracts up to 2 to 4 ins. long, very similar to the leaves. *Spikes* oblong-cylindrical, about $\frac{1}{16}$ in. long and $\frac{1}{4}$ in. in diameter, usually simple. *Spikelets* lanceolate or ovate-lanceolate, about $\frac{1}{4}$ in. in length, containing one flower. The lowest glumes empty and subequal, obtuse, about $\frac{1}{2}$ in. long. Third glume boat-shaped acuminate, $\frac{1}{16}$ in. long, 2 nerves on either side of the keel which is serrated. Fourth glume slightly larger, thinner in texture and with the nerves scarcely marked. *Stamens* 2. *Nut* obovate-ellipsoid, strongly compressed laterally, about $\frac{1}{16}$ in. long; style with two filiform arms, about $\frac{1}{3}$ in. long.

Dehra Dun (Gamble), Saharanpur (Jameson), Moradabad (Thomson), Haldwani (Parker). *DISTRIB.*: Throughout India and Ceylon and in most tropical or subtropical regions.

3. *K. monocephala*, Rottb. *Descr. et Ic.* 13, t. 4, fig. 4; *F. B. I.* vi, 588; *Prair Beng. Pl.* 1135; *Cooke Fl. Bomb.* ii, 876; *C. B. Clarke Ill. Cyp.* t. II, fig. 1-2.

An erect glabrous plant (except the glume keels), with well-developed rhizomes either long and slender or shorter and stouter and covered with brown, persistent, not fibrous, scale leaves. Stems up to 12 ins. high, slender, covered with leaves only at the base; leaf-sheaths pale brown not fibrous. *Leaves* linear, $\frac{1}{16}$ to $\frac{1}{4}$ in. in breadth and often as long as the stem, acuminate, rough on the midrib and margins. Bracts 3 to 4, unequal up to 10 ins. long, similar to the leaves. *Spikes* subglobose, about $\frac{1}{4}$ in. in diameter, solitary. *Spikelets* obliquely lanceolate-elliptic, $\frac{1}{8}$ in. long, containing one flower. The lowest glume hyaline with 3 to 5 nerves on each side of the midrib, about $\frac{1}{16}$ in. long. The second glume similar but narrower and more acute. The third glume boat-shaped, acuminate, with 3 well-marked nerves on each side of the prominently winged keel which is slightly serrated. Fourth glume slightly narrower and more elongated and with a less prominent wing to the keel. *Stamens* 2—3. *Nut* obovate, very much compressed $\frac{1}{16}$ in. long and $\frac{1}{16}$ in. broad; style flattened and relatively broad with short arms.

Dehra Dun (Duthie), Saharanpur, (Royle), Gonda, Haldwani (Parker), Bahraich (Duthie). *DISTRIB.*: Throughout India and Ceylon and widely spread in the warm and temperate regions of the Old World, except the Mediterranean.

5. *COURTOISIA*, Nees. *Fl. Brit. Ind.* vi, 625.

Herbs with erect simple stems and grass-like leaves. *Spikelets* compressed in globose spikes, rachilla disarticulating above the two lowest glumes. *Glumes* the two lowest usually empty, 1—3 following bisexual, winged on the keel, the uppermost sterile. *Stamens* 3, anthers oblong.

Style short persistent, stigmas 3, long. Nut trigonous, apex acute, continuous with the style. Species 2, India, Africa and Madagascar.

C. cyperoides, Nees, in *Linnaea* (1835) 286; *F. B. I.* vi, 625; *Prain Beng. Pl.* 1147; *Cooke Fl. Bomb.* ii, 877.

Annual, glabrous, tufted, roots fibrous. Stems 2 in. to 2 ft. high, triquetrous, glabrous. Leaves $\frac{1}{10}$ — $\frac{1}{8}$ in. broad, usually longer than the stem, sheaths membranous, deeply split. Umbels simple or compound, rays 3—10, 1—3 in. long, secondary rays 3—6, up to 1 in. long, bearing dense globose yellowish-brown heads composed of many short spikelets; bracts 3 or more of different sizes the longest much exceeding the rays. Flowering glumes usually 2, $\frac{1}{8}$ in. long, boat-shaped, keel prominently winged throughout its length, sides membranous, tip shortly cuspidate, usually only one glume nut-bearing. Nut $\frac{1}{8}$ in. long, narrowly trigonous-fusiform, beaked, brown, embraced by the glumes.

Bundelkhand (Duthie). **DISTRIB.:** Tehri-Garhwal (Gamble!) Central Provinces (Lowrie and others!) Assam, Madras, Burma and Madagascar.

6. MARISCUS, Vahl; *Fl. Brit. Ind.* vi, 619.

Perennial glabrous erect herbs, generally similar to *Cyperus* in most of their characters. Inflorescence a solitary head of spikelets or more commonly, and in all our species, umbellate, the primary or secondary rays terminating in compact heads of narrow spikelets; bracts similar to the leaves. Glumes 4 to 14, in two opposite rows, persistent on the rachilla, the 2 or 3 lowest and the uppermost empty, the flowering glumes 1 to 10. The axis of the spikelet disarticulating and falling off in fruit just above the 2 lowest empty glumes which are left on the main rachis. Bristles absent. Style 3-branched and nut 3-sided. Species about 160, in all warm regions.

Inflorescence a compound umbel with the secondary rays terminating in globular heads of narrowly linear spikelets, each of which bears 4 to 10 nuts

1. *M. dilutus*.

Inflorescence a simple umbel with rays terminating in cylindrical heads of spikelets, each of which bears 1 to 2 nuts

Rhizome not producing stolons. Spikelets each bearing 2 nuts

2. *M. cyperinus*.

Rhizome producing stolons. Spikelets each bearing 1 nut

3. *M. paniceus*.

1. M. dilutus, Nees in *Wight Contrib.* (1834) 90. *Cyperus dilutus*, Vahl. *Enum.* v. 2 (1806) 357; *Cooke Fl. Bomb.* ii, 875. *Mariscus microcephalus*, Presl. *Rel. Hænk.* i, 182; *F. B. I.* vi, 624; *Prain Beng. Pl.* 1147.

An erect perennial glabrous herb. Rhizome short. Stem 1—4 ft. high, obscurely trigonous, smooth, longitudinally striated. Leaves variable, linear, tapering to an acuminate apex, generally about as long as the stem, $\frac{1}{8}$ to $\frac{1}{4}$ in. broad, frequently somewhat spongy, margins

and keels more or less scabrid; sheaths broad, reddish-brown, not fibrous. Primary umbel large with numerous rays of various lengths up to 7 ins.; secondary umbels similar but the rays shorter and ending in compact spheroidal spikes about $\frac{3}{4}$ in. diameter and composed of numerous slender spikelets; primary bracts numerous, leaf-like but generally shorter and less spongy. *Spikelets* narrowly linear, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, terete, red-brown, bearing 2 to 10 nuts; rachilla slender provided with hyaline wings by the decurrent glumes, oblong lanceolate or elliptic, obtuse, $\frac{1}{8}$ in. long, $\frac{1}{16}$ in. broad, with faint longitudinal striations, keel rounded. *Stamens* 3. *Nut* narrowly oblong in outline, trigonous, narrowed above into an acute beak, $\frac{1}{12}$ — $\frac{1}{10}$ in. long; style with its 3 branches $\frac{1}{8}$ in. long.

Dehra Dun (Gamble), Moradabad (Thomson), Saharanpur, Shahjahanpur (Duthie), Haldwani (Parker). *DISTRIB.*: Throughout most of India and Tropical Africa.

2. *M. cyperinus*, *Vahl Enum. ii, 377; F. B. I. vi, 621; Collett, Fl. Siml. 558.*

An erect glabrous herb. Rhizome short, not producing stolons, covered with more or less fibrous sheaths. Stems about 1—2 ft. high, longitudinally striated, trigonous. *Leaves* linear tapering to an acute or acuminate apex, generally about as long as the stem, up to $\frac{1}{2}$ in. broad, margins and keel smooth or slightly scabrid, sheaths reddish, the lowermost fibrous. Umbel terminal, simple, composed of 6—12 rays of different lengths up to 2 ins. and terminating in dense cylindrical spikes up to 1 in. long but generally shorter and about $\frac{1}{4}$ in. in diam.; bracts leaf-like but often broader and more scabrid. *Spikelets* numerous, $\frac{1}{4}$ in. long, each ripening 2 nuts. The two lowest glumes empty, short; the third and fourth glumes nut-bearing, ovate when spread out, obtuse, nearly $\frac{1}{8}$ in. long, keel with 3 strong nerves, sides with reddish brown dots, and scarcely hyaline margins; the fifth glume very much reduced and empty. *Stamens* 3. *Nut* oblong-ellipsoid, slightly curved, trigonous, $\frac{1}{12}$ in. long; style with the three stigmatic branches about as long as the nut.

Moradabad (Thomson). *DISTRIB.*: N. W. India, Coromandel, Ceylon, Malay Peninsula and Trop. Asia and Polynesia; in Assam and Sikkim represented by the variety *bengalensis*, C. B. Cl.

3. *M. panicus*, *Vahl. var. Roxburghianus, C. B. Cl.; F. B. I. vi, 621; Cooke Fl. Bomb. ii, 875.*

An erect perennial glabrous herb. Rhizome short, more or less horizontal, covered with fibrous leaf-sheaths and giving rise to slender somewhat rigid stolons. Stem up to 2 ft. high, smooth, trigonous, frequently thickened into nodules at the base where it passes into the rhizome. *Leaves* generally shorter than the stem, up to $\frac{1}{2}$ in. broad; sheaths of the stem-leaves not fibrous, generally reddish. Umbel terminal, simple, composed of 6 to 21 rays of different lengths, up to 3 ins. and terminating in dense cylindrical spikes up to 1 in. long, but generally shorter, and $\frac{1}{4}$ in. diam.; bracts leaf-like but

often broader and more scabrid. *Spikelets* numerous, $\frac{1}{2}$ in. long, each ripening 1 nut. The two lowest glumes empty, short; the third glume nut-bearing, elliptical-lanceolate when spread out, nearly $\frac{1}{2}$ in. long, keel with 3 strong nerves, sides often with reddish-brown dots and hyaline margins; the fourth glume very much reduced and empty. *Stamens* 3. Nut oblong-ellipsoid, slightly curved, trigonous, $\frac{1}{12}$ — $\frac{1}{16}$ in. long, pale brown; style with the 3 stigmatic branches about as long as the nut.

Dehra Dun (Duthie, etc.), Saharanpur, Bahraich (Harsukh), Siwalik Range (Lowrie). Throughout most of India; Ceylon, Java.

7. HELEOCHARIS, R. Br.; Fl. Brit. Ind. vi, 625 (*Eleocharis*).

Stems simple, tufted erect. *Leaves* wanting, sheaths few cylindrical, truncate or with a small unilateral subapical tooth, non-flowering leaflike stems often present. *Inflorescence* a solitary (rarely more) ovoid or cylindrical terminal spikelet. *Glumes* imbricate on all sides of the rachilla, the lowest usually empty, bract-like, shorter than the spikelet. The lowest and several succeeding flowers bisexual, the upper imperfect. Hypogynous bristles 8—5 rarely fewer or 0. *Stamens* 1—3. *Style* base dilated, usually sharply constricted and apparently articulated on the nut but persistent. *Nut*, obovoid, plano-convex when the style is bifid, trigonous when the style is trifid. Species over 100, cosmopolitan.

Spikelets distinctly wider than the stems.

Spikelets $\frac{1}{10}$ — $\frac{1}{4}$ in. long, nut minute tipped by the minute style base

1. *H. atropurpurea*.

Spikelets $\frac{1}{2}$ —1 in. long, nut $\frac{1}{4}$ in. long, style base almost half as long as the nut

2. *H. palustris*.

Spikelets scarcely wider than the stem, glumes with narrow scarious margins

3. *H. plantaginea*.

1. *H. atropurpurea*, Kunth, Enum. ii (1837) 151; F. B. I. vi, 627; Prain Beng. Pl. 1149; Cooke Fl. Bomb. ii, 889.

Annual, stems 2—6 in. high, very slender, tufted, sheaths short, membranous. *Spikelets* $\frac{1}{10}$ — $\frac{1}{3}$ in. long, ovoid, much broader than the stem, rachilla slender, pitted. *Glumes* $\frac{1}{10}$ — $\frac{1}{8}$ in. long, broadly ovate oblong, obtuse, keel green, margins broad membranous dark colored. *Bristles* 4—7 as long as the nut, white, often wanting or very small. *Nut* minute $\frac{1}{10}$ — $\frac{1}{16}$ in. long, black, polished, obovoid, biconvex, tipped with the pale disciform style-base, style 2-fid.

Dehra Dun (Parker) common in drying up rice fields. Moradabad (Thomson), Shahjahanpur (Duthie). *DISTRIB.*: Most tropical countries.

2. *H. palustris*, R. Br. Prodr. Fl. Nov. Holl. (1810) 224 in obs.; F. B. I. vi, 628; Prain Beng. Pl. 1149; Cooke Fl. Bomb. ii, 890; Collett Fl. Siml. 559.

Stems 4—20 in. high $\frac{1}{8}$ — $\frac{1}{2}$ in. diam. tufted, longitudinally striate, sheaths membranous, truncate or sometimes produced as a small

triangular limb. *Spikelets* $\frac{1}{2}$ —1 in. long, ellipsoid or cylindrical, yellow or brown, wider than the stem, supported at the base by a bract continuous with the top of the stem and half-surrounding it, margin of the bract broad, scarious, rachilla stout. *Glumes* much imbricate, about $\frac{1}{2}$ in. long, ovate-lanceolate or elliptic, keel green margins broad hyaline or brown. *Bristles* 4—6, as long as the nut, brown, retrorsely scabrid. *Nut* $\frac{1}{2}$ in. long, broadly obovoid, biconvex, pale brown, tipped by the broadly conical style-base which is nearly half as long as the nut, style long, stigmas 2.

Saharanpur (Jameson), Aligarh (Duthie, Jameson), Kheri (Inayat).
DISTRIB.: Cosmopolitan except Australia.

3. *H. plantaginea*, R. Br. Prodr. Fl. Nov. Holl. (1810) 224 in obs.; F. B. I. vi, 625; Prain, Beng. Pl. 1148; Cooke Fl. Bomb. ii, 888.

Stems rush-like, 1—3 ft. high, terete, densely tufted, $\frac{1}{8}$ in. in diam. or rather more (up to $\frac{1}{2}$ in. when dried and pressed flat) longitudinally striate and distantly transversely septate when dry, sheaths membranous, soon torn and somewhat fibrous. *Spikelets* $\frac{1}{2}$ —1½ in. long, about the same diameter as the stem, pale straw color, supported at the base by an amplexicaul bract appearing continuous with the stem, rachilla stout angled. *Glumes* closely imbricate, $\frac{1}{2}$ in. long, persistent, oblong, obtuse with a narrow scarious margin, back striate, keel not prominent. *Bristles* 7, about as long as the nut, retrorsely scabrid. *Nut* $\frac{1}{2}$ in. long, light yellowish-brown, tipped by the persistent conical style base which is about $\frac{2}{3}$ as long as the nut, style very long, stigmas 2—3.

Moradabad (Thomson). DISTRIB.: tropics of the old world.

8. FIMBRISTYLIS, Vahl ; Fl. Brit. Ind. vi, 630.

Annual or perennial tufted herbs, roots fibrous or woody, stolons 0. *Leaves* near the base of the stem. *Inflorescence* terminal, umbellate or corymbose or of few or one spikelet. *Glumes* spirally imbricate or the lower distichous or subdistichous, the lower 1—3 and sometimes the upper empty, hypogynous bristles 0. *Stigmens* 1—3, filaments flattened. *Style* long, usually flattened and more or less villous on the edges, base dilated, 2 or 3 fid. *Nut* obovoid, biconvex or trigonous, with a more or less inconspicuous gynophore. Species about 125 in all warm regions.

Stigma 2, nut biconvex.

Spikelets solitary or 2—3.

Glumes glabrous.

Spikelets $\frac{1}{2}$ — $\frac{1}{2}$ in. long, *glumes* $\frac{1}{2}$ in. long, nut $\frac{1}{2}$ in. long

1. *F. scharnoides*.

Spikelets $\frac{1}{2}$ — $\frac{1}{2}$ in. long, *glumes* $\frac{1}{10}$ in. long, nut $\frac{1}{10}$ in. long

2. *F. diphylla* var. *annua*.

Glumes hoary

9. *F. ferruginea*.

- Spikelets numerous.
 Glumes glabrous.
 Nut with a minute gynophore or with none.
 Spikelets not exceeding $\frac{1}{4}$ in. nut not exceeding $\frac{1}{10}$ in.
 Spikelets not squarrose, style base glabrous.
 Leaves often as long as the stem, not coriaceous.
 Glumes $\frac{1}{10}$ in. long, concave, nut $\frac{1}{20}$ in. long. 2. *F. diphylla*.
 Glumes $\frac{1}{10}$ in. long, boat-shaped nut $\frac{1}{20}$ in. long. 3. *F. dichotoma*.
 Leaves always short, coriaceous 4. *F. spathacea*.
 Spikelets squarrose, style base with long pendent hairs 5. *F. squarrosa*.
 Spikelets $\frac{1}{2}$ — $\frac{1}{3}$ in. nut $\frac{1}{10}$ in. long 6. *F. rigidula*.
 Nut with a distinct gynophore 7. *F. podocarpa*.
 Glumes puberulous. 8. *F. fuscinox*.
 Tips of glumes spreading, not black 9. *F. ferruginea*.
 Tips of glumes incurved, nut brownish
 Stigmas 3, nut trigonous. 10. *F. monostachya*.
 Spikelets solitary
 Spikelets several to numerous.
 Spikelets discrete.
 Annuals, stems not flattened upwards.
 Lower glumes distichous, nut $\frac{1}{20}$ in. long 11. *F. tenera*.
 Glumes all spirally imbricate, nut $\frac{1}{20}$ in. long.
 Spikelets ellipsoid, subacute, glumes $\frac{1}{8}$ in. long. 12. *F. quinqueangularis*.
 Spikelets subglobose, obtuse, glumes $\frac{1}{10}$ in. long 13. *F. miliacea*.
 Perennial, stems flattened upwards 14. *F. complanata*.
 Spikelets or some of them in clusters of 2—5 15. *F. junciformis*.

1. *F. schoenoides*, Vahl, *Enum. ii* (1806) 286; *F. B. I. vi*, 634; *Prain Beng. Pl. 1153*; *Cooke Fl. Bomb. ii*, 880; *Collett, Fl. Siml. 560*.

Tufted 3—12 in. high, glabrous, stems slender, striate, leaves very narrow almost filiform, sheaths with membranous margins. *Spikelets* usually solitary, sometimes 2 or 3, $\frac{1}{4}$ — $\frac{1}{3}$ in. long, ovoid, bracts (empty glumes) usually similar to the flowering glumes, occasionally leaf-like and exceeding the spikelets. *Glumes* $\frac{1}{8}$ in. long, suborbicular, shortly mucronate, keeled, many-nerved, very concave, straw-colored or pale brown, deciduous. *Rachilla* after the fall of the glumes ragged with minute scales. *Style* long flattened, hairy on the edges in the upper half. *Nut* $\frac{1}{2}$ in. long, biconvex, compressed, obovoid, stipitate, shining, pale straw color or whitish.

Dehra Dun (Duthie, Gamble), Saharanpur (Royle), Cawnpore (Duthie).
 DISTRIB.: S. E. Asia, N. Australia.

2. *F. diphylla*, Vahl, *Enum. ii* (1806) 289; *F. B. I. vi*, 636; *Prain Beng. Pl. 1153*; *Cooke Fl. Bomb. ii*, 882; *Collett, Fl. Siml. 561*.

Tufted, 2—24 in. high, stems striate, leaves often as long as the stems up to $\frac{1}{2}$ in. wide, scabrid on the margins towards the apex, sheaths glabrous or more or less villous, margins membranous. *Spikelets* in simple or compound umbels, ovoid $\frac{1}{8}$ — $\frac{1}{4}$ in. long, primary bracts leaflike exceeding the inflorescence or not. *Glumes* $\frac{1}{10}$ in. long, closely imbricate, concave, glabrous, broadly ovate, keel green 3-nerved,

excurrent as a small mucro, margins smooth, brown or reddish. *Rachilla* after the fall of the glumes ragged from the scaly edges of the areoles. *Style* flattened, broad, villous on the edges. *Nut* $\frac{1}{10}$ in. long, pale straw-colored or nearly white, glistening, biconvex 5—6 ribbed on each face, with elegant crosslines between the ribs.

Dehra Dun (Duthie, etc.). A common rainy season weed. Saharanpur, Pilibhit, Cawnpore (Duthie), Gonda. **DISTRIB.:** all warm regions.

var. ANNUA, Clarke (*sp. Rœm. & Sch.*). A dwarf form about 2 in. high. Spikelets reduced to 1—3 or a few.

Dehra Dun (Duthie 6815, 7662).

3. *F. dichotoma*, Vahl, *Enum. ii* (1806) 287; *F. B. I. vi*, 635; *Prair. Beng. Pl.* 1153; *Cooke Fl. Bomb. ii*, 880; *Collett, Fl. Siml.* 561.

Tufted, 2—20 in. high, stems striate, sometimes very slender, leaves as long as the stems or shorter, up to $\frac{1}{8}$ in. broad, scabrid on the margins towards the apex, sheaths more or less villous or glabrous, margins membranous. *Spikelets* in compound or decomposed umbels, ellipsoid or subcylindric $\frac{1}{8}$ — $\frac{1}{4}$ in. long, primary bracts leaf-like usually much exceeding the inflorescence. *Glumes* $\frac{1}{10}$ in. long, closely imbricate, boat-shaped, keel green 1—3-nerved, prominent and excurrent as a small mucro, margins membranous, pale brown. *Rachilla* after the fall of the glumes deeply pitted. *Style* flattened, villous in the upper half. *Nut* $\frac{1}{10}$ in. long, pale brown, biconvex, 5—9-ribbed.

Saharanpur (Royle, Jameson), Delhi (Royle), Agra (Jameson), Merwára (Lowrie), Etawah (Duthie), Pilibhit (Inayat), Kheri (Inayat), Gorakhpur (Harsukh). **DISTRIB.:** Warm regions of the old world.

F. æstivalis, Vahl. A very similar plant but more pubescent and with a smooth nut possibly occurs but the specimens are too young for satisfactory identification.

4. *F. spathacea*, Roth, *Nov. Pl. Sp.* (1821) 24; *F. B. I. vi*, 640; *Cooke Fl. Bomb. ii*, 882.

Perennial, rhizome woody, stems 6—18 in. long, stiff, striate, leaves many near the base of the stem and up to $\frac{1}{2}$ its length, coriaceous, narrow, scabrid on the recurved margins, sheaths glabrous, margins not hyaline. *Spikelets* $\frac{1}{8}$ — $\frac{1}{2}$ in. long, ovoid in simple or compound umbels which are often congested or subcapitate, bracts nearly as long as the rays, leaf-like, rigid with broad bases. *Glumes* $\frac{1}{10}$ in. long, boat-shaped, obtuse, with a small obtusely triangular auricle on either side a little below the middle (caused by a portion of the glume breaking away and remaining attached to the rachillum), keel distinct, 1—2 additional pairs of rather obscure nerves, white and hyaline except for red streaks near the keel. *Rachilla* after fall of the glumes very ragged with prominent scales. *Style* glabrous, not flattened, conspicuously swollen at the base. *Nut* $\frac{1}{10}$ in. long, minutely stipitate, biconvex, broadly obovate, obtuse, brown at first then dark grey or almost black, microscopically rugose.

Merwára (Duthie 4920). **DISTRIB.:** Orissa, S. India, Ceylon, Arabia, Malaya, etc.

5. **F. squarrosa**, Vahl, *Enum. ii* (1806) 289; *F. B. I. vi*, 635; *Prair Beng. Pl. 1153*; *Collett, Fl. Siml. 560*.

Annual, tufted, more or less pubescent or glabrous, stems 2—8 in. high, slender, striate, leaves narrow, about half the length of the stem, sheaths densely pubescent. *Spikelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, squarrose from the prominent tips of the glumes, in umbels consisting of a sessile spikelet, several spikelets on pedicels of various lengths and a few rays the latter bearing a sessile spikelet and 1—3 pedicelled spikelets, bracts several, leaf-like the longest exceeding the rays. *Glumes* $\frac{1}{2}$ in. long including the awn, blade broadly oblong, pale brown, keel excurrent as a curved awn about as long as the blade. *Rachilla* after the fall of the glumes rather slender, not deeply pitted. *Style* slender minutely hairy below the bifurcation, base slightly swollen and bearing many silky hairs which hang down over the nut and are $\frac{1}{2}$ — $\frac{3}{4}$ of its length. *Nut* $\frac{1}{2}$ in. long, obovoid, compressed, smooth minutely stipitate, straw-colored.

Moradabad (Thomson). *DISTRIB.*: Northern India from Kashmir to Assam and Burma and all warm regions.

6. **F. rigidula**, Nees in *Wight Contrib.* (1834) 99; *F. B. I. vi*, 640; *Prair Beng. Pl. 1153*; *Collett, Fl. Siml. 561*.

Perennial, stems bulbously thickened at the base clothed with the bases of the leaf-sheaths which tend to break up into separate fibres, flowering stems 6—18 in. high, striate, leaves half the length of the stem or much shorter, up to $\frac{1}{10}$ in. wide, not narrowing upwards slightly scabrid on the margins, sheaths glabrous or nearly so with broad membranous margins. *Spikelets* in simple or somewhat compound umbels $\frac{1}{2}$ — $\frac{1}{2}$ in. long, ellipsoid or subcylindric, bracts usually very much shorter than the rays sometimes almost as long. *Glumes* $\frac{1}{2}$ in. long, concave, broadly ovate, dark brown in the upper half, keel not prominent slightly excurrent in the lower glumes. *Rachilla* after the fall of the glumes somewhat rough and pitted. *Style* hairy on the edges in the upper portion. *Nut* $\frac{1}{8}$ in. long, brown or grey, biconvex, broadly obovate-obtuse in outline, minutely stipitate, very obscurely apiculate, minutely lacunose and reticulate.

Saharanpur (Royle) Kheri (Inayat). *DISTRIB.*: Himalaya ascending to 6,000 ft. from Simla eastward and neighbouring plains, East Asia.

7. **F. podocarpa**, Nees in *Wight Contrib.* (1834) 98 (*ex parte*); *F. B. I. vi*, 638; *Prair Beng. Pl. 1153*.

Tufted 8—16 in. high, stems striate, slender, leaves about half as long as the stems, $\frac{1}{10}$ — $\frac{1}{12}$ in. wide, scabrid on the margins, sheaths more or less hairy with narrow membranous margins. *Spikelets* in simple or compound umbels, the umbel or branches of compound umbels with usually 3—5 spikelets, $\frac{1}{4}$ in. long, ovoid, primary bracts leaflike exceeding the inflorescence. *Glumes* $\frac{1}{2}$ in. long, boat-shaped, keel a narrow sharp ridge excurrent as a small cusp, margins brown. *Rachilla* after the fall of the glumes marked with large shallow areoles the margins of which project as scales especially at the base of the areole.

Style flattened, ciliate above the base. *Nut* $\frac{1}{8}$ in. long, pale straw-color, polished, biconvex, broadly elliptic in outline, margin thickened, faces with many fine longitudinal striæ, gynophore obpyramidal $\frac{1}{6}$ in. long.

Saharanpur (Royle). This species has not recently been collected in N. W. India. I have only seen three gatherings all of Royle. **DISTRIB.:** West Himalaya from the Simla district (Royle) to Assam, Chota Nagpur, Malaya, China.

8. *F. fuscinox*, *C. B. Clarke in Fl. Brit. Ind. vi (1893), p. 638; Prain Beng. Pl. 1154.*

Tufted, stems rigid, striate, 8—20 in. high, leaves $\frac{1}{2}$ — $\frac{3}{4}$ the length of the stem, rigid, coriaceous, tip obtuse, sheaths glabrous, brown, fibrous when old. *Spikelets* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, narrowly ovoid, somewhat angular owing to the keeled glumes, in large compound umbels consisting of several rays and many pedicelled spikelets, bracts leaf-like with dilated bases. *Glumes* $\frac{1}{2}$ in. long, broadly ovate, boat-shaped, acute, mucronate, keel 3-nerved, brown almost glabrous. *Rachilla* after the fall of the glumes rather stout with deeply pitted areoles. *Style* not flattened, glabrous. *Nut* $\frac{1}{8}$ in. long, suborbicular in outline, biconvex, microscopically lacunose, dark brown, finally black.

Moradabad (Thomson) fide Clarke. **DISTRIB.:** Sikkim Terai (Clarke!)

9. *F. ferruginea*, *Vahl, Enum. ii (1806), 291; F. B. I. vi, 638; Prain Beng. Pl. 1154; Cooke Fl. Bomb. ii, 881.*

Tufted 8—30 in. high, stems striate, leaves half as long as the stems or less, up to $\frac{1}{2}$ in. wide, scabrid on the margins, sheaths more or less hairy with membranous margins. *Spikelets* in simple or sometimes compound umbels, usually 5—10 sometimes reduced to 1 or 3, $\frac{1}{4}$ — $\frac{1}{2}$ in. long, ellipsoid or subcylindric, bracts usually shorter than the inflorescence. *Glumes* $\frac{1}{2}$ in. long, broadly ovate, concave, keel not prominent slightly excurrent, hoary in the upper half, brown. *Rachilla* after fall of the glumes rough from the ragged edges of the areoles. *Style* broad flattened hairy on the edges in the upper half. *Nut* $\frac{1}{8}$ in. long, pale brown, biconvex, suborbicular in outline, minutely stipitate and apiculate, microscopically multistriate.

Saharanpur (Gollan), Merwára (Duthie 4916). **DISTRIB.:** Throughout the warmer parts of India, S. E. Asia, Australia.

10. *F. monostachya*, *Hassk. Pl. Jav. Rar. (1848), 61; F. B. I. vi, 649; Prain Beng. Pl. 1152; Cooke Fl. Bomb. ii, 885; Collett, Fl. Siml. 563.*

Densely tufted, stems thickened at the base, 3—16 in. high, slender or filiform, striate, leaves about half as long as the stem or more, almost filiform, sheaths smooth with membranous margins. *Spikelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, ovoid, acute, solitary supported at the base by a bract which is usually leaf-like, shorter than the spikelet, hispid on the margins and with a small dilated base, sometimes the bract is more glume-like, this is followed by 2 or 3 bracts or empty glumes which become

progressively more glume-like. *Glumes* sub-distichous $\frac{1}{2}$ in. long, ovate, boat-shaped, strongly keeled, cuspidate, coriaceous, straw-colored. *Rachilla* after the fall of the glumes with conspicuous red-dotted scales (the margins of the glumes on either side being persistent). *Style* broad, flattened, hairy on the edge, base large, conical. *Nut* $\frac{1}{10}$ in. long, pear-shaped, trigonous, minutely tubercled except on the narrowed base and short pyramidal apex, pale straw-colored.

Saharanpur. **DISTRIB.:** Throughout the warmer parts of India and most warm countries.

11. *F. tenera*, *Rœm. & Schult. Syst. ii, Mant. (1824), 57; F. B. I. vi, 642; Prain Beng. Pl. 1154.*

Annual tufted stems slender 6—12 in. high, leaves up to half the length of the stem $\frac{1}{10}$ in. wide, glabrous, often very much reduced, sheaths glabrous, rather thin with hyaline margins. *Spikelets* $\frac{1}{2}$ — $\frac{1}{3}$ in. long narrowly ovoid or subcylindric in lax subcompound umbels consisting of a sessile spikelet, 2 or 3 spikelets on pedicels of various lengths and 2 or 3 rays which usually bear one sessile and one or two pedicelled spikelets, bracts leaf-like with dilated bases, shorter than the rays. *Glumes* $\frac{1}{12}$ in. long broadly ovate, acuminate, with an auricle on either side, somewhat boat-shaped, 3-nerved the keel prominent, slightly excurrent, brown, margin hyaline. *Rachilla* after the fall of the glumes rather stout, the areoles large depressed with prominent margins. *Style* glabrous, base swollen, stigmas 3. *Nut* $\frac{1}{12}$ in. long trigonous-obovoid, dirty white, minutely verrucose.

Dehra Dun (Brown) Pilibhit, Shikohabad (Duthie 6510), Agra (Jameson). **DISTRIB.:** Punjab to Bengal and Madras (var. *oxylepis*, Clarke). Other varieties in Tropical Africa and Malaya.

12. *F. quinquangularis*, *Kunth. Enum. ii (1837), 229; F. B. I. vi, 644; Prain Beng. Pl. 1154; Cooke Fl. Bomb. ii, 883; Collett, Fl. Siml. 561.*

Annual tufted, stems 1—2 ft. high, angular, striate, leaves longer or shorter than the stem, up to $\frac{1}{10}$ in. wide, scabrid on the margins and midrib beneath, sheaths glabrous with broad membranous margins. *Spikelets* $\frac{1}{2}$ — $\frac{1}{3}$ in. long, ellipsoid or narrowly ovoid, subacute, very numerous in decompound umbels, rays very slender, pedicels filiform, bracts very narrow, leaf-like, shorter than the umbel. *Glumes* $\frac{1}{12}$ in. long, ovate, somewhat boat-shaped, keel 3-nerved, slightly excurrent, margins brown, hyaline. *Rachilla* after the fall of the glumes ragged with small black scales. *Style* slightly villous below the 3 stigmas, not much dilated at the base. *Nut* $\frac{1}{10}$ in. long, globosely obovoid, pale brown or whitish, minutely tuberculate.

Dehra Dun (Royle, etc.), Saharanpur, Agra (Jameson), Shikohabad (Duthie), Shahjahanpur (Duthie). **DISTRIB.:** Throughout India, Ceylon, China, Malaya, Australia.

13. *F. miliacea*, *Vahl, Enum. ii, (1806), 287; F. B. I. vi, 644 Prain Beng. Pl. 1155; Cooke, Fl. Bomb. ii, 883.*

Annual tufted, stems 1—2 ft. high, angular, striate, leaves usually about as long as or rather longer than the stem, up to $\frac{1}{2}$ in. broad, scabrid on the margins towards the apex, sheaths glabrous, margins scarious. *Spikelets* $\frac{1}{2}$ — $\frac{1}{3}$ in. long, subglobose, obtuse in decompound umbels, rays and pedicels filiform, bracts linear-filiform with broad dilated bases shorter than the rays. *Glumes* $\frac{1}{10}$ in. long, ovate, obtuse, somewhat boat-shaped or concave, obscurely nerved, keel not or scarcely excurrent, margins brown, hyaline. *Rachilla* after the fall of the glumes deeply pitted, the edges of the areoles pale and very short. *Style* glabrous scarcely swollen at the base. *Nut* $\frac{1}{10}$ in. long, obovoid, pale brown, minutely tuberculate.

Dehra Dun (Parker), Saharanpur (Royle), Moradabad (Thomson). Very similar to *F. quinquangularis* but readily separable by the difference in the rachilla after the fall of the glumes. **DISTRIB.** Throughout India and most warm countries.

14. *F. complanata*, Link. Hort. Berol. i (1827), 292; F. B. I. vi, 646; Prain Beng. Pl. 1155; Cooke Fl. Bomb. ii, 885; Collett, Fl. Siml. 562.

Tufted, rhizome short, creeping, stems 8 in.—2 ft. high, flattened in the upper half and scabrid on the edges beneath the umbel, striate, leaves shorter than the stems $\frac{1}{10}$ — $\frac{1}{8}$ in. wide, tip abruptly narrowed, scabrid-ciliate, sheaths smooth coriaceous with membranous margins. *Spikelets* $\frac{1}{2}$ in. long, narrowly ellipsoid, acute, in compound or decompound umbels, rays flattened, bracts the biggest leaf-like appearing as a continuation of the stem as seen from behind, amplexicaul as seen from in front, shorter than the umbel, scabrid-ciliate, the others linear-subulate with broad bases. *Glumes* subdistichous $\frac{1}{10}$ in. long or slightly less, ovate, acutely keeled the keel more or less excurrent, margins brown. *Rachilla* after the fall of the glumes pitted, rough with short ascending acute scales. *Style* slender glabrous with a short conical base. *Nut* $\frac{1}{8}$ in. long, whitish, obovoid, obtusely trigonous, one face broader than the other two, faintly striate, obscurely tuberculate.

Dehra Dun (Parker) Haldwani (Parker). In Himalayan specimens the nut is $\frac{1}{8}$ in. long, smooth, with sometimes one face larger than the other two. In C. P. and Orissa specimens the nut is $\frac{1}{5}$ in. long and minutely tubercled. **DISTRIB.:** Warm regions of the old world.

15. *F. junciformis*, Kunth. Enum. ii (1837), 239; F. B. I. vi, 647; Prain Beng. Pl. 1155; Cooke Fl. Bomb. ii, 886; Collett, Fl. Siml. 562.

Rhizome woody, horizontal, covered with the fibrous remains of the leaf sheaths, stems 6—16 in. high, angular, striate, leaves crowded at the base of the stem and usually much less than half its length, $\frac{1}{2}$ — $\frac{1}{3}$ in. wide, abruptly pointed, scabrid on the margins, sheaths coriaceous with broad membranous margins. *Spikelets* $\frac{1}{2}$ — $\frac{1}{4}$ in. long, some solitary others in clusters of 2—5, arranged in compound umbels, bracts several, leaf-like, much shorter than the rays. *Glumes* $\frac{1}{2}$ in. long, ovate, boat-shaped, the lower glumes mucronate, sides brown,

margins narrow scarious. *Rachilla* after the fall of the glumes rough, pitted. *Style* slender, pubescent below the 3 stigmas, base small conical. *Nut* $\frac{1}{8}$ in. long, trigonous obovoid, pale straw-colored nearly smooth or verrucose.

Delhi (Jameson), Saharanpur (Royle), Moradabad (Thomson), Pilibhit (Inayat), Bahraich (Harsukh). Flowers June, July. **DISTRIB.:** Throughout India, Madagascar, Philippines.

9. BULBOSTYLIS, Kunth.; Fl. Brit. Ind. vi, 651.

Tufted annuals with fibrous roots. *Stems* slender leafy only at the base, sheaths usually finely hairy. *Spikelets* congested or umbelled, occasionally reduced to one spikelet. *Glumes* spirally imbricate, 1—2 lowest empty. Hypogynous bristles 0. *Stamens* 1—3, usually 2. *Style* as long as the nut, linear, glabrous, base very small bulbiform leaving a minute button on the nut after falling, stigmas 3. *Nut* obovoid, obtuse, trigonous, scarcely stipitate, smooth. Species 70 in all warm regions.

B. barbata, Kunth. *Enum. ii* (1837), 208; *F. B. I. vi*, 651; *Prain Beng. Pl.* 1157; *Collett, Fl. Siml.* 563. *Stenophyllus barbata*, *Rottb. Cooke Fl. Bomb. ii*, 887.

Stems 2—10 in. high, very slender, striate, sheaths striate on the back, hyaline in front, mouth pilose with very slender hairs, blade filiform as long as or shorter than the stem. *Spikelets* $\frac{1}{8}$ — $\frac{1}{2}$ in. long 3—20 in dense heads at the top of the stems, bracts filiform, the longest often erect and about twice as long as the spikelets so that the head appears lateral. *Glumes* $\frac{1}{2}$ in. long, boat-shaped, ovate, keel green, excurrent as a small mucro, margins hyaline, often minutely puberulous and ciliolate. *Rachilla* after the fall of the glumes winged and scaly. *Nut* $\frac{1}{8}$ in. long, obovoid, pale brown or yellow, very minutely stipitate and tipped with a button no larger than the stipe.

Delhi (Jameson), Saharanpur (Royle), Moradabad (Thomson), Jaipur (Sadhu Singh), Ajmer (Lowrie), Bundelkhand (Duthie), Pilibhit. A plant of sandy soil. **DISTRIB.:** Throughout India and all warm regions.

10. SCIRPUS, Linn. (in; part); Fl. Brit. Ind. vi, 653.

Herbs of very various habit, glabrous or the inflorescence slightly hairy. *Inflorescence* terminal or lateral of one to many spikelets in clusters or umbels. *Glumes* spirally imbricate or rarely the lowest subdistichous, 1—2 lowest and the uppermost empty. Hypogynous bristles present or not, sometimes broad ovate. *Stamens* 1—3. *Style* 2—3-fid, glabrous, base linear or conic, continuous with the nut. *Nut* obovoid, trigonous or biconvex, smooth or nearly so. Species about 130; throughout the world.

Spikelets 1-many in simple clusters or heads (in *supinus* a cluster on a ray sometimes added).

Clusters lateral on the stem.

Bristles present.

Stem terete, style 2-fid 1. *S. erectus*.

Stem triquetrous, style 3-fid 2. *S. mucronatus*.

Bristles 0.

Glumes $\frac{1}{8}$ in. long or longer.

Glumes acute, not or scarcely keeled 3. *S. articulatus*.

Glumes mucronate, keeled.

Glumes smooth, nut $\frac{1}{8}$ in. long 4. *S. supinus*.

Glumes multistriate, nut $\frac{1}{8}$ in. long 5. *S. Roylei*.

Glumes $\frac{3}{4}$ in. long with a cusp of the same length 6. *S. squarrosus*.

Clusters terminal.

Perennial, style 3-fid 7. *S. kyllingoides*.

Annual, style 2-fid 8. *S. Michelianus*.

Spikelets many stalked or umbelled (sometimes reduced in *litoralis* and *maritimus*).

Umbels lateral, the lowest bract erect appearing as a continuation of the stem but sometimes short.

Bristles soft, linear, plumose 9. *S. litoralis*.

Bristles harsh, retrorsely scabrid 10. *S. lacustris*.

Umbels terminal, bracts leafy.

Umbels not decomposed, spikelets few or many, rather large 11. *S. maritimus*.

Umbels decomposed, spikelets very numerous and small 12. *S. chinensis*.

1. *S. erectus*, Poir, Encyc. vi (1804), 761; F. B. I. vi, 656; Prain Beng. Pl. 1160.

Roots fibrous. Stems 4—15 in. high, terete, tufted, sheaths with an oblique mouth, sometimes produced in a short erect blade. Spikelets 1—3 in a single lateral head near the apex of the stem $\frac{1}{4}$ — $\frac{1}{2}$ in. long. Glumes $\frac{1}{8}$ in. long, broadly ovate, acute, concave, keel not very prominent. Bristles 5—6, retrorsely scabrid (rarely 0, C. B. Clarke). Style usually 2-fid. Nut $\frac{1}{2}$ in. long, plano-convex, broadly obovoid, apiculate, slightly transversely undulate, straw-colored, brown, ashy-grey, finally usually nearly black.

Dehra Dun (Parker) Bahraich (Inayat). A weed of rice fields. DISTRIB.: Throughout India, temperate Asia, N. America, Australia.

2. *S. mucronatus*, Linn. Sp. Pl. (1753), 50; F. B. I. vi, 657; Prain Beng. Pl. 1161; Collett, Fl. Siml. 564.

Perennial, roots fibrous, rhizome short, horizontal. Stems 8—30 in. high, tufted, sharply triquetrous, $\frac{1}{10}$ — $\frac{1}{4}$ in. thick, sheaths loose, membranous, mouth oblique. Spikelets $\frac{1}{3}$ — $\frac{1}{4}$ in. long in a single lateral cluster of 1—12 close below the top of the stem. Glumes $\frac{1}{2}$ in. long, broadly ovate, acute, keeled, finely multistriate. Bristles 5—6, retrorsely scabrid. Style 3-fid. Nut $\frac{1}{2}$ in. long, broadly obovate in outline, apiculate, unequally trigonous or biconvex, dark brown, shining, nearly smooth.

Dehra Dun (Parker), Saharanpur (Royle), Agra (Jameson), Pilibhit, Kheri (Inayat), Gonda (Harsukh), Gorakhpur (Harsukh). DISTRIB.: Northern India, Europe, Australia, Madagascar.

3. *S. articulatus*, Linn. *Sp. Pl.* (1753), 47; *F. B. I. vi*, 656; *Prair Beng. Pl.* 1160; *Cooke Fl. Bomb. ii*, 891.

Roots fibrous. *Stems* 6—24 in. high, terete, tufted, when dried and pressed flat $\frac{1}{10}$ — $\frac{1}{4}$ in. wide, septate, sheaths loose, membranous, very oblique at the mouth, the apex sometimes free from the stem for about 1 in. but with no blade. *Spikelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, brown, in a single dense lateral head situated below the middle of the stem and often close to the base. *Glumes* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovate, acute, membranous, not or obscurely keeled. *Bristles* 0. *Style* 3-fid. *Nut* $\frac{1}{16}$ in. long, obovoid, acutely triquetrous, apiculate, faces transversely undulate-rugose, black.

Margins of ponds. Kheri (Inayat), Dholpur (Jameson), Bundelkhand (Duthie), Ajmer (Lowrie). **DISTRIB.:** Warm regions of the old world.

4. *S. supinus*, Linn. *Sp. Pl.* (1753), 49; *F. B. I. vi*, 655; *Prair Beng. Pl.* 1160; *Cooke Fl. Bomb. ii*, 892.

Roots fibrous. *Stems* 4—15 in. high, terete, tufted, sheaths with an oblique mouth sometimes produced in a short erect blade. *Spikelets* 1—8, usually about 3—4 in a single lateral cluster or occasionally a cluster on a ray in addition, situated a little below the apex of the stem, $\frac{1}{8}$ — $\frac{1}{3}$ in. long. *Glumes* $\frac{1}{10}$ in. long, ovate, keeled, the keel produced as a suberect mucro. *Bristles* 0. *Style* 3-fid. *Nut* $\frac{1}{8}$ in. long, globosely obovoid, trigonous, one face larger than the other two, minutely apiculate, faces transversely undulate-rugose, black.

Dehra Dun (Gamble, Parker), Saharanpur (Royle), Shahjahanpur, (Duthie), Jhansi (Duthie), Bundelkhand (Duthie). A common weed in rice fields. **DISTRIB.:** Most parts of the world.

5. *S. Roylei*, (*Nees*) *comb. nova*. *S. quinquefarius*, Ham. *ex Bœck. in Linnæa XXXVI* (1869-70), 701; *F. B. I. vi*, 657; *Prair Beng. Pl.* 1160; *Cooke Fl. Bomb. ii*, 892. *Isolepis lupulina*, *Nees and I. Roylei*, *Nees in Wight Contrib.* (1834), 107.

Roots fibrous. *Stems* 6—18 in. high, terete, tufted, when dried and pressed up to $\frac{1}{10}$ in. wide, often conspicuously septate, sheaths loose, membranous, mouth oblique. *Spikelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long, 1—9 in a single dense lateral head situated about the middle of stem. *Glumes* $\frac{1}{2}$ in. long, elliptic-oblong, mucronate, membranous, multistriate, keeled, brownish straw-colored. *Bristles* 0. *Style* 3-fid. *Nut* as for *S. articulatus*.

Saharanpur (Royle), Ajmer (Duthie), Jhansi (Duthie), Gwalior (Maries), Dholpur (Jameson), Aligarh, Etah, Etawah (Duthie). **DISTRIB.:** Throughout India, Afghanistan, Turkestan, Africa.

6. *S. squarrosus*, Linn. *Mant.* (1771), 181; *F. B. I. vi*, 663; *Prair Beng. Pl.* 1158; *Cooke Fl. Bomb. ii*, 896; *Collett, Fl. Siml.* 564.

Annual, tufted, roots fibrous. *Stems* 2—6 in. high, filiform, terete, sheaths short membranous, the older slit down to the base, leaves 1 in. long or less; filiform. *Spikelets* $\frac{1}{8}$ — $\frac{1}{4}$ in. long, softly bristly from the tips of the glumes solitary or 2—4 in a head, bracts 1—3, the

longest usually erect (so that the spikelets appear lateral) and about 1 in. long. *Glumes* $\frac{1}{5}$ in. long excluding the cusp which is slightly recurved and as long as or rather longer than the rest of the glume, trapeziform, suddenly narrowed into the cusp. *Bristles* 0. *Style* minute with 3 recurved stigmas. *Nut* $\frac{1}{8}$ in. long, narrowly obovoid, trigonous, brown, finally black.

Dehra Dun (Duthie). A common rains weed in flower pots and similar moist places. *DISTRIB.*: Throughout India, tropical Africa, China.

7. *S. kyllingoides*, *Bæck. in Linnæa XXXVI* (1870), 733; *F. B. I. vi*, 662; *Prair Beng. Pl.* 1160; *Cooke Fl. Bomb. ii*, 895.

Perennial, slender stolons sometimes present. *Stems* 3—6 in. high, rarely more, slender, base thickened. *Leaves* half as long as the stem, $\frac{1}{10}$ in. broad, grass-like. *Head* $\frac{1}{2}$ — $\frac{1}{4}$ in. diam., terminal, of 5—15 spikelets, bracts 3—4, leaf-like, spreading or pendent, 1—3 in. long. *Glumes* ovate, contracted rather suddenly into a linear obtuse tip. *Bristles* 0. *Style* 3-fid. *Nut* minute, $\frac{1}{2}$ the length of the glume oblong-obovoid, unequally trigonous, smooth, brown or black.

Dehra Dun (Vicary) Goona (King) Saugor (Vicary) *vide* Clarke. I have seen no specimens from the area. *DISTRIB.*: Scattered in India and tropical Africa.

8. *S. Michelianus*, *Linn. Sp. Pl.* (1753), 52; *F. B. I. vi*, 662; *Prair Beng. Pl.* 1158; *Cooke Fl. Bomb. ii*, 895.

Annual, roots fibrous. *Stems* 1—5 in. high, tufted, triquetrous, leafy below, sheaths membranous, striate, the older split to the base, blade as long as or longer than the stem, narrow, grass-like. *Spikelets* $\frac{1}{2}$ — $\frac{1}{3}$ in. long, numerous, in dense terminal heads $\frac{1}{4}$ — $\frac{1}{2}$ in. diam. bracts several, long, leaf-like with dilated bases. *Glumes* $\frac{1}{2}$ in. long, elliptic, keel rather broad, 3-nerved, produced as a mucro, margins hyaline. *Bristles* 0. *Style* 2-fid. *Nut* between $\frac{1}{8}$ and $\frac{1}{10}$ in. long, fusiform, pale dull brown.

Delhi (Royle) Agra (Jameson) Gwalior (Maries) Kheri (Inayat). *DISTRIB.*: Throughout India, Europe, Asia, Algeria.

9. *S. litoralis*, *Schrad. Fl. Germ. I* (1806), 142, t. 5, fig. 7; *F. B. I. vi*, 659; *Prair Beng. Pl.* 1161; *Cooke Fl. Bomb. ii*, 894.

Rhizome horizontal, slender. *Stems* 2—3 ft. high, $\frac{1}{8}$ — $\frac{1}{4}$ in. in diam. slightly triquetrous towards the top, sheaths soft, membranous, open, leaves short or 0 or grass-like and very slender for the size of the plant. *Spikelets* $\frac{1}{2}$ — $\frac{1}{3}$ in. long, in lax subcorymbose or paniculate umbels situated laterally near the apex of the stem (or lowest bract 1—6 inches long appearing as a continuation of the stem) sometimes reduced almost to a head, rays when present 1—2 in. long. *Glumes* $\frac{1}{2}$ in. long, elliptic-oblong, membranous, notched at the top, mucronate in the notch by the excurrent slender green keel. *Bristles* 2—7, soft, linear, plumose upwards. *Style* 2-fid. *Nut* $\frac{1}{2}$ in. long, broadly obovoid, biconvex, dull brown, apiculate smooth.

Saharanpur (Royle), Gwalior (Maries). **DISTRIB.:** Most parts of the Old World.

10. S. lacustris, *Linn. Sp. Pl.* (1753), 48; *F. B. I. vi*, 658; *Collett, Fl. Siml.* 564.

Rhizome horizontal. *Stems* 2—6 ft. high, terete or somewhat trigonous at the top, sheaths membranous ending in an acute tip or blade 4 inches long or longer and floating. *Spikelets* $\frac{1}{3}$ — $\frac{1}{2}$ in. long, discrete or clustered in once or twice compound umbels sometimes reduced almost to a small head, situated at the apex of the stem the lowest bract 1—3 inches long, erect, appearing as a continuation of the stem. *Glumes* $\frac{1}{2}$ in. long, ovate, concave, scarious, tip notched, margins pilose, keel excurrent as a small scabrid mucro. *Bristles* 5—6, retrorsely scabrid. *Style* 2—3 fid. *Nut* $\frac{1}{12}$ — $\frac{1}{10}$ in. long, obovoid, plano-convex, long apiculate, smooth, pale ultimately dark brown.

Pilibhit (Inayat). **DISTRIB.:** Kumaon! Kashmir! Afghanistan! Baluchistan! Scattered throughout the world except S. America, abundant in Europe.

11. S. maritimus, *Linn. Sp. Pl.* (1753), 51; *F. B. I. vi*, 658; *Prair Beng. Pl.* 1161; *Cooke Fl. Bomb. ii*, 893.

Rhizome creeping, nodes dilating into woody tubers. *Stems* 1—3 ft. high, stout, trigonous, sheaths long often clothing the stem to half its height, mouth truncate with a small V-shaped scarious portion, usually split in older leaves, blade grass-like often as long as the stem, coriaceous, scabrid on the margins towards the apex. *Spikelets* $\frac{1}{2}$ —1 in. long, 3—8 or solitary on each ray or umbel rarely reduced to a head of 1—3 spikelets, rays of unequal length, subcorymbose, bracts several leaf-like, the lowest usually much exceeding the umbel. *Glumes* $\frac{1}{4}$ in. long, broadly ovate, bifid at the apex, membranous, brown or golden-brown, minutely pubescent, the apical lobes more or less fimbriate, keel excurrent as a more or less curved awn. *Bristles* 3—6, unequal, retrorsely scabrid. *Style* 3-fid. *Nut* $\frac{1}{2}$ in. long, obovoid, one face larger than the other two hence plano-convex rather than trigonous, smooth, blunty pointed at both ends, pale straw-colored (not seen quite ripe).

Saharanpur (Jameson), Merwára (Duthie, Lowrie), Jhansi (Duthie), Gwalior (Maries), Mainpuri (Duthie), Aligarh (Jameson), Moradabad (Thomson), Kheri (Inayat).

var. AFFINIS, C. B. Clarke. *Spikelets* capitate, usually 1—3, ovoid-lanceolate, glumes straw-coloured, almost glabrous. *Style* 2-fid. *Nut* rather smaller but over $\frac{1}{10}$ in. long compressed biconvex, minutely lacunose (microscopically a honey-combed surface pattern) brown or pale straw-color.

Saharanpur (Royle), Delhi (Royle), Agra (Jameson), Gwalior (Maries), Pilibhit (Inayat), Kheri (Inayat), Bahraich (Inayat), Gorakhpur (Harsukh). According to Clarke the bristles are 4, as long as the nut in *var. affinis*. Neither the number of bristles nor their size is

constant. I have found them scarcely half the length of the ripe nut and up to 6 in number. **DISTRIB.:** World wide in various forms.

12. *S. chinensis*, Munro in Seem. *Bot. Voy. Herald* (1852-57), 423; *F. B. I. vi*, 662; *Prain Beng. Pl.* 1159; *Collett, Fl. Siml.* 564.

Rhizome stoloniferous. *Stems* 2—7 ft. high, solitary, leafy, sheath loose, mouth oblique, blade often 12 in. long or more, $\frac{1}{2}$ in. broad, scabrid on the margins and midrib beneath. *Spikelets* $\frac{1}{2}$ in. long, ellipsoid, in clusters of 3—15 arranged in large terminal compound corymbose umbels, rays up to 5 in. long, bracts several, leafy, the lowest exceeding the umbel, the upper reduced to tubular sheaths. *Glumes* $\frac{1}{8}$ in. long, ovate, concave, obtuse, keel broad, 3-nerved, margins scarious. *Bristles* 0 (in the local form, sometimes 3, rarely 5, Clarke). *Style* 2-fid. *Nut* $\frac{1}{10}$ — $\frac{1}{8}$ in. long excluding the minute stipe and short apiculus, elliptic, compressed, pale dull brown.

Dehra Dun (Gupta). Like many other Himalayan plants this has been found in the Mothronwala swamp: **DISTRIB.:** Himalaya up to 5,500 ft. from Chamba eastward to Burma and China.

11. **FUIRENA**, Rottb.; *Fl. Brit. Ind. vi*, 665.

Annual or perennial herbs leafy to above the middle or to the top. *Leaves* grass-like with an annular membrane at the mouth of the sheath. *Spikelets* many flowered in dense axillary and terminal pedunculate clusters. *Glumes* spirally imbricate, aristate, hairy in the upper half. Hypogynous bristles 2-seriate, the outer (or sepals) 3, bristle-like or 0, the inner (or petals) 3, with claws and broad limb or linear or 0. *Stamens* 2—3. *Style* long, slender, glabrous, deciduous, stigmas 3. *Nut* obovoid, trigonous, more or less stipitate, beaked. Species 25 scattered in all warm regions.

Leaves glabrous, glumes with a scabrid mucro, inner scales setiform

1. *F. Wallichiana*.

Leaves patently hairy, glumes with a hispidly hairy mucro, inner scales quadrate

2. *F. glomerata*.

1. *F. Wallichiana*, *Kunth. Enum. II* (1837), 182; *F. B. I. vi*, 665, *Cooke Fl. Bomb. ii*, 897.

Rhizome creeping, short. *Stems* 12—18 in. high, triquetrous, slightly pubescent at the top. *Leaves* 2—8 in. long by $\frac{1}{2}$ in. broad or less, midrib prominent, sheaths long, ligule pubescent. *Spikelets* $\frac{1}{4}$ — $\frac{1}{2}$ in. long in corymbose clusters, bracts and branches of the corymb small. *Glumes* $\frac{1}{2}$ in. long, excluding the stout scabrid mucro which is $\frac{1}{10}$ in. long, elliptic-oblong, rounded at the tip below the mucro, pubescent and ciliate, lined with dark red streaks. Outer bristles shorter than the nut, bristle-like, reddish-brown scabrid. Inner bristles similar to the outer, much longer than the nut but irregular sometimes small often 0. *Nut* $\frac{1}{10}$ in. long, light brown or greyish, trigonous, globose, pyramidally pointed at each end, finely longitudinally ribbed.

Hardwar (Wallich) Goona (King) fide Clarke, Merwára (Duthie). Duthie's No. 4919 from Merwára is the type of var. *evoluta* C. B.

Clarke in Fl. Brit. Ind. vi, 666. Clarke has noted on the sheet 'setæ hypogynæ extraordinarily though irregularly developed.' He describes them "petals narrowly elliptic 3-nerved shortly stalked with long linear papillose-scabrous arista, overtopping the nut." He figures them in Illustrations of Cyperaceæ, t. LVIII, fig. 9. I have failed to find anything like this but find the bristles as described above. **DISTRIB.:** Punjab to the Deccan.

2. F. glomerata, Lamk. Ill. I (1791), 150; F. B. I. vi, 666; Prain Beng. Pl. 1157; Cooke Fl. Bomb. ii, 898.

Annual, tufted. Stems 4—16 in. high, triquetrous, pilose. Leaves 2—5 in. long, hairy, 5-nerved, sheaths long, more or less patently hairy. Spikelets $\frac{1}{2}$ — $\frac{3}{4}$ in. long, 3—10 in clusters, axillary and terminal, bracts small. Glumes $\frac{1}{2}$ in. long excluding the hispid awn which is sometimes nearly as long as the blade, obovate-oblong, tip rounded ciliate, margins membranous, pubescent, keel 3-nerved running into the awn. Outer bristles small and inconspicuous (or linear as long as the nut C. B. Clarke). Inner scales quadrate, apiculate base cordate with a short slender claw, back with 3 raised veins, the scales adpressed to the nut and concealing it. Nut $\frac{1}{8}$ in. long, stipitate, apiculate, trigonous, globosely obovoid, pale brown, smooth.

Bundelkhand (Duthie 7051). **DISTRIB.:** Central Provinces, Bihar, S. E. Asia, Australia, tropical Africa.

12. ERIOPHORUM, Linn.; Fl. Brit. Ind. vi, 663.

Glabrous grass-like herbs, leafy only near the base. Spikelets in compound umbels or corymbs sometimes reduced to few or one spikelet. Glumes spirally imbricate. Hypogynous bristles 6 divided nearly to the base into ligulate segments accrescent and comose in fruit so that the inflorescence becomes cottony. Stamens 1—3, anterior. Style slender, glabrous, deciduous, stigmas 3. Nut sessile, trigonous, smooth, apex narrowed. Species 10 mainly arctic and N. temperate.

E. comosum, Wall. ex Nees in Wight Contrib. (1834), 110; F. B. I. vi, 664; Prain Beng. Pl. 1157; Cooke Fl. Bomb. ii, 896; Watt, E. D. iii, 266; Collett, Fl. Siml. 565.

Tufted, stems 6—18 in. long, slender, tough, sheaths very short, brown somewhat fibrous, leaves usually longer than the stems, very narrowly linear with serrulate margins. Spikelets $\frac{1}{2}$ — $\frac{3}{4}$ in. long, narrowly ellipsoid, reddish-brown, very numerous, in compound or decomposed irregular umbels, bracts several leaf-like exceeding the inflorescence and often 12 in. long or more. Glumes $\frac{1}{2}$ — $\frac{3}{4}$ in. long, ovate-lanceolate, mucronate, 1-nerved, hyaline. Anthers large, yellow, with a conspicuous pointed red tip. Nut $\frac{1}{10}$ in. long, trigonous-fusiform, dusky brown, supported by a ring of greyish cottony hairs much longer than the nut.

Dehra Dun and Saharanpur Siwaliks common on cliffs. Saugor. Has much the appearance of Bhabar grass but is readily distinguished by the leaf sheaths being woolly in Bhabar Grass. It is almost always

found on steep rocks or hanging from vertical cliffs. **DISTRIB.:** From Afghanistan along the Himalaya and Siwaliks to China. Hilly tracts throughout India.

13. LIPOCARPHA, R. Br.; Fl. Brit. Ind. vi, 667.

Glabrous herbs leafy only at the base. *Leaves* grass-like. *Spikelets* 1—8 in a single terminal head. *Glumes* spirally imbricate, numerous. Hypogynous bristles or perianth of two elliptic hyaline scales as long as and adherent to the nut, one anticus the other posticus. *Stamens* 1—3, anticus. *Style* small, slender, glabrous, stigmas 2 or 3. *Nut* small oblong or ovoid, plano-convex, smooth, invested by the hypogynous scales. Species 13 in warm regions.

L. argentea, R. Br. in *Append. Tuckey Congo* (1818), 459; *F. B. I. vi*, 667; *Prair Beng. Pl.* 1157; *Collett, Fl. Siml.* 565.

Rhizome hardly any. *Stems* usually 10—20 inches, triquetrous smooth. *Leaves* half as long as the stem or less, linear-filiform with revolute margins, sheaths striate, deeply slit down. *Spikelets* $\frac{1}{2}$ — $\frac{3}{4}$ in. long, pale straw color or grey, bracts usually 3 the longest 2—6 in. long, spreading. *Glumes* $\frac{1}{5}$ — $\frac{1}{4}$ in. long, spathulate-oblongate, apex triangular, keel not prominent, sides hyaline with minute dark specks and streaks. *Scales* nearly as long as the glume, twice as long as the nut, longitudinally nerved and easily torn into fibrous shreds. *Nut* $\frac{1}{10}$ in. long, subcylindric, slightly widened upwards, obscurely trigonous, brown, microscopically closely punctate.

Dehra Dun (Duthie) Saharanpur (Royle). **DISTRIB.:** Along the Himalaya 1—6,000 ft. from the Kangra district to Assam. Tropical and subtropical Old World.

14. SCLERIA, Berg.; Fl. Brit. Ind. vi, 685.

Annual or more usually perennial herbs. *Stems* trigonous, leafy. *Leaves* grass-like usually with cutting scabrid edges. *Spikelets* dimorphous, androgynous or unisexual, solitary or clustered on the branches of a panicle, rarely spicate or capitate, primary bracts leaf-like, secondary filiform. Androgynous spikelets with one female flower below and a few male above; female spikelet similar but upper portion reduced to a small rudiment pressed against the nut or 0 when the female flower appears terminal. *Glumes* 2—4 empty below the female glume or in the male spikelets 2 empty below the male glumes. *Stamens* 1—3, anthers often mucronate. *Style* linear, deciduous, stigmas 3. *Nut* bony, shining, gynophore usually prominent, apex dilated often into a 3-toothed saucer. Species 150, in most warm regions.

Annuals with fibrous roots.

Disk 3-lobed, nut with raised reticulations

Disk entire, nut smooth

Perennials with woody rhizomes.

Panicle lax, branches ascending, nut smooth

Panicle dense, branches stiff, spreading, nut reticulate

1. *S. tessellata*.

2. *S. annularis*.

3. *S. hebecarpa*.

4. *S. elata*.

1. *S. tessellata*, Willd. *Sp. Pl. IV* (1805), 315; *F. B. I. vi*, 686; *Prain Beng. Pl. 1133*; *Cooke Fl. Bomb. ii*, 903.

Annual, root fibrous, the fibres nearly black. *Stems* 1—2 ft. high, rather slender, hairy or glabrate. *Leaves* 6—12 in. long, $\frac{1}{2}$ in. broad or less, sheaths more or less winged, the mouth truncate. *Spikelets* solitary or in small clusters on the branches of a narrow erect terminal panicle. Fruiting glumes about $\frac{1}{2}$ in. long, broadly ovate, keeled, acuminate, ferruginous green. *Nut* broadly ellipsoid $\frac{1}{10}$ in. long, white, with close raised mainly longitudinal reticulations, disk straw-colored with 3 obtuse lobes.

Central India (Wingate), Indore. **DISTRIB.:** Throughout India except the North-West, Malaya, China, Japan, Australia.

2. *S. annularis*, Kunth. *Enum. II* (1837), 359; *F. B. I. vi*, 687; *Cooke Fl. Bomb. ii*, 903.

Closely resembles *S. tessellata*. Leaf-sheaths winged, the angles with minute downward directed spinules, the mouth with a short triangular prolongation. *Spikelets* in the partial inflorescence more densely spicate. *Glumes* with scabrid keel. *Nut* smooth, seated on a brown disk with truncate margin.

Saugor (Witt). **DISTRIB.:** Central and S. W. India, China.

3. *S. hebecarpa*, Nees in *Linnaea IX* (1835), 303; *F. B. I. vi*, 689; *Prain Beng. Pl. 1133*; *Cooke Fl. Bomb. ii*, 904.

Rhizome $\frac{1}{2}$ in. in diam. woody, clothed with ovate striate dark red scales. *Stem* 2—3 ft. high. *Leaves* 12 in. long $\frac{1}{2}$ — $\frac{1}{3}$ in. broad, long acuminate, sheaths winged, scabrid, mouth with an ovate hairy prolongation. *Spikelets* solitary or in small clusters on the suberect branches of a narrow terminal sparingly branched panicle, bracts long filiform. Fruiting glumes 3, broadly ovate, cuspidate, the uppermost $\frac{1}{2}$ in. long. *Nut* $\frac{1}{2}$ in. long, broadly ovoid, obscurely trigonous, apiculate, white, polished, minutely hairy when young, disk pale brown, lobes triangular-ovate, acute $\frac{1}{4}$ — $\frac{1}{3}$ the length of the nut.

Dehra Dun (Duchie), 2443. **DISTRIB.:** Throughout India except the N. W., Malaya, China, Australia.

4. *S. elata*, Thw. *Enum.* (1864), 353; *F. B. I. vi*, 690; *Prain Beng. Pl. 1133*.

Rhizome stout, woody. *Stem* 3—5 ft. *Leaves* 12—20 by $\frac{1}{2}$ — $\frac{3}{4}$ in. narrowed into a long filiform tip, scabrid on the veins and margins, sheaths triquetrous or winged, mouth with a very short rounded hairy prolongation. *Spikelets* subsolitary, very numerous on the spreading branches of a large stiff pyramidal panicle, bracts long, linear-filiform. Fruiting glumes 3, very broadly ovate, slightly keeled, cuspidate, the uppermost $\frac{1}{2}$ in. long. *Nut* $\frac{1}{10}$ in. long, globose, apiculate, reticulate with shallow pits, minutely hairy on the transverse ridges when young, pale straw-colored, disk with very short rounded lobes the same color as the nut.

Dehra Dun (Gamble). **DISTRIB.:** Throughout India except the N. W. China, Java.

15. CAREX, Linn. Fl. Brit. Ind. vi, 699.

Perennial grass-like herbs. *Stems* triquetrous. *Inflorescence* of simple or more often paniced spikes which are either androgynous or unisexual. Male flowers forming a simple spike each consisting of 3 rarely 2 stamens in the axil of a bract or glume. Female spikelets forming a spike each in the axil of a bract or glume and consisting of a bottle-shaped or compressed glume or utricle which completely surrounds the spikelet which is so reduced as to resemble a simple flower, consisting of a naked ovary, the axis of the spikelet being very rarely evident. *Utricle* completely enclosing the nut, the 2 or 3 stigmas exerted from the commonly 2-fid neck or beak of the utricle. *Nut* compressed or trigonous. Species about 800 throughout the world mainly in cold and temperate regions.

Stigmas 2, utricle compressed	1. <i>C. cernua</i> .
Stigmas 3, utricle not compressed.	
Panicle lax or of few spikes.	
Spikes 2—3 in. long, female below male above	2. <i>C. myosurus</i> .
Spikes up to 1½ in. long, the upper 2—3 wholly male the rest wholly female.	3. <i>C. Wallichiana</i> .
Panicle dense, decomposed	4. <i>C. condensata</i> .

1. *C. cernua*, *Bott. Illustr. IV* (1876), t. 578; *F. B. I. vi*, 708; *Pflanzenr. IV*, 20, p. 353, fig. 65 D-F.

Rhizome stoloniferous. *Stem* 18—30 in. high, triquetrous, scabrid upwards, basal sheaths brown not fibrous. *Leaves* about ½ in. wide as long as the stem, flat, scabrid. *Spikes* 5—8, dense, cylindric, 1—2 in. long, the terminal usually female only at the top, one or two or sometimes all the rest shortly male at the base otherwise female, the lower on short spinulose peduncles. *Bracts* foliaceous, much exceeding the inflorescence. *Glumes* obovate-oblong, truncate or emarginate, sides pale brown with small dark spots, keel broad 3-nerved excurrent as a long hispid tip, ½ in. long including the tip. *Utricle* ½ in. long, flattened, obovate-acute in outline, minutely stipitate, yellowish or brownish with minute purple spots, apiculate by the very short entire beak.

Kheri (Inayat 22,886). **DISTRIB.:** Kashmir (Gammie!), Jaunsar (Rogers!), Assam eastwards to Japan with varieties in Australia and S. Africa.

2. *C. myosurus*, *Nees, in Wight, Contrib.* (1834), 122; *F. B. I. vi*, 723; *Pflanzenr. IV*, 20 p. 258.

Rhizome stout woody. *Stems* 2—3 ft. high, obtusely triquetrous, smooth leafy, base covered with reddish-brown reticulately fibrous sheaths. *Leaves* ½—¾ in. wide, flat, the upper as long as the inflorescence, coriaceous, scabrid. *Panicle* 8—12 in. long, lax, bracts foliaceous, rachis scabrid. *Spikes* 2—3 in. long, ½ in. broad, long-tailed by the upper male portion. *Glumes* ½ in. long, ovate-oblong, apiculate, keel green slender, sides chestnut, membranous, margins narrow hyaline.

Utricle $\frac{1}{8}$ in. long, ellipsoid, narrowed at both ends, longitudinally nerved, somewhat hairy, beak hispid-scabrid, 2-fid, half as long as the utricle.

Dehra Dun (Sohan Lal). **DISTRIB.:** Himalaya 2—7,000 ft. from Kashmir to Bhotan, Khasia and Nilgiri Hills.

3. C. Wallichiana, *Presc. ex Nees in Wight Contrib.* (1834), 129; *F. B. I. vi*, 747; *Prain Beng. Pl.* 1131; *Collett, Fl. Siml.* 570; *Pflanzenr. IV*, 20, p. 749.

Rhizome stoloniferous. *Stems* 12—30 in. high, sharply triquetrous smooth or scabrid upwards, basal sheaths purplish, somewhat reticulately fibrous. *Leaves* $\frac{1}{2}$ — $\frac{1}{4}$ in. wide, flat, with rigid filiform tips exceeding the stems. *Spikes* 5—6, the upper 2—3 approximate, linear-cylindric, male $\frac{3}{4}$ — $1\frac{1}{2}$ in. long, the rest female, distant, $\frac{1}{2}$ — $1\frac{1}{2}$ in. long, dense. *Bracts* foliaceous exceeding the inflorescence. *Glumes* $\frac{1}{2}$ in. long, ovate or ovate-lanceolate, more or less aristate, pale brown, 3-nerved. *Utricle* $\frac{1}{8}$ in. long, ovoid, greyish-brown, densely pubescent, abruptly tipped by the short deeply 2-fid beak.

Saharanpur, Moradabad (Thomson), Kheri (Inayat), Bahraich (Inayat), Gorakhpur (Harsukh). **DISTRIB.:** Afghanistan to Japan.

4. C. condensata, *Nees in Wight Contrib.* (1834), 123; *F. B. I. vi*, 716; *Cooke Fl. Bomb. ii*, 905; *Collett, Fl. Siml.* 568; *C. cruciata*, *Kuckenth. Pflanzenr. IV*, 20, p. 265.

Rhizome thick woody. *Stems* 2—3 ft. high, obtusely triquetrous smooth, leafy, base thickened, surrounded by the dark-brown fibrous remains of the sheaths. *Leaves* $\frac{1}{2}$ — $\frac{2}{3}$ in. wide, flat, the upper exceeding the inflorescence, coriaceous, margins scabrid. *Panicle* decompound, the partial panicles $1\frac{1}{2}$ — $2\frac{1}{2}$ in. long, pale brown, dense, the upper approximate, the lower rather remote, long peduncled; bracts leaf-like, bracteoles filiform, rachis hispid. *Spikes* $\frac{1}{4}$ — $\frac{3}{8}$ in. long, narrowly oblong, terete, with 3—4 female and several male flowers. *Glumes* $\frac{1}{2}$ in. long, ovate-oblong, apiculate, membranous, marked with red dots and streaks. *Utricle* $\frac{3}{8}$ — $\frac{1}{2}$ in. long, ellipsoid-trigonous, with a 2-fid beak $\frac{1}{2}$ the length of the utricle, irregularly ribbed, scabrid-pilose.

Dehra Dun (Duthie 10,714). **DISTRIB.:** Himalaya from Dalhousie to Bhotan 1—10,000 ft. common.

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<i>bovina</i> Edgew.	i	413	<i>lateritia</i>	ii	129
<i>eriantha</i> DC.	i	413	<i>spectabilis</i> Willd.	ii	129
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<i>glomerata</i> DC.	i	414	<i>iberidifolia</i> Benth.	i	450
<i>hamiltonii</i> DC.	i	415	<i>Brachypterum</i>	i	247
<i>hieracifolia</i> DC.	i	414	<i>scandens</i> Benth.	i	247
<i>var. hamiltonii</i>	i	415	<i>Brachystelma</i> Br.	i	512
<i>var. macrostachya</i>	i	415	<i>lævigatum</i> Hk.f.	i	512
<i>jacquemontii</i> Hook.f.	i	415	<i>parviflorum</i> Hk.f.	i	512
<i>lacera</i> DC.	i	414	<i>pauciflorum</i> Duthie	i	512
<i>laciniata</i> DC.	i	415	<i>Bradleia</i>		
<i>macrostachya</i> DC.	i	415	<i>lanceolaria</i> Roxb.	ii	194
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<i>procera</i> DC.	i	416	<i>Planch.</i>	i	367
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<i>frutescens</i> Don	ii	230	<i>var. dichotoma</i>		
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<i>rugolosa</i> Wedd.	ii	224	<i>campestris</i>	i	44
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<i>scabrella</i> Gaud.	ii	225	<i>var. Sarson</i> Prain	i	44
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<i>procumbens</i> Roxb.	ii	127	<i>var. agrestis</i> Prain	i	43
<i>repanda</i> Willd.	ii	128	<i>napus</i> L.	i	44
<i>repens</i> L.	ii	127	<i>var. dichotoma</i> Prain	i	44
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<i>serrata</i> Roxb.	i	138	<i>suaveolens</i> Don	ii	10
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<i>thurifera</i> Roxb.	i	138	<i>cissioides</i> Wall.	i	347
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<i>tenellum</i> Fisch.	i	540			

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<i>umbellata</i> Klein	i	347	<i>arborea</i> Roxb.	ii	86
<i>Bryonopsis</i> Arn.	i	349	<i>incana</i> Roxb.	ii	86
<i>laciniosa</i> Naud.	i	349	<i>macrophylla</i> Vahl.	ii	86
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<i>latifolia</i> Roxb.	i	173	<i>polygonoides</i> L.	ii	159
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<i>falcatum</i> L.	i	359	<i>Calystegia</i> Br.	i	547
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<i>Cæsalpinia</i> L.	i	278	<i>Canscora</i> Lamk.	i	522
<i>bonducella</i> Flem.	i	278	<i>decussata</i> Rœm. &		
<i>coriaria</i> Willd.	i	279	<i>Schult.</i>	i	523
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<i>indicus</i> Spr.	i	197	<i>grandis</i> L.f.	i	51
<i>Calamintha</i> Mœn.	ii	108	<i>heteroclitia</i> Roxb.	i	50
<i>clinopodium</i>	ii	108	<i>horrida</i> L.f.	i	52
			<i>sepiaria</i> L.	i	52
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<i>var. acuminata</i> Fing.	ii	11	<i>anavinga</i> D. & G.	i	330
<i>var. cerasiformis</i>			<i>graveolens</i> Dalz.	i	330
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<i>var. grossa</i> Sendt.	ii	11	<i>tomentosa</i> Roxb.	i	330
<i>var. nigra</i>	ii	11	<i>Cassia</i> L.	i	267
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<i>cerassiforme</i> Roxb.	ii	11	<i>amcena</i> Buch.-Ham.	i	272
<i>frutescens</i> L.	ii	11	<i>angustissima</i> Lamk.	i	272
<i>var. baccata</i> Irish	ii	12	<i>auriculata</i> L.	i	270
<i>frutescens</i> Roxb.	ii	11	<i>dimidiata</i> Roxb.	i	272
<i>grossum</i> Roxb.	ii	11	<i>fastigiata</i> Vahl.	i	269
<i>var. cerassiformis</i>	ii	11	<i>fistula</i> L.	i	268
<i>minimum</i> Roxb.	ii	11	<i>glauca</i> Lamk.	i	268
<i>purpureum</i> Roxb.	ii	11	<i>var. suffruticosa</i>	i	269
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<i>lucida</i> Roxb.	i	307	<i>mimosoides</i> L.	i	272
<i>Cardamine</i> L.	i	40	<i>var. wallichiana</i>	i	273
<i>hirsuta</i> L.	i	40	<i>obovata</i> Collad.	i	271
<i>var. sylvatica</i>	i	40	<i>obtusata</i> Roxb.	i	271
<i>impatiens</i> L.	i	40	<i>obtusifolia</i> L.	i	270
<i>sylvatica</i> Link.	i	40	<i>occidentalis</i> L.	i	269
<i>Cardiospermum</i> L.	i	166	<i>prostrata</i> Koen.	i	271
<i>halicacabum</i> L.	i	166	<i>pumila</i> Lamk.	i	271
<i>Carduus</i>			<i>rhombofolia</i> Roxb.	i	268
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<i>cernua</i> Bott.	ii	417	<i>suffruticosa</i> Koen.	i	269
<i>condensata</i> Nees	ii	418	<i>tora</i>	i	270
<i>cruciata</i> Kuck.	ii	418	<i>var. 'β.'</i> W. & A.	i	270
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<i>wallichiana</i> Presc.	ii	418	<i>wallichiana</i> DC.	i	273
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<i>arborea</i> Roxb.	i	317	<i>filiformis</i> L.	ii	170
<i>herbarca</i> Roxb.	i	316	<i>Castanea</i>	ii	170
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<i>papaya</i> L.	i	351	<i>vesca</i> Gærtn.	ii	252
<i>Carissa</i> L.	i	483	<i>vulgaris</i> Lamk.	ii	252
<i>carandas</i> L.	i	483	<i>Casuarina</i> Forst.	ii	250
<i>diffusa</i> Roxb.	i	484	<i>equisetifolia</i> Forst.	ii	250
<i>hirsuta</i> Roth.	i	484	<i>muricata</i> Roxb.	ii	250
<i>spinarum</i> L.	i	483	CASUARINACEÆ	ii	250
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<i>spinosa</i> Royle	i	149	Pav.	i	32
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<i>argentea</i> L.	ii	131	<i>Spr.</i>	ii	206
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<i>cyanus</i> L.	i	451	<i>indicum</i> L.	i	451
<i>moschata</i> L.	i	451	<i>leucanthemum</i> L.	i	451
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<i>hispida</i> Br.	ii	32	<i>Cicer</i> L.	i	236
<i>nepalensis</i> Don	ii	32	<i>arietinum</i> L.	i	236
<i>Centunculus</i> L.	i	461	<i>lens</i> Willd.	i	237
<i>pentandrus</i> Br.	i	461	<i>Cichorium</i>		
<i>tenellus</i> Duby	i	461	<i>endivia</i> L.	i	451
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<i>demersum</i> L.	ii	255	<i>glabra</i> Roxb.	i	31
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