FLORA OF HAZARIBAGH DISTRICT, BIHAR

Volume II
(TROPAEOLACEAE TO ORCHIDACEAE)

N. D. PARIA
S. P. CHATTOPADHYAY

BOTANICAL SURVEY OF INDIA
Ministry of Environment and Forests

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भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

GOVT. OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
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Cover Photo : Close up view of an inflorescence of Leonotis nepetaefolia.

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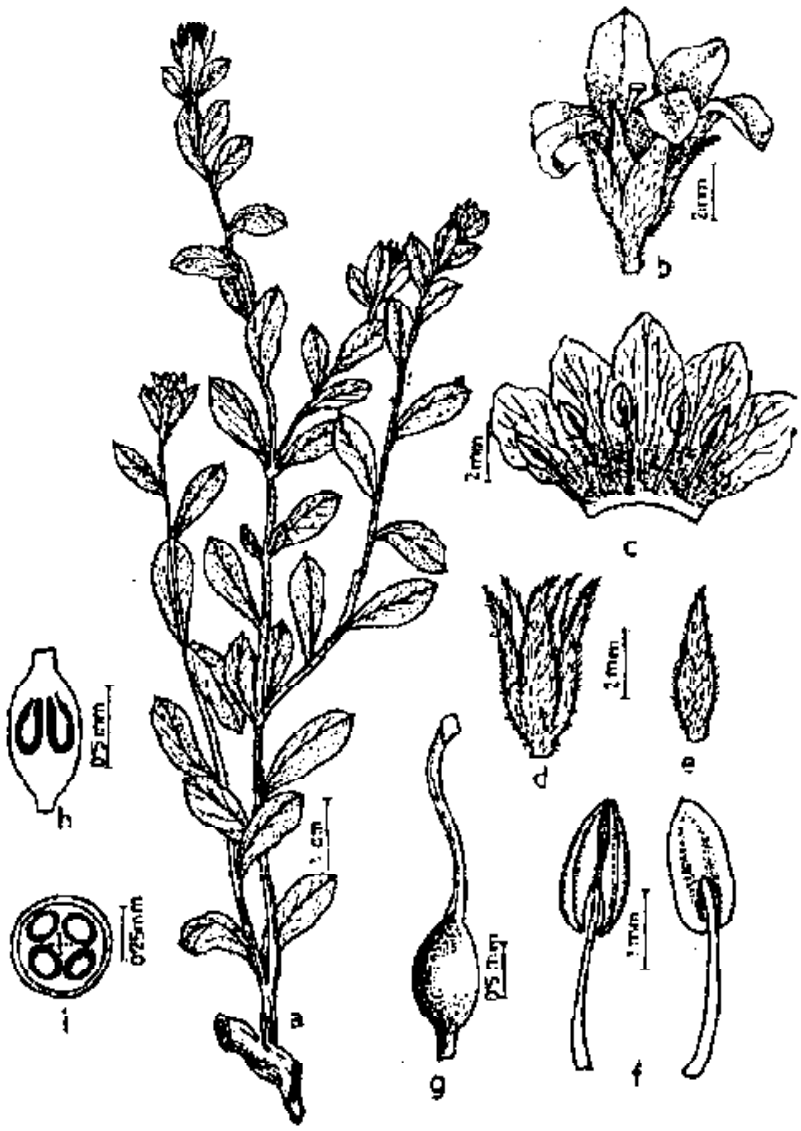

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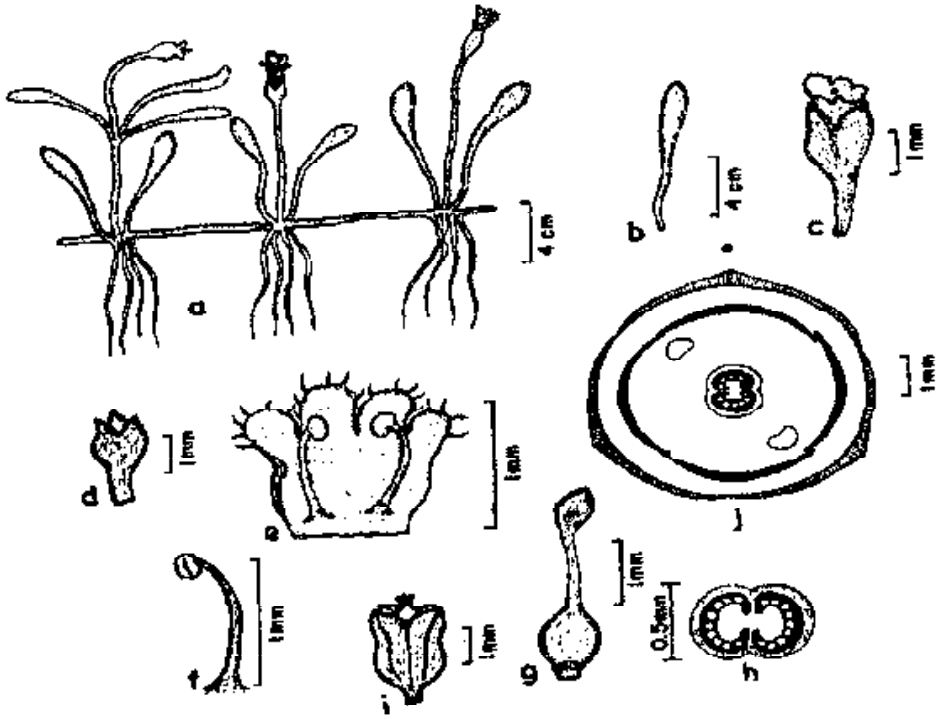

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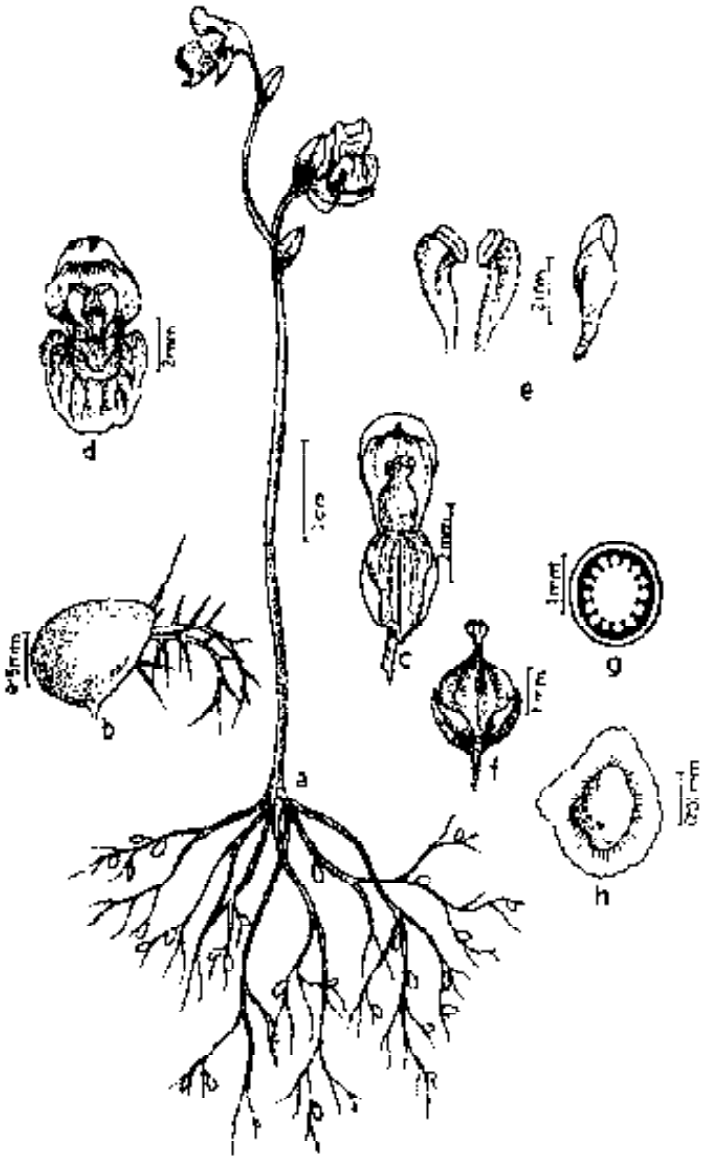

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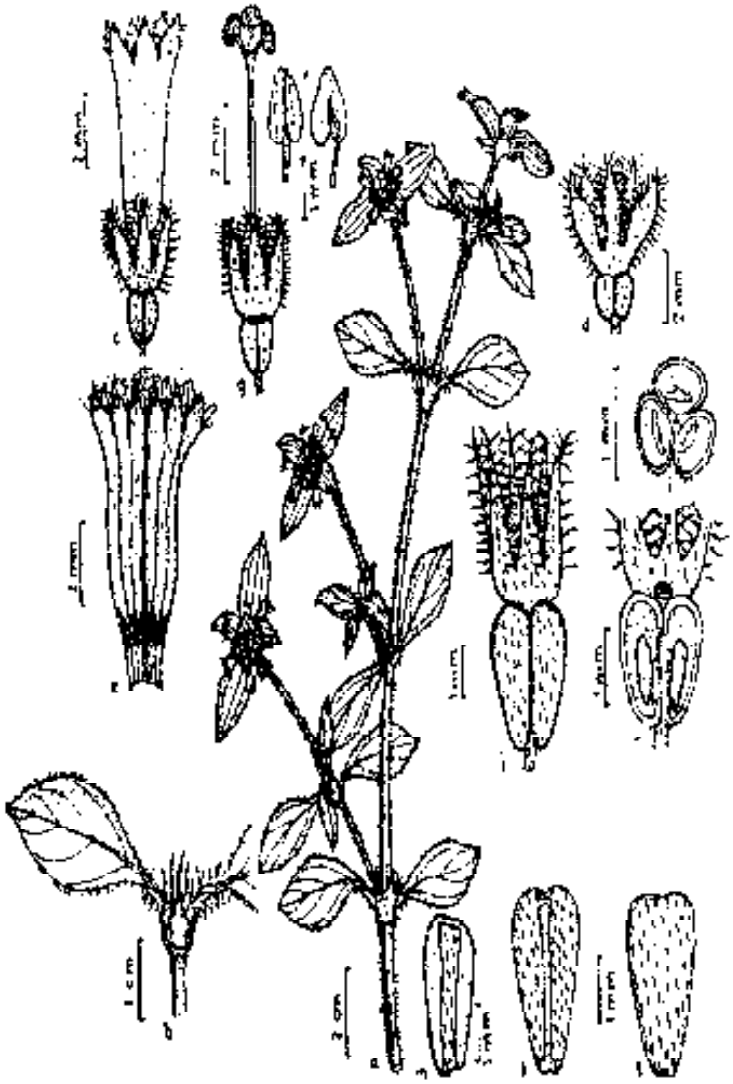

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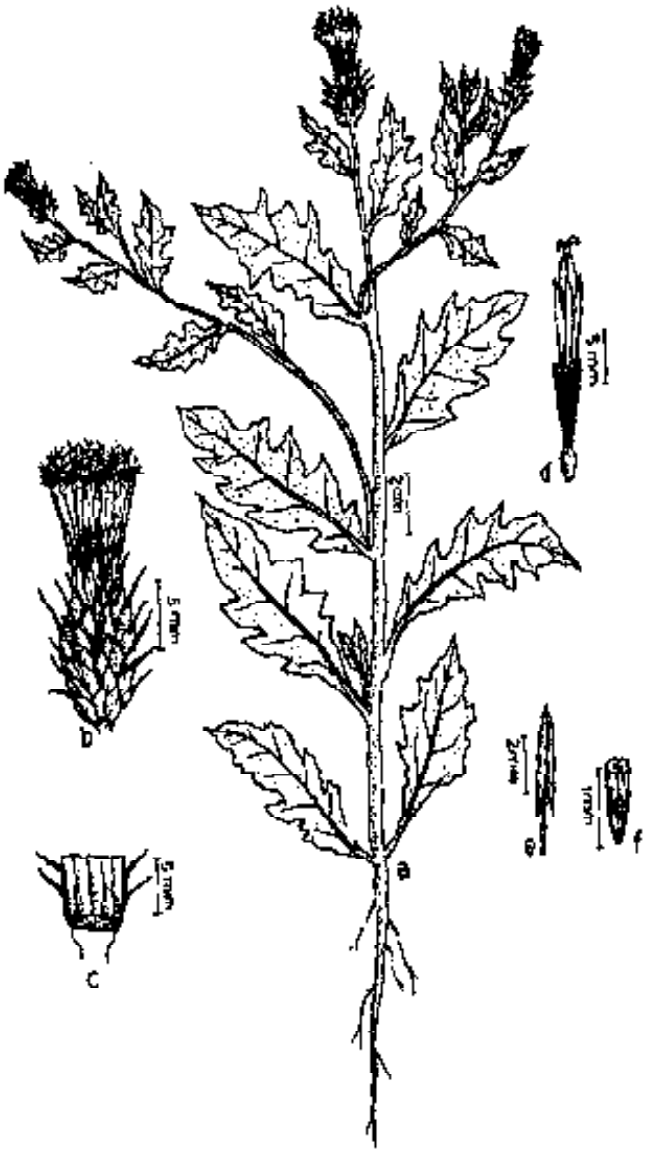
(a) twig, (b) opposite leaves and stipules, (c) flower, (d) calyx, (e) corolla, split open, (f) stamens, (g) pistil, (h) l. s. of ovary, (i) t. s. of ovary, (j) fruit with persistent calyx, (k) mericarp with adaxial face, (l) mericarp with abaxial face, (m) seed. (P. 844)



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(a) habit, (b) head with spiny involucre, (c) part of involucre, (d) disc floret, (e) stamen, (f) fruit. (P. 864)

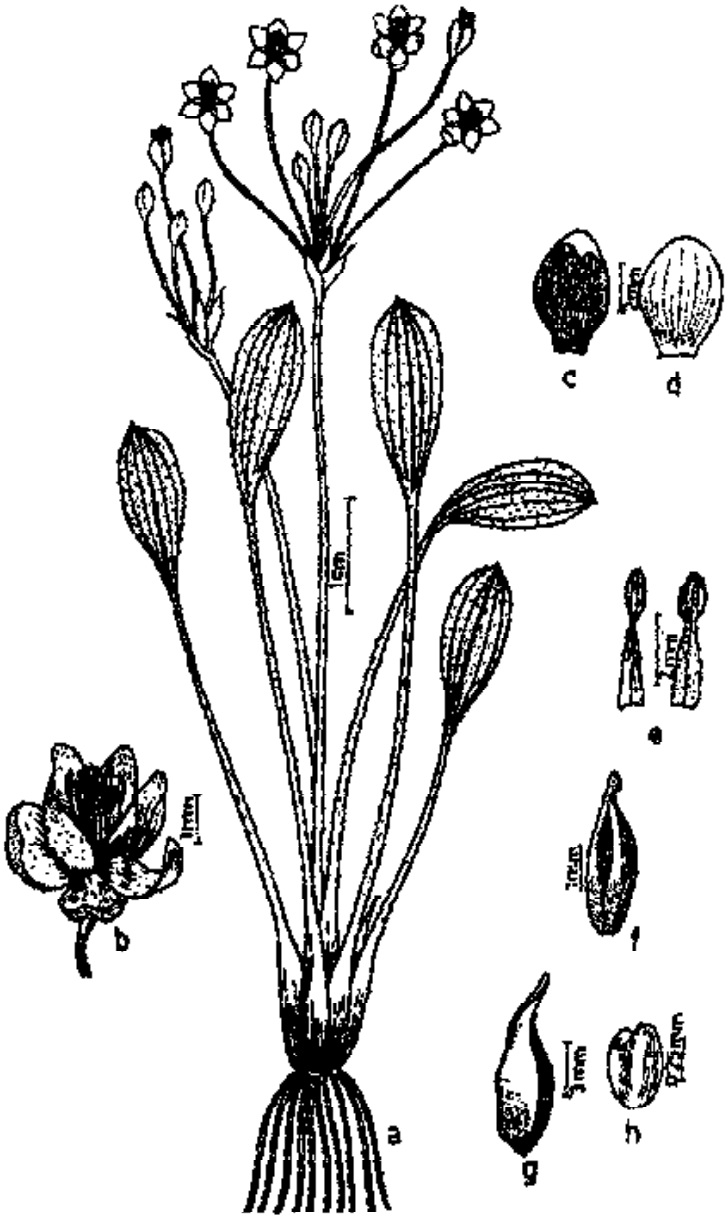

Fig. 11 : *Butomopsis latifolia* (D. Don) Kunth
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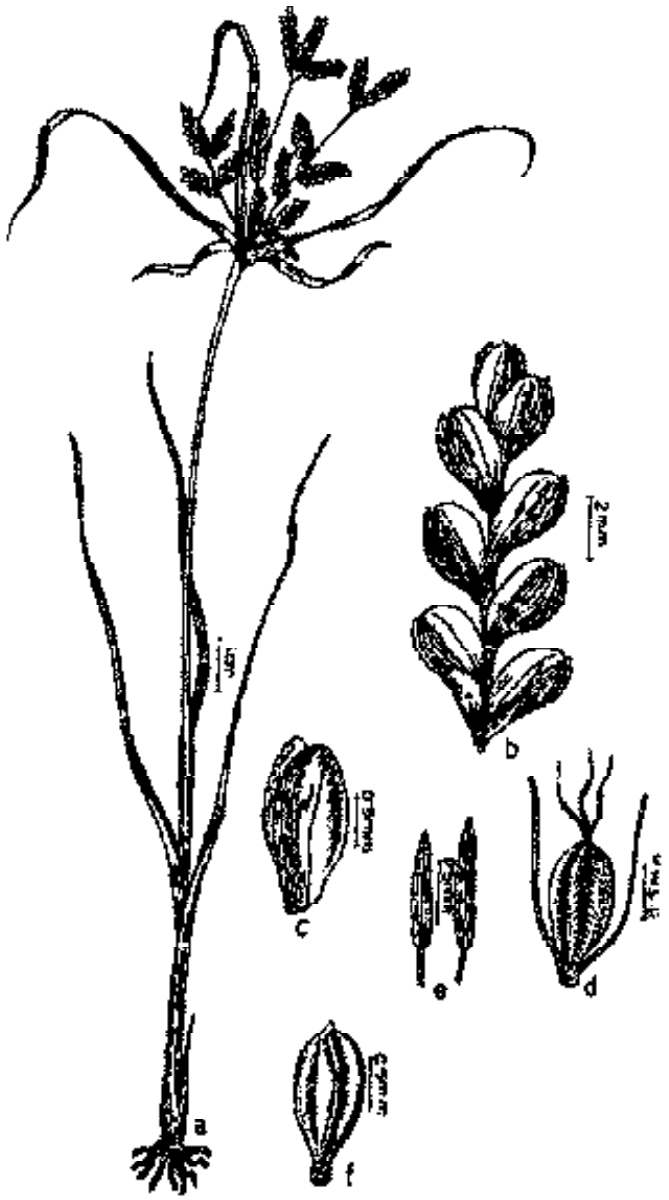

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(a) habit, (b) spikelet, (c) glume, (d) deflorate flower, (e) stamens, (f) nut.
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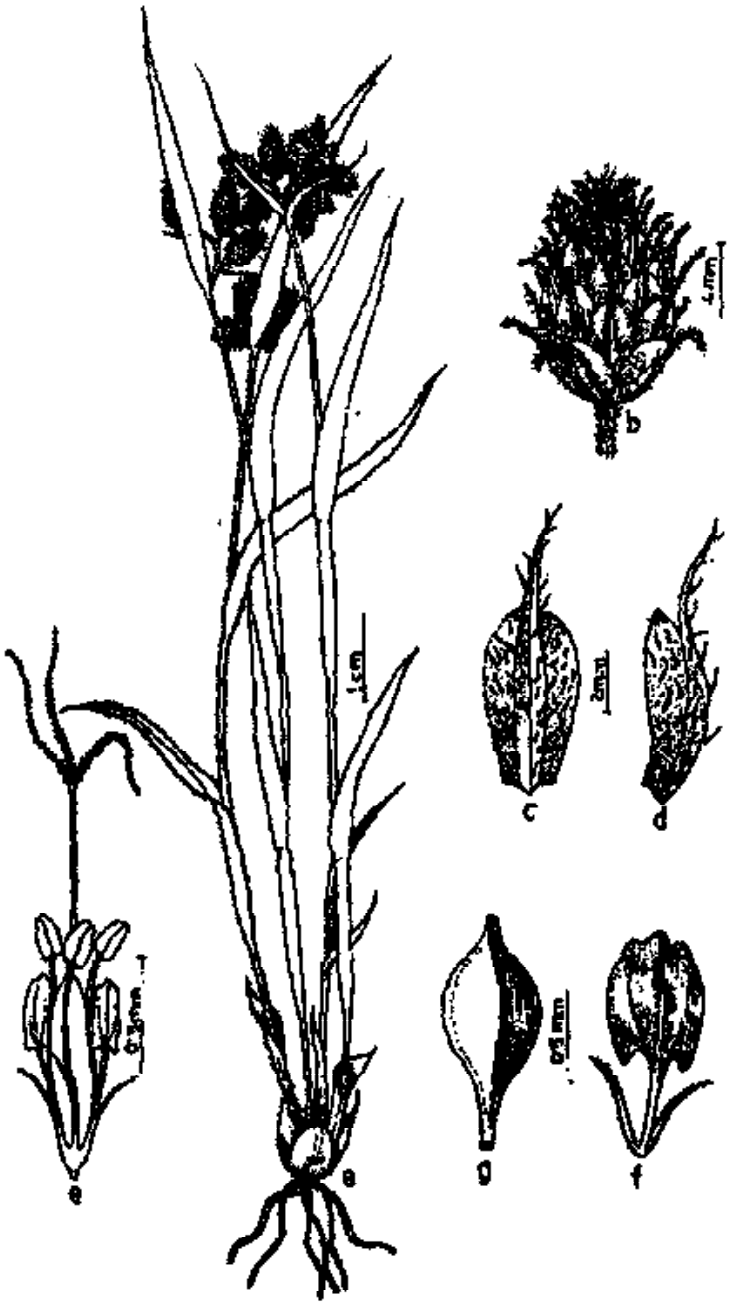
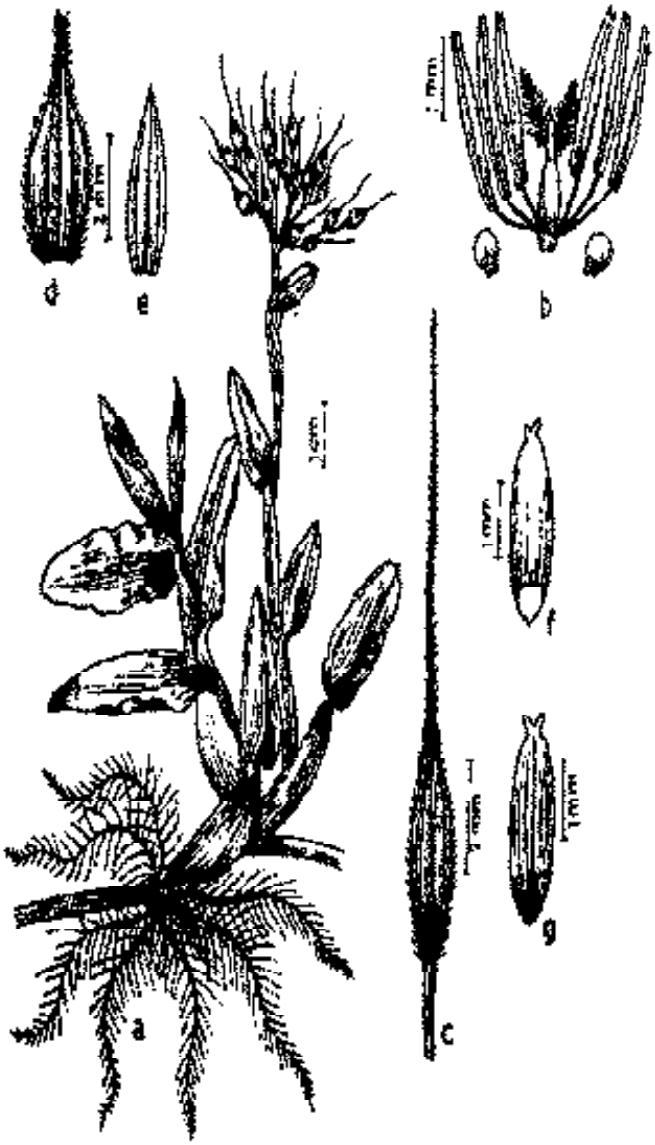


Fig. 13 : *Fuirena ciliaris* (L.) Roxb.
(a) habit, (b) spikelet, (c) glume (dorsal view), (d) glume (lateral view), (e) deflorate flower, (f) scaly perianth segment and two bristle like awns, (g) nut. (P. 1008)



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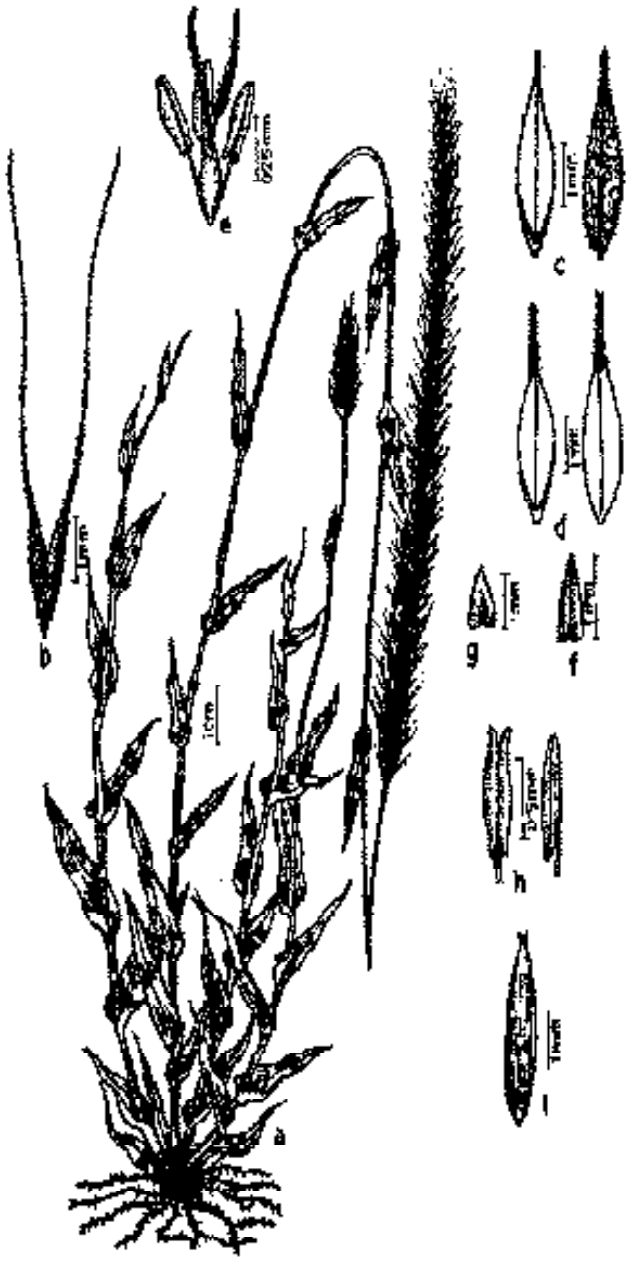
(a) habit, (b) flower including stamens, ovary and lodicules, (c) spikelet without glume, (d) lemma without awn, (e) palea, (f) grain showing embryo, (g) grain showing a linear hilum. (P. 1095)



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(a)habit, (b) spikelet, (c) lower glume, front & back, (e) stamens and pistil, (f) lemma, (g) palea, (h) stemens, (i) caryopsis. (P. 1119)

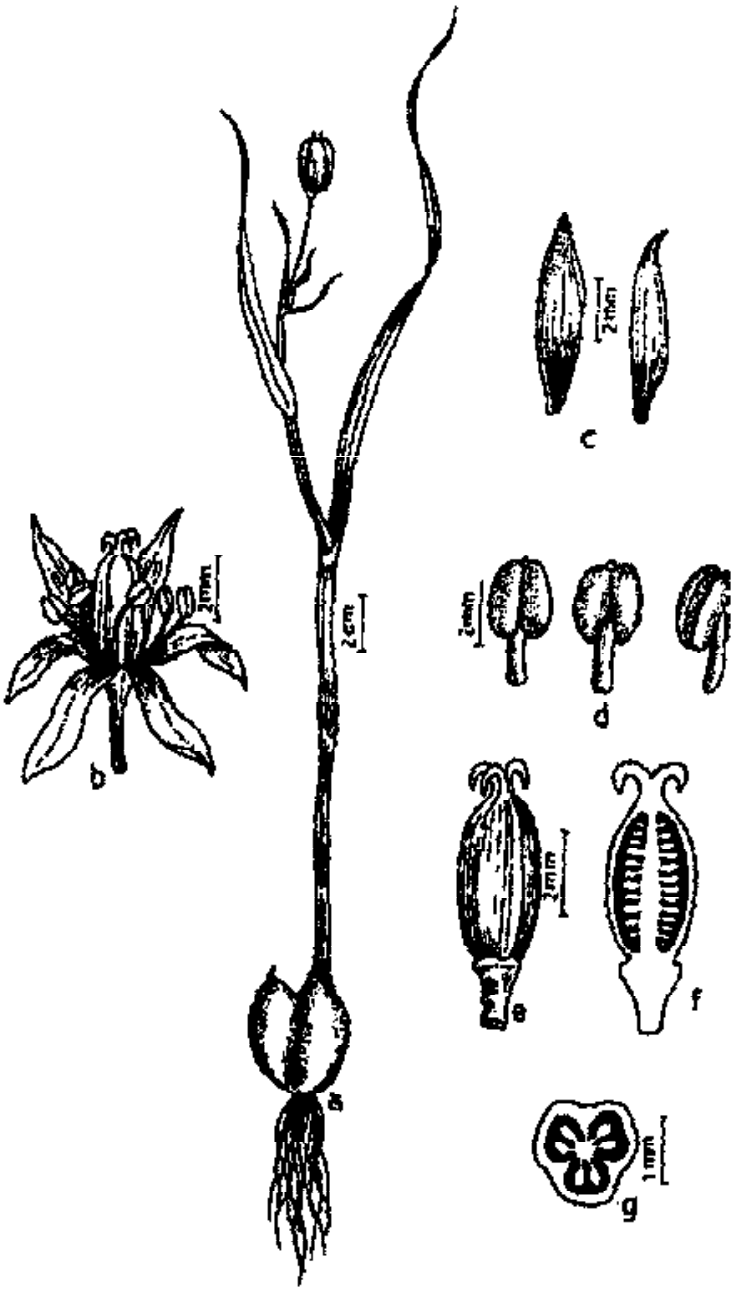


Fig. 16 : *Iphigenia indica* (L.) A. Gray
(a) habit, (b) flower, (c) perianth-segments (d) anthers, (e) pistil, (f) l.s. of ovary, (g) t.s. of ovary. (P. 1168)

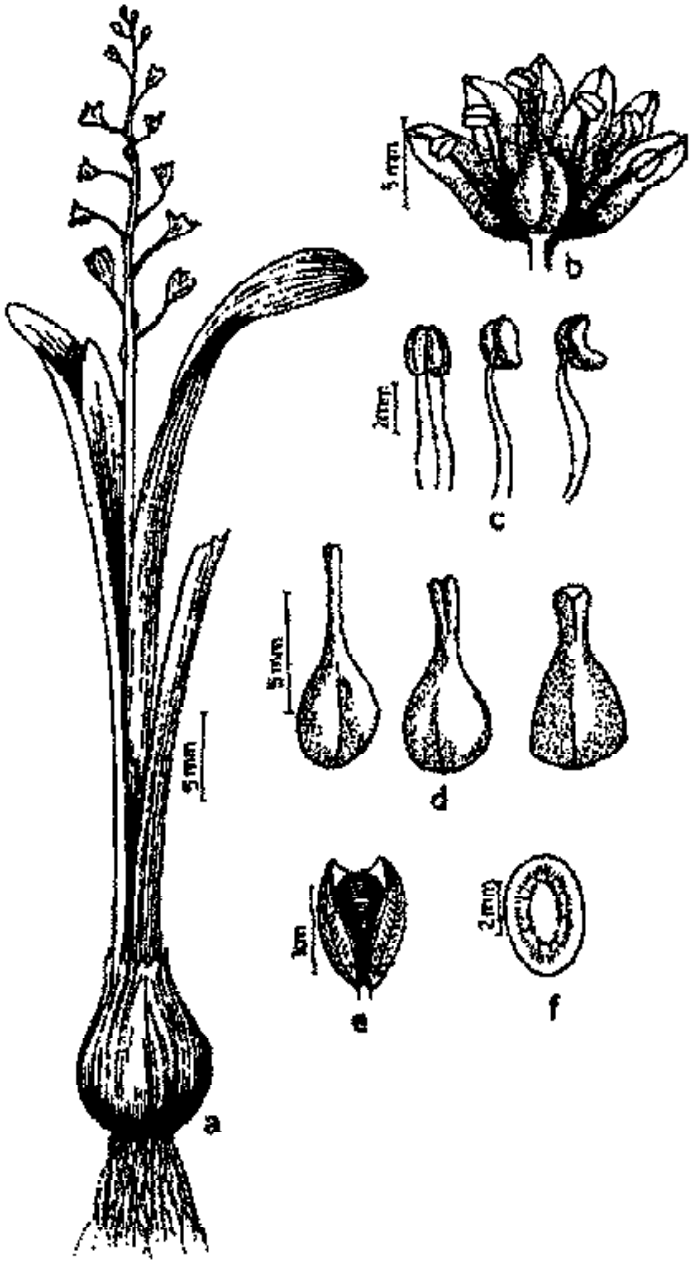


Fig. 17 : *Urginea indica* (Roxb.) Kunth
(a) habit, (b) dissected flower, (c) variation in stamens, (d) variation in carpels, (e) fruit, (f) seed. (P.1169)

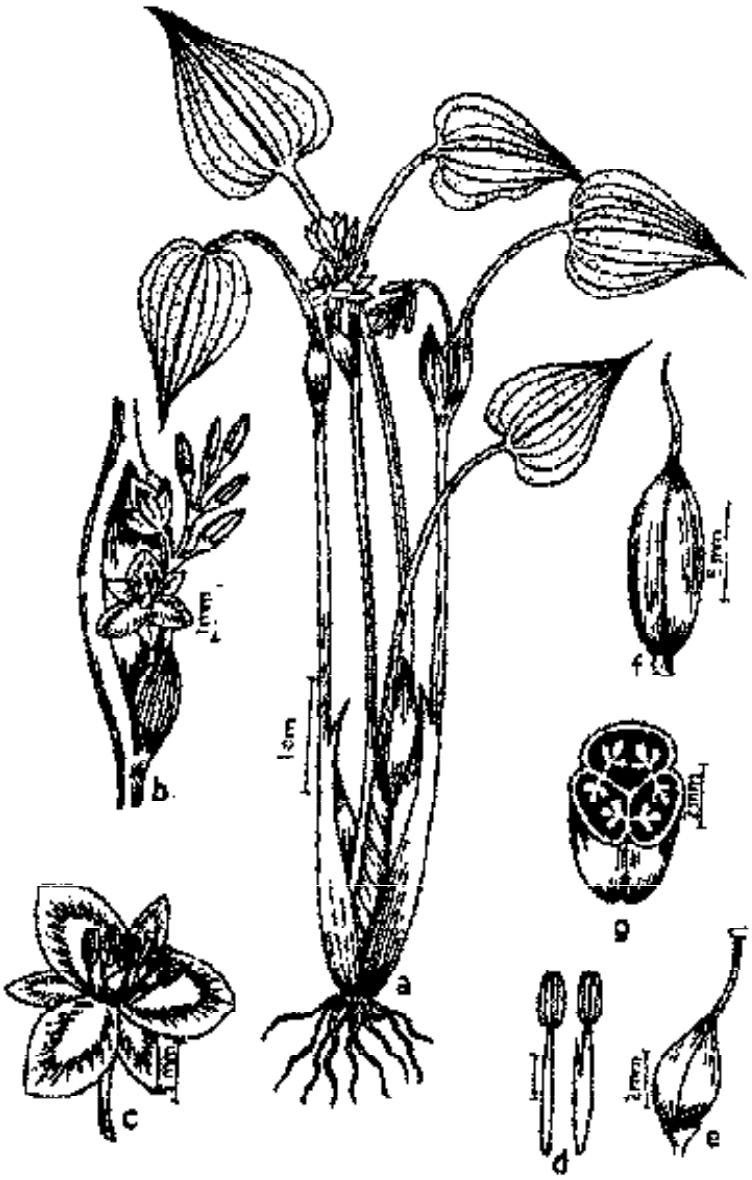
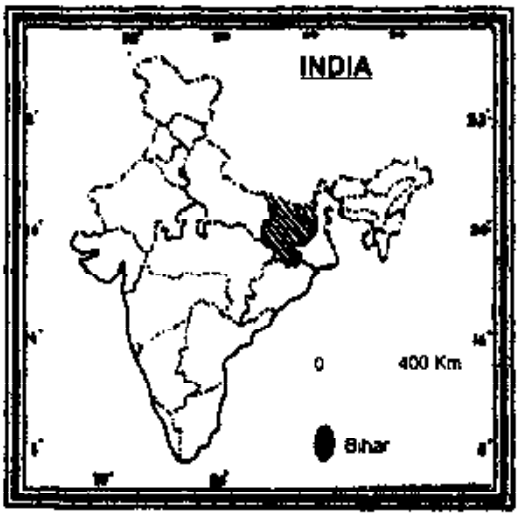
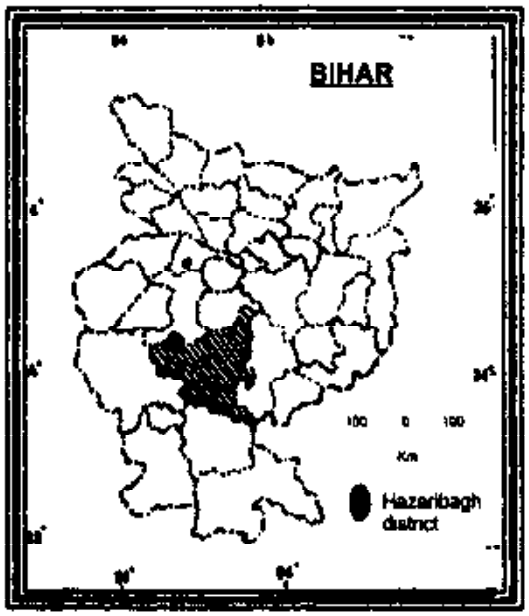
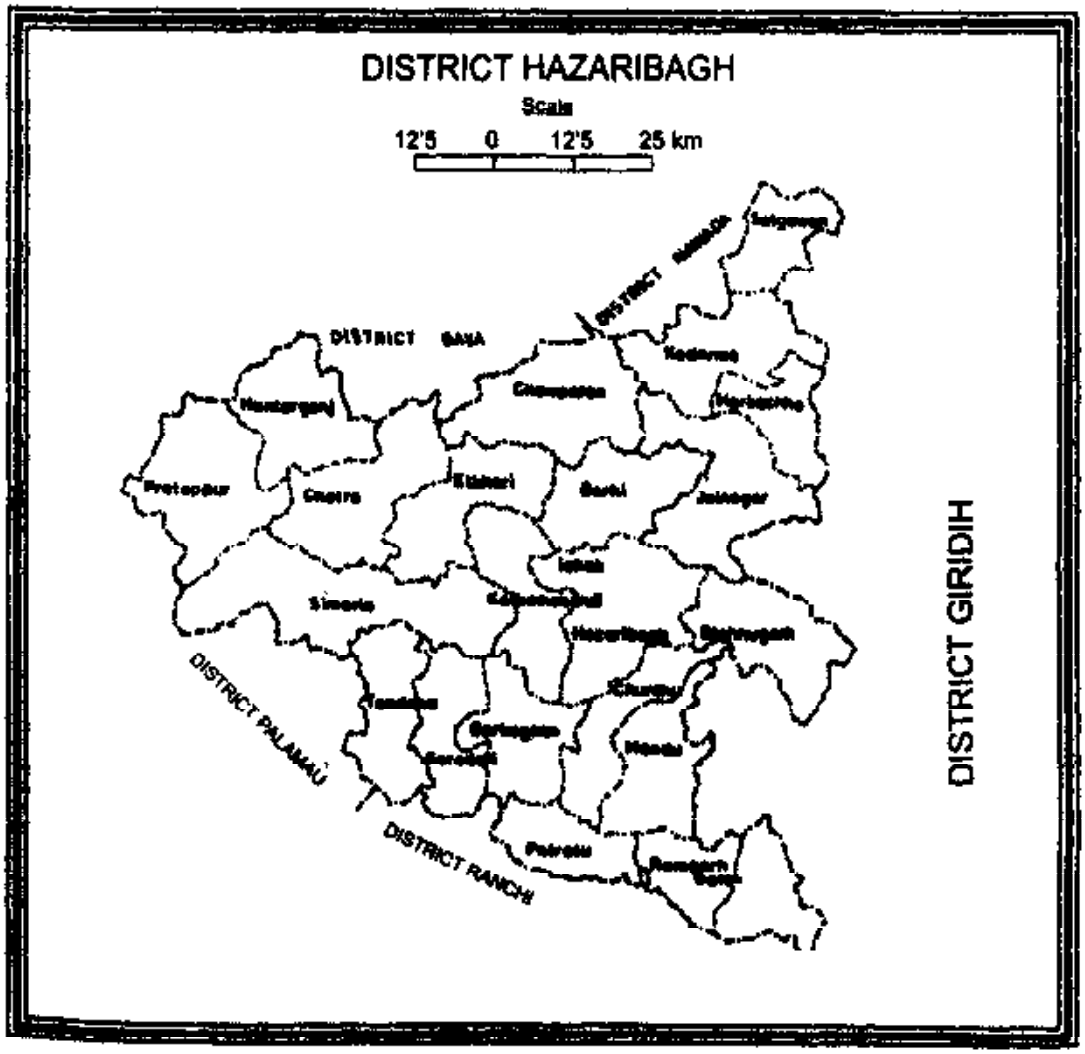


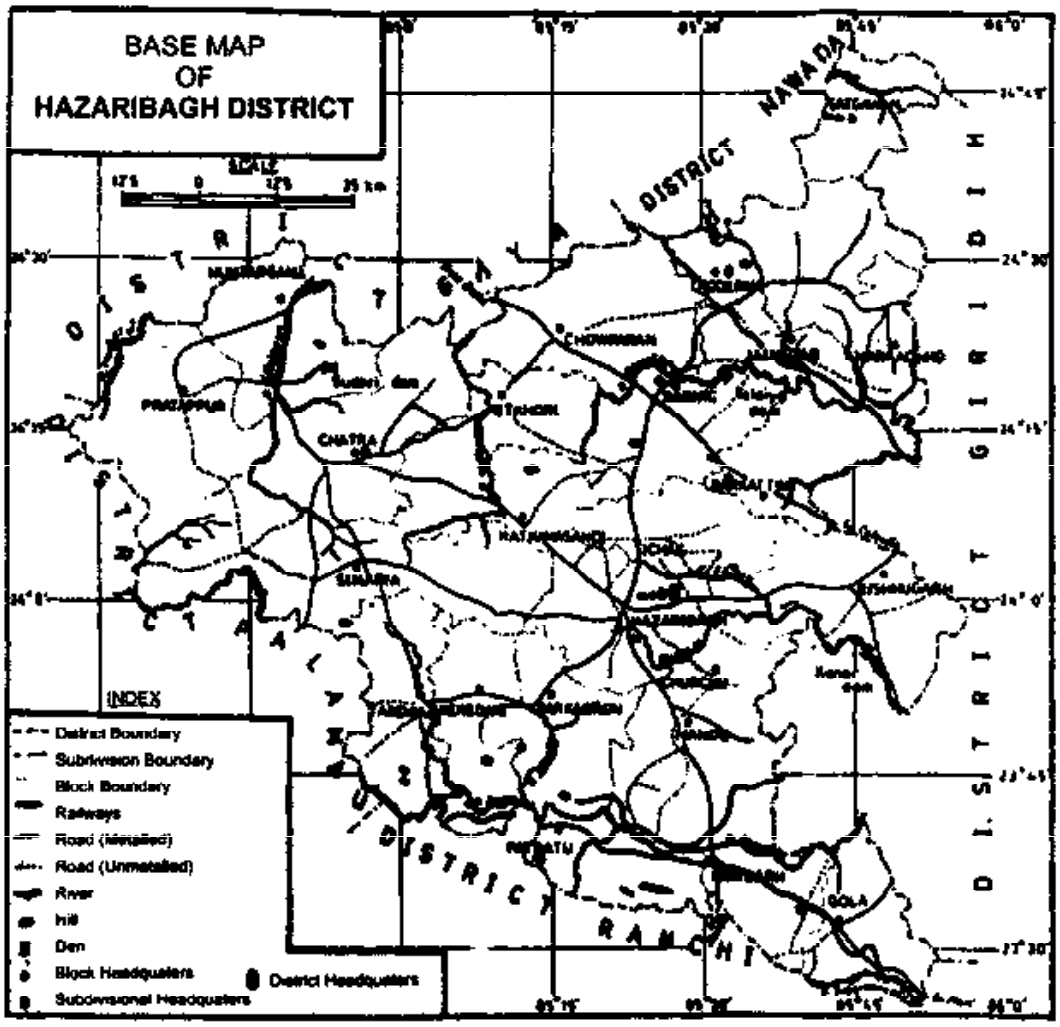
Fig. 18 : *Monochoria vaginalis* (Burm.f.) Presl
(a) habit, (b) inflorescence, (c) flower,
(d) stamens, (e) pistil (f) fruit, (g) t.s. of fruit.(P.1157)



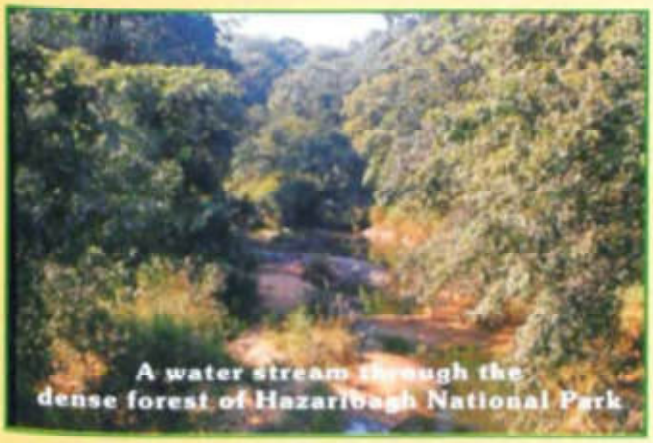




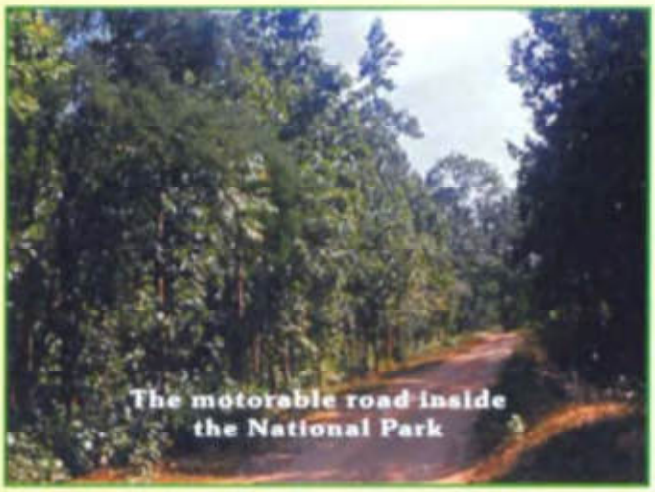
Base map of Hazaribagh District



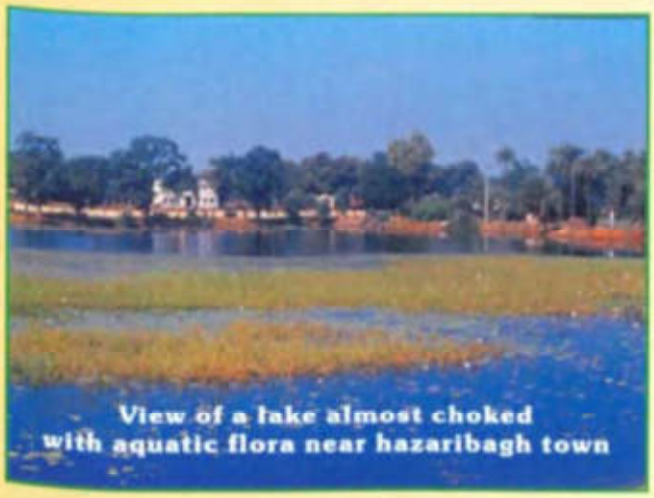
Location Map of the study area



A water stream through the dense forest of Hazaribagh National Park



The motorable road inside the National Park



View of a lake almost choked with aquatic flora near hazaribagh town

Acanthospermum hispidum DC.

Justicia betonica L.

Jasticia quinquangularis Koen. ex. Roxb.

Leonotis nepetaefolia (L.) R. Br.

Close up view of an inflorescence of Leonotis nepetaefolia.

View of an aggressive climber (Ipomoea) on Phoenix sylvestris Roxb.

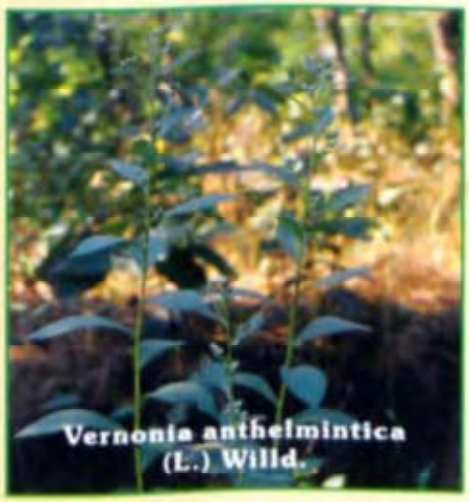
Carthamus tinctorius L. in cultivation

Pennisetum pedicellatum Trin.

Elephantopus scaber L.

Vicoa indica (L.) DC.

Indoneesiella echioides (L.) Sreemadh.



Vernonia anthelmintica (L.) Willd.

Trichodesma indicum (L.) R. Br.

90. TROPAEOLACEAE

TROPAEOLUM L.

Tropaeolum majus L., Sp. Pl. 345. 1753 ; Bailey, Man. Cult. Pl. ed. 2, 662. 1949 ; Matthew in Rec. Bot. Surv. India 20 : 58. 1969.

Trailing or decumbent, glabrous, annual herbs. Leaves orbicular or somewhat reniform, entire, sinuate or variously lobed, usually papillose and glaucous beneath, 5-15 cm in diam., with about 9 main veins radiating from petiole. Flowers 2.5-6.5 cm across, solitary. Pedicels 6-15 cm long. Sepals 1.5-2.5 cm long ; nectar-spur straight or curved, 2.5-3.5 cm long. Petals yellow, red, scarlet, maroon to creamy-white, mostly rounded, evenly toothed, the lower ones deeply fringed on claw. Stamens 8, free, unequal. Stigmas linear.

Fl. & Fr. : Jan. - Apr.

Ecology : Common ; planted in gardens as an ornamental ; sometimes met with as an escape in waste places, along roadsides, etc.

Distribution : Planted almost throughout India. Native in Peru, New Granade and Brazil, at present cultivated throughout the world.

Specimens examined : Hazaribagh, 1609 ; Chatra, 1710.

Uses : Plant is used in cystitis and inflammation of kidneys. Juice is used as a cure for itch. Plant-extract is used in the infections of urinary and respiratory tracks.

91. BALSAMINACEAE

IMPATIENS L.

Impatiens balsamina L., Sp. Pl. 938. 1753 ; Hook. f. in Hook. f., Fl. Brit. India 1 : 453. 1874 ; Prain, Bengal Pl. 1 : 296. 1903; Hook. f. in Rec. Bot. Surv. India 4:13 & 13 & 19. 1911; Haines, Bot. Bihar & Orissa pt. 2 : 158. 1921.

Local name : Gul-mendi.

Annuals, to 50 cm tall. Stems erect, simple or sparsely branched, glabrous, or pubescent when young. Leaves spirally arranged, lowermost occasionally opposite, sessile to shortly petiolate, lanceolate to narrowly elliptic or oblanceolate, cuneate at base, acute at apex, serrate-dentate with several glands towards base, glabrous or finely pubescent, 3 - 10 × 1 - 2.5 cm. Flowers solitary or in fascicles of 2 - 3; bracts inconspicuous, linear-lanceolate, 1.5 - 2 mm long; pedicels slender, 1 - 1.5 cm long, becoming pendent in flower. Lateral 2 sepals narrowly ovate-lanceolate, 2 - 3 mm long ; lower sepal deeply navicular, 1.2 - 2 cm long, abruptly constricted into a 1.5 - 2.5 cm long filiform spur, incurved in distal half, glabrous or finely pubescent. Dorsal petal cucullate, 1 - 1.5 cm long, with a shallow crest terminating in a short acute point ; lateral united petals 2 - 2.5cm long ; upper petal of each pair oblong, obtuse or apiculate, about one-third the size of suborbicular, unevenly bilobed lower petal. Capsule fusiform, 1 - 2 × 0.6 - 0.8 cm, densely tomentose.

Fl. & Fr. : July - Sept.

Ecology : Common ; in open wet waste places, roadsides, river-banks, forest-edges, etc. ; also widely cultivated in gardens as an ornamental.

Distribution : Throughout tropical and sub-tropical parts of India. South-East Asia.

Specimens examined : Chatra, 976 ; Hazaribagh, 2253.

Uses : Leaves and seeds are edible. Flowers are used for lumbago and intercostal neurlgia. Seeds yield an oil which is used as an illuminant.

Note : *Impatiens balsamina* is an extremely variable species as regards to the size of leaves and flowers and as such, Hooker f. (1874) recognised 6 varieties. The species is widely cultivated and also naturalised in different parts of the district. However, no attempt has been made to recognise any varieties in the present work.

92. UMBELLIFERAE

Key to the Genera

1a. Leaves and umbels simple :

- 2a. Mericarps 7-9- ribbed ... 2. CENTELLA
- 2b. Mericarps 3-ribbed ... 7. HYDROCOTYLE

1b. Leaves and umbels compound :

- 3a. Ovary and fruit bristly or scaly-hairy :
  - 4a. Involucres pinnatifid. Rays 15-30 ... 5. DAUCUS
  - 4b. Involucres not pinnatifid. Rays 2 - 9 :
    - 5a. Calyx-teeth inconspicuous or absent. Vittae 3 in the intervals, 4 on the commissure ... 8.TRACHYSPERMUM
    - 5b. Calyx-teeth distinct, subulate. Vittae solitary under each secondary ridge ...4. CUMINUM
- 3b. Ovary and fruit entirely glabrous :
  - 6a. Calyx-teeth distinct ... 3.CORIANDRUM
  - 6b. Calyx-teeth inconspicuous or absent :
    - 7a. Flowers yellow or yellowish-green ...6. FOENICULUM
    - 7b. Flowers white or reddish ... 1. CARUM

1. CARUM L.

Carum carvi L., Sp. Pl. 263. 1753 ; Clarke in Hook. f., Fl. Brit. India 2 : 680. 1879 ; Buwalda in Blumea 2 : 186. 1936 & in Steenis, Fl. Males. ser 1, 4 : 133. 1949; Hiroe, Umbellif. Asia no. 1 : 76. 1958.

Local name : Shia jira.

Stems erect, terete, striate, to 55 cm long. Petioles to 13 cm long, upper ones gradually shorter, uppermost ones absent, all of them with a sheath having membranous margins and auriculate apex; lamina oblong, to 13 × 5 cm, bipinnate ; segments divided. Compound umbels terminal to stems and its branches ; peduncles 2 - 10 cm long; rays 5 - 8, 0.5 - 2 cm long ; pedicels 6 - 14, 1.5 - 5 mm long, accrescent to 0.9 cm in fruit. Involucres none or 1, subulate. Involucels none. Petals obcordate, with short inflexed tips, white. Stylopodium bipartite, halves low-conical. Mericarps usually falcate, yellowish, distinctly ribbed, 4-5 × 0.8 - 1 mm.

Fl. & Fr. : Dec. - Mar.

Ecology : Common ; found under cultivation in the fields and gardens.

Distribution. : India : Wild in N. Himalayan regions, cultivated almost in all parts of the country, particularly in Bihar, Orissa, Punjab, Uttar Pradesh, Andhra Pradesh, Kashmir, Tamil Nadu. Indigenous in Europe and temperate Asia, now cultivated elsewhere in the World.

Specimens examined : Ghanghree, 1071 ; Ramgarh, 1136.

Uses : Dried fruits are used as spice and for flavouring bread, meat, sausages, vegetables, etc, ; also used as stomachic and carminative.

2. CENTELLA L.

Centella asiatica (L.) Urban in Mart., Fl. Bras. 11(1) : 287, t. 78. f. 1. 1879. Gamble, Fl. Madras 1 : 556. 1919; Buwalda in Blumea 2 : 134. 1946 & in Steenis, Fl. Males. ser 1, 4 : 117. 1949; Hiroe, Umbellif. Asia no. 1 : 11. 1958. *Hydrocotyle asiatica* L., Sp. Pl. 234. 1753 ; Clarke in Hook. f., Fl. Brit. India 2 : 669. 1879 ; Prain, Bengal Pl. 1 : 535. 1903 ; Haines, Bot. Bihar & Orissa pt. 3 : 405. 1922.

Local name : Brahma-manduki.

Stoloniferous, creeping herbs, with perennial root stock. Stems with long stolons, nearly glabrous or puberulous in younger parts. Leaves chartaceous, long-petioled, borne in rosettes, orbicular-reniform, crenate or crenate-dentate, ± glabrous, 1.5 - 5 cm in diam; petiole 3 - 20 (-30) cm long, sheathing at base, sometimes puberulous. Umbels solitary, or 2 - 5 together in axils of 3 - 3.5 mm long bracts. Flowers usually 3 in each umbel, middle one sessile, lateral ones short-pedicellate. Involucres 2, 3 - 3.5 mm long. Calyx-teeth obsolete. Petals brown, ovate-rounded, 1.2 - 1.5 mm long. Mericarps to 2.5 × 3.5 mm, didymous, subhairy when young.

Fl. & Fr. : Apr. - July.

Ecology : Very common ; in shady places, grassy localities, banks of rivers and ponds, gardens, along side-walls, etc.

Distribution. : Throughout India. Widespread in both tropical and subtropical regions of the World.

Specimens examined : Hazaribagh, 496 ; Satgawan, 584 ; Hunterganj, 2122.

Uses : Plant is used as diuretic and tonic ; also used in diseases of skin and leprosy. Leaf extract is given as tonic and for improving memory ; also useful in syphilitic skin diseases.

3. CORIANDRUM L.

Coriandrum sativum L., Sp. Pl. 256. 1753; Clarke in Hook.f., Fl. Brit. India 2 : 717. 1879; Prain, Bengal Pl. 1 : 540. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 413. 1922; Buwalda in Blumea 2 : 171. 1936 & in Steenis, Fl. Males. ser. 1, 4 : 128. 1949; Hiroe, Umbellif. Asia no. 1 : 127. 1958.

Local name : Dhania.

Erect, glabrous, annual herbs, to 20 cm long. Stems slender branched, terete, striate. Lower leaves palmatilobed to-partite; middle ones pinnate; upper ones pinnate to bipinnate; ultimetely segments linear-lanceolate, 0.5 mm long. Umbels terminal and axillary, compound, 3-5-rayed. Peduncles 2-10 cm long. Involucres absent or rarely 1, 4-5 mm long. Rays 1-2.5 cm long. Involucres 3-5, linear, 4-5 mm long. Calxy teeth triangular-lanceolate to oblong - lanceolate, radiating, 0.7-1 mm long. Petals white, radiating; other petals of rays 4-4.5 mm long, bipartite, with inflexed tips. Fruits nearly globose, 3-3.5 × 2-2.5 mm; mericarps hollow inside, with dorsal primary ribs strongest and undulated, and secondary ones filiform and obscure.

Fl. & Fr. : Dec. - Mar.

Ecology : Very common ; cultivated in the fields ; also self-grown in waste places, road-sides, etc.

Distribution. : Throughout India. Indigenous from the Mediterranean regions to Central Asia, cultivated nearly in all parts of the World.

Specimens examined : Hazaribagh, Chattopadhyay 505; Barkagawan, Chattopadhyay 1267.

Uses : Plant is used for flavouring, and in the preparation of chatneys and sauces. Fruits are used as spice, carminative, diuretic and tonic.

4. CUMINUM L.

Cuminum cyminum L., Sp. Pl. 254. 1753 ; Clarke in Hook. f., Fl. Brit. India 2 : 718. 1879 ; Buwalda in Blumea 2 : 178. 1936 & in Steenis, Fl. Males. ser 1, 4 : 131. 1949; Hiroe, Umbellif. Asia no. 1 : 44. 1958.

Local name : Jira.

Annual. Stems 15 - 30 cm long, erect, strongly divergently branched from base, terete, striate, entirely glabrous. Leaves short-petioled or sessile on a sheath, to 1 × 0.5 cm, with membranaceous white margins, auriculate at apex or tapering into the petiole ; lamina 4-10 cm long, bipinnate ; segments to 1.5 mm broad, linear. Compound umbels opposite to the leaves or terminal. Peduncles 2 - 4 cm long. Rays 4 - 6, 1 - 1.5 cm long. Pedicels 3 - 7, 4 - 5 mm long. Involucres 3 - 5, 2 - 3.5 cm long, tripartite or twice tripartite ; segments filiform, sessile on 0.5 mm long sheath, with membranaceous white margins; involucels 2 - 4, 7 - 9 mm long, with membranaceous-white margins. Calyx-teeth 1-1.5 mm long, linear-subulate, persistent. Petals obcordate, with inflexed tips, white to reddish, *ca* 1 × 0.5 mm. Mericarps ± laterally flattened, 5 - 7 × 2.5 - 3 mm; main ribs filiform, bristly ; ridges with stellate-hairy line.

Fl. & Fr. : Mar. - June.

Ecology : Very common ; cultivated in the fields, gardens, etc.; also met with as an escape in waste places, road-sides, vacant plots, etc.

Distribution. : India : Almost throughout India, particularly in Punjab, Uttar Pradesh, Madhya Pradesh, Bihar and Deccan Peninsula. Indigenous in Tourkestan, cultivated almost in all parts of the World.

Specimens examined : Gola , 790 ; Hazaribagh, 1471.

Uses : Fruits are used as a condiment in curry powders and for flavouring dishes ; also used medicinally as carminative, stomachic, stimilant and in dyspepsia and diarrhoea.

5. DAUCUS L.

Daucus carota L., Sp. Pl. 242. 1753 ; Clarke in Hook. f., Fl. Brit. India 2 : 718. 1879 ; Prain, Bengal Pl. 1 : 541. 1903 ; Haines, Bot. Bihar & Orissa pt. 3 : 413. 1922 ; Buwalda in Blumea 2 : 208. 1936 & in Steenis, Fl. Males. ser. 1, 4 : 140. 1949; Hiroe, Umbellif. Asia no. 1 : 40. 1958.

Local name : Gajar.

Biennial. Stems 15 - 120 cm tall, solitary, glabrous or papillate-hispid. Leaves oblong in outline, 5 - 15 × 2 - 7 cm, 2 - 3 pinnate ; ultimate divisions linear-lanceolate, acute and mucronate at apex, glabrous or hispid on veins and margins, 3 - 12 × 0.5 - 2 mm. Petioles 4 - 10 cm long. Peduncles 2.5 - 6 cm long, hispid. Involucres usually reflexed, filiform, usually pinnately divided, scarious-margined, 0.5 - 3 cm long. Rays 15 - 30, 3 - 7 cm long. Involucels 5 - 7, usually entire, ± scarious, ciliate. Pedicels 20 - 30, 0.4 - 1 cm long. Calyx-teeth triangular, acute. Petals unequal, white. Fruit ovoid, 3 - 4 × 1.8 - 2 mm ; secondary ribs with prominent spines, glochidiate.

Fl. & Fr. : Jan. - Mar.

Ecology : Common ; cultivated in the fields, gardens, etc.

Distribution. : Almost throughout India. Spontaneous in Europe, N. Africa and temperate Asia, cultivated nearly all parts of the world.

Specimens examined : Churchu , 694 ; Chatra , 1851.

Uses : Underground roots are used as vegetable ; young leaves are eaten raw or steamed with rice.

6. FOENICULUM Adans.

Foeniculum vulgare Mill., Gard. Dict. ed. 8, no. 1. 1768 ; Clarke in Hook. f., Fl. Brit. India 2 : 695. 1879 ; Prain, Bengal pl. 1 : 537. 1903 ; Haines, Bot. Bihar & Orissa pt. 3 : 411. 1922 ; Buwalda in Blumea 2 : 200. 1936 & in Steenis, Fl. Males. ser. 1, 4 : 136. 1949; Hiroe, Umbellif. Asia no. 1 : 51. 1958.

Local name : Saunf.

Erect, annual or perennial herbs, 60-90 cm long. Stems glabrous, terete, striate. Leaves 3-4 pinnate ; ultimate segments filiform. Sheaths white-margined, 4-12 cm long in lower leaves, shorter upwards, with apex having cucullate-connate auricles. Umbels terminal to the stems and the branches, compound, 30-70 - rayed ; involucres and involucels absent. Rays 5-7 cm long. Pedicels 5-30, 0.5-1 cm long. Calyx-teeth absent. Petals yellow, curved inwards. Fruits oblong or ellipsoid, 4-7 mm long; mericarps nearly equal, with prominent ribs; vittae 1 in each furrow and 2 in the commissure.

Fl. & Fr. : Dec. - Mar.

Ecology : Very common ; cultivated in the fields, gardens, etc.; also met with as an escape in waste places, roadsides, vacant plots, etc.

Distribution. : Throughout India. Indigenous in the Mediterranean regions, cultivated all over the World.

Specimens examined : National Park, 1166 ; Ghanghree , 2120.

Uses : Fruits are used for flavouring soups and other dishes,

and sauces and confectionery. They are also used as aromatic, stimulant, carminative and in diseases of chest and kidney.

7. HYDROCOTYLE L.

Hydrocotyle sibthorpioides Lam., Encycl. 3 : 153. 1789 ; Buwalda in Bluma 2 : 128. 1936 & in Steenis, Fl. Males. ser. 1, 4 : 115. 1949. Horoe, Umbellif. Asia no. 1 : 10. 1958.

H. rotundifolia Roxb. ex DC., Prodr. 4 : 64. 1830 ; Clarke in Hook. f., Fl. Brit. India 2 : 668. 1879 ; Prain, Bengal Pl. 1 : 535. 1903; Haines, Bot. Bihar & Orissa pt. 3 : 406. 1922.

Local name : Khulkhuri.

Creeping herbs. Stems thin or almost filiform, ascending upwards, somewhat fleshy, glabrous or sparsely hairy. Leaves membranous, long-petioled, 3 - 5 palmatilobed to partite, with crenate to serrate segments, deeply cordate at base, glabrous or thinly short-hairy, 0.8 - 2.5 cm across. Petioles very slender, 1 - 6 cm long or shorter in the uppermost leaves. Stipules ovate, entire or fringed, 0.15 cm long. Umbel solitary, leaf-opposed, 10-15-flowered. Peduncles 0-3 cm long, filiform, glabrous or short-hairy. Involucres 4 - 10 around and between flowers, ovate, acute, *ca* 0.05 cm long with base having 2 acute teeth. Pedicels very short. Calyx-teeth obsolete. Petals greenish-white, ovate, 0.03 - 0.05 cm long. Mericarps 0.1 - 0.12 × 0.13 - 0.14 cm, glabrous or short-hairy, smooth, often red-punctulate.

Fr. & Fl. : Feb. - Oct.

Ecology : Not common ; along banks of rivers, shaded and damp waste places, etc.

Distribution. : India : North-West Himalaya, Chotanagpur, plains of West Bengal, Sikkim and Khasia hills. Australia, tropical

Asia, tropical Africa, S. America and Malesia.

Specimens examined : Ramgarh Cant. , 1225 ; Telaiya Dam , 1852.

Uses : Plant is used in rheumatism, pulmonary, digestive, and cutaneous troubles, and also as diuretic and vermifuge. Leaves are applied to boils to promote suppuration. Roots are chewed in liver complaints.

8. TRACHYSPERMUM Link

Key to the Species

1a. Ultimate segments of lower leaves to 0.1 cm broad. Calyx-teeth distinct. Fruit with broad roundish, scale- like hairs ...1.*T. ammi*

1b. Ultimate segments of lower leaves more than 0.2 cm broad. Calyx-teeth obsolete. Fruit with narrow, obtuse, nipple-shaped hairs ...2. *T. roxburghianum*

1. **Trachyspermum ammi** (L.) Sprague in Kew Bull. 1929 : 228. 1929; Buwalda in Steenis, Fl. Males. ser. 1, 4 : 132. 1949. *Sison ammi* L., Sp. Pl. 252. 1753.

Ammi copticum L., Mant. Pl. 1 : 56. 1767.

Trachyspermum copticum (L.) Link, Enum. Pl. Hort. Berol. 1: 267. 1821; Hiroe, Umbelif. Asia no. 1 : 47. 1958.

Carum copticum (L.) Hiern, Fl. Trop. Africa 3 : 12. 1871 ; Clarke in Hook.f., Fl. Brit. India 2 : 682. 1879 ; Prain, Bengal Pl. 1 : 536. 1903 ; Haines, Bot. Bihar & Orissa pt. 3 : 407. 1922.

Local name : Ajowan.

Diffuse, annual herbs, 25 - 45 cm long. Stems much branched, striate, glabrous. Leaves 2 - 3- pinnate ; ultimate segments narrow-oblong, 0.6 - 1 mm long. Umbels terminal or seemingly lateral, compound, 5 - 9 rayed. Involucres 3 - 5, oblong. Rays 0.5 - 1 cm long. Involucels 4 - 5, oblong ; both involucres and involucels unequal, hirsute, membranous-margined. Pedicels 4 - 15, 3 - 6 mm long. Calyx-teeth subulate, *ca* 0.3 mm long. Petals white, obcordate, with inflexed tips. Fruits ovoid, scaly hairy along the ribs, 2 mm long ; mericarps sub-pentagonous, nearly plane on the inner face.

Fl. & Fr. : Feb. - Apr.

Ecology : Very common ; cultivated in gardens and fields; also self-sown in wasteplaces, roadsides, vacant localities, etc.

Distribution. : Almost throughout India. Indigenous and cultivated in Egypt, Abyssinia, S. W. Asia; subspontaneous in Europe.

Specimens examined : Ichak, 1316, Jhumri Telaiya, 1756.

Uses : Fruits are used as stimulant, antispasmodic, tonic and carminative ; also administered in flatulence, dyspepsia, diarrhoea and cholera. Paste of crushed fruits is applied to abdomen externally for relief from colic. Roots are used as carminative an diuretic. Fruits are used as spice.

2. **Trachyspermum roxburghianum** (DC.) Craib, Fl. Siam. Enum. 1 : 788. 1931; Buwalda in Blumea 2 : 184. 1936 & in Steenis, Fl. Males. ser. 1, 4 : 132. 1949. *Ptychotis roxburghiana* DC., Prodr. 4 : 109. 1830.

Carum roxburghiana (DC.) Kurz in J. Asiat. Soc. Bengal 46(2): 114. 1877: Clarke in Hook. f. , Fl. Brit. India 2 : 682. 1879; Prain, Bengal Pl. 1 : 536. 1903; Haines, Bot. Bihar &Orissa pt. 3 : 407. 1922.

Trachyspermum involucratum Wolff in Pflazenr. 90 : 89. 1927, non Marie 1922; Hiroe, Umbellif. Asia no. 1 : 47. 1958.

Local name : Agmud, Radhuni.

Stems 15-90 cm long, striate, subglabrous, usually strongly branched. Leaves pinnate ; leaflets pinnatifid to pinnatipartite, ultimate segments 2 - 3 mm broad, those of upper leaves gradually narrower to nearly filiform. Compound umbels terminal and axillary; peduncles 2 - 8 cm long. Rays 2 - 6, 1 - 2.5 cm long. Pedicels 5 - 15, 2 - 6 mm long. Involucres 2 - 5; involucels 5 - 8 ; both very narrow, finely ciliate. Calyx-teeth hardly 0.1 mm long. Petals *ca* 1.2 × 0.8 mm, obcordate, white or greenish-white.Mericaps oblong, *ca* 2.5 × 0.8 mm, with narrow, obtuse nipple-shaped hairs.

Fl. & Fr. : Nov. - Apr.

Ecology : Common ; cultivated in fields, gardens, etc., also met with as an escape in waste places, roadsides, etc.

Distribution. : Throughout India. Native country unknown, now cultivated and subspontaneous in tropical S. E. Asia and Malesia.

Specimens examined : Raja Rappa, 866 ; Ramgarh, 1911.

Uses : Fruits are used as spice and in preparing pickles and chutneys ; also used in medicine in carminative preparations, and also useful in dyspepsia, bronchitis and asthma.

93. LOGANIACEAE

Key to the Genera

1a. Trees or shurbs. Leaves petiolate. Flowers 5-merous. Style 1. Fruit a berry ...2. STRYCHNOS

1b. Herbs. Leaves sessile. Flowers 4-merous.
Styles 2, free below and connate above.
Fruit a capsule ...1. MITRASACME

1. MITRASACME Labill.

* **Mitrasacme pigmaea** R. Br. var. **malaccensis** (Wight) Hara in J. Jap. Bot. 30 : 24. 1955 ; Leenh. in Steenis, Fl. Males. ser. 1, 6 : 383. 1962. (Pl. 4 : Fig. 13). *M. malaccensis* Wight, Ic. 4 (4) : 15, t. 1601. 1850.

M. polymorpha auct. non R. Br. : Clarke in Hook. f., Fl. Brit. India 4 : 80. 1883, incl. var. *parishii*, excl. syn. *M. trinervis* ; Mooney, Suppl. Bot. Bihar & Orissa 88. 1950.

Erect, annual herb, to 35 cm, branched at base. Stems terete, densely white-hirsute in lower part. Leaf pairs spaced, upper 2 pairs rosulate at base of inflorescence ; all leaves ovate-elliptic to linear-lanceolate, cuneate at base, obtuse or subacute at apex, hirsute along margin, subglabrous to densely hirsute above and on midvein beneath, usually 3-nerved, 5 - 15 × 2 - 6 mm. Inflorescences terminal, umbellate-paniculate, to 20 cm long; peduncle long, terete or grooved. Bracts oblong-lanceolate, ciliate along margin and midvein beneath, to 3 mm long; pedicels to 5 mm in flower, to 1.2 cm in fruit. Calyx conical-campanulate, 1.5 - 2.5 mm long ; lobes triangular. Corolla urceolate-campanulate, white, brown, 3 - 5 mm long ; lobes rounded. Filaments 1.5 - 3 mm long. Stigma 2-lobed. Capsule globular, 1.2 - 1.5 mm across, with styles remaining connate for greater part. Seeds angular-ellipsoid, warty.

Fl. & Fr. : Oct. - Dec.

Ecology : Rare ; along the edges of open sal forests, in grasslands etc.

Distribution. : India : Deccan Peninsula and Bihar. Nepal,

Myanmar, Indo-China, S. China, Hainan, Formosa, Japan, Caroline Islands, Australia and Malesia.

Specimen examined : National Park. 953.

2. STRYCHNOS L.

Strychnos nux-vomica L., Sp. Pl. 189. 1753 ; Clarke in Hook.f., Fl. Brit. India 4 : 90. 1883 ; Prain, Bengal Pl. 2 : 704. 1903; Haines, For. Fl. Chota Nagpur 420. 1910 & Bot. Bihar & Orissa pt. 4 : 564. 1922 ;

Local name : Kochila, Bailewa.

Tree, to 20 m tall. Branches yellowish grey, sometimes with axillary thorns. Leaves pergamentaceous to charactaceous, broadly ovate to elliptic, faintly cordate at base, obtuse to gradually acuminate and apiculate at apex, 3 to 5-plinerved, 7 - 15 × 6 - 1 cm; petioles 0.6 1 cm long. Inflorescences terminal on short axillary branchlets, 4 - 4.5 cm long, thinly tomentose. Sepals ovate, densely pubescent outside, 1 - 1.2 mm long. Corolla salver-shaped, 1 - 1.2 cm long ; tube sparsely woolly inside in lower half ; lobes with thickened and minutely tomentose margins. Style sparsely woolly near middle; stigma orbicular. Berry 3 - 5 cm in diam., orange when ripe. Seeds to 4, discoid, densely sericeous, 1.7 - 2.5 cm across and 3.5 - 4 mm thick.

Fl. : Mar. - May ; *Fr.* : Nov. - Jan.

Ecology : Not common ; in forests and near villages.

Distribution. : Throughout the tropical parts of India. Sri Lanka, Siam, Indo - China and Malesia.

Specimens examined : Katkamasandi, 1405; Pratappur, 2072.

Uses : Ripe seeds are used as tonic, stimulant and febrifuge ; also in nervous disorders. Leaves in poultice are applied on sloughing wounds and magot infested ulcers. Decoction of bark is used in epilepsy. Wood is used for agricultural implements, tool-handles, ploughs, cart-wheels and fancy cabinet work. Juice of fresh wood is used in dysentery, cholera and fevers.

94. GENTIANACEAE

Key to the Genera

1a. Flowers regular or nearly so. All stamens perfect and equal :

2a. Ovary 1-celled. Anthers twisting spirally after dehiscence ...2.CENTAURIUM

2b. Ovary 2-celled. Anthers not twisting spirally after dehiscence ...3.EXACUM

1b. Flowers irregular. All stamens not perfect and equal :

3a. Calyx tubular. Stigma 2-lobed or 2-lamellate. Flowers white or pink ...1.CANSCORA

3b. Calyx campanulate. Stigmas 2, recurved. Flowers yellow ...4.HOPPEA

1. CANSCORA Lam.

Key to the Species

1a. Calyx-tube striate ; lobes long-acuminate. Corolla pink ...2. *C. diffusa*

1b. Calyx-tube wingled ; lobes shortly acuminate. Corolla white ...1.*C. decussata*

1. **Canscora decussata** (Roxb.) Roem. & Schult., Mant. 289. 1827 ; Clarke in Hook. f., Fl. Brit. India 4 : 104. 1885 ; Prain, Bengal Pl. 2 : 708. 1903 ; Haines, For. Fl. Chota Nagpur 422. 1910 & Bot. Bihar & Orissa pt. 4 : 569. 1922. *Pladera decussata* Roxb., Fl. Ind. 1: 418. 1820, p.p., excl. syn.

Local name : Sankhaphuli.

Slender, 10-40 cm long. Stem, branches and pedicels 4-winged. Leaves oblong-lanceolate, subcordate or rounded at base, acute at apex, minutely ciliolate, 3-nerved at base, 1.2 - 3.5 × 0.4 - 1.5 cm, gradually smaller upwards and bracteiform on inflorescence. Pedicels 1 - 2 cm long, strongly winged. Calyx-tube 0.8 - 1.2 cm long ; lobes lanceolate, shortly acuminate, dorsally winged, 2.5 - 3.5 mm long. Corolla white ; tube as long as calyx ; lobes of upper lip obovate-orbicular, 5 - 6 × 4 - 5 mm, each with 2 green spots towards base ; lobes of lower lip ovate-oblong, 3.5 - 4.5 mm long. Stigmas orbicular, hirtellous. Capsule oblong, 0.6 - 0.8 × 0.15 - 0.2 cm, obtuse, tipped by persistent style, septicidally 2-valved. Seeds *ca* 0.4 mm.

Fl. & Fr. : Oct. - Feb.

Ecology : Common ; in exposed damp grassy localities, waste places, fields and shady areas under "sal" forests.

Distribution. : Throughout India. Myanmar, Sri Lanka and tropical Africa.

Specimens examined : Ghanghree , 1019 ; Ichak , 1834.

Uses : Juice of fresh plant is used in insanity, epilepsy and nervous debility.

2. **Canscora diffusa (Vahl) R. Br.**, Prodr. Fl. Nov. Holl. 451. 1810 ; Clarke in Hook.f., Fl. Brit. India 4 : 103. 1883 ; Prain, Bengal Pl. 2 : 708. 1903 ; Haines, For. Fl. Chota Nagpur 423. 1910 & Bot. Bihar & Orissa pt. 4 : 569. 1922 . *Gentiana diffusa* Vahl, Symb. Bot. 3 : 47. 1794.

Canscora tenella Wight, Icon. Pl. Ind. Orient. 4 : 7, t. 1327. f. 3. 1850.

C. diffusa (Vahl) R. Br. var. *tenella* (Wight) Clarke in Hook. f., Fl. Brit. India 4 : 103. 1883 ; Haines, Bot. Bihar & Orissa pt. 4 : 569. 1922.

Slender or filiform, diffusely branched from above base, to 30cm long. Stems narrowly margined. Leaves 3 - 5 nerved at base ; lower ones oblong or oblong-lanceolate, narrowed at base into a short petiole, acute or shortly acuminate at apex, entire, 2 - 3.5 × 0.8 - 1.5cm ; uppermost ones smaller and passing into bracts. Cymes diffusely branched. Pedicels quadrangular, narrowly winged, 0.6 - 1.5 cm long. Calyx-tube ribbed, not winged, 3.5 - 5 mm long ; lobes linear-lanceolate, long acuminate, 1.5 - 2.5 mm long. Corolla tube linear, as long as calyx ; limb pink ; lobes of upper lip oblong. Filament of longer stamen uniformly thin to apex. Stigmas oblong-orbicular, with minutely pubescent margins. Capsule linear-ovoid to oblong, 4-6 mm long, with recurved valves. Seeds ca. 0.3 mm long.

Fl. & Fr. : Sept. - Mar.

Ecology : Very common ; among rocks near river banks, ravines, streams, steep earth walls and old walls, grassy places, roadsides, damp waste places, etc.

Distribution. : Throughout India. Tropical Africa, Southern and South-east Asia to tropical Australia.

Specimens examined : Raja Rappa , 380 ; National Park, 420 ; Hunterganj , 2116.

Uses : Same as *C. decussata.*

2. CENTAURIUM Hill

Centaurium centaurioides (Roxb.) Rao & Hemadri in J. Bombay Nat. Hist. Soc. 67 : 357. 1970. *Chironia centaurioides* Roxb., Fl. Ind. 1 : 584. 1832 ('Centaureoides').

Erythraea roxburghii D. Don in Lond. & Edinb. Phil. Mag. & J. Sci. 8 : 77. 1836; Clarke in Hook. f., Fl. Brit. India 4 : 102. 1883 ; Prain, Bengal Pl. 2 : 707. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 568. 1922.

Centaurium roxburghii (D. Don) Druce in Rep. Bot. Exch. Club. Brit. Isl. 4 : 614. 1916 (1917) ; Mooney, Suppl. Bot. Bihar & Orissa 89. 1950.

Small herbs, 5 - 20 cm tall. Radical leaves persistent, numerous, obovate or elliptic, obtuse, 1.8 - 2.5 × 0.6 - 0.8 cm ; cauline ones smaller and narrower. Flowers long-pedicellate, in each fork of dichasial cymes ; pedicels 0.6 - 1.2 cm long. Calyx 7 - 8 mm long ; segments keeled, linear-subulate. Corolla salver-shaped, constricted near mouth, much longer than calyx, 1.2 - 1.6 cm long ; lobes 4-5 mm long, rose-coloured, elliptic, spreading. Stamens all perfect and equal ; anthers twisting spirally after dehiscence. Ovary 1- celled; stigma large, 2-lobed. Capsule narrowly oblong, 7 - 9 mm long, 2-valved.

Fl. & Fr. : Mar. - May.

Ecology : Not common ; dry paddy-fields, grassy lowlands, etc.

Distribution : Throughout India and Bangladesh.

Specimens examined : Telaiya Dam , 1848 ; Ghanghree , 2171.

Uses : Plant is used as tonic, stomachic and febrifuge.

3. EXACUM L.

Exacum pedunculatum L., Sp. Pl. 112. 1753 ; Clarke in Hook.f., Fl. Brit. India 4 : 97. 1883 ; Prain, Bengal Pl. 2 : 706. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 567. 1922.

Exacum sulcatum Roxb., Fl. Ind. 1 : 415. 1820.

Annual herbs, 7 - 30 cm tall. Stems much branched above. Leaves subsessile, 3 - 5 nerved at base, elliptic or lanceolate, cuneate at base, acute at apex, 1.5 - 5 × 0.8 - 1.5 cm. Cymes terminal, to 4 cm long. Pedicel to 1 cm long. Calyx-lobes 4, ovate, acuminate, 4 - 5 mm long, dorsally winged ; wing strongly nerved, lanceolate. Corolla blue, to 1.5 cm across ; lobes 4, elliptic, 5 - 8 mm long. Stamens 4 ; filaments 0.8 - 1.5 mm long ; anthers 2.5 - 3 mm long, apical pore extending halfway. Ovary 2-celled by intrusion of locular wall ; placentation appearing axile ; style long, declinate. Capsule subglobose, 4 - 5 mm in diam., smooth. Seeds circular.

Fl. & Fr. : Oct. - Jan.

Ecology : Very common ; in paddy-fields, grassy lowlands, bank of ponds, etc.

Distribution : Throughout India. Bangladesh and Sri Lanka.

Specimens examined : Hazaribagh , 1202 ; Ramgarh Cant., 1899.

Uses : Plant is used as tonic and stomachic.

4. HOPPEA Willd.

Hoppea dichotoma Willd. in Ges. Naturf. Fr. Neue Schrift. 3: 435. 1801 ; Clarke in Hook. f., Fl. Brit. India 4 : 100. 1883 ; Prain,

Bengal Pl. 2 : 708. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 570. 1922

Pladera pusilla Roxb., Fl. Ind. 1 : 419. 1820.

Plant divaricately branched, 2.5 - 8 cm high. Stems and branches quadrangular, ± winged. Leaves opposite, ovate-elliptic, acute, 5 - 7 × 1.5 - 2 mm, becoming lanceolate and bracteiform on inflorescence. Cymes paniculate, dense or lax. Flowers 4-merous, irregular, yellow; pedicel short. Calyx 2.5 - 3 mm long; lobes overtopping the corolla, lanceolate, very acute, with a strong green nerve at each margin. Corolla ventricose, shorter than calyx; lobes ovate-oblong, obtuse. Stamens inserted on corolla tube, perfect and longer than others. Ovary 1 - celled; stigma clavate, obscurely 2-lipped. Capsule subglobose to ellipsoid, 2.5 - 3 mm long. Seeds obscurely reticulate.

Fl. & Fr. : Sept. - Nov.

Ecology : Very common ; in rice fields, grassy and sandy waste places, etc.

Distribution. : Throughout India. Bangladesh.

Specimens examined : Raja Rappa, 381 ; Ramgarh Cant., 1248; Etkhori, 1870.

Uses : Plant is used in piles and epilepsy.

95. APOCYNACEAE

Key to the Genera

1a. Seeds with tuft of coma at one end or both ends :

2a. Anthers free from stigma ; anther-cells with rounded bases :

3a. Seeds with tuft of coma at both ends. Calyx eglandular within. Leaves whorled ...2.ALSTONIA

3b. Seeds with tuft of coma at apex. Calyx eglandular within. Leaves decussate ...6.HOLARRHENA

2b. Anthers conniving in a cone around and adhering to the stigma ; anther-cells with basal tails or spurs :

4a. Anthers ± exserted, attached to the mouth of corolla-tube, Coma apical ...13.WRIGHTIA

5a. Mouth of corolla with a ring of scales; corolla-lobes overlapping to left in bud. Small to medium-sized trees:

5b. Mouth of corolla naked; corolla-lobes overlapping to right in bud. Twinners ...12.VALLARIS

4b. Anthers included in corolla tube. Coma basal :

6a. Leaves whorled. Mouth of corolla with a ring of scales. Erect shurbs ...8.NERIUM

6b. Leaves decussate. Mouth of corolla without scales. Straggling shurbs ...7.ICHNOCARPUS

1b. Seeds without tuft of coma :

7a. Fruit an indehiscent drupe or berry, or dehiscent capsule, as broad as, or broader than long :

8a. Fruit a dehiscent spiny capsule. Seeds minutely winged ...1.ALLEMANDA

8b. Fruit an indehiscent drupe or berry, not spiny. Seeds not winged :

9a. Plants with long sharp spines. Fruit a globose fleshy berry ...3.CARISSA

9b. Plants without spines. Fruit drupaceous :

10a. Leaves spirally arranged. Drupe turbinate, slightly compressed laterally. Seeds flattened ...11.THEVETIA

10b. Leaves usually in whorls of 3 - 5. Drupe neither turbinate, nor compressed. Seeds not flattened ...10.RAUVOLFIA

7b. Fruit of 2 dehiscent follicles, much longer than broad :

11a. Leaves spirally arranged. Seeds winged. Deciduous trees ...9.PLUMERIA

11b. Leaves decussate. Seeds not winged. Evergreen shurbs, or herbs :

12a. Inflorescence not overtopped by axillary branches. Calyx glandular. Follicles not ribbed ...5.ERVATAMIA

12b. Inflorescence not overtopped by axillary branches. Calyx eglandular. Follicles ribbed ...4.CATHARANTHUS

1. ALLEMANDA L.

Allamanda cathartica L., Mant. Pl. 214. 1771 ; Prain, Bengal Pl. 2 : 667. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 532. 1922

Climbing perennial shrubs. Leaves in whorls of 3 or 4, sometimes opposite, subcoriaceous, short-petioled, obovate, attenuate to cuneate at base, acuminate, wavy-margined, glabrous except on veins beneath, wrinkled when dried, with 10-12 parallel lateral veins; petioles to 0.5 cm long. Flowers 5 - 8 cm long and limb 3 - 3.5 cm across. Calyx-lobes ovate-oblong, 0.8 - 1.2 cm long. Corolla yellow; tube proper 2 - 3.5 cm long, greenish at base, cylindrical in lower half, campanulate above ; lobes ovate-orbicular, obtuse, 2.5 - 3.5 cm long. Capsule subglobose, 2 - 4 cm in diam. ; spine 0.5 - 1 cm. Seeds 1.2 - 1.5 cm long.

Fl. : June - Aug. *Fr.* : Oct. - Jan.

Ecology : Common ; planted in gardens as an ornamental ; sometimes escaping from cultivation.

Distribution. : Throughout India. Native of tropical America, introduced and naturalised in other tropical countries.

Specimens examined : Pratappur , 944 ; Hazaribagh , 1627.

Uses : Extract of root with ethanol is active against carcinoma of nasopharynx. Extract of leaves with sodium bicarbonate is used to prevent the growth of tumour.

2. ALSTONIA R. Br., *nom. cons.*

Alstonia scholaris (L.) R. Br., Mem. Wern. Nat. Hist. Soc. 1 : 76. 1811 (1810) ; Hook. f. in Hook. f., Fl. Brit. India 3 : 642. 1882 ; Prain, Bengal Pl. 2 : 672. 1903 ; Haines, For. Fl. Chota Nagpur 425. 1910 & Bot. Bihar & Orissa pt. 4 : 539. 1922. *Echites scholaris* L., Mant. Pl. 1 : 53. 1767.

Local name : Chatawan, Chatium.

Large tree, 20 - 30 m tall. Bark grey, rough. Branches whorled; young ones lenticellate. Leaves in whorls of 5 - 10, subcoriaceous, oblong-elliptic to oblanceolate, cuneate at base, obtusely acute at apex, glabrous, 5 - 15 × 2 - 7 cm with 30 - 40 pairs closley parallel lateral nerves ; petiole 0.5 - 1.2 cm long. Cymes dense, almost glomerate, arranged in a sessile umbel or in two superposed umbels. Calyx cupular, 2.5 - 3 mm long ; lobes 5, unequal, ovate, densely puberulous. Corolla greenish-white ; tube 6 - 8 mm long, villous at mouth ; lobes obovate-oblong, overlapping to left, 2 - 2.5 mm long. Follicles pendulous, divaricate, 20 - 50 cm long ; seeds rounded at both ends, 3 - 5 mm long; coma longer than seed.

Fl. : Nov. - Jan. *Fr.* : June - Aug.

Ecology : Common ; usually planted along roadsides and near habitations ; sometimes grows wildly along banks of streams and other inundated places.

Distribution. : Throughout India. Sri Lanka, South-east Asia from Myanmar and South China through Malesia to Queensland and Africa.

Specimens examined : Simaria, 812; Hazaribagh , 1605.

Uses : Bark in liquid extract is used against chronic diarrhoea, asthma and cardiac troubles. Leaves used in beriberi, dropsy and congested liver. Latex is applied by local people to sores, ulcers, tumour and rheumatic swellings. Wood is used for packing cases, match-splints, pencils, paper industry, etc.

3. CARISSA L., *nom. cons.*

Key to the Species

1a. Leaves shining above; leaf-nervation distinct. Berry 1.2 - 2 cm long, 4 - or more - seeded ...1.*C. carandas*

1b. Leaves dull above ; leaf-nervation obscure when fresh, conspicuous when dried. Berry 0.6 - 0.7 cm long, 2-seeded ...2.*C. paucinerva*

1. **Carissa carandas** L., Mant. Pl. 52. 1767 ; Hook. f. in Hook. f., Fl. Brit. India 3 : 630. 1832 ; Prain, Bengal Pl. 2 : 668. 1903 ; Haines, For. Fl. Chota Nagpur 424. 1910 & Bot. Bihar and Orissa pt. 4 : 535. 1922.

Local name : Karaunda.

Large shrub to small trees, to 5 m tall, with many dichotomous, rigid, spreading branches ; axils and nodes of branchlets with 2 simple or forked sharp spines of 2 - 4 cm long. Leaves short-petioled, thinly coriaceous, oblong, broadly ovate or obovate, rounded or obtuse, sometimes retuse and shortly mucronate at apex, subcuneate at base, shining above, 3.5 - 7 × 2.5 - 5 cm with the distinct lateral nerves arching towards the margins; petiole 3 - 5 mm long. Peduncle 1.5 - 2.5 cm long, puberulous. Pedicel 4.5 - 5 mm long. Calyx-segments subulate-lanceolate, puberulous without, 4 - 5 mm long. Corolla white, 1.8 - 2 cm across ; tube 1.5 - 1.8 cm long, puberulous ; lobes oblong-lanceolate, half as long as tube. Ovary ca. 2 mm across. Style 6 - 7 mm long. Berry ellipsoid, at first red, purplish black when ripe, polished, 1.2 - 2 cm long, 4-or more-seeded.

Fl. : Apr. - June. *Fr.* : May - July.

Ecology : Common ; usually planted near habitations for its fruits ; sometimes common in scrub jungles along the banks of rivers.

Distribution. : Throughout India. Nepal, Myanmar, Sri Lanka and Malesia.

Specimens examined : National Park,197; Chatra, 977.

Uses : Fruits are edible, suitable for jellies. Root is stomachic and anthelmintic. Decoction of leaves is given in remittent fevers.

2. **Carissa paucinerva** DC. in DC., Prodr. 8 : 333. 1844 ; Hook.f. in Hook. f. Fl. Brit. India ; Prain, Bengal Pl. 2 : 669. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 533. 1922.

Local name : Jangli Karaunda.

Small, suberect shrub, to 2 m long, with rigid 2 to 3-chomotomous branches. Spines straight, divaricate, 2.5 - 5 cm long. Leaves variable, elliptic-oblong, ovate to elliptic-lanceolate, cuneate, subcuneate - rhomboid, or often rounded at base, acute or subacute and apiculate at apex, entire, dull above, pale beneath, glabrous on both surfaces, 1.5 - 4 × 1.2 - 3 cm, with 3 - 4 pairs of very oblique secondary nerves being obscure when fresh; petiole to 3.5 mm long. Peduncle to 2 cm long, puberulous. Calyx-lobes linear-lanceolate, *ca* 2.5 mm long. Corolla white ; tube slender, 0.7 - 1 cm long ; lobes narrowly linear-lanceolate, 3 - 4 mm long. Berry ellipsoid, 2-seeded, 6 - 7 mm long, black when ripe.

Fl. : Mar. - May. *Fr.* : Nov. - Dec.

Ecology : Very common ; in scrub forests of drier zones, valleys of low hills, etc.

Distribution. : Bihar, Orissa, Peninsular India.

Specimens examined : Pratappur, 904 ; National Park, 1190 ; Koderma Forest, 1786.

Uses : Fruits are edible. Wood is used for making combs, spoons and other such articles. Plant is used for fences.

4. CATHARANTHUS G. Don

Key to the Species

1a. Leaves oblong, oblong-obovate or elliptic-obovate, obtuse or rounded and apiculate at apex. Corolla 3 - 5 cm in diam. when expanded, tube 2.5 - 3 cm long. Follicles patent hairy ...2.*C. roseus*

1b. Leaves lanceolate, acuminate. Corolla 0.5 - 0.6 cm in diam., tube 0.5 - 0.8 cm long. Follicles glabrous ...1.*C. pusillus*

1. **Catharanthus pusillus** (Murr.) G. Don, Gen. Syst. 4 : 95. 1837-1838 ; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 45. 1983. *Vinca pusilla* Murr., Comm. Gotting 3 : 66, t_1 & t_2. 1773; Hook. f. in Hook.f., Fl. Brit. India 3 : 640. 1882 ; Prain, Bengal Pl. 2 : 1277. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 537. 1922.

Lochnera pusilla (Murr.) Schum. in Pflanzenfam. 4 (2) : 145. 1895; Duthie, Fl. Upp. Gang. Pl. 2 : 34. 1911; Gamble, Fl. Madras 2 : 809. 1923.

Local name : Teankio.

Glabrous, annual herbs, 15 - 45 cm long, with acutely quadrangular stems. Leaves shortly-petiolate, lanceolate, narrowed at base, acuminate at apex, minutely scabrid along margins, glabrous, 3 - 7 × 0.8 - 2 cm; petioles 3 - 6 mm long ; stipular glands axillary, subulate. Flowers subsessile, solitary or in pairs. Calyx-segments 5, unequal, filiform, 3.5 - 4 mm long. Corolla white, 5 - 6 mm across; tube 5 - 8 mm long, with hairy mouth ; lobes 5, broadly obovate, apiculate, 2.5 - 3 mm long. Ovaries oblong, 1.2 - 1.5 mm long ; style 5 - 6 mm long. Follicles 2 - 4 cm long, diverging, straight, glabrous. Seeds linear-oblong, rounded at both ends, 1.5 - 2 mm long, black.

Fl. & Fr. : July - Sept.

Ecology : Very common ; in waste and cultivated lands.

Distribution. : India : Western Himalayas, Western and Central India, Gangetic Plains, Chota Nagpur, Deccan Peninsula. Sri Lanka.

Specimens examined : Hazaribagh , 228 ; Ramgarh , 1138.

Uses : Decoction of dried plant boiled in oil is rubbed on loins in case of lumbago. Plant is poisonous to cattle, causing temporary blindness with urticarial rash on body.

2. **Catharanthus roseus** (L.) G. Don, Gen. Syst. 4 : 95. 1837-1838 ; Stern in Lloydia 29 : 196-200. 1966; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 44. 1983. *Vinca rosea* L., Syst. Nat. ed. 10, 2 : 944. 1759 ; Hook. f. in Hook.f., Fl. Brit. India 3 : 640. 1882; Prain, Bengal Pl. 2 : 672. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 537. 1922.

Lochnera rosea (L.) Reichenb., Consp. Regni Veg. 134. 1828 ; Gamble, Fl. Madras 2 : 809. 1923.

Local name : Sadabahar.

Erect, perennial subshrubs, to 75 cm. long. Stems widely branched. Leaves oblong or oblong-obovate or elliptic-obovate, cuneate at base, obtuse or rounded and apiculate at apex, entire, glabrous or finely pubescent, deep green and polished, 3 - 10 × 2 - 4 cm; petiole 0.6 - 1.5 cm long. Flowers shortly pedicelled, solitary or paired. Calyx *ca* 6 mm long ; lobes 5, subequal, hairy. Corolla white or pink, 3-5 cm across ; tube 2.5 - 3 cm long, pubescent without and below the anthers within ; lobes 5, obovate-triangular, apiculate, 1.5-2 cm long ; anthers 3 mm long. Ovaries oblong, 3.5 - 4 mm long ; ovules many, marginal ; style 2.5 - 3 cm long. Follicles finely ribbed, patent hairy, 2 - 3 cm long. Seeds oblong, truncate at both ends, 1.8 - 2.5 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common ; usually planted in gardens as an ornamental ; also runs as an escape in waste places, roadsides, and on dilapidated walls.

Distribution. : Throughout India. Endemic to Madagascar, introduced and widely naturalised throughout the tropics.

Specimens examined : Gola , 761 ; Hazaribagh , 1569.

Uses : Plant is used in diabetes. Leaf-juice is applied for relief of pain due to wasp stings. Root contains different alkaloids which possess hypotensive, sedative and tranquillizing properties. Plant-extract is used to inhibit the growth of tumour.

5. ERVATAMIA (DC.) Stapf

Ervatamia divaricata (L.) Burkill in Rec. Bot. Surv. India 10 : 320. 1925 ; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 27. 1983. *Nerium divaricatum* L., Sp. Pl. 209. 1753.

Nerium coronarium Jacq., Collect. 1 : 138. 1786.

Tabernaemontana coronaria (Jacq.) Willd., Enum. Hort. Berol. 275. 1809; Hook. f. in Hook. f., Fl. Brit. India 3 : 646. 1882; Prain, Bengal Pl. 2 : 637. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 537. 1922.

Ervatamia coronaria (Jacq.) Stapf in Dyer, Fl. Trop. Africa 4(1) : 127. 1902 ; Gamble, Fl. Madras 2 : 813. 1923.

Local name : Tagar, Chandni.

Shrubs, to 2 m tall. Stems dichotomously much-branched, with pale bark. Leaves herbaceous, in unequal pairs, elliptic-oblong,

obovate or oblanceolate, attenuate to cuneate at base, obtusely acuminate or subcaudate at apex, glabrous, shining, green above, paler beneath, 8 - 15 × 2 - 4 cm ; petiole 0.6 - 1 cm long ; axils of petioles glandular. Cymes dichasially branched. Calyx cupular, puberulous, 0.4 cm long ; lobes ovate, subequal, 2 - 3 mm long. Corolla white ; tube 1.5 - 2 cm long, glabrous ; lobes 5, obliquely oblong, with curled margins, 1 - 1.5 cm long. Anthers lanceolate, 2 - 2.5 mm long. Ovary glabrous, *ca* 1 mm across ; style *ca* 1 cm long; stigma beaked. Follicles spindle-shaped, 3 - 7 ribbed, sessile or short-stipitate, 3 - 4 cm long. Seeds 3 - 6 per fruit, enveloped in a fleshy aril, ± irregularly ellipsoid, without coma.

Fl. & Fr. : Apr. - Sept.

Ecology : Common ; planted in parks and garden; also runs as an escape near habitations and in the foot-hills.

Distribution. : Throughout India. Native of Southern Himalaya but cultivated throughout the Tropics since the ancient times.

Specimens examined : Hazaribagh , 208 ; Hunterganj , 2139.

Uses : Root is chewed for relief from tooth-ache ; also used as a vermicide ; Root-pulp surrounding seeds is employed for dyeing fabrics.

6. Holarrhena R. Br.

Holarrhena pubescens (Buch. - Ham.) Wall ex G Don , Gen. Syst. 4 : 78. 1838; Rani & Matthew in Matthew, Fl . Tamil Nadu Carnatic pt. 2 : 910. 1983, p.p.; Panigr. in Taxon 36 : 464 - 467. 1987. *Echites pubescens* Buch. - Ham.in Trans.Linn. Soc. 13 : 524. 1822.

Nerium antidysentericum sensu L., Sp. Pl. 209. 1753, p.p.excl.

lectotype *Hermann* 44 (BM, vide R. Br. 1811).

Echites antidysenterica sensu Roxb., Hort. Beng. 20. 1814, non (L.) Roxb. 1814.

E. antidysenterica Roth in Roem. & Schult., Syst. Veg. 4 : 394. 1819 & Nov. Gen. Sp. 138. 1821, non (L.) Roxb. ex Fleming 1810, p. p., nec (L.) Roxb. 1814.

Holarrhena antidysenterica sensu Wall., num.List. No. 1672. 1829, non (L.) Wall.; Hook. f. in Hook. f., Fl. Brit. India 3 : 644. 1882; Prain, Bengal Pl. 1 : 674. 1903 ; Haines, For. Fl. Chota Nagpur 426. 1910 & Bot. Bihar & Orissa pt. 4 : 538. 1922.

Local name : Kurchi.

Large shrub to small trees, to 5 m tall. Bark pale. Leaves chartaceous, shortly petiolate, elliptic-oblong to ovate-oblong, rounded to obtuse or shortly cuneate at base, acute to abruptly acuminate,entire, pubescent or glabrous , 10-20 × 5-12 cm with 10-15 pairs lateral nerves arching near the margins ; petiole to 6mm long. Cymes 7-15 cm in diam. Bracts small , ciliate. Pedicels slender, to 1.5 cm long . Calxy with small basal glands within; glands alternating with small linear lobes; calyx-segments 5 , unequal, lanceolate , acuminate , hirsute without , 2-3 mm long . Corolla white, 2.5-3 cm across ; tube slender, 0.8 - 1.2 cm long, slightly inflated near base ; lobes overlapping to left in bud, 1.2-1.4 cm long. Style puberulous, *ca* 1 mm long ; stigma conical, 2- lobed. Follicles slender, terete , 20 - 35 cm long, dotted with white spots. Seeds linear, compressed, 0.8 -1.2 cm long. Coma 3 -5 cm long, brown, deciduous.

Fl. : May - July. *Fr.* : Dec. - Feb.

Ecology : Very common; in hilly forests, private gardens, near village surroundings, roadsides, etc.

Distribution : Throughout the drier forests of India including

tropical Himalaya. Indo-China, Myanmar, Malesia.

Specimens examined : National Park , 65 ; Joynagar , 1496; Chatra, 1665.

Uses : Decoction of bark is used in amoebic dysentery and diarrhoea. Wood is used for making small articles , such as picture frames, toys, mathematical instruments, etc.

Note : Stevens (in Saldan. & Nicols., Fl. Hassan Dist. 434.1976) adopted *H. antidysenterica* (Roth) DC. as the correct name and *Echites antidysenterica* Roth as its basionym . According to him, the name *H.antidysenterica* Wall. is invalid because it was based on an unpublished name, *E. antidysenterica* Roxb. Rani and Matthew(*l.c.*) treated *Nerium antidysentericum* L as *nomen ambiguum* and also kept *Echites antidysenterica* Roxb. ex Fleming aside in giving the priority . Panigrahi (*l.c.*) clearly discusses on the nomenclatural problems involved.

7. ICHNOCARPUS R. BR., *nom. cons.*

Ichnocarpus frutescens (L.) R. Br. in Mem. Wern. Nat.Hist. Soc.1 : 62. 1811 (reprint 1810) and in Ait . f. , Hort. Kew. ed. 2, 2 : 69. 1811; Hook. f. in Hook. f., Fl. Brit. India 3 : 669. 1882; Prain , Bengal Pl.2 : 680. 1903; Haines, For. Fl. Chota Nagpur 429. 1910 & Bot. Bihar & Orissa pt. 4 : 546.1922. *Apocynum frutescens* L., Sp. Pl. 213.1753.

Local name : Kalidudhi, Siamalata.

Plant to 8 m tall, with glabrous or rusty tomentose branches. Leaves subcoriaceous , elliptic-oblong , rounded to subcuneate at base, acute to shortly acuminate at apex, entire, glabrous above, glabrous to sparsely pubescent beneath, 3-7 × 1.5- 2.5 cm, with 4-6 pairs of lateral nerves; petiole 3-6 mm long . Flowers in terminal and

axillary paniculate cyme . Pedicels 3-4 mm long .Calyx-lobes ovate, subequal , eglandular, tomentose, 1.2-1.5 mm long . Corolla cream, 5-6 mm across ; tube 2-3 mm long ; mouth pubescent ; lobes falcate, acuminate, twice as long as the tube. Anthers sagittate , conniving in a cone around and adhering to stigma, produced at base into 2 tails. Disk-lobes much longer than hairy ovary. Style obconic below columnar stigma. Follicles rusty pubescent when young, curved, 10-15 cm long. Seeds black, 1-1.2 cm long. Coma scanty, white, as long as seeds.

Fl. : Sept. - Dec. *Fr.* : Jan. - Apr.

Ecology : Common ; in hedges, scrub jungles, forests, etc.

Distribution : Almost throughout India. Sri Lanka, S.E. Asia to Australia.

Specimens examined : National Park , 59; Koderma Forest , 1259; Etkhori , 1869

Uses : Stem is much used for tying and fishing- nets and basket making Powdered root is used in diabetes and stone in bladder. Root is used for fever, dyspepsia and skin troubles.

8. NERIUM L.

Nerium oleander L., Sp. Pl. 209 1753; Huber in Dassan. & Fosb., *N. indicum* Mill., Gard. Dict. ed. 8, n. 2. 1768; Santap., Fl. Khandala ed. 2, 150. 1967. Rev. Handb. Fl. Ceylon 4 : 28. 1983.

N. odorum Sol. in Ait., Hort. Kew. 1 : 297. 1789; Roxb ., Fl. Ind. 2 : 2 1832; Hook. f. in Hook. f. , Fl. Brit. India 3 : 655. 1882; Prain, Bengal Pl. 2 : 676. 1903; Haines, For Fl. Chota Nagpur 427. 1910 & Bot. Bihar & Orissa pt. 4 : 541. 1922.

N. odoratum Lam., Encycl. Meth. Bot. 3 : 456. 1792.

Local name : Kaner

Erect, rigid shrub, to 10 m tall. Leaves mostly in whorls of three, linear- lanceolate, narrowed down into a short petiole at base, acuminate at apex, entire, dark-green and shining above, sparsely pubescent when young, 10- 15 × 1.5-2.5 cm, with a stout midrib and numerous lateral veins arising at almost right angles from midvein. Flowers 3-3.5 cm across. Calyx glandular within Calyx-lobes subulate- lanceolate, acute, 5-7 mm long. Corolla rose or white, rarely yellow ; tube 1.6-2 cm long, cylindrical below, infundibuliform above, with rows of bristles below the filaments within; throat with 5 deeply laciniate scales; lobes slightly longer than tube, obliquely obovate-rounded. Spurs of anther linear, twice as long as cells, furnished with twisted hairs. Style filiform or thickened above the middle; tip of stigma subglobose. Follicles cylindrical, 12-20 cm long, at first coherent by their tips, finally splitting and dehiscent along ventral suture. Seeds numerous.

Fl. & Fr. : Almost throughout the year in cultivated plants; in wild ones flowering during Apr.-Sept. and fruiting during Nov.-Feb.

Ecology : Common ; cultivated in gardens as an ornamental ; sometimes grows as an escape.

Distribution : Throughout India. From Mediterranean through Persia, Afganistan, W. Himalaya, Nepal to Japan.

Specimens examined : Jhumri Telaiya , 285; Ichak ,1399.

Uses : Leaves and bark contain olenadrin, a cardiotonic. An oil extracted from root-bark is used in skin diseases.

Note : N. indicum and *N. oleander* are sometimes treated as distinct species by many authors . However , Grant , Fosberg & Smith (in Smithsonian Contrib. Bot. 17 : 53 1974) provided sufficient reasons and inclined to consider them conspecific.

9. PLUMERIA L.

Plumeria rubra L. , Sp. Pl. 209. 1753; Sachet in Smiths. Contrib. Bot. 23 : 25 1975 ; Huber in Dassan. & Fosb ., Rev Handb . Fl. Ceylon 4 : 29 1983.

P. acuminata R.Br. in Ait., Hort. Kew. 2 : 70 1789; Roxb., Fl . Ind. 2 : 20.1832.

P. acutifolia Poir. in Lam., Encycl. suppl. 2 : 667. 1812; Hook. f. in Hook. f., Fl. Brit. India 3 : 641. 1882 ; Prain , Bengal Pl. 2 : 670. 1903; Haines, For Fl. Chota Nagpur 425. 1910 & Bot. Bihar & Orissa pt. 4 : 536. 1922.

Small tree, to 10 m tall. Leaves subcoriaceous, broadly obovate-oblong to oblong-lanceolate, attenuate to cuneate at base, acute or acuminate at apex, glabrous to sparsely pubescent below, 20-30 × 7-10 cm, with 30-40 pairs lateral nerves arching towards the margins; Petiole 2.5 - 3.5 cm long with a gland at top. Flowers many, fragrant. Calyx-lobes rounded, 2.5 - 3 mm across. Corolla cream, yellow, rose or combinations of them ; tube 1.5 - 2.5 cm long, expanded from above the middle;lobes broadly obovate, 3 - 3.5 × 2 -2.5 cm. Filaments obsolete; anthers obtuse, cells rounded at base. Follicles cylindrical, 10 - 25 cm long.

Fl. : May - July. *Fr.* : Aug. - Oct.

Ecology : Commonly grown as an ornamental plant in gardens; often found in semi-wild state near habitations, along the roads, etc.

Distribution : Throughout India Native to tropical America, introduced and widely naturalised elsewhere in Tropics.

Specimens examined : Pratappur , 924 ; Ramgarh , 1902.

Uses : Bark-decoction is used as a purgative, febrifuge and in dropsical and venereal affections. Latex is applied by local people for itch, rheumatism and gum-troubles.

Note : This is being treated *P. rubra* L. and *P. acuminata* R. Br. (syn. *P. acutifolia* Poir.) as conspecific as done by Sachet (*l.c.*) and Huber (*l.c.*) Sachet remarked that "the species is a pantropical ornamental with many colour forms from deep red through pink, yellow to white". However, van Steenis [in DC., Trop. Nat. 26(4) : 63-66. 1937] and Brink (in Blumea 6 : 385.1950) including many other botanists treated the two as distinct species.

10. RAUVOLFIA L.

Rauvolfia serpentina (L.) Benth. ex Kurz, For. Fl. Burma 2 : 171. 1877; Hook.f. in Hook. f. , Fl. Brit. India 3 : 632. 1882; Prain, Bengal Pl. 2 : 671. 1903; Haines, For. Fl. Chota Nagpur 425. 1910 & Bot. Bihar & Orissa pt. 4 : 539. 1922. *Ophioxylon serpentinum* L, Sp. Pl. 1043. 1753.

Local name : Chota chand.

Erect, glabrous, perennial suffruticose herbs, to 1.5 m tall. Leaves in whorls of 3, thinly membranous, broadly oblong or oblanceolate, narrowed down into a short petiole at base, acute or acuminate at apex, entire, green and shining above, pale beneath.7 - 17 × 2.5 - 6.5 cm. Cymes corymbose, dense, many- flowered , 2 - 5cm in diam. Pedicels 4 - 6 mm long, bright red . Bracts minute, lanceolate,1 - 1.5 mm long. Calyx-lobes bright red, ovate-lanceolate, each with 2 marginal glands, 1.5 - 2 mm long . Corolla-tube 1 - 1.2cm long , slender, slightly inflated above the middle, often curved; throat hairy; lobes obovate, 2.5 - 3 mm long. Anthers apiculate, cells rounded at base. Disk annular. Ovaries connate with their lower half or little beyond; stigma calyptriform at base, 2 - fid. Drupes didymous and connate with their lower half , obliquely ovoid, minutely apiculate, glabrous, shining , black when ripe, 0.6 - 1 cm diam.

Fl. : May-July. *Fr.* : July-Sept.

Ecology : Very common; in grassy damp places, forests, etc.

Distribution : India. Sub-Himalayan tract from Punjab to Sikkim, Assam, West Bengal, Bihar, Chota Nagpur, Orissa, Deccan Peninsula and Andaman Islands. Myanmar, Sri Lanka.

Specimens examined : National Park , 194.; Patratu ,1334; Telaiya Dam, 1847.

Uses : Plant is used for relief from nervous disorders, excitement, insanity and epilepsy. Roots are used for intestinal troubles and in case of difficult delivery. They are also believed by local people to have curing capacity in snake-bite. Juice of leaves is used for clearing the corneal opacity.

11. THEVETIA Adans.

Thevetia peruviana (Pers.) K.Schum. in Engler & Prantl, Nat. Pfl. fam.4(2) : 159. 1895; Huber in Dassan & Fosb., Rev. Handb. Fl. Ceylon 4 : 29. 1983. *Cerbera peruviana* Pers., Syn. Pl. 1 : 267. 1805.

Cerbera thevetia L., Sp. Pl. 209. 1753.

Thevetia neriifolia Juss. ex Steud., Nom. 2 : 608. 1841; Prain, Bengal Pl. 2 : 669. 1903; Haines, For. Fl. Chota Nagpur 425. 1910 & Bot. Bihar & Orissa pt. 4 : 535. 1922.

Local names : Pile kaner, Kulkephul.

Evergreen, much -branched, small bushy trees, to 4 m tall. Leaves subsessile, linear-lanceolate, cuneate at base, acute at apex, glabrous on both surfaces, with revolute margins, shining above, glabrous , 10-15× 0.7-1 cm , with 16-20 pairs faint lateral nerves.Cymes

terminal, but often overtopped by axillary branches. Flowers 5-8 cm long; pedicel to 2.5 cm long. Calyx-lobes unequal, lanceolate, to 1cm long.Corolla yellow, infundibuliform, 4-7 cm long; tube proper 1-1.5 cm long, pubescent near throat; the limb much longer than tube; lobes obovate, 3-3.5 × 1.5-1.7 cm. stamens attached at throat of narrow tube; anthers mucronate, 1.8-2 mm long. Ovary single, 2 - lobed, 2 - celled with 2 ovules in each cell; stigma conic with a basal ring. Drupe broadly turbinate, 3-4 cm across, slightly compressed laterally. Seeds 0.8-1 cm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; planted in gardens, near temples, etc.; also found wildly in forests, roadsides, etc.

Distribution : Throughout the plains of India. Native of tropical America; widely naturalised in the Tropics.

Specimens examined : Pratappur, 604; Hazaribagh , 1564; Barkattwa , 1696.

Uses : Bark is used as cathartic, emetic and febrifuge. Roots are made into a paste and applied to tumours. Seeds are used as an abortifacient and purgative in rheumatism and dropsy.

12. VALLARIS Burm. f.

Vallaris solanacea (Roth) Kuntze, Rev. Gen. 147. 1891; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 59. 1983. *Peltanthera solanacea* Roth, Nov. Pl. Sp. 132. 1821.

Vallaris heynii Spreng., Syst. Veg. 1 : 635. 1825 ; Hook. f. in Hook. f., Fl. Brit. India 3 : 650. 1832 ; Prain, Bengal Pl. 2 : 675. 1903; Haines, For. Fl. Chota Nagpur 427. 1910 & Bot. Bihar & Orissa pt. 4 : 543. 1922.

Local name : Ramsar.

Stems light grey, cord-like, tough, lenticellate. Leaves herbaceous, elliptic or oblong, cuneate to almost rounded at base, acute or short-acuminate at apex, entire, glabrous or pubescent, pellucid-dotted, with a more or less clearly defined median ridge on upper side, 3.5-10 × 2-3.5 cm; petiole 0.8-1.5 cm long, axils glandular. Cymes 3-10-flowered, dichotomous, much shorter than leaves, pubescent. Pedicels slender, often decurved, much longer than calyx. Sepals ovate-oblong, puberulous, 3.5-4 mm long. Corolla-tube equalling or longer than sepals; limb spreading. Disk ciliate. Filaments villous, anthers woolly. Follicles straight, tapering from a rounded base to a stiff point, 10-15 × 3-5 cm, glabrous. Seeds ovate-oblong, 2-2.5 cm long; coma 2-2.5 cm long, silvery-white.

Fl. : Apr. - June. *Fr.* : Nov. - Feb.

Ecology : Common; usually planted as an ornamental for its fragrant flowers, sometimes found wildly in hedges, valleys of hills, forests, etc.

Distribution : Almost throughout India, Nepal, Bangladesh. Myanmar, Sri Lanka.

Specimens examined : National Park, 950; Koderma Forest, 2002.

Uses : Latex is applied to wounds and sores. Bark is used as astringent. Flowers and fruits are edible.

13. Wrightia R. Br.

Wrightia arborea (Dennst.) Mabb. in Taxon 26 : 533. 1977; Panigr. & Murti, Fl. Bilaspur 1 : 354. 1989. *Periploca arborea* Dennst., Schlussel Hort. Malab. 13, 23 & 25. 1818

Wrightia tomentosa Roem. & Schult. in Linn., Syst. Veg. 4 :

414. 1819; Hook. f. in Hook. f., Fl. Brit. India 3 : 653. 1882; Prain, Bengal Pl. 2 : 674. 1903; Haines, For. Fl. Chota Nagpur 427. 1910 & Bot. Bihar & Orissa pt. 4 : 541. 1922.

Local name : Dharauli.

Tree, to 9 m tall. Bark light-grey, rough. Branchlets tomentose. Leaves elliptic, elliptic-oblong or obovate-oblong, cuneate at base, caudate-acuminate at apex, entire, tomentose on both surfaces, 6-15 × 3-6 cm ; petioles to 6 mm long. Cymes corymbose, few-flowered. Flowers 2 - 3 cm across; pedicels stout, to 1 cm long. Calyx-lobes ovate, tawny pubescent outside, 2-3 mm long. Corolla cream-coloured or yellowish ; tube short and stout, 5 mm long with a fleshy ring of fimbriate scales in month; lobes oblong, 1.2 - 1.8 cm long. Corona of 2 series but virtually single by connation ; epipetalous segments truncate, almost entire, alternipetalous segments deeply bifid. Anthers white, rather stout, 5 - 6 mm long. Carpels connate. Follicles connate throughout into a cylinder, 15-40 cm long, apically beaked, greenish, warty with prominent lenticels, septicidally dehiscent when ripe. Seeds slender, 1.2 - 1.6 cm long. Coma white, 2.5 - 4 cm long.

Fl. : Apr. - July. *Fr.* : Dec. - Feb.

Ecology : Very common; in deciduous forests, valleys of hills, etc.

Distribution : Throughout Tropical parts of India. Eastern Himalayas, Myanmar, Sri Lanka, Thailand, Malesia, Indo-China and South China.

Specimens examined : Hazaribagh, 501; Pratappur Forest , 2018.

Uses : Wood is used for turnery, pen-holders, bed-stead legs, mirror-frames, boxes, match-splints, printing-blocks, mathematical instruments, etc. Latex yields a yellow dye which is used for fast colouration of cotton fabrics.

96. ASCLEPIADACEAE

Key to the Genera

1a. Filaments free ; pollen-masses granular, 2 together in each anther-loculus :

2a. Leaves shining , not variegated. Corolla-lobes contorted in bud. Corona-scales nearly as long as anthers. Follicles rather stout, 1.2-1.8 cm wide ... 3.CRYPTOLEPIS

2b. Leaves not shining, variegated with white along veins above. Corolla-lobes valvate in bud. Corona -scales much shorter than anthers. Follicles slender, 0.5-0.6 cm wide ... 5.HEMIDESMUS

1b. Filaments connate. Pollen-masses waxy, solitary in each anther-loculus :

3a. Erect herbs or shrubs :

4a. Leaves broadly oblong, obovate or panduriform, glaucous, cordate at base. Corolla pale violet, rarely white, 3-4.5 cm. in diam. Corona-scales laterally compressed, with basal spur on the back. ... 2. CALOTROPIS

4b. Leaves narrowly lanceolate or oblong-lanceolate, not glaucous, narrowed at base. Corolla red or orange-red, 1-2 cm in diam. Corona-scales erect, spoon-shaped, without a spur ... 1. ASCLEPIAS

3b. Twining or straggling undershrubs or shrubs :

5a. Corona corolline, adnate to the corolla-tube between the lobes ...4. GYMNEMA

5b. Corona staminal, adnate to the anthers or staminal column :

6a. Corolla-lobes valvate in bud. Corona of a single series of lobes. Follicles smooth ... 6. HOYA

6b. Corolla lobes contorted in bud. Corona of 2 series of lobes. Follicles echinate ...7. PERGULARIA

1. ASCLEPIAS L.

Asclepias curassavica L., Sp. Pl. 215. 1753; Hook. f. in Hook. f., Fl. Brit. India. 4 : 18. 1883; Prain, Bengal Pl. 2 : 689. 1903; Haines, For. Fl. Chota Nagpur 423. 1910 & Bot. Bihar & Orissa pt. 4 : 551. 1922; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 74. 1983.

Plant simple or branched, 0.5 - 1 m tall with a somewhat woody base. Leaves chartaceous, decussate, lanceolate or oblong-lanceolate, cuneate at base, acute to subacuminate at apex, glabrous or hairy on nerves beneath, 7-15 × 1.5-3 cm; petiole 1-2 cm long. Cymes umbelliform, terminal or axillary. Flowers 1 - 1.5 cm across. Peduncle 2 - 6 cm long. finely pubescent. bracts linear, 4.5 - 5 mm long. Pedicel 1.5-2 cm long, pubescent. Calyx-lobes lanceolate, acute, 3.5-4 mm long, with a gland between lobes in sinus. Corolla red or orange-red, 1-2 cm in diam; lobes obovate, *ca* 8 × 5 mm. Corona of 5 stipitate, tabular hoods adnate to staminal column; an acicular structure (horn) arching over the gynostegium. Anthers with membranous inflexed lips; pollen - masses 0.8 - 1 mm long. Stigma 1.2 - 1.5 mm across. Follicles fusiform, long tapering and acute at apex, 6-7 cm long and

1-1.2 cm in diam. Seeds *ca* 6 × 3.5 mm, flattend with thickened margin. Coma silky, 2-2.5 cm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Common ; cultivated as an ornamental in gardens, sometimes found as an escape in waste places, forest-edges, watersides, etc.

Distribution : Throughout India. Native of tropical America, introduced and naturalised throughout the Tropics.

Specimens examined : Hazaribagh, 1576; Ramgarh , 1982.

Uses : Roots are used in piles and gonorrhoea. Juice of leaves is anthelmintic, antidysenteric and used against cancer. Latex is used to remove warts and corns. Stem yields a fibre. Plant is also used as a fish-poison.

2. Calotropis R. Br.

Key to the Species

1a. Corolla purplish uniformly; lobes spreading. Corona-scales truncate ... *1. C. gigantea*

1b. Corolla white with purple blotch; lobes erect. Corona-scales acute. ... *2. C. procera*

Calotropis gigantea (L.) R. Br. in Ait. f., Hort. Kew. 2 : 78. 1811; Hook. f. in Hook.f., Fl. Brit. India 4 : 17. 1883; Prain, Bengal Pl. 2 : 688. 1903; Haines, For. Fl. Chota Nagpur 433. 1910 & Bot. Bihar & Orissa pt. 4 : 550. 1922; Huber in Dassan. & Fosb., Rev. Hanbd. Fl. Ceylan 4 : 78. 1983. *Asclepias gigantea* L. , Sp. Pl. 214. 1753.

Local names : Akwan, Akona.

Large shrubs to small trees, to 3 m tall. Leaves sessile or subsessile, obovate-oblong or panduriform, cordate and semi-amplexicaul at base, abruptly acute at apex, glaucous green, smooth above, cottony beneath, 10-20 × 4-10 cm. Cymes subumbellate. Flowers 3-4 cm across. Peduncles 5-10 cm long. Bracts and bracteoles lanceolate, ± 1 cm. long. Pedicels 2-3 cm long. Calyx-lobes ovate, 3-4 mm long, valvate, puberulous outside. Corolla light purple uniformly; segments ovate-lanceolate, spreading, thick-fleshy, revolute and twisted in age, 1.2-1.5 cm long. Corona-scales truncate. Top of column 5-angled. Follicles inflated, recurved, glabrous, green to 8 × 4 cm. Seeds broadly ovate, 5 - 6 mm long, flattened, brown, minutely tomentose, with 2.5 - 3 cm long silky coma.

Fl. : Dec. - July. *Fr.* : Feb.-June.

Ecology : Common; in waysides, along railway lines, waste lands and near village surroundings, etc.

Distribution : Throughout India. Tropical Himalayas, from east to west China, Maldive Islands, Sri Lanka and Malesia.

Specimens examined : Hazaribagh, 283; Gola, 1526.

Uses : The root is applied in snake and scorpion bite. It is pounded in water and the liquor made from mahua (*Madhuca longifolia*) flowers is mixed and applied externally in leprosy and also taken orally. Bark yields a fibre which is used by local people for fishing-nets, bow strings and twine.

2. **Calotropis procera** (Ait. f.) Dryand in Ait. f., Hort. Kew. ed. 2, 2 : 78. 1811; Hook. f. in Hook. f., Fl. Brit. India 4 : 18. 1883; Prain, Bengal Pl. 2 : 688. 1903; Haines, For. Fl. Chota Nagpur 433. 1910 & Bot.Bihar & Orissa pt. 4 : 551. 1922; *Asclepias procera* Ait. f., Hort. Kew 1 : 305. 1789.

Local names : Akwan, Akona.

Small to medium-sized shrubs, to 2 m tall. Leaves sessile or subsessile, elliptic-obovate to oblong, with a cordate and semi-amplexicaul base, abruptly acute to short-acuminate at apex, glabrous on both surfaces with age, 10-12 × 4-10 cm. Cymes subumbellate. Peduncles 5-15 cm long. Pedicels 2.5-3 cm long. Calyx-lobes ovate, 3-4 mm long. Corolla white with purplish blotch; segments ovate, erect, with recurved tops. Follicles inflated, recurved, green, to 10 × 5 cm. Seeds ovoid, 5-6 mm long. Coma silky, 2.5-3 cm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Common; in railway tracks, roadsides, waste lands, river beds, etc.

Distribution : India : Western and Central India, Bihar, West Bengal, Orissa, Maharashtra. Nepal, Ava, Persia, Tropical Africa.

Specimens examined : Ichak, 325; Barkattwa, 1698.

Uses : Stem yields a fibre used in similar way like that of *C.gigantea*. Root-bark is used in leprosy.

3. CRYPTOLEPIS R. Br.

Cryptolepis buchananii Roem. & Schult., Syst. Veg. 4 : 409. 1819; Hook. f. in Hook. f., Fl. Brit. India 4 : 5. 1883; Prain, Bengal Pl. 2 : 685. 1903; Haines, For. Fl. Chota Nagpur 431. 1910 & Bot. Bihar & Orissa pt. 4 : 549. 1922.

Local name : Karanta.

Branches glabrous, terete. Leaves coriaceous, elliptic, oblong or ovate-elliptic,rounded or subcuneate at base, suddenly narrowed into apiculate, acuminate or subcaudate apex, entire, glabrous, green and shining above, pale-glaucous beneath, 7-13 × 4-6 cm, with 10-15 pairs of horizontally parallel lateral nerves uniting to form an intramarginal ring; petiole 0.6-1.2 cm long. Cymes 2.5-5 cm long;

peduncle to 1.5 cm long. Flowers 1.2-1.5 cm across; bracts ovate, with scarious margins; pedicels 2.5 - 3 mm long. Calyx-lobes ovate-lanceolate, 2-2.5 mm long. Corolla pale greenish-yellow, 1-1.4 cm long; tube very short, 2.5-3 mm long; lobes lanceolate, 7-9 mm long. Filaments free; anthers sagittate, connivent over style apex; pollen masses granular, 2 in each anther loculus. Follicles straight, divaricate, gradually narrowed from above the middle into a blunt point, 5-10 cm long. Seeds ovate - oblong, compressed, 5-6 mm long. Coma silky white, 2 - 2.5 mm long.

Fl. : May-June. *Fr.* : Dec.-Feb.

Ecology : Common; in scrub jungles.

Distribution : Throughout India. Subtropical Himalayas, Sri Lanka, Myanmar, east to west and south China, Pakistan, Nepal and Bhutan.

Specimens examined : Hazaribagh, 218; National Park, 404.

Uses : The plant yields a fibre which is used by tribals for cordage and for making a kind of cloth.

Note : Much variable in size and shape of leaves and their apices and bases. Bark peeling off in very thin strips in old stem.

4. Gymnema R. Br.

Gymnema sylvestre (Retz.) R. Br. ex Schult., Syst. Veg. ed. 15, 6: 57. 1820; Hook. f. in Hook. f., Fl. Brit. India 4 : 29. 1883; Haines, For. Fl. Chota Nagpur 435. 1910 & Bot. Bihar & Orissa pt. 4 : 556. 1922. *Periploca sylvestre* Retz. Obs. Bot. 2 : 15. 1781.

Local names : Merasingi, Gur-mar.

Stems slender, much-branched, running over the tops of high trees, pubescent in younger parts. Leaves thinly coriaceous, elliptic-oblong, rounded, truncate or subcordate at base, acute or shortly

acuminate at apex, sparsely to densely pubescent on both surfaces especially on nerves; petioles 4-10 mm long, densely pubescent. Cymes much shorter than leaves. Flowers minute, 3.5-4 mm across. Peduncle densely pubescent, shorter than petiole. Pedicels slender, 4-8 mm long. Bracts minute, ovate-oblong, pubescent. Calyx-lobes obovate, 1.2-1.5 mm long, pubescent, with membranous margins. Corona single, corolline, consistine of 5 fleshy elongate sales adnate to throat of corolla tube between lobes. Corolla pale-yellow, 2-2.5 mm long, campanulate, minutely ciliate; lobes ovate-deltoid, recurved, as long as tube. Anthers with connective produced into a membranous tip. Style-apex thick, sub-hemisheric. Follicles usually solitary, glabrous, 6-7.5 cm long and 5-7 mm wide. Seeds narrowly ovoid-oblong, pale brown, flat, with a broad thin wing, 7-10 mm long.

Fl. : Aug.-Sept. *Fr.* : Jan.-Mar.

Ecology : Common; in scrub jungles, twining and straggling with branchlets hanging over from crowns of trees.

Distribution : India : Western Paninsula, Bihar, Orissa, Sri Lanka. tropical Africa.

Specimens examined : Hunterganj. 932; National Park, 2059.

Uses : Leaves when chewed paralyse temporarily the sense of taste for sugar due to presence of gymnemic acid and on this account they are used locally in diabetes. Leaf-powder is a cardiac stimulant and diuretic.

5. HEMIDESMUS R. Br.

Hemidesmus indicus (L.) R.Br. in Ait. f., Hort. Kew ed. 2, 2: 75. 1811; Hook. f. in Hook. f., Fl. Brit. India 4 : 5. 1883; Prain, Bengal Pl. 2 : 685. 1903; Haines, For. Fl. Chota Nagpur 432. 1910 & Bot. Bihar & Orissa pt. 4 : 548. 1922. *Periploca indica* L., Sp. Pl. 211. 1753.

Local name : Anandamal.

Stems slender, terete, striate, glabrous, thickened at nodes. Leaves coriaceous, variable, elliptic-oblong to linear-lanceolate, subcuneate or rounded at base, acute to subacuminate, or often obtuse and apiculate at apex, entire, glabrous, not shining, often variegated with white above along the veins, pale and sometimes silvery white beneath, 5-10 × 1.5-4 cm; petiole 3-4 cm long. Flowers 5-6 mm across. Pedicels 4-5 mm long, with ovate, acute, imbricate bracts. Calyx-lobes ovate, herbaceous to thick, with ciliolate margins, 1.2-1.5 mm long. Corolla rotate, purplish-brown within, glabrous and greenish without; tube about as long as clayx; lobes ovate-oblong, 3.5 - 4 mm long. Corona of 5 fleshy short lobes inserted in mouth of corolla tube, much shorter than anthers. Filaments free; anthers connivent by their tips over style apex. Follicles 10-15 cm long, slender, slightly fulcate, glabrous. Seeds flattened, ovate-oblong, 4-4.5 mm long. Coma 2-2.5 cm long, brownish white.

Fl. : Aug.-Sept. *Fr.* : Oct.-Dec.

Ecology : Very common, in scrub jungles, hedges, etc.

Distribution : India: Northern India, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal and Sikkim through Orissa to Deccan Peninsula. Sri Lanka.

Specimens examined : National Park , 204; Pratappur . 1557.

Uses : Roots are used as a demulcent, diaphoretic, diuretic and alterative. They are also used locally in rheumatism, different urinary diseases, skin troubles, leucorrhoea, syphilis, scorpion-string and snake-bite.

6. HOYA R. Br.

Hoya wightii Hook. f. in Hook. f., Fl. Brit. India 4 : 59. 1883, p.p.; Stevens in Saldan. & Nicols., Fl. Hassan Dist. 450. 1976.

Hoya pendula sensu auct. excl. basionym : Prain, Bengal Pl. 2 : 700. 1903, p.p.; Haines, For. Fl. Chota Nagpur 438. 1910 & Bot. Bihar & Orissa pt. 4 : 561. 1922.

Leaves elliptic or elliptic-lanceolate, cuneate to subattenuate at base, acute at apex, revolute marginally, glabrous, 6-10 × 3-5 cm, with lateral veins almost at right angles to midrib; petiole 1.5 - 2.5 cm long. Peduncles 0.3-0.6 cm long. Pedicels 1.5-2.5 cm long, stout. Sepals linear-lanceolate, glabrous, shorter than corolla tube. Corolla cream-coloured; lobes 0.7-1 cm long, glabrous within, puberulous on margins. Filaments connate; anthers with connective produced into a membranous tip; waxy pollen masses with a narrow pellucid margin. Follicles slender, straight, 7-10 cm long.

Fl. & Fr. : Aug.-Nov.

Ecology : Common; in dense forests on trees.

Distribution : India : Deccan Peninsula, Chota Nagpur, Bihar and Orissa.

Specimens examined : Keredari, 647; National Park, 2053.

Uses : Stem yields a fibre which is used by local people in making ropes, cordage, etc. The plant is used as emetic.

7. PERGULARIA L.

Pergularia daemia (Forsk.) Chiov., Result. Sc. Miss. Stefani-Paoli Somal. Ital. 1 : 115.1916; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 86. 1983. *Asclepias daemia* Forsk., Fl. Aegypt.-Arab.51.1775.

Cynanchum extensum Jacq. Misc. 2 : 353. 1781-82.

Daemia extensa (Jacq.) R.Br. in Ait. f.,Hort. Kew. ed. 2, 2 : 76. 1811; Hook. f. in Hook. f., Fl. Brit. India 4 : 20.1883; Prain, Bengal

Pl. 2 : 692. 1903.

Pergularia extensa (Jacq.) N.E.Brown in Thistleton-Dyer, Fl. Cap. 4: 758. 1908; Haines, For. Fl. Chota Nagpur 434. 1910 & Bot. Bihar & Orissa pt. 4 : 552. 1992.

Local name : Utran.

Twining herb with hispidly hairy stems. Leaves membranous, with rounded incurved basal lobes, acute to subacuminate at apex, 5-15 × 3.5-13 cm; petiole 3-8 cm long. Cymes drooping. Flowers 1.5 - 2 cm across. Peduncles 5 - 10 cm long. Pedicels 1.5-5 cm long. Bracts and bracteoles linear, ± 3 mm long. Calyx-lobes small, ovate, puberulous, 3.5 - 4 mm long. Corolla green or yellowish green; tube short infundibular; lobes linear or ovate-oblong, spreading with reflexed margins, densely hairy within, 1-1.2 cm long. Corona staminal, in 2 series, outer a five - lobed, denticulate annulus at base of staminal column, the inner of 5 fleshy segments attached to column above its base. Pollen masses clavate, compressed. Gynostegium elongate. Follicles lanceolate, narrowed into a long beak, puberulous, 3.5-5 cm long. Bristles long, soft. Seeds broadly ovate, pubescent, with ciliate margin, 4-6 mm long.

Fl. : Oct.-Dec. *Fr.* : Dec.-Jan.

Ecology : Very common; in hedges, fences near and within villages, forests, etc.

Distribution : Throughout India. Tropical and South Africa, West Asia, Tropical Himalayas, Myanmar, Malesia, Sri Lanka.

Specimens examined : Chatra , 560; National Park , 973; Joynagar, 1802.

Uses : Plant has emetic and expectorant properties. Decoction of leaves is used in infantile diarrhoea, asthma, etc. Plant extract is given for uterine and menstrual troubles.

97 SOLANACEAE

Key to the Genera

1a. Fruit a dry capsule :

- 2a. Flowers in terminal racemes or panicles. Capsule smooth ...5. NICOTIANA
- 2b. Flowers solitary. Capsule tuberculate or prickly ... 3. DATURA

1b. Fruit a fleshy berry :

- 3a. Anthers connivent in a cone around style :
  - 4a. Anthers mostly dehiscing by apical pores, rarely by short apical slits ... 7. SOLANUM
  - 4b. Anthers dehiscing by longitudinal slits ... 4. LYCOPERSICON
- 3b. Anthers not connivent in a cone :
  - 5a. Calyx greatly enlarged and enclosing completely the fruit ... 6. PHYSALIS
  - 5b. Calyx not greatly enlarged and never completely enclosing the fruit :
    - 6a. Corolla elongated, narrowly tubular. Flowers in a few- to many-flowered inflorescence ...2. CESTRUM

6b. Corolla rotate - campanulate.Flowers usually solitary or sometimes few together in leaf axils, not in inflorescence. ... 1.CAPSICUM

CAPSICUM L.

Key to the Species

1a. Flowers usually solitary; pedicel in fruit pendent. Corolla white ... *1. C. annum*

1b. Flower usually 2, sometimes to 5; pedicel in fruit erect. Corolla greenish-white ... *2. C. frutescens*

1. **Capsicum annum** L., Sp. Pl. 188. 1753; Prain, Bengal Pl. 2: 747. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 608. 1922; Haiser & Pickersgill in Taxon 18 : 278. 1968; Deb in J. Econ. Tax. Bot. 1 : 35. 1980; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 395. 1987.

C. frutescens auct. non L. : Clarke in Hook. f., Fl. Brit. India 4 : 239. 1883.

Local name : Lalmirich.

Herbs or small shrubs, to 1.5 m tall, laxly branched. Stems angular, glabrate to ± pubescent on younger parts. Leaves solitary or paired, ovate-lanceolate, acuminate, subentire, 2-15 × 1-6 cm; petioles 0.7-3 cm long. Flowers usually solitary. Pedicels usually enlarging in distal portion, pendent in fruit. Calyx truncate or with very small umbos. Corolla white; lobes widely spreading, lanceolate, to 4 mm long. Anthers bluish, dehiscing longitudinally. Fruit pendent, oblong-ovoid, acute, to 5 cm long, turning reddish mostly when ripe, shining. Seeds smooth, yellow, 3-5 mm in diam.

Fl. & Fr. : Almost throughout the year, but chiefly during Nov.-Jan.

Ecology : Very common; cultivated in fields, gardens, etc.; also found as an escape near habitations, gardens, waste places, agricultural fields, etc.

Distribution : Throughout India; probably native of Mexico to Columbia, now cultivated in all parts of the World.

Specimens examined : Ramgarh Cant., 1891; Satgawan, 1976.

Uses : Fruits are carminative, extensively used as a spice. Capsicum preparations are used as counter-irritants in lumbago, neuralgia and rheumatism.

2. **Capsicum frutescens** L., Sp. Pl. 189. 1753; Prain, Bengal Pl. 2 : 749. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 609. 1922; Heiser & Pickersgill in Taxon 18 : 280. 1969; Deb in J. Econ. Tax. Bot. 1 : 35. 1980. Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 397. 1987.

C. *minimum* auct. non Roxb. : Clarke in Hook. f., Fl. Brit. India 4 : 239. 1883, *p.p.*

Local name : Mirich.

Soft-stemmed shrub, to 2 m tall. Stems angular and grooved, more or less pubescent. Leaves solitary or paired, ovate-lanceolate, acuminate, 2-9 × 1-4 cm; petiole 0.5-2.5 cm long. Flowers usually 2 at each node, sometimes to 5. Pedicels in fruit erect. Calyx cupular, truncate or with small deltoid umbos, lacking a constriction at base near pedicel. Corolla greenish-white, with spreading to recurved lobes. Anthers bluish, dehiscing longitudinally. Style exserted beyond anthers. Fruit erect, cylindric or of various shapes, red.

Fl. & Fr. : Almost throughout the year, but chiefly during Nov.-Jan.

Ecology : Common; cultivated in fields, gardens, etc.; also found as an escape near habitations, agricultural fields, waste lands, roadsides, etc.

Distribution : Throughout India. Probably native of S. America, now widely cultivated in all warmer regions of the World.

Specimens examined : Hazaribagh, 718; Etkhori, 1446.

Uses : Fruits are carminative; also employed in preparation of hot sauces.

2. CESTRUM L.

Key to the Species

1a. Corolla-lobes obtuse or rounded, reflexed. Leaves lanceolate-oblong or elliptic-oblong, acute ...1. *C. diurnum*

1b. Corolla-lobes acute, erect. Leaves ovate-lanceolate, acuminate ...2. *C. nocturnum*

*** 1. Cestrum diurnum** L., Sp. Pl. 191. 1753; Francy in Candollea 6 : 284. 1935; Deb in J. Econ. Tax. Bot. 1 : 36. 1980.

Local name : Dinka-raja.

Perennial shrub, to 2 m tall. Younger branches sparsely pubescent. Leaves oblanceolate-oblong or elliptic-oblong, obliquely rounded to cuneate at base, acute, greenish above, whitish beneath, 8-15 × 3-5 cm; petiole to 1 cm long. Flowers many, in long-peduncled axillary or terminal panicles. Calyx puberulous outside, 0.35-0.4 cm long; segments ovate-triangular, acute. Corolla white, 1.5-2.5 mm long; lobes reflexed, obtuse or rouded. Ovary globose, *ca* 1.5 mm across. Berry subglobose, dark purple on maturity, to 5 mm in diam.

Fl. & Fr. : Jan.-Apr. and Sept.-Oct.

Ecology : Common; in wastelands, along railway tracks and in shrubberies.

Distribution : Throughout India. Native of West Indies, now widely cultivated throughout the Tropics.

Specimens examined : Ramgarh, 563; Hazaribagh, 1560.

Use : The species is planted in gardens as ornamental for its scented flowers.

* 2. **Cestrum nocturnum** L., Sp. Pl. 191. 1753; D'Arcy in Ann. Missouri Bot. Gard. 60 : 607. 1973; Deb in J. Econ. Tax. Bot. 1 : 36. 1980; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 408. 1987.

Local name : Rantki-rani.

Erect, perennial shrub, to 3 m tall. Branches drooping. Leaves ovate-lanceolate, rounded or cuneate at base, acuminate, entire-repand, glabrous on both surfaces, 5-15 × 2.5-5 cm; petiole 1-2.5 cm long. Flowers sessile, in sessile or short-peduncled, axillary and terminal cymes, combined into a leafy panicle. Calyx 3.5-4 mm long; lobes triangular, subacute. Corolla 2-2.5 cm long, greenish-white; lobes erect, acute, ciliate within, plicate. Filaments with a linear short appendage at base. Berries small, ovoid, white, to 4 mm in diam. Seeds many, compressed.

Fl. & Fr. : Jan.-Apr. and Sept.-Nov.

Ecology : Common; in waste places, hedges and ravine-slopes; also cultivated as a garden ornamental.

Distribution : Throughout India. Native of West Indies and Central America, widely cultivated in the Tropics.

Specimens examined : Jhumri Telaiya, 289; Satgawan, 593.

Uses : The species is planted as an ornamental for its scented flowers.

3. DATURA L.

Key to the Species

1a. Capsule spherical, inclined or nodding, dehiscing irregularly, covered with stout deltoid prickles ...1. *D. metel*

1b. Capsule ovoid, erect, dehiscing by 4 valves, covered with slender short prickles ...2. *D. stramonium*

1. **Datura metel** L., Sp. Pl. 179. 1753; Deb in J. Econ. Tax. Bot. 1 : 37. 1980; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 404. 1987.

D. fastuosa L., Syst. Nat. ed. 10, 2 : 932. 1759; Clarke in Hook. f., Fl. Brit. India 4 : 242. 1883; Prain, Bengal Pl. 2 : 751. 1903; Haines, For. Fl. Chota Nagpur 442. 1910 & Bot. Bihar & Orissa pt. 4 : 651. 1922.

D. alba Nees in Trans. Linn. Soc. London 17 : 73. 1834.

D. fastuosa L. var. *alba* (Nees) Clarke in Hook. f., Fl. Brit. India 4 : 243. 1883; Prain, Bengal Pl. 2 : 751. 1903.

Local name : Sadah dhatura or Safed dhatura.

Erect, annual-perennial, divaricately branched undershrubs, to 1 m tall. Stem somewhat zig-zag, softly pubescent, rather succulent, lenticellate. Leaves broadly ovate-triangular to elliptic, obliquely rounded at base, acute or subacuminate at apex,entire, angled or irregularly toothed, minutely grey-pubescent, glaucous-green above, paler beneath, 7-20 × 4-12 cm; lateral nerves 6-8 pairs; petiole 2.5-10 cm long. Flowers erect, usually solitary, rarely in 2, 10-12 cm across; pedicels 1-1.5 cm long. Calyx herbaceous, minutely pubescent, 5-8 cm long; lobes subequal, triangular, acuminate, 1.2-1.5 cm long. Corolla white or purple, to 16 cm long; tube 1-15 cm

long; limb 3.5-4 cm long, sinuately 5-lobed with 5 or 10 linear-lanceolate teeth. Filaments to 9 cm long, hairy at base; anthers oblong, obtuse 0.8-1.2 cm long. Ovary 6-7 mm, covered with soft prickles; style 8-12 cm long. Capsule spherical. 3-5 cm across, pendulous or nodding, covered with stout deltoid prickles, dehiscing irregularly. Seeds reniform, closely-packed, nearly smooth, yellowish-brown, 3.5-4 mm in diam.

Fl. & Fr. : Most of the year, but chiefly during June-Sept.

Ecology : Very common; in waste places, along roadsides, railway tracks, in scrub jungles, etc.

Distribution : Throughout India. Native in India, widespread in the Old World Tropics.

Specimens examined : Pokharia (National Park), 99; Jhumri Telaiya, 176; Simaria, 1639.

Uses : All parts of the plant are narcotic. Medicinally the plant is used for asthma.

2. **Datura stramonium** L., Sp. Pl. 179. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 242. 1883; Haines, For. Fl. Chota Nagpur 441. 1910 & Bot. Bihar & Orissa pt. 4 : 614. 1922; Deb in J. Econ. Tax. Bot. 1 : 37. 1980; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 405. 1987.

D.tatula L., Sp. Pl. ed. 2, 256. 1762.

D. stramonium L. var. *tatula* (L.) Clarke in Hook. f., Fl. Brit. India 4:242. 1883; Prain, Bengal Pl. 2 : 751. 1903.

Local name : Datura.

Erect, widely branched, somewhat coarse, annual-perennial herbs, to 1 m tall. Stems glabrous or sparsely puberulous on young parts, green or purplish. Leaves broadly ovate, ovate-elliptic to triangular, truncate, cuneate or sometimes subcordate, often unequal sided at base, acute or acuminate at apex, sinuately dentate, glabrate to sparsely pubescent, 5-20 × 3-12 cm; petiole 2-5 cm long. Flowers

erect, solitary in axils, 7-13 cm long; pedicels 4-10mm long. Calyx 5-angled, narrowly tubular, 3-5 cm long; teeth acutely lanceolate, puberulous. Corolla white or purple, 6-10 cm long; limb with 5 subulate 5-6 mm long teeth. Staminal filaments hairy at base. Capsule ovoid, erect, 4-7 cm long, densely covered with short prickles, splitting regularly at top into 4 valves. Seeds black, reniform, minutely pitted, 2.5-3 mm long.

Fl. & Fr. : July-Dec.

Ecology : Not common; on waste grounds, roadsides, near river banks, along railway tracks, etc.

Distribution : India : Tropical Himalaya from Kashmir to Sikkim, West Bengal, Bihar, Chota Nagpur, Western Peninsula. Cosmopolitan, especially in warm temperate countries, introduced from America.

Specimens examined : Hazaribagh, 253; Satgawan, 1987.

Uses : Leaves and flowering tops are narcotic, spasmodic and anodyne. Leaves are used in cigarettes for asthma. Seeds are employed for homicidal purposes.

4. LYCOPERSICON Mill.

Lycopersicon esculentum Mill., Gard. Dict. ed. 8, n. 2. 1768; Clarke in Hook. f., Fl. Brit. India 4 : 237. 1883, *p.p.*; Prain, Bengal Pl. 2 : 743. 1903; Haines, For. Fl. Chota Nagpur 439. 1910 & Bot. Bihar & Orissa pt. 4 : 614. 1922; Torrell in Taxon 26 : 129-131. 1977.

Solanum lycopersicum L., Sp. Pl. 185. 1753; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 386. 1987.

Lycopersicum lycopersicum (L.) Karsten, Deutsche Fl. 966. 1882.

Lycopersicon lycopersicon (L.) Britton & Brown, Illus. Fl. 3 : 137. 1898.

Lycopersicon lycopersicum (L.) Farwell, Ann. Rep. Commissioners Park & Boulevards Detroit 11 : 84. 1900; Deb in J. Econ. Tax. Bot. 1 : 41. 1980.

Local names : Tamatar, Vilayithi baingan.

Sprawling ephemeral herbs, to 1 m long. Leaves to 25 × 20 cm, broadly ovate in outline; lobes usually toothed, alternating with minor interstitial leaflets; petioles 2-5 cm long. Inflorescence lateral, few- to several-flowered; peduncles to 7 cm long. Flowers 1.5-2 cm across; pedicels articulating above base. Calyx accrescent and reflexed in fruit. Corolla yellow, 0.6-1 cm long. Filaments flattened dorsally; anthers connivent in a cone around style, opening by longitudinal slits. Ovary covered with minute hairs. Berry large, red or yellow when ripe, juicy, to 3-6(-10) cm in diam, with fleshy and much-ramified placenta. Seeds 2-3 mm in diam., discoid, yellow.

Fl. & Fr. : Dec.-Feb.

Ecology : Very common; cultivated in fields; also met with as an escape in waste places, roadsides, near habitations, vacant plots, agricultural fields and field-borders, etc.

Distribution : Throughout India. Native of E. and S. America, and Mexico; widely cultivated throughout the World.

Specimens examined : Churchu, 692; Ghanghree, 1297.

Uses : Fruits are consumed in salads and used as vegetables.

Note : Most of the authorities preferred to place "tomato" under the genus LYCOPERSICON because of the anthers dehiscing by lateral slits, not by apical pores. However, Hepper (*l.c.*) pointed out that it should be placed in the genus SOLANUM in view of the fact that there are some species of SOLANUM which possess rather intermediate anthers with oblique apical pores.

Further, Schubert (in Taxon 24 : 171-177. 1975) and Nicolson (*Ibid.* 389-390) argued that the correct name for the "tomato" should

be *Lycopersicon lycopersicum* (L.) Karsten,rather than *L. esculentum* Mill. However, Torrell (*l.c.*) has argued strongly that since the combination was intended as a tautonym, it should not be so treated and then *L. esculentum* Mill. should be retained as correct name.

5. NICOTIANA L.

Key to the Species

1a. Corolla tube narrow below, expanded above; lobes rose. Leaves totally cauline. Capsule 1.5-2 cm long ...2. *N. tabacum*

2b. Corolla tube linear, slightly swollen above; lobes white. Leaves cauline and radical. Capsule 0.8-1 cm long ...1. *N. plumbaginifolia*

1. **Nicotiana plumbaginifolia** Viv. Elench., Pl. Hort. Dinegro 26, t. 5. 1802; Clarke in Hook. f., Fl. Brit. India 4 : 246. 1883; Prain, Bengal Pl. 2 : 752. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 616. 1922.

Local name : Ban-tamaku.

Erect, annual-biennial herbs, to 1 m tall. Stems simple or branched from base, glandular-pubescent. Radical leaves in rosette, obovate-spathulate, cuneate at base or decurrent into a subulate petiole, 10-20 cm × 15-20 cm; cauline ones sessile, elliptic or elliptic-obovate, with a semi-amplexicaul base, obtuse or subacute at apex, 5-15 × 3-8 cm; upper ones smaller, passing into bracts; all leaves undulate-crispy, glabrous, glandular-dotted beneath. Panicle lax, terminal, to 8 cm long. Pedicels 5-7 mm long. Calyx 0.7-1 cm long, glandular-pubescent; lobes linear-lanceolate, acuminate, unequal, 3-4 mm long. Corolla greenish white, glandular - pubescent outside, 2.5-4 cm long, salverform; tube linear, slightly swollen above, to 4cm long; lobes 0.7-1 cm long, white,obtuse. Stamens sub-exserted, attached near corolla-throat; anthers oblong-cordate, *ca* 1.5 mm long.

Capsule 0.8-1 cm long, ovate, glabrous. Seeds minutely rugose, 0.5-0.6 mm long.

Fl. : Apr.-May. *Fr.* : May-June.

Ecology : Very common; in waste places, along roadsides, gardens, agricultural fields, as weed of cultivation on fallow fields, etc.

Distribution : Almost throughout India. Native of Central and South America; introduced and widely naturalised in other tropical countries.

Specimens examined : Hazaribagh, 248; Etkhori, 1446.

Uses : The plant contains alkaloids nornicotine and nicotine which have different medicinal importance. It is also grown as an ornamental in houses, gardens, etc.

2. **Nicotiana tabacum** L., Sp. Pl. 180. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 245. 1883; Prain, Bengal Pl. 2 : 153. 1903; Haines, For.Fl. Chota Nagpur 439. 1910 & Bot. Bihar & Orissa pt. 4 : 616. 1922.

Local name : Tamaku.

Stout herbs to undershrubs, to 3 m tall. Stems sparingly branched. Leaves all cauline, large, elliptic or obovate, narrowed at base into a winged petiole, acuminate at apex, 25-50 × 18-35 cm, upper ones gradually smaller, semi-amplexicaul, lanceolate; petiole and its foliose wings decurrent on stem. Panicle large, terminal, to 30 cm long, many-flowered, with clasping bracts and linear bracteoles. Calyx campanulate-tubular, 1-1.8 cm long, irregularly loded; tube slightly accrescent. Corolla rose, 4-5 cm long and 2-3 cm across at top; tube narrow below, expanded above; lobes acute. 4 stamens subequal, 1 somewhat shorter; filaments pubescent except near apex. Stigma globose-capitate. Capsule ovoid, 1.5-2 cm long, exserted from calyx. Seeds globose or ellipsoid, brown, *ca* 5 mm in diam.

Fl. & Fr. : Dec.-Feb.

Ecology : Very common, cultivated in fields, sometimes met with as an escape in waste places, agricultural fields and field-borders.

Distribution : Throughout India : Native of tropical America, widely cultivated throughout the Tropics.

Specimens examined : Satgawan, 592; Katkamasandi, 1400.

Uses : Leaves are used as tobacco in manufacture of cigarettes, cigars, bidi, cheroot, snuff, etc.; also employed in medicine as sedative, anti-spasmodic and vermifuge, in gastro-intestinal disorders and skin troubles.

6. PHYSALIS L.

Physalis minima L., Sp. Pl. 183. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 238. 1883; Prain, Bengal Pl. 2 : 750. 1903; Haines, For. Fl. Chota Nagpur 439. 1910 & Bot. Bihar & Orissa pt. 4 : 607. 1922.

P. pubescens Wight, Ill. Ind. Bot. t. 1668, f. 6. 1850, non L. 1753.

Local name : Tulati pati.

Erect or decumbent-ascending, much branched or sometimes simple, annual herbs, 15-60 cm tall. Stems angular-ribbed above, subterete below, green, usually tinged with purple, patent-hairy. Leaves ovate-elliptic, chartaceous, obliquely rounded or subcordate at base, acute to subacuminate at apex, coarsely toothed or lobed along margins, sparsely pubescent, 4-10 × 2-5 cm; petiole 1-4 cm long, slender, ± pubescent. Flowers 5-8 mm across, nodding; pedicels 0.5-1 cm long in flower, 1 - 2.5 cm long in fruit, patent - hairy. Calyx 3-5 mm (in flower), patent - hairy without; lobes triangular, 3-3.5mm long. Corolla wide-campanulate, induplicate valvate, yellow with brown spots within at base, 0.8-1 cm long; lobes triangular-ovate,

acute, 3.5-4 mm long. Stamens unequal; anthers purple, oblong, *ca* 2.5 mm long. Ovary ovoid, *ca* 1.5 mm across; style *ca* 4 mm long, glabrous. Fruiting calyx bladder-like, distinctly 8-10-angled, subglobose or ovoid, reticulately veined, 1.5-2.5 cm long. Berry yellow when ripe, globose, 1-1.5 cm diam., entirely enveloped in enlarged calyx.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; in waste places, gardens, arable lands, along railway tracks, roadsides, etc.

Distribution : Throughout India. Tropical Asia, Africa, Australia.

Specimens examined : Ramgarh, 532; Barhi, 896; Simaria, 1624.

Uses : Plant is used as tonic, diuretic and purgative. Fruits and leaves are cooked as vegetable by tribals.

7. SOLANUM L.

Key to the Species

1a. Plants unarmed :

- 2a. Leaves pinnate. Plants with subterranean tubers ...5. *S. tuberosum*
- 2b. Leaves simple. Plants without subterranean tubers :
  - 3a. Corolla white, to 1 cm across. Berry 0.5-0.7 cm in diam., black or blackish-purple or yellow when ripe ...2. *S. nigrum*
  - 3b. Corolla bluish, 2-5 cm across. Berry 5-25 cm long, white, yellow or dark-purple ... 1. *S. melongena*

1b. Plants armed :

4a. Inflorescence mostly 1-flowered. Berry 5-25 cm long ...1. *S. melongena*

4b. Inflorescence with few to many flowers. Berry much less than 5 cm in diam. :

5a. Calyx unarmed. Flowers white. Fruiting pedicels erect. Leaves unarmed or with 1-few prickles on midrib beneath and petiole ... 4. *S. torvum*

5b. Calyx prickly. Flowers purple, blue, or white. Leaves with many prickles throughout :

6a. Prickles on main stem curved from broad base. Ripe berry orange ... 6. *S. violaceum*

6b. Prickles straight, lacking a broad base :

7a. Erect undershrub. Ripe berry shining red ...3. *S. sisymbrifolium*

7b. Prostrate or decumbent - ascending. Ripe berry yellow, or white with green streaks ...7. *S. virginianum*

1. **Solanum melongena** L., Sp. Pl. 186. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 235. 1883; Prain, Bengal Pl. 2 : 746. 1903; Haines, For. Fl. Chota Nagpur 439. 1910 & Bot. Bihar & Orissa pt. 4 : 612. 1922; Santap. in J. Bomb. Nat. Hist. Soc. 47 : 655. 1948; Deb in J. Econ. Tax. Bot. 1 : 48. 1980; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 373. 1987.

S. longum Roxb., Fl. Ind. 1 : 567. 1832.

Local name : Baingun.

Large perennial herbs, to 60 cm tall, much-branched and spreading, sparsely armed with slender straight prickles, or sometimes unarmed. Stems stellate-pubescent specially on younger parts. Leaves simple, ovate in outline, sinuately lobed, cordate, truncate or subcuneate and unequal sided at base, acute at apex, softly stellate-pubescent on both sides, usuallly armend along midrib, 4-18 × 3-10cm; petioles to 6 cm long. Flowers mostly solitary, sometimes in few-flowered supra-axillary inflorescences, with first flowers functionally staminate, later ones perfect; pedicels 1-2 cm long. Calyx densely stellate-pubescent, to 1 cm long in flower, enlarging considerably in fruit. Corolla bluish, 2-5 cm across. Ovary stellate-pubescent on top; style stellate-pubescent; stigma of 2-4 small discoid lobes. Berry very long, 5-25 cm long, elllipsoid or ovoid, white, yellow or dark-purple.

Fl. : July-Sept. *Fr.* : Nov.-Jan.

Ecology : Very common; mostly cultivated in gardens, fields, etc., sometimes met with as an escape in waste places near habitational sites.

Distribution : Throughout India. All the tropical countries.

Specimens examined : Hazaribagh, 11; Hunterganj, 1727

Uses : Fruits are consumed as vegetable. Roots are antiasthmatic and stimulant. Leaves are used in bronchitis, asthma and dysuria. Fruits are given in liver complaints.

2. **Solanum nigrum** L., Sp. Pl. 186. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 229. 1883; Prain, Bengal Pl. 2 : 745. 1903; Haines, For. Fl. Chota Nagpur 440. 1910 & Bot. Bihar & Orissa pt. 4 : 610. 1922.

Local name : Makoi .

Erect or rambling, sparingly branched, unarmed, annual herbs, to 1 m high. Stems terete or angular, somewhat zig-zag, glabrous or

sparsely hairy. Leaves simple, ovate, ovate-oblong or ovate-elliptic, membranous, cuneate or often decurrent at base, acute at apex, entire or sinuately toothed, glabrous or sparsely pubescent, 6-10 × 3-5 cm; petiole 2-5 cm long. Inflorescences mostly supra-axillary, 4-8 - flowered, umbelliform or racemiform; peduncle 1-3 cm long, appressed hairy. Pedicels 4-7 mm long. Calyx cupular, 1.5-2 mm long; lobes ovate-rounded, puberulous outside. Corolla white, 0.6-1cm across; lobes oblanceolate, basally decurrent. Style hairy in the lower part; stigma capitellate. Berry globose, glabrous, 5-7 mm in diam., black or blackish-purple or yellow when ripe. Seeds discoid, minutely pitted, ca. 0.3 mm across.

Fl. & Fr. : Most of the year, but mostly during Feb.-July.

Ecology : Very common; in shady waste places, gardens, open forests, cultivated lands, railway tracks, etc.

Distribution : Throughout India. Cosmopolitan.

Specimens examined : National Park, 25; Hazaribagh, 485.

Uses : Plant is used as antiseptic and antidysenteric. Decoction of plant is used as narcotic and antispasmodic. Extract of immature herb is effective in cirrhosis of liver. Fruits are used in heart diseases, fevers, diarrhoea and eye troubles. Leaves and tender shoots are eaten as vegetable by poor people in villages.

Note : Highly variable in habit, size, shape and margin of leaves, size of floral parts and colour, shape and size of fruits, etc.

*3. **Solanum sisymbrifolium** Lam., Tab.Encycl. Meth. Bot. 2 : 25. 1799; Prain, Bengal Pl. 2 : 746. 1903; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 387. 1987.

Densely prickly and stellate-pubescent, erect, perennial undershrubs, to 1.5 m tall. Leaves oblong or oblong-lanceolate in outline, pinnatifid to pinnatisect, with many prickles throughout, glandular-pubescent, 5-30 ×3-15 cm; lobes oblong, 1-5 × 0.5-1.5cm,

prickles straight, lacking a broad base; petiole 1.5-2.5 cm long. Inflorescences lateral and terminal, aculeate, 3-10 - flowered. Pedicels 1-1.5 cm long. Calyx deeply 5-partite, densely glandular-pubescent, prickly, to 1 cm long in flower; lobes ovate-triangular, acute. Corolla purple or white, 2-2.5 cm long; lobes coherent, ovate-triangular, acute. Ovary glabrous; style simple, curved. Berry globose-obovoid, shining red when ripe, 0.5-1.5 cm in diam., enveloped by much enlarged calyx. Seeds light brown, minutely pitted, *ca* 0.5 mm diam.

Fl. & Fr. : Almost throughout the year, but chiefly during Nov.-Feb.

Ecology : Rare; along railway tracks, roadsides, waste places, etc.

Distribution : Western ghats, Nilgiri Hills, Bihar, West Bengal and elsewhere in the country. Native to S. America, adventive in many countries of Asia.

Specimens examined : Patratu, 573; Ramgarh, 1842.

Use : Fruits are sweet and eaten.

4. **Solanum torvum** Sw., Nov. Gen. & Sp. Pl. 47. 1788; Clarke in Hook. f., Fl. Brit. India 4 : 234. 1883; Prain, Bengal Pl. 2 : 746. 1903; Haines, For. Fl. Chota Nagpur 440. 1910 & Bot. Bihar & Orissa. pt. 4 : 612. 1922.

Local names : Bangar betahet, Kutunbi.

Erect, stellate- pubescent, undershrub, to 2 m tall, with very few hooked prickles usually scattered only on stem and petioles. Stem with fewer erect branches, often tinged with dark purple. Leaves broadly ovate-elliptic to oblong, chartaceous, obliquely truncate to subcordate at base, acute at apex, sparsely stellate-hairy above, densely so beneath, entire or with shallow, somewhat broadly triangular lobes, unarmed except the midrib beneath, 8-15 × 6-12cm; petiole 2-6 cm long, armed with few prickles. Inflorescences supra-axillary, sessile or shortly peduncled, dichotomous, to 5 cm long,

many-flowerd. Pedicels 5-8 mm long, densely glandular and stellate-hairy calyx 6 6.5 mm long, cupular, glandular and stellate - hairy lobes oblong-lanceolate, acuminate, 1.5-2 mm long. Corolla white, stellately hairy outside, 7-8 mm long; lobes lanceolate, acute, 1.2-1.5 cm long. Ovary glandular - hairy; stigma obtuse. Berry globose, 0.5-1.5 cm in diam, glabrous, at first yellow, turning dull-orange when ripe. Seeds smooth, *ca* 2mm diam. Fruiting pedicels erect.

Fl. & Fr. : Most of the year, but cheifly during Feb.-Apr. and Aug.-Nov.

Ecology : Common ; in waste places, along roadsides, on river-banks, and in forest - edges and forest-clearings.

Distribution : Throughout India. Native of W. Indies, introduced and widely naturalised throughout the Tropics.

Specimens examined : Hazaribagh, 16; National Park, 213.

Uses : Fruits are cooked and eaten as vegetable; also useful in liver and spleen enlargements. Fruit-decoction is given in cough. Roots in poltice are used for cracks in feet.

5. **Solanum tuberosum** L., Sp. Pl. 185. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 229. 1883; Prain, Bengal Pl. 2 : 745. 1903; Haines, For. Fl. Chota Nagpur 439. 1910 & Bot. Bihar & Orissa pt. 4 : 610. 1922.

Local name : Alu.

Tufted herb, with tuberous underground stems. Aerial stems ribbed to winged, thinly hairy in younger parts. Leaves interruptedly imparipinnate, each pair of larger leaflets following 1-2 pairs of much smaller ones; lower pair small; leaflets herbaceous, ovate to obovate-elliptic, hairy on both surfaces, 1.5-7 × 1.2-5 cm. Inflorescences terminal and lateral, erect, 7-16 - flowered. Pedicels 1-3 cm long, hairy, articulate. Calyx 0.8-1.5 cm long; lobes long-acuminate. Corolla white or purple, hairy outside, 1.2-2 cm long; limb slightly lobed. Berry globose, green, glabrous, 1.2-1.5 cm in diam.

Fl. : Dec.-Jan. *Fr.* : Jan.-Feb.

Ecology : Very common; cultivated in fields; also met with as an escape in waste places near habitations, agricultural fields, roadsides, etc.

Distribution : Almost throughout India. Native of Peru, now widely cultivated throughout the world especially in temperate zones and in highlands of Tropics.

Specimens examined : Keredari, 51; Ramgarh Cant., 1891.

Uses : Tuberous underground stems are widely consumed as food in variety of ways. They are also used as raw material for manufacture of starch, ethyl alcohol and other industrial products. Leaf-extract is used as antispasmodic in cough. Tuber is ground and made into a paste for application to burns.

6. **Solanum violaceum** Ortega, Hort. Matr. Dec. 56. 1798; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 462. 1976; Lester & Niakan in D'Arcy Solanaceae : biology & systematics 450. 1986; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 378. 1987.

S. sodomeum L., Sp. Pl. 187. 1753, *nom. rejic.*

S. indicum auct. non L., *nom. rejic.* : Clarke in Hook. f., Fl. Brit. India 4 : 234. 1883; Prain, Bengal Pl. 2 : 746. 1903; Haines, For. Fl. Chota Nagpur 441. 1910 & Bot. Bihar & Orissa pt. 4 : 612. 1922.

Local name : Barhanta, Birhatta.

Erect, stellate - pubescent, armed, perennial undershrub, to 2 m tall. Stems with broad-based, curved prickles, covered with minute stellate hairs. Leaves ovate-oblong in outline, thick-coriaceous, obliquely truncate, cuneate or subcordate at base, acute to acuminate at apex, sinuate to deeply 2-3- pinnately lobed, finely stellate-tomentose above, densely so beneath, with scattered prickles on veins, 5-15 × 2.5-7 cm; petioles 1.2-2.5 cm long. Flowers 2-2.5 cm across, in 8 to 12 flowered leaf opposed inflorescence of 2 -3 cm long.

Pedicels 1.3-1.5 cm long. Calyx cupular, stellate-pubescent; lobes triangular, prickly, to 6 mm long. Corolla blue or purple, minutely stellate-pubescent outside; lobes deltoid-ovate, acute. Ovary hairy at top; style stellately hairy, curved at apex. Berry globose, orange when ripe, glabrous, 6-8 mm across. Seeds smooth, discoid, yellow, *ca* 2 mm in diam.

Fl. & Fr. : Throughout the year, but chiefly during Oct.-May.

Ecology : Common; in waste places, along roadsides, railway tracks, abandoned cultivated grounds, etc.

Distribution : Throughout the tropical parts of India. Sri Lanka.

Specimens examined : Gola, 772; Ramgarh Cant., 1239.

Uses : Roots are carminative and expectorant, useful in coughs and catarrhal affections, dysuria and colic. It is pounded and applied to nasal ulcers. Leaves are eaten as vegetables and also lopped for fodder.

Note : According to Lester & Niakan (*l.c.*) the well-known name of the taxon *S. indicum* L. has been replaced by *S. violaceum* for nomenclatural reasons. The white-flowered African Plant, previously known as *S. indicum*, is taxonomically distinct from purple-flowered ones of Asia and as such, they are now called *S. anguivi* Lam.

7. **Solanum virginianum** L., Sp. Pl. 187. 1753; Hepper & Jaeger in Kew Bull. 41 : 434. 1986; Hepper in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 375. 1987.

S. surattense Burm. f., Fl. Ind. 57. 1768, excl. syn. Pluk. & Raj; Santap. in Bull. Bot. Surv. India 3 : 20. 1961; Deb in J. Econ. Tax. Bot. 1 : 51. 1980.

S. xanthocarpum Schard. & Wendl., Sert. Hannov. 1 : 8, t. 2. 1795; Clarke in Hook. f., Fl. Brit. India 4 : 236. 1883; Prain, Bengal Pl. 2 : 746. 1903; Haines, For. Fl. Chota Nagpur 440. 1910 & Bot. Bihar & Orissa pt. 4 : 613. 1922.

Local name : Keteli, Ketai.

Prostrate or decumbent-ascending, horizontally branched, annual-perennial, armed herbs, woody at the base. Stems ± zig-zag, glabrous, except younger parts covered with stellate hairs. Prickles many, compressed, yellow, straight lacking a broad base, glabrous and shining, to 2 cm long. Leaves ovate-elliptic to oblong in outline, lacerate, pinnatifid or pinnatisect, glabrous, stellate-pubescent on both surfaces when young, 3-8 × 1.5-5 cm, chartaceous, obtuse or subacute at apex, attenuate at base; segments triangular-elliptic, irregularly dentate, with prickles along veins throughout, 0.8-1.5 cm long; petioles stellate-pubesent and prickly, 1 - 2.5 cm long. Flowers 2-2.5 cm across, in 2- to 6- flowered lax, to 10 cm long, extra-axillary cymes. Peduncles 2-3cm long, aculeate, stellate-pubescent. Pedicels aculeate, 1-1.2 cm long, curved and prickly, 6-8 mm long, divided half-way down; lobes linear-lanceolate, acuminate, glandular within. Corolla purple or blue, 1.5-2 cm across; segments deltoid, stellate-pubescent, 1-1.2 cm. Ovary stellate-pubescent and glandular at top; style glabrous; stigma incurved. Berry globose, yellow, or white with green streaks, glabrous, 1.2-1.8 cm in diam. Seeds smooth, 2-2.5 mm in diam.

Fl. & Fr. : Dec.-June.

Ecology : Common; in waste places, along roadsides, on sandy river beds, fields, rocks, etc.

Distribution : Throughout India. Himalayas, S.E.Asia, Malesia, Australia and Polynesia.

Specimens examined : Hazaribagh, 116; Telaiya Dam, 147; Ramgarh, 548.

Uses : Root-extract is given in cough, asthma, and pain in chest.Stems, flowers and fruits are used in burning sensation in feet accompanied by vesicular watery eruptions; fruit-juice is used for sore-throat. Seeds are also used in asthma and cough. Juice of leaves, mixed with black pepper, is prescribed in rheumatism.

98. CONVOLVULACEAE

Key to the Genera

1a. Pollen spinulose :

2a. Fruit capsular, thin-walled, opening by valves or irregularly dehiscing ...4. IPOMOEA

2b. Fruit indehiscent, woody, coriaceous or fleshy :

3a. Fruit woody. Stigma with 2 linear - oblong lobes ...7.RIVEA

3b. Fruit coriaceous or fleshy. Stigma bi-globular ...1. ARGYREIA

1b. Pollen not spinulose :

4a. Style absent; stigma 1, with 4 or 10 longitudinal rays. Corolla-lobes bifid ...2. ERYSIBE

4b. Style(s) present; stigma(s) otherwise. Corolla-lobes (sub)entire:

5a. Outer 3 or all of sepals much enlarged in fruit, scarious, reticulately veined, falling off with fruit. Flowers in racemes or panicles. Style 1, entire or bifid ...6. PORANA

5b. Sepals not enlarged in fruit, or if enlarged, then neither scarious nor reticulately veined, remaining attached to pedicel after dehiscence of the fruit :

6a. Styles 2, free, each 2-branched ...3. EVOLVULUS

6b. Style 1, entire; stigma with 2 globose lobes ...5. MERREMIA

1. ARGYREIA Lour.

Key to the Species

1a. Stamens exserted. Corolla 1.3-1.8 cm long ...1. *A. bella*

1b. Stamens included. Corolla 3.5-5 cm long ...2. *A. strigosa*

1. **Argyreia bella** (Clarke) Raizada in Ind. For. 93 : 754. 1967. *Lettsomia bella* Clarke in Hook. f., Fl. Brit. India 4 : 192. 1883; Prain, Bengal Pl. 2 : 741. 1903; Haines, For. Fl. Chota Nagpur 464. 1910 & Bot. Bihar & Orissa pt. 4 : 588. 1922.

Climber, with white-woolly branches. Leaves ovate, cordate at base, acute at apex, glabrous or softly hairy above, white-tomentose beneath, 10-15 × 7-11 cm; petiole 2.5-8 cm long. Cymes capitate; peduncles 1.2-6 cm long. Bracts subspathulate or oblong, 5-7 mm long. Calyx 1-1.2 cm long, appressed hairy; outer 3 sepals elliptic-lanceolate, densely white-hirsute in flower, ovate, coriaceous and accrescent in fruit; inner 2 sepals smaller. Corolla 1.3-1.8 cm long; tube white; limb pink, spreading, 1.5-2 cm in diam. Anthers exserted. Berry scarlet, 6-8 mm in diam, dry when ripe. Seeds brown.

Fl. : Aug.-Oct. *Fr.* : Dec.-Jan.

Ecology : Common; in forests, hedges, grassy glades, waste places, along railway tracks, etc.

Distribution : Endemic to Chota Nagpur.

Specimens examined : National Park, 867; Ramgarh, 1729.

2. **Argyreia strigosa** (Roth) Santap. & Patel in Trans. Bose Res. Inst. Cal. 22 : 41. 1958; Panigr. & Murti, Fl. Bilaspur 1 : 382. 1989. *Ipomoea strigosa* Roth, Nov. Pl. Sp. 113. 1821.

Lettsomia setosa Roxb., Fl. Ind. 2 : 80. 1824; Clarke in Hook. f., Fl. Brit. India 4 : 194. 1883; Prain, Bengal Pl. 2 : 742. 1903; Haines,

For. Fl. Chota Nagpur 464. 1910 & Bot. Bihar & Orissa pt. 4 : 589. 1922.

Argyreia setosa (Roxb.) Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 425. 1834.

A large climber, with milky juice. Branched appressedly strigose. Leaves broadly ovate or oblong-ovate, cordate at base, obtuse or acute or shortly cuspidate at apex, sparsely hirsute on both surfaces, 10-15 × 8-13 cm; petiole 2.5-8 cm long, strigose. Cymes corymbose, 3-10 cm in diam, densely many-flowered; many branches 2-3-chasial; peduncles stout, appressedly strigose, 5-20 cm long. Flowers sessile, at angles of ultimate branches ; bracts broadly elliptic or suborbicular-oblong, coriaceous, strigose, 0.8-1.2 cm long. Sepals broadly oblong, or 3 outer or all suborbicular, thick, concave, slightly fleshy and accrescent in fruit, strigose, 0.8-1.2 cm long. Corolla strigose, tubular-infundibuliform, 3.5-5 cm long; tube somewhat ventricose in middle, white; limb 2.5-3.2 cm in diam. purple. Stamens included. Berry depressed-globose, yellow or orange, succulent, 2-4- seeded, 6-8 mm in diam.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; in hedges, waste places, roadsides, scrub jungles, etc.

Distribution : Throughout the tropical and subtropical parts of India. Sri Lanka, Myanmar, Nepal.

Specimens examined : National Park, 412; Pratappur, 1750.

Uses : Leaves are eaten as vegetable by poor people in villages. Pliable stems are substituted for ropes.

2. ERYCIBE Roxb.

Erycibe paniculata Roxb., Pl. Corom. 2 : 31, t. 159. 1798; Clarke in Hook. f., Fl. Brit. India 4 : 180. 1883; Prain, Bengal Pl. 2 : 724. 1903; Haines, For. Fl. Chota Nagpur 460. 1910 & Bot. Bihar & Orissa. pt. 4 : 605. 1922.

Erycibe wightiana Grah., Cat. Bombay Pl. 137. 1839; Gamble, Fl. Pres. Madras 2 : 930 (653). 1923.

E. paniculata Roxb. var. *wightiana* (Grah.) Clarke in Hook. f., Fl. Brit. India 4 : 181. 1883.

Diffuse or subscandent or climbing shrubs, with conical protuberances on trunk. Branches long, flexuous, rusty - tomentose when young, more or less angular. Leaves obovate or obovate-oblong to oblanceolate, suddenly acuminate at apex, attenuate at base, entire, glabrescent, shining, 7-10 × 2-4.5 cm; petiole 0.6-1.5 cm long. Flowers borne in terminal, many-flowered panicles of 10-20 cm long; buds globose, 2-3 mm across; pedicels 3-4 mm long. Sepals subequal, ovate to rounded, densely brown-tomentose, 2.5-3 mm across. Corolla pale white, campanulate-rotate, 0.8-1 cm long; lobes crisped-margined. Filaments short, flattened; anthers apiculate. Stigma sessile, sub-globose, often 5-rayed. Fruits sub-baccate, ovoid to ellipsoid, somewhat leathery, black when ripe, 1-1.5 cm long, glabrous, 1-seeded. Seeds elllipsoid, 6-7 mm long.

Fl. : May-June. *Fr.* : Apr.-May of the following year.

Ecology : Common; along river banks, streams, deciduous forests, etc.

Distribution : Throughout India. Sri Lanka, Myanmar, Malaya Peninsula, Australia.

Specimens examined : National Park, 98; Pratappur, 2078.

Uses : Sweet fruits are eaten. Bark is used by Santals in cholera.

3. EVOLVULUS L.

Key to the Species

1a. Leaves with densely appressed pilose hairs on both surfaces. Peduncle well-developed. Sepals lanceolate. Corolla shallowly lobed, pale blue or rarely white ... 1. *E. alsinoides*

1b. Leaves almost glabrous or minutely hairy beneath. Peduncle almost absent or short. Sepals ovate-oblong to oblong. Corolla distinctly lobed, white ... 2. *E. nummularius*

Evolvulus alsinoides (L.) L., Sp. Pl. ed. 2, 392. 1762; Clarke in Hook. f., Fl. Brit. India 4 : 220. 1883; Prain, Bengal Pl. 2 : 725. 1903; Haines, For. Fl. Chota Nagpur 462. 1910 & Bot. Bihar & Orissa pt. 4 : 585. 1922. *Convolvulus alsinoides* L., Sp. Pl. 157. 1753.

Trailing or prostrate or ascending, annual-perennial herbs, with a somewhat woody base. Stems few to serveral from base, often branched, slender, appressedly and patently hairy. Leaves oblong, elliptic or obovate-spathulate, rounded or attenuate at base into *ca* 2 mm long petiole, obtuse or shallowly emerginate and mucronate at apex, densely appressed-pilose on both surfaces, 7-20 × 3-10 mm. Peduncles filiform, shorter to much longer than leaves, appressed-hairy, 1 to few-flowered. Pedicels as long as or slightly longer than calyx. Bracts linear-spathulate, 1.5-4 mm long. Sepals lanceolate, villose, 2.5-3 mm long. Corolla blue or rarely white, rotate, 5-8 mm in diam. Capsule globular, glabrous, 4-valved, 3-4 mm in diam. Seeds 4 or less, ovoid, black, 1.5 - 1.7 mm long.

Fl. & Fr. : July-Nov.

Ecology : Very common; in dry open rocky localities, grasslands, along roads, border of cultivated fields, etc.

Distribution : Throughout the tropical and subtropical parts of India. Native of American Tropics, now widely spread and pantropical.

Specimens examined : Hazaribagh, 13; Gola, 775 : Mandu, 845; Chatra, 1690.

Uses : Water-extract from stems and roots is used to cure dysentery. Root is used as febrifuge.

2. **Evolvulus nummularius** (L.) L., Sp. Pl. ed. 2, 391. 1762; Prain, Bengal Pl. 2 : 726. 1903; Mooney, Suppl. Bot. Bihar & Orissa 91.1950. *Convolvulus nummularius* L., Sp. Pl. 157. 1753.

Prostrate, perennial herbs. Stems slender, few to several, glabrescent to patent-hairy, 10-40 cm long, rooting at nodes. Leaves distichous, broadly ovate, elliptic or orbicular, rounded, truncate or subcordate at base, rounded or emarginate at apex, glabrous on both surfaces or appressed-hairy beneath, 5-15 × 3.5-1.5 mm; petiole 1.5-5 mm long. Flowers 7-8 mm across, 1 or 2 together in leaf-axils. Peduncle absent or very short. Pedicels 2-6 mm long. Bracts linear to lanceolate, 0.8-1.5 mm long. Sepals ovate-oblong, obtuse or subacute, ciliate along margins, sparsely pilose or glabrous, 2.5-4mm long. Corolla rotate or broadly funnel-shaped, white; limb distinctly lobed. Capsule globular, glabrous, 4-valved, 3-4 mm in diam. Seeds 4 or less,black or brown, subglobose, 1.2-1.5 mm in diam.

Fl. & Fr. : Mar.-Nov.

Ecology : Common; in waste places, roadsides, gardens, lawns, fields, river-banks, irrigation canals, etc.

Distribution : Throughout India. Native to tropical America, introduced and naturalised in several Old World regions including Africa, Madagascar, Malesia, Sri Lanka, etc.

Specimens examined : Hazaribagh, 35; Telaiya Dam,167; Ramgarh Cant., 539.

Uses : Plant is used in various ways medicinally by poor people in villages.

4. IPOMOEA L.

Key to the Species

1a. Sepals awned at or below apex. Stamens and style exserted :

2a. Leaves pinnati-partite with 10-18 pairs of linear to filiform segments ...8. *I. quamoclit*

2b. Leaves not pinnately cut, entire, angled or lobed, cordate at base ...5. *I. hederifolia*

1b. Sepals not awned at or below apex. Stamens and style included :

3a. Ovary 3-celled. Leaves entire or 3-lobed ...6. *I. nil*

3b. Ovary 2-celled :

4a. Sepals entirely glabrous :

5a. Leaves palmately compound ...2. *I. cairica*

5b. Leaves not compound, entire or occasionally lobed :

6a. Corolla funnel- shaped. Sepals subequal. Stems nearly glabrous. Pedicel not clavate in fruit. Marshy or aquatic ... 1. *I. aquatica*

6b. Corolla salver-shaped. Sepals unequal, outer 2 shorter than inner 3. Stems woolly. Pedicel clavate in fruit. Terrestrial ...9. *I. sepiaria*

4b. Sepals hairy :

7a. Flowers borne in lax cymes. Erect or ascending or subscandent shrub ...3. *I. carnea* ssp. *fistulosa*

7b. Flowers aggregated into heads. Twining or prostrate herbs :

8a. Leaves entire. Heads sessile, not involucrate. Capsule pubescent ...4. *I. eriocarpa*

8b. Leaves 5-9-lobed. Heads long-peduncled, involucrate. Capsule glabrous ...7. *I. pes-tigridis*

1. **Ipomoea aquatica** Forsk., Fl. Aeg.-Arab. 44. 1775; Clarke in Hook. f., Fl. Brit. India 4 : 210. 1883.

Ipomoea reptans sensu auct. Mult., e.g., Prain, Bengal Pl. 2 : 736. 1903; Haines, For. Fl. Chota Nagpur 469. 1910 & Bot. Bihar & Orissa pt. 4 : 597. 1922; non *Convolvulus reptans* L., 1753.

Local name : Karmi.

Trailing or creeping on moist soil or mud, or floating on water, annual-perennial, marshy or aquatic herbs. Stems hollow or spongy, 2-3 m long, rooting at nodes; branchlets subsucculent. Leaves variable in shape and size, ovate-triangular, lanceolate or linear, cordate to sagittate or hastate at base with rounded or acute, entire or dentate basal lobes, acute or obtuse to retuse and mucronulate at apex, entire or coarsely dentate above basal lobes, glabrous, 3-15 × 1-8 cm; petiole 4-15 cm long. Flowers 6-8 cm across, solitary or in 2-few-flowered cymes; pedicels 2.5-5 cm long, glabrous; bracts minute, narrow, acute. Sepals subequal, ovate-oblong or ovate-elliptic, obtuse, minutely mucronate, glabrous, with thin pale margins, 6-8 mm long. Corolla

purplish-white, funnel-shaped, 3-5 cm long. Filaments thickened and hairy at base. Ovary glabrous. Capsule ovoid to subglobose, glabrous, 0.8-1 cm across. Seeds 4 or 2, greyish-pubescent or sometimes glabrous.

Fl. & Fr. : Almost throughout the year, but chiefly during Nov.-Mar.

Ecology : Very common; in marshy or inundated localities, along margins of stagnant shallow ponds, ditches, wet rice fields, irrigation canals, river-banks, etc.

Distribution : Throughout India Native of Old World Tropics, now naturalised in several countries in New World.

Specimens examined : Jhumri Telaiya, 314; Hazaribagh, 705; Hunterganj, 2132.

Uses : Young terminal shoots and leaves are used as vegetable and in salads. Plant-juice is used as emetic. Plant is also considered wholesome for women suffering from nervous and general debility.

2. **Ipomoea cairica** (L.) Sweet, Hort. Br. 287. 1827; Gamble, Fl. Madras 2 : 918 (645). 1921. *Convolvulus cairicus* L., Syst. ed. 10, 922. 1759.

Ipomoea palmata Forsk., Fl. Aeg-Arab. 43. 1775; Clarke in Hook. f., Fl. Brit. India 4 : 214. 1883; Haines, Bot. Bihar & Orissa pt. 4 : 601. 1922.

I. pulchella auct. non Roth : Prain, Bengal Pl. 2 : 737. 1903; Haines, For. Fl. Chota Nagpur 470. 1910, p.p.

Slender, herbaceous, perennial twiners, with a tuberous rootstock. Stems often prostrate, ± tuberculate or smooth. Leaves ovate to orbicular in outline, 3-10 × 3-10 cm, palmately divided to base into 5-7 segments; segments lanceolate or elliptic or elliptic-obovate, narrowed at both ends, obtuse and mucronulate at apex, entire, glabrous, 2-5 × 0.7-2 cm, the basal pair of segments usually again

lobed or parted; petiole 2-7 cm long, with a pair of glands at apex on lower side and pseudo-stipules at base. Flowers 4-5 mm across, axillary and solitary, or in 2 to few-flowered, axillary, lax panicles. Peduncle 1-6 cm long. Pedicels 2-3 cm long. Bracts minute. Sepals subequal or the exterior ones slightly shorter, ovate, obtuse to acute and mucronulate at apex, often minutely tuberculate without, pellucid-dotted, with pale scarious margins, 4-7 mm long. Corolla funnel-shaped, purple, or white with purplish-red towards base, 4 6 cm long. Stamens and styles included; filaments pilose at base; anthers apiculate. Capsule subglobose, glabrous, 1-1.2 cm across, 2-celled, 4-valved. Seeds 4 or less, subglobose or ovoid, densely tomentose and silky-hairy along edges, 4.5-6 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Common; in roadsides, forest edges, thickets, hedges, stream banks and waste places; also cultivated in gardens.

Distribution : Throughout India. Tropical Asia, Africa, Australia and America.

Specimens examined : Barkagawan, 888; Hazaribagh, 1581; Bishnugarh, 1934.

Uses : Tuberous roots and stems are used as food. Seeds are used as purgative.

3. **Ipomoea carnea** Jacq. ssp. **fistulosa** (Mart. ex Choisy) Austin in Taxon 26 : 237. 1977 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 322. 1980. *Ipomoea fistulosa* Mart. ex Choisy in DC., Prodr. 9 : 349. 1845.

I. carnea auct. non Jacq. : Haines, Bot. Bihar & Orissa pt. 4 : 600. 1922.

Erect or ascending, perennial undershrub, with milky latex, 2-5 m tall. Stems fistular, glabrous except puberulous young parts. Leaves ovate-triangular, deltoid to hastate, chartaceous, cordate or hastate at base, acuminate at apex, entire, glabrous, 10-20 × 6-10cm;

petiole to 8 cm long, with a pair of glands at apex on lower side. Calyx-segments subequal, ovate-rounded, obtuse, hairy outside, 6-7 mm long, with alternate glands. Flowers in many- flowered, axillary or terminal cymes. Peduncles 4-20 cm long. Pedicel 1-3 cm long. Bracts minute, ovate, caducous. Sepals subequal, ovate-rounded, concave, hairy outside, 6-7 mm long, with alternate glands. Corolla pink to rose, funnel-shaped, 6-7 cm across, with hairy mid-petalline bands. Stamens unequal, ciliate below; anthers oblong. Ovary conical. Capsule globose, glabrous, 1.5-2 cm long. Seeds brown-villous, 7 -8 mm long.

Fl. & Fr. : Nov.-Feb.

Ecology : Very common; in water sides of streams and canals; often cultivated as a hedge plant in the gardens for fencing and also naturalised in different parts of village surroundings.

Distribution : Throughout India. Native to tropical America, introduced and naturalised in all tropical countries.

Specimens examined : Hazaribagh, 284; Bishnugarh, 1106; Jhumri Telaiya, 2214.

Use : Plant is used as mild purgative.

Note : ssp. *carnea* does not occur in Asian countries.

4. **Ipomoea eriocarpa** R. Br., Prodr. 484. 1810; Clarke in Hook. f., Fl. Brit. India 4 : 204. 1883.

Convolvulus hispidus Vahl, Symp. Bot. 3 : 29. 1794.

Ipomoea hispida (Vahl) Roem. & Schult., Syst. Veg. 4 : 238. 1819, non Zucc. 1809; Prain, Bengal Pl. 2 : 734. 1903; Haines, For. Fl. Chota Nagpur 469. 1910 & Bot. Bihar & Orissa pt. 4 : 734. 1922.

Twining or prostrate, annual herbs, with milky juice. Stems slender, retrorsely or patently pilose. Leaves lanceolate to oblong or sometimes ovate-lanceolate, cordate or semihastate at base with

rounded sinus and basal lobes, acute or acuminate and mucronulate at apex, entire-repand, sparsely pilose on both surfaces, 2.5-9 × 1-5cm; petiole 0.5 - 7 cm long, pilose. Flowers 1-1.2 cm across, sessile or very shortly pedicelled, borne in sessile or shortly peduncled, 1-3-or more-flowered, head-like, cymose clusters. Bracts linear or lanceolate, 0.4-1 cm long. Sepals subequal, ovate, acuminate at apex, pilose, 6-8 mm long, the inner ones slightly shorter and narrower. Corolla tubular to funnel-shaped, slightly exceeding the sepals, 0.7-1 cm long, pink, glabrous except pilose mid-petalline bands. Stamens and style included; filaments and style hairy at base. Capsule broadly ovoid to subglobose, 5-6 mm in diam., pubescent, crowned by hairy style-base, 2-celled, 4-valved. Seeds 4, glabrous, minutely reticulate, black, 2.2 - 2.5 mm long.

Fl. : June-Aug. *Fr.* : Aug.-Oct.

Ecology : Common; in grassy waysides, thickets, hedges, agricultural fields, sandy localities, forests, etc.

Distribution : Throughout India. Tropical Africa to Transvaal, Madagascar, Egypt, Pakistan, tropical Asia, Sri Lanka and northern Australia.

Specimens examined : Etkhori, 1451; Ramgarh Cant., 1904; Hazaribagh, 2274.

Uses : Plant is used as cattle fodder. Young leaves and stems are eaten as vegatables. Seeds are edible. Plant is boiled in oil and used in rheumatism, epilepsy and leprosy.

5. **Ipomoea hederifolia** L., Syst. Nat. ed. 10, 925. 1759; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 325. 1980.

I. angulata Lam., Tab. Encyl. 1 : 464. 1791; Ooststr. in Blumea 3 : 653. 1940.

I. phoenicea Roxb., Fl. Ind. 2 : 92. 1824.

Quamoclit phoenicea (Roxb.) Choisy, Mem. Soc. Phys. Geneve 6 : 433. 1834; Prain, Bengal Pl. 2 : 737. 1903.

Ipomoea coccinea auct. non L. : Clarke in Hook. f., Fl. Brit. India 4 : 199. 1883; Haines, For. Fl. Chota Nagpur 471. 1910.

Quamoclit coccinea auct. non Moench. : Haines, Bot. Bihar & Orissa pt. 4 : 591. 1922.

Slender, herbaceous, annual twiners. Stems terete or slightly angular, glabrous or sparsely pilose, 2-5 m long. Leaves ovate to suborbicular in outline, cordate at base, acuminate and mucronate at apex, entire, angular, coarsely dentate or obscurely to deeply 3-lobed, glabrous, 3-15 × 3-10 cm; petiole shorter or longer than blade, 3-12 cm long, glabrous or sparsely pilose. Flowers borne in lateral or terminal, few to several-flowered, long-peduncled cymes of 10-35 cm long. Peduncle terete or angular, glabrous or pubescent, 4-20 cm long, cymosely branched at top; first ramification dichasial, subsequent ones monochasial. Pedicels erect, angular, 5-7 mm long, accrescent to 9-15 cm in fruit. Bracts minute, triangular, mucronulate, 1.5-2 mm long. Sepals subequal, oblong-rectangular, obtuse or truncate at apex with 3-4 mm long straight or slightly curved awn inserted below the tip; outer sepals 2-2.5 mm long, inner ones 2.5-3 mm long (excluding awn). Corolla scarlet with yellow throat, salver-shaped; tube 3-4 cm long, slightly curved, narrowed towards the base; limb 2-2.5 cm in diam., erect. Stamens and styles exserted; filaments unequal, glabrous. Capsule globular, 5-7 mm in diam., glabrous, 4-celled, 4-valved; dissepiments thin, membranous, persistent, with a thickened circular margin. Seeds 4, 3.5-4 mm long, black, densely pubescent.

Fl. & Fr. : July-Sept. and Nov.-Jan.

Ecology : Common; cultivated in gardens as an ornamental plant; also runs wild in waste places, fields, grasslands, thickets, forests, etc.

Distribution : Throughout India. Native to tropical America, introduced and naturalised in most of the tropical countries of the World.

Specimens examined : Ichak, 352; Hazaribagh, 2266.

Use : Root is used as sternutatory.

6. **Ipomoea nil** (L.) Roth, Cat. Bot. 1 : 36. 1797; Prain, Bengal Pl. 2 : 734. 1903; Haines, For. Fl. Chota Nagpur 470. 1910; Austin in Taxon 35 : 356 : 1986. *Convolvulus nil* L., Sp. Pl. ed. 2, 1 : 219. 1762.

Ipomoea hederacea auct. non Jacq : Clarke in Hook. f., Fl. Brit. India 4 : 199. 1883; Prain, Bengal Pl. 2 : 734. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 734. 1922.

Local name : Kaladana.

Twining or often prostrate, annual or perennial herbs. Stems retrorsely hirsute. Leaves broadly ovate to suborbicular in outline, entire or 3-lobed, cordate at base, acuminate at apex, appressed-hairy on both surfaces, 4-15 × 3-12 cm; petiole 3-15 cm long, retrorsely hirsute. Flowers 4-5 cm across, borne in 1-5 or more flowered umbellate cymes. Peduncle 2.5-12 cm long, hirsute. Pedicels 0.5-1cm long, hirsute. Bracts linear, 5-8 mm long. Sepals equal, lanceolate, tapering towards apex into a linear acumen, patently hirsute in basal portion, 2-2.5 cm long. Corolla funnel-shaped, pale blue or bright blue or reddish-purple, 5-6 cm long. Stamens and styles included; filaments with curled hairs at base. Capsule ovoid to globose, 0.8-1 cm in diam, glabrous, mucronate by style-base, 3-valved and 3 - celled. Seeds pyriform, black, puberulous, 4.5-5 mm long.

Fl. : Aug.-Nov. *Fr.* : Oct.-Dec.

Ecology : Common; in roadsides, thickets, hedges, waste places, scrub jungles, open lands, etc.

Distribution : Throughout the tropical and subtropical parts of India. Native of America, now pantropical.

Specimens examined : Hazaribagh, 713; Koderma, 1997.

Use : Dried seeds are used as purgative.

7. **Ipomoea pes-tigridis** L., Sp. Pl. 162. 1753; Clarke in Hook. f.. Fl. Brit. India 4 : 204. 1883; Prain, Bengal Pl. 2 : 734. 1903; Haines. For. Fl. Chota Nagpur 470. 1910 & Bot. Bihar & Orissa pt. 4 : 595. 1922.

I. pes-tigridis L. var. *hepatscaefolia* (L.) Clarke in Hook. f., Fl. Brit. India 4 : 204. 1883.

Local name : Languli-lata.

Twining, or often prostrate, annual herbs. Stems slender, patently rigid-hairy. 0.5-3 m long. Leaves ovate-orbicular or transversely elliptic in outline, 3-7.5 × 2.5-10 cm, palmately divided nearly to base with 5-7(-9) segments; segments broadly oblong to ellliptic-oblong or elliptic, contracted at base, acute or acuminate at apex, appressedly or patently hairy, 2-8 × 0.5-4 cm; petiole 2-10 cm long, hairy like stem. Flowers subsessile, borne in few-flowered, axillary, involucrate, peduencled, dense, cymose heads. Peduncle 2-15 cm long, patent-hairy. Outer bracts foliaceous, oblong to oblong-lanceolate, 1.5-3 cm long; inner ones narrower and shorter. Sepals unequal, lanceolate, hairy, 0.7-1.2 cm long. Corolla white or purple, funnel-shaped with spreading limb, 3-5 cm long, the mid-petalline bands sparsely hairy. Stamens and style included, both to 1 cm long; filaments glabrous. Capsule ovoid, glabrous, glabrous, 0.8-1 cm long, 1-celled, 4-valved. Seeds 4, grey-pubescent, black, 3.5-4 mm long.

Fl. & Fr. : July-Oct.

Ecology : Common; in waste places, grass-lands, thickets, gardens, forest edges, cultivated grounds, roadsides, etc.

Distribution : Throughout the tropical parts of India. Tropical Africa and Asia.

Specimens examined : Jhumri Telaiya, 299; National Park, 411; Gola, 1532.

Uses : Plant is used as cattle fodder. Leaves in form of poultice are employed to boils, sores, pimples and carbuncles. Root is used as purgative.

8. **Ipomoea quamoclit** L., Sp. Pl. 159. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 190. 1883; Haines, For. Fl. Chota Nagpur 471. 1910.

Quamoclit vulgaris Choisy, Mem. Soc. Phys. Geneve 6 : 434. 1834; Haines, Bot. Bihar & Orissa pt. 4 : 591. 1922.

Q. pinnata Boj., Hort. Maurit. 224. 1837; Prain, Bengal Pl. 2 : 738. 1903.

Local name : Kamalata.

Slender, herbaceous, annual twiners, rarely prostrate. Stems glabrous, muricate, 3-6 m long. Leaves ovate or oblong in outline, 2-10 × 1-6 cm, pinnatipartite with 10-18 alternate or opposite pairs of linear to filiform segments of 0.5-3 cm long; petiole 0.8-3.5 cm long, often with pseudo-stipules. Flowers borne in 1-few-flowered axillary cymes. Peduncle commonly exceeding leaves, 2-12 cm long. Pedicels 0.8-2 cm long, thickend and clavate in fruit. Bracts minute, deltoid, acute. Sepals unequal, oblong to oblong-spathulate, pale on margins, obtuse, with a 0.6-1 mm long mucro inserted below the tip; outer sepals 4-5 mm long, inner ones 5-6 mm long (excluding mucro). Corolla red, salver-shaped; the tube 2.5-3.5 mm long, straight, inflated above, slightly narrowed towards base; limb expanded, 1.6-2 cm in diam., with acute, mucronulate lobes. Stamens and styles exserted; filaments hairy at base. Capsule ovoid, obtuse, 6-8 mm long, often crowned by style-base, 4 - cellled, 4-valved; dissepiments thin, membranous, persistent, with a thickened circular margin. Seeds 4, ovoid-oblong, blackish-brown, 5-6 mm long, with tuft of minute hairs scattered irregularly.

Fl. & Fr. : July-Sept.

Ecology : Common; cultivated in gardens as an ornamental plant; also runs wild in waste places, hedges, thickets, forest edges, etc.

Distribution : Throughout India. Native to tropical America, now widely cultivated and naturalised in the Old World Tropics.

Specimens examined : Ramgarh, 1123; Hazaribagh, 2273.

Uses : Leaves are eaten as pot-herb. Pounded leaves are applied in hemorrhoids and carbuncles. Powdered root is used as sternulatory.

9. **Ipomoea sepiaria** Koen. ex Roxb., Fl. Ind. 2 : 90. 1824; Clarke in Hook. f., Fl. Brit. India 4 : 209. 1883; Prain, Bengal Pl. 2 : 736. 1903; Haines, For. Fl. Chota Nagpur 470. 1910 & Bot. Bihar & Orissa pt. 4 : 598. 1922

I. maxima auct. non (L.) Sweet : Ooststr. in Steenis, Fl. Males. Ser. 1, 4 : 472. 1953.

Local name : Bankalmi.

Slender, variable, perennial twiner. Stems woolly. Leaves ovate or triangular, chartaceous, cordate at base, acute and apiculate at apex, entire, glabrous, 2-4 × 2-3 cm; petiole 2.5-5 cm long, slender. Flowers in pedunculate, subumbellate cymes. Peduncle 2.5-15 cm long. Bracts small, lanceolate, caducous. Pedicels 3-10 mm long, clavate in fruit. Sepals subequal, broadly elliptic, obtuse-apiculate, glabrous, the two outer shorter than the inner 3, rugose on back, 6-8 mm long. Corolla purple or whitish, salver-shaped, with mouth suddenly widen, 2.5-4 cm long; lobes of limb acute, shortly apiculate. Filaments hairy at base. Capsule ovoid, glabrous, 4-valved, 7-8 mm across, 4-or 2-seeded. Seeds white-velvety, black.

Fl. & Fr. : Nov.-Apr.

Ecology : Common; in village surroundings, thickets, etc.

Distribution : Throughout India. Tropical Africa, Tropical Asia, Malesia to Formosa, Queensland, Australia.

Specimens examined : Hazaribagh, 520; Ghanghree, 2156.

Uses : Plant is eaten as pot-herb; also used as cattle fodder. Plant-extract is used as diuretic and deobstruent.

5. MERREMIA Dennst. ex Endlich., *nom. cons.*

Key to the Species

1a. Leaves reniform-rounded, usually broader than long. Stems creeping and rooting at nodes. Peduncles very short or absent. Sepals long - ciliate, inner 3 longer and deeply emarginate ...1. *M. emarginata*

1b. Leaves neither reniform-rounded nor broader than long. Stems twining or prostrate or trailing, not rooting at nodes. Peduncles 1.5-10 cm long. Sepals not ciliate, inner ones not emarginate :

2a. Leaves on 1-6 cm long petiole, ovate in outline, entire, crenate to shallowly or deeply 3-lobed, cordate at base ...2. *M. hederacea*

2b. Leaves sessile or on 0.05-0.3 cm long petiole, linear, linear-oblong, spathulate, pandurate or subquadrate, with truncate, hastate or stem-clasping base ...3. *M. tridentata*

1. **Merremia emarginata** (Burm.f.) Hall. f., Bot. Jahrb. Syst. 16 : 552. 1893; Prain, Bengal Pl. 2 : 730. 1903. *Evolvulus emarginatus* Burm. f., Fl. Ind. 77, t. 30. f.1.1768.

Convolvulus reniformis Roxb., Fl. Ind. 2 : 67. 1824.

Ipomoea reniformis (Roxb.) Choisy in Mem. Soc. Phys. Geneve 6 : 446. 1834; Clarke in Hook. f., Fl. Brit. India 4 : 206. 1883; Haines, For. Fl. Chota Nagpur 468. 1910 & Bot. Bihar & Orissa pt. 4 : 596. 1922.

Merremia gangetica auct. non (L.) Cufod. : Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 473. 1976, *p.p.*

Local name : Musakani.

Slender, diffuse, pubescent, perennial herbs. Stems numerous, creeping and rooting at nodes, 25-30 cm long, clothed with scattered soft hairs. Leaves reniform-rounded, obtuse, crenate, cordate at base, 1-2.5 × 1.2-3 cm, usually broader than long; petioles 0.6-2.5 cm long, hairy. Flowers yellow, axillary, solitary or in 2-3-flowered cymose clusters. Peduncle very short or absent. Bracts small, ovate, acute, hairy. Pedicels short, *ca* 3 mm long. Sepals lanceolate, apiculate, slightly hairy on the back, ciliate on the margins, outer 2 apiculate, inner 3 larger, emarginate, 4 mm long. Corolla *ca* 6 mm long, campanulate, yellow; lobes acute. Anthers oblong. Ovary glabrous, tip attenuate into style; stigma large. Capsule subglobose, smooth, surrounded by slightly enlarged ciliate sepals, 2-celled, 3-5 mm across. Seeds black, glabrous.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; on grassy places, moist sandy soil near ponds, streams, etc.

Distribution : Throughout India. Paleotropics.

Specimens examined : Patratu, 1326; Hazaribagh, 2258.

Uses : Plant is used as pot-herb; also in rheumatism, neuralgia and for cough.

2. **Merremia hederacea** (Burm.f.) Hall. f. in Bot. Jahrb. 18 : 118. 1893; Prain, Bengal Pl. 2 : 730. 1903. *Evolvulus hederaceus* Burm. f., Fl. Ind. 77, t. 30. f. 2. 1768.

Ipomoea chryseides Ker-Gawl. in Bot. Reg. 4, t. 270. 1818; Clarke, in Hook. f., Fl. Brit. India 4 : 206. 1883; Haines, For. Fl. Chota Nagpur. 468. 1910. & Bot. Bihar & Orissa pt. 4 : 597. 1922.

Merremia convolvulacea Dennst. ex Hall. f. in Bot. Jahrb. 16 : 552. 1893; Prain in Rec. Bot. Surv. India 3 : 244. 1905.

M. chryseides (Ker-Gawl.) Hall. f. in Bot. Jahrb. 16 : 552. 1893; Prain, Bengal Pl. 2 : 730. 1903.

Slender, twining, or sometimes prostrate, annual herbs; the prostrate ones sometimes rooting at nodes or internodes. Stems smooth or minutely tuberculate, glabrous or sparsely hirsute. Leaves ovate in outline, broadly cordate at base, obtuse, acute or acuminate and mucronulate at apex, entire or crenate to shallowly or deeply 3-lobed, glabrous or sparsely hairy, 1.5-5 × 1.2-4 cm; petiole slender, 1-6 cm long, minutely tuberculate in basal half. Flowers borne in one to several-flowered cymes. Peduncle thicker than petioles, shorter than or exceeding the leaves, 1-10 cm long, glabrous, smooth or often minutely tuberculate, branched at the top; first ramification dichasial, the subsequent ones often monochasial. Pedicels 2-4 mm long, smooth or minutely tuberculate. Bracts narrow-obovate, mucronulate, 2.5-3 mm long, caducous. Sepals unequal, broadly obovate to spathulate, notched at apex, mucronulate, covcave, glabrous or often pilose on the back and along the margins, the outer two 3.5-4 mm long, inner ones 4.5-5 mm long. Corolla yellow, campanulate, glabrous without, long-hairy within near hairy base of filaments. Capsule broadly conical to depressed-globose, somewhat 4-angular, 5-6 mm high, 4-valved with transversely or reticulately wrinkled valves. Seeds 4, blackish, nearly glabrous or short-pubescent or long-hairy at hilum and along the edges, 2-2.5 mm long.

Fl. & Fr. : Sept.-Jan.

Ecology : Common; in thickets, open grasslands, sandy river-banks, etc.

Distribution : Throughout India. Tropical Africa, Madagascar, tropical Asia to China, Malesia, Queensland and some Pacific Islands.

Specimens examined : Katkamasandi, 1407; Pratappur, 2087; Markachho, 1960.

Uses : Leaves, in form of poultice, are applied to chopped hands and feet.

3. **Merremia tridentata** (L.) Hall. f., Bot. Jahrb. 16 : 552. 1893; Prain, Bengal Pl. 2 : 730. 1903; Ooststr. in Blumea 3 : 315. 1939 & in Steenis, Fl. Males. ser. 1, 4 : 445. 1953. *Convolvulus tridentatus* L., Sp. Pl. 153. 1753.

Evolvulus tridentatus (L.) Sp. Pl. ed. 2, 392. 1762.

Ipomoea tridentata (L.) Roth in Roem., Arch. Bot. 1, 2 : 38. 1798; Clarke in Hook. f., Fl. Brit. India 4 : 205. 1883; Haines, For. Fl. Chota Nagpur 468. 1910 & Bot. Bihar & Orissa pt. 4 : 596. 1922.

Key to the Subspecies

1a. Leaves mostly obtuse, truncate or emarginate at apex. Outer sepals mostly obtuse to emarginate at apex, inner ones attenuate - acuminate with an acute apex. Corolla 1-1.2 cm long. Filaments inserted about 0.15 cm above the corolla base ...1. ssp. *tridentata*

1b. Leaves mostly attenuate towards acute apex. All sepals attenuate-acuminate to apex with an acute point. Corolla 1.2-2 cm long. Filaments inserted about 0.3 cm above the corolla-base ... 2. ssp. *hastata*

Note : Austin (in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 353. 1980), however, is in against the Ooststroom (*l.c.*)'s treatment of designating infraspecific taxa under M.*tridentata*. He considers it as a polymorphic species and therofore, keeps it in broad sense.

1. ssp. **tridentata** - Ooststr. in Steenis, Fl. Males. ser. 1,4 : 445. 1953.

Prostrate herb. Stems 10-80 cm long, angular, glabrous, several from a stout root. Leaves glabrous, linear, linear-oblong, oblanceolate, spathulate or subquadrate, with truncate to hastatae base having spreading or parallel basal lobes, mostly obtuse, truncate or emarginate and mucronulate to tridentate at apex, 0.5-2.5 × 0.1-0.5cm; petiole 0.5 - 2 mm or nearly absent. Flowers in 2-3 - flowered

cymes. Peduncles axillary, 0.8-1.5 cm long. Pedicels 4-8 mm long, glabrous, angular, thickend above in fruit. Bracts minute, oblong, mucronulate. Outer sepals mostly shorter than inner, oblong, obtuse or emarginate and mucronulate, 3-4 mm long; inner ones lanceolate, attenuate-acuminate into a slender point, 4-6 mm long. Corolla funnel-shaped, yellow or yellowish-white, 1-1.2 cm long. Filaments inserted *ca* 1.5 mm above corolla-base, glabrous, or sparsely hairy at slightly dilated base. Ovary glabrous, capsule ovoid, 4-5 mm long, 4-valved; pericarp papery, glabrous, straw-coloured. Seeds 4 or less, 2-2.5 mm long, dull black, glabrous.

Fl. & Fr. : July-Oct.

Ecology : Very common; in sandy damp places, waste lands, scrub jungles, near streams, etc.

Distribution : India : Deccan Peninsula, Orissa, West Bengal, Uttar Pradesh, central India. Tropical Asia, tropical Africa and Mascarene Islands.

Specimens examined : Tilaiya Dam, 192; Ramgarh, 531.

Uses : Plant is used for rheumatism, hemiplegia, piles and urinary disorders. Decoction of root is used as tonic and urinary disorders. Plant is relished by cattle.

2. ssp. **hastata** Ooststr. in Blumea 3 : 317. 1939 & in Steenis, Fl. Males. ser. 1, 4 : 445. 1953.

Merremia hastata Hall. f. in Bot. Jahrb. Syst. 16 : 552. 1893, *nom. illegit.*; Prain, Bengal Pl. 2 : 730. 1903; Gamble, Fl. Madras 2 : 929(652). 1923.

Ipomoea angustifolia Jacq., Icon. Pl. Rar. 2 : 10. 1975; Clarke in Hook., f., Fl. Brit. India 4 : 205. 1883.

I. hastata (Hall. f.) Haines, Bot. Bihar & Orissa pt. 4 : 596. 1922.

Herbaceous twiner, occasionally prostrate. Stems one or several from a stout root, slender, ± angular to subulate, glabrous, 60-200cm long. Leaves narrowly oblong or linear-oblong or pandurate,± contracted above base, with stem-clasping, obscurely to sharply dentate basal lobes, gradually attenuate towards distinctly mucronate, sharply acute or obtuse apex, mostly glabrous, larger than ssp. *tridentata*, 2.5 - 8 × 0.15-1.5 cm; petiole nearly absent, or very short, 1-3 mm long. Flowers in one to few-flowered cymes. Peduncles axillary, 1.5-8 cm long. Pedicels as long as or longer than calyx, *ca* 6 mm long, angular, thickened above and accrescent to 1.5 cm long in fruit. Bracts minute, subulate. Sepals equal in length or outer ones a little shorter, 6-8 mm long, lanceolate to ovate-lanceolate, acute-acuminate into a sharp, slender point. Corolla funnel-shaped, 1.2-2cm long, pale yellow or white. Filaments inserted Ca. 3 mm above corolla-base, hairy at slightly dilated base. Ovary glabrous. Capsule subglobose-ovoid, 4-valved; pericarp papery, glabrous; dissepiment sometimes persistent after dehiscence. Seeds 4 or less, 2.5 3 mm long, dark-black or grey, glabrous.

Fl. & Fr. : July-Sept.

Ecology : Common; on sandy moist places, open grasslands, in waste places, borders of cultivated fields, waysides, forests, etc.

Distribution : India : Deccan Peninsula, Orissa, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh. Tropical Asia, tropical East Africa, Hong Kong, Formosa and tropical Australia.

Specimens examined : Simaria, 1490; Chatra, 1853; Jhumri Telaiya, 2218.

Uses : Same as those of ssp. *tridentata.*

6. PORANA Burm. f.

Porana paniculata Roxb., Pl. Corom. 3 : 31, t. 235. 1819; Clarke in Hook. f., Fl. Brit. India 4 : 222. 1883; Prain, Bengal Pl. 2 : 724. 1903; Haines, For. Fl. Chota Nagpur 461. 1910 & Bot. Bihar & Orissa pt.4 : 590. 1922.

Local name : Safed bel.

Large woody twiner with greyish tomentellous, almost downy stems. Leaves obtuse, acute, acuminate or shortly cuspidate at apex, hairy on both surfaces, basally 5-7-nerved, 4-9 × 2.5-6 cm; nerves prominent beneath; petiole 0.5-2.5 cm long. Inflorescence lateral or terminal, paniculate, densely many-flowered. Sepals linear, densely tomentellous, 1-1.5 mm long; 3 of them much enlarged in fruit. Corolla infundibuliform, 5-6 mm long; limb shallowly lobed to crenate. Filaments about equal in length, as long as the anthers or little shorter, adnate to corolla, inserted near corolla-base. Style 1, entire, as long as or shorter than ovary; stigma globose, lobed. Capsule ovoid-globular, ca. 5 mm in diam. Seed usually 1, glabrous.

Fl. : Oct.-Dec. *Fr.* : Dec. - Jan.

Ecology : Common; in forests, scrub jungles, etc.

Distribution : Throughout India including Himalaya. Cultivated as an ornamental or runs wild in the Tropics.

Specimens examined : Chowparan, 1381; National Park, 1522; Koderma forest, 1910.

Uses : Stems are used for making coarse baskets. Plant is, sometimes, cultivated as an ornamental for its dense masses of white fragrant flowers.

7. RIVEA Choisy

Rivea hypocrateriformis (Desr.) Choisy, Mem. Soc. Phys. Geneve 6 : 408. 1834; Clarke in Hook. f., Fl. Brit. India 4 : 184. 1883; Prain, Bengal Pl. 2 : 739. 1903; Haines, For. Fl. Chota Nagpur 462. 1910 & Bot. Bihar & Orissa pt. 4 : 586. 1922. *Convolvulus hypocrateriformis* Desr. in Lam., Encycl. 3 : 561. 1792.

Local name : Phang.

Twining shrub. Leaves orbicular, subcoriaceous, cordate at base, obtuse and apiculate at apex, entire, appressedly silky beneath when young, glabrous above, penni-nerved, 3-8 cm in diam; petiole to 6cm long. Inflorescence on axillary peduncles, 1-3-flowered, cymose, mostly with a single flower open at a time. Bracts lanceolate. Pedicel to 7 cm long. Sepals ovate-elliptic, obtuse, concave, to 6 × 4 mm inner two smaller. Corolla white, salver-form, 6-7 cm across; tube 4-5 cm long; limb glabrous or thinly pubescent without. Stamens unequal, villous at base, inserted near middle of corolla tube, 1.5-1.8cm long. Ovary oblong, 3.5-4 mm long; style 3-3.5 mm long; stigmas papillose. Fruits conical, to 1.5 × 1 cm. Seeds enclosed with a mealy pulp.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in forests.

Distribution : India : Western India, Uttar Pradesh, Bihar, Orissa, West Bengal, central India, Deccan Peninsula and Assam. Pakistan, Nepal.

Specimens examined : Ghanghree, 1031; Pratappur, 1382; National Park, 2178.

Uses : Young leaves and shoots are eaten as vegetables. Roots are given after parturition.

99. CUSCUTACEAE

CUSCUTA L.

Cuscuta reflexa Roxb., Pl. Corom. 2 : 3, t. 104. 1799; Clarke in Hook. f., Fl. Brit. India 4 : 225. 1883; Prain, Bengal Pl. 2 :723. 1903; Haines, For. Fl. Chota Nagpur 471. 1910 & Bot. Bihar & Orissa pt. 4 : 605. 1922.

Local name : Akasbel.

Parasitic twining herbs. Stems very long, fleshy, branched, glabrous, yellowish-green or yellow, 1-2.5 mm across, often in dense masses with pendulous branches. Flowers sessile or very shortly pedicelled, borne in clusters of 2-4, arranged in short racemes; bracts ovate-etsuborbicular, obtuse, fleshy, 1.2-1.5 mm long. Calyx cupulate, divided almost to the base, 2.4-2.5 mm long; lobes 5, orbicular, obtuse, verrucose on the back. Corolla whitish, campanulate-tubular, 0.8-1 cm long; lobes 5, ovate to ovate-triangular, obtuse or sub-acute, crenate or entire, erect,spreading or reflexed. Corolla - scales 5, near base of tube, fimbriate, 1.5 mm long. Filaments short, inserted just below the sinus. Ovary ovate-conical, fleshy; style simple, short and thick; stigmas 2, distinct, thick and fleshy, 1-2 mm long. Capsule globose-conical, 5-6 mm across, circumscissile near the base, 2-4-seeded. Seeds black, 3-3.5 mm long.

Fl. : Oct.-Dec. *Fr.* : Dec.-Jan.

Ecology : Very common; parasitic on the species of ADHATODA, CALOTROPIS, CLERODENDRUM, LANTANA, DURANTA, ACACIA, VITEX, ZIZYPHUS, etc.

Distribution : Throughout India. Afganistan, Sri Lanka, China, Siam and Malesia.

Specimens examined : National Park, 433; Koderma Forest, 1265.

Uses : The plant is a purgative and also used in flatulence and liver complaints. Cuscutin seeds are regarded as diaphoretic, demulcent and tonic.

Note : Profusely branched and spreading in dense masses, covering whole crowns of the plants like a yellowish net.

100. MENYANTHACEAE

NYMPHOIDES Seguier

Key to the Species

1a. Corolla-lobes densely fimbriate on inner surface. Petioloid stem thick. Flowers heterostylous. Seeds 20 to more, smooth ... 2. *N. indica*

1b. Corolla-lobes with a median longitudinal crest on inner surface. Petioloid stem much slender. Flowers homostylous. Seeds 5-10 in a capsule, tuberculate ...1. *N. hydrophylla*

1. **Nymphoides hydrophylla** (Lour.) O. Kuntze, Rev. Gen. Pl. 2 : 429. 1891; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 208. 1981. *Menyanthes hydrophylla* Lour., Fl. Cochinch. 1 : 129. 1790.

M. cristata Roxb., Pl. Corom. 2 : 3, t. 105. 1798.

Limnanthemum cristatum (Roxb.) Griseb., Gen. Sp. Gent. 342. 1839; Clarke in Hook. f., Fl. Brit. India 4 : 131. 1883; Prain, Bengal Pl. 2 : 709. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 571. 1922.

Nymphoides cristata (Roxb.) O. Kuntze, Rev. Gen. Pl. 2 : 429. 1891; Subram., Aquat. Ang. 24, f. 16. 1962.

Perennial herbs. Rhizome short, erect. Petioloid branches slender, to 80 cm long. Floating leaves oval-orbicular, deeply cordate-hastate at base with rounded lobes, faintly crenate, pale green above, purplish and with prominent greenish veins beneath, 5-12 × 4-10 cm; petioles 0.6-3 cm long. Flower-fascicles more than 20-flowered. Flowers homostylous; bracts ovate, 2-2.5 mm long; pedicels 3-6 cm long, slender. Calyx-lobes oblong-lanceolate, 4-6 mm long. Corolla white,

to 2 cm across when expanded; lobes 5-6, oval-oblong, rounded at apex, undulate at margins, glabrous, with a longitudinal, median, undulate crest on upper surface. Filaments short. Style very short, stigmatic branches 2-fid. Capsule broadly ovoid or subglobose, 4-6 mm in diam. Seeds 5-10, globose, yellowish-white, tuberculate, *ca* 2 mm in diam.

Fl. & Fr. : Oct.-Jan.

Ecology : Very common; in ponds, ditches, canals, pools, stagnant water near paddy fields, etc.

Distribution : Throughout India. Sri Lanka, Malesia and S. China.

Specimens examined : Hazaribagh, 267; Markachho, 1954.

Uses : Plant is used in fever and jaundice. Decoction of stalks and leaves are used in skin affections. Seeds are used as anthelmintic. Leaves and stems are eaten by poor people in form of a curry.

2. **Nymphoides indica** (L.) O. Kuntze, Rev. Gen. Pl. 2 : 31. 1824; Subram., Aquat. Ang. 24, t. 2. f. 14. 1962; Cramer in Dassan. & Fosb., Rev.Handb. Fl. Ceylon 3 : 207. 1981. *Menyanthes indica* L., Sp. Pl. 145. 1753.

Limnanthemum indicum (L.) Griseb., Gen. Sp. Gent. 343. 1839; Clarke in Hook. f., Fl. Brit. India 4 : 131. 1883; Prain, Bengal Pl. 2 : 709. 1903; Haines, Bot. Bihar & Orissa, pt. 4 : 570. 1922.

Local name : Bara chuli.

Perennial herbs. Rhizome horizontal or oblique, thick; scale-like leaves ovate, numerous. Petioloid branches simple, thick, to 1.2 m long. Floating leaves rather thick and fleshy, oval-orbicular to orbicular, deeply cordate at base with obtuse basal lobes and a triangular sinus, coarsely crenate to sinuate at margins, verrucose and with prominent veins beneath, 7-30 × 4-25 cm; petiole stout, 0.8-1.5 cm long. Flower-fascicles more than 20-flowered. Flowers heterostylous; bracts oblong-lanceolate, thick, sheathing, 6-8 mm long, pedicels 6-10 cm long.

Calyx-lobes oblong, subacute, hyaline-margined, 6-8 mm long, reflexed with age. Corolla 2.5-4 cm across when expanded, white with yellow throat; lobes usually 6, oblong, obtuse, densely fimbriate, with cottony outgrowths on inner surface, 1.2-1.6 cm long. Filaments broadened at base. Disk glands 7-8, suborbicular, papillose at apex. Capsule obovoid-subglobose, 6-8 × 4.5 - 6 mm. Seeds 20 or more, globose, pale yellow, smooth, 1.2 mm in diam.

Fl. & Fr. : Nov.-Mar.

Ecology : Common; in streams, tanks, ponds, etc.

Distribution : Almost throughout India. Widespread in the Old World Tropics.

Specimens examined : Hazaribagh, 265; Hunterganj, 2125.

Uses : Subterranean parts and petioles are used as vegetable. Plant is used as an antiscorbutic and febrifuge.

101. HYDROPHYLLACEAE

HYDROLEA L., *nom. cons.*

Hydrolea zeylanica (L.) Vahl, Symb. Bot. 2 : 46. 1791; Clarke in Hook. f., Fl. Brit. India 4 : 133. 1883; Prain, Bengal Pl. 2 : 711. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 571. 1922. *Nama zeylanica* L., Sp. Pl. 226. 1753.

Procumbent annual herb, 15-100 cm long, often much branched; rooting at lower nodes. Stems creeping for lower part, giving rise to many erect branches, erect for upper part, glabrous below, glandular hairy towards apex, succulent. Leaves variable in both size and shape, narrowly lanceolate, often oblong or elliptic, slightly obtuse to narrowed at base, acute at apex, glabrous, slightly glaucescent beneath, 2-10 × 0.8-2.5 cm, higher ones becoming smaller and passing

into bracts; petioles 3-6 mm long, glabrous in mature leaves, glandular-pubescent in young leaves. Flowers *ca* 1 cm in diam., borne in racemes or cymes at end of short lateral branches, and in terminal panicles by suppression of leaves; pedicels, 3-8 mm long, patently glandular hairy. Calyx also patently glandular hairy, 5-7 mm long; segments lanceolate, narrowed towards tip. Corolla-tube white; segments blue with darker veins, ovate, 4-6 mm. Filaments filiform, 2-5 mm long, white or lilac. Ovary pubescent at apex; styles divergent, pilose, blue, with white capitate stigma. Capsule ovoid-ellipsoid, thinly pilose, 4-5 mm long, bursting irregularly. Seeds oblong, 0.8 - 1 mm long.

Fl. & Fr. : Dec.-Feb.

Ecology : Common, in paddy fields, humid or swampy localities, margins of ditches or allied water courses, etc.

Distribution : Throughout India. Sri Lanka, Nepal, Malesia, Australia, tropical Africa and America.

Specimens examined : Hazaribagh, 726; Tandwa, 1422; Chowparan, 1684.

102. BORAGINACEAE

Key to the Genera

1a. Herbs :

2a. Leaves all alternate :

3a. Style terminal on the entire ovary, not inserted between the carpels :

4a. Style 2-fid; stigmas without conical appendages. Leaves crisped with coarsely crenate-serrate margins ...1. COLDENIA

4b. Style simple, ending in a stigmatic disc with conical appendage. Leaves neither crisped nor crenate-serrate as above ...5. HELIOTROPIUM

3b. Style arising from between the carpels, simple ... 3. CYNOGLOSSUM

2b. Leaves opposite below, alternate above. Style simple, terminal ...7. TRICHODESMA

1b. Woody shrubs or trees :

5a. Style deeply 4-fid. Calyx tubular or campanulate, enlarging in fruit; teeth very short, usually irregular ... 2. CORDIA

5b. Style simple with entire or slightly 2-lobed stigma, or cleft above middle. Sepals connate below in a 5-partite calyx, not enlarging in fruit :

6a. Plant of stream margins. Style simple, with entire or slightly 2-lobed stigma. Cyme simple, small, few-flowered ...6. ROTULA

6b. Plant of dry places. Style cleft above middle. Cyme panicled, elongated, many-flowered ...4. EHRETIA

1. COLDENIA L.

Coldenia procumbens L., Sp. Pl. 125. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 144. 1883; Prain, Bengal Pl. 2 : 718. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 577. 1922; Steenis in Blumea 15 : 155. 1967; Kazmi in J. Arnold Arb. 51 : 148. 1970.

Local name : Tripungki.

Procumbent, lying flat on ground. Branches numerous, densely pilose, to 25 cm long. Leaves elliptic-obovate, thick-herbaceous, acute

to decurrent at base, rounded-emarginate at apex, coarsely serrate-crenate, pilose above, densely so beneath, 1.5-4 × 0.6-2 cm, lateral nerves impressed above, prominent beneath; petiole densely pilose, 0.4-1 cm long. Flowers axillary, solitary, nearly sessile; bracts 0. Calyx densely hairy, almost divided to base; lobes 4, ovate, thick, acute, 1.5-2 mm long. Corolla cream-coloured, tubular, 2-2.5 mm long; lobes 4, ovate, rounded at apex, ca. 0.5 mm long. Stamens 4, included, attched near middle of tube. Style terminal on entire ovary, 2-fid; stigmas capitate.Drupes 4-lobed, *ca* 3 × 4 mm, grooved, hairy.

Fl. & Fr. : Aug.-May.

Ecology : Common; in fallow fields, waste lands, river banks, rice fields, etc.

Distribution : Throughout India. Pakistan, Sri Lanka, and other tropical countries.

Specimens examined : Telaiya Dam, 190; Hunterganj, 2149.

Uses : Fresh leaves are ground and applied to rheumatic swellings.

2. CORDIA L.

Key to the Species

1a. Leaves rugose, impressed above. Calyx densely tomentose throughout, ribbed upwards ...1. *C. macleodii*

1b. Leaves smooth. Calyx glabrescent beneath, villous but not ribbed upwards ...2. *C. obliqua* var. *wallichii*

1. **Cordia macleodii** (Griff.) Hook. f. & Thoms. in J. Linn. Soc. Bot. 2 : 128. 1858; Clarke in Hook. f., Fl. Brit. India 4 : 139. 1883; Prain, Bengal Pl. 2 : 714. 1903; Haines, For. Fl. Chota Nagpur

474. 1910 & Bot. Bihar & Orissa pt. 4 : 575. 1922; Kazmi in J. Arnold Arb. 51 : 143. 1970. *Hemigymnia macleodii* Griff. in Calcutta J. Nat. Hist. 3 : 363. 1843.

Local names : Dahipalas, Dhaiman.

Polygamous, small tree, to 12 m tall. Bark light grey, smooth. Branchlets densely white-pubescent. Leaves alternate, or sometimes subopposite, orbicular or broadly ovate, cordate or rounded at base, obtuse at apex, with sinuate margins, becoming firm and hard when mature, impressed rugose above with numerous close cystoliths, densely grey-tomentose beneath, basally or subbasally 3-5-nerved, 6-16 × 5-13 cm; petioles 2-5 cm long, tomentose. Inflorescence of terminal and axillary paniculate cymes, 5-10 cm diam. Flowers subsessile, 1-1.2 cm across. Calyx thick, ribbed, densely tomentose throughout, ribbed upwards, 6-8 mm long; lobes usually 6, spreading, spathulate-oblong, nearly as long as tube. Filaments hairy at base. Drupe ovoid, acute, 1.2-1.8 cm long, seated in cup-shaped calyx.

Fl. : Mar. - Apr. *Fr.* : May-June.

Ecology : Not common, in forests.

Distribution : India : Orissa, Chota Nagpur, Bihar, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh and Karnataka. Pakistan.

Specimen examined : National Park, 974.

Uses : Bark is used in jaundice. Wood is used for carts, yokes, axe-handles, turnery and furniture.

2. **Cordia obliqua** Willd. var. **wallichii** (G. Don) Clarke in Hook. f., Fl. Brit. India 4 : 137. 1883; Prain, Bengal Pl. 1 : 714. 1903. *C. wallichii* G. Don, Gen. Syst. 4 : 379. 1838.

C. tomentosa Wall. in Roxb., Fl. Ind. 2 : 339. 1824, non Roem. & Schult. 1819.

C. obliqua Willd. var. *tomentosa* (Wall.) Kazmi in J. Arnold Arb. 51 : 143. 1970.

C. myxa auct. non L. : Clarke in Hook. f., Fl. Brit. India 4 : 136.

1883, *p.p.*; Prain, Bengal Pl. 1 : 714. 1903; Haines, For. Fl. Chota Nagpur 473. 1910 & Bot. Bihar & Orissa pt. 4 : 574. 1922.

Local name : Buralessura.

Medium-sized tree, to 12 m tall, bark with numerous shallow longitudinal fissures; branchlets glabrous or ± brown tomentose when young. Leaves variable, suborbicular, broadly ovate, elliptic or obovate,obtuse ± or abruptly acuminate, rounded or cuneate at base, entire or slightly sinuate-dentate, ± glabrous above, densely stellate-fulvous or white-tomentose beneath, with 3 or rarely 5 basal veins, 7-13 × 6-12 cm; petiole 2-4 cm long. Inflorescence large, lax, of terminal or axillary pedunculate cymes; peduncles 2.5-5 mm long. Flowers 0.5-1 cm across; pedicels short. Calyx 2.2-2.5 mm long, glabrescent beneath, villous but not ribbed upwards, splitting irregularly at time of opening of flower; teeth densely fulvous-villous. Corolla white; tube as long as calyx; lobes 5, oblong, obtuse, recurved, as long as tube. Filaments hairy at base. Drupe ovoid, 1.5-2.5 cm long, apiculate, yellowish-brown, pink or blackish when ripe, shining, rugose, supported by saucer-sharped, faintly striate calyx; pulp viscid, sweetish.

Fl. : Mar. - Apr. *Fr.* : July-Aug.

Ecology : Common; in deciduous forests, along streams, village-surroundings; also planted in gardens, parks, roadsides, etc.

Distribution : Throughout India. Sri Lanka, Pakistan, North Africa.

Specimens examined : Barkattwa, 522; National Park, 2029.

Uses : Fruits are considered demulcent, expectorant and astringent, used for bronchial affections.

3. CYNOGLOSSUM L.

Cynoglossum lanceolatum Forsk., Fl. Aegypt.-Arab. 41. 1775; Clarke in Hook. f., Fl. Brit. India 4 : 156. 1883; Prain, Bengal Pl. 2 : 719. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 580. 1922; Kazmi in J. Arnold Arb. 52 : 343. 1971.

C. micranthum Desf., Tab. Ecole Bot. ed. 1, 220. 1804; Clarke in Hook. f., Fl. Brit. India 4 : 156. 1883.

Erect, biennial or perennial herb, 60-150 cm tall. Stems with long spreading branches, appressed-hispid. Basal leaves on 5-8 cm long petiole, lanceolate, attenuate at base, acute at apex, to 30 × 4cm; veins inconspicuous above, raised and prominent beneath; cauline leaves subsessile to short-petioled, to 12 × 2 cm; upper cauline ones sessile, much narrowed and reduced in size; all leaves crispy-dentate, appressed-hispid, with white, tubercle-based hairs. Inflorescence axillary and terminal, bifurcate to dichotomously branched, with spreading scorpioid branches, elongated in fruit. Calyx divided to base; lobes ovate, obtuse, densely hairy externally, glabrous within, *ca* 1 mm long, enlarged to 2 mm long and spreading in fruit. Corolla light blue, 2-3 mm long; lobes ovate; faucal appendages broader than long. Stamens included; anthers ovate, minute, filaments short. Nutlets 4, ovate, 1-2 mm in diam., dorsally convex, appendiculate all round; appendages of equal length, glochidiate at apex; persistent style 0.7-0.9 mm long in fruit.

Fl. & Fr. : Nov.-Apr.

Ecology : Very common; in waste places, river-banks, grassy waste localities, gardens, forest-edges, etc.

Distribution : India : Bihar, Uttar Pradesh, West Bengal, Punjab, Kashmir, Orissa. Africa excluding N.W.parts, Arabia, Pakistan, China, Nepal, Myanmar, Thailand, Philippines, Formosa and Ryu Kyu.

Specimens examined : Hazaribagh, 247; Raja Rappa, 871; Chatra, 1102.

4. EHRETIA L.

Ehretia laevis Roxb., Pl. Corom. 1 : 42, t. 56. 1796; Clarke in Hook. f., Fl. Brit. India 4 : 141. 1883; Prain, Bengal Pl. 2 : 718. 1903; Haines, For. Fl. Chota Nagpur 475. 1910 & Bot. Bihar & Orissa pt. 4 : 576. 1922; Kazmi in J. Arnold Arb. 51 : 147. 1970.

E. floribunda Benth. in Royle, Illustr. Bot. Himal. Mount. 1 : 306. 1839.

E. laevis Roxb. var. *floribunda* (Benth.) Brandis, For. Fl. Ind. 340. 1874; Clarke in Hook. f., Fl. Brit. India 4 : 143. 1883.

Local names : Chamror, Dantranga.

Small to medium-sized tree, to 12 m tall. Bark grey, smooth. Leaves broadly ovate to oblong, unequally cuneate at base, obtusely acute to acuminate at apex, undulate, somewhat lustrous above, minutely glandular-pubescent beneath particularly in vein-axils, 7-12 × 5-10 cm; petioles 1-2.5 cm long. Inflorescence terminal and axillary, appearing just before leaf renewal, loosely dichotomous; branches somewhat scorpioid. Flowers sessile or subsesile, borne unilaterally in two ranks on branches. Calyx 1-2 mm long, towny-tomentose. Corolla subrotate, 2.5-3.5 mm long; lobes oblong, recurved, 2-2.5 mm long. Style 2-3 mm long; lobes to 1 mm long. Drupe depressed-globose, 3-5 mm in diam., red at first, turning black and wrinkled when dry, breaking up into 4 single-seeded pyrenes.

Fl. : Feb.-Apr. *Fr.* : Apr.-June.

Ecology : Common; in forests, on river banks, etc.

Distribution : Throughout tropical and subtropical regions of India. Pakistan, Indo-China, Myanmar, Hainan, Polynesia and Australia.

Specimens examined : Jhumri Telaiya, 669; Pratappur, 902; Raja Rappa, 1846.

Uses : Wood is used for brush-back, shoe-lasts, match-boxes and splints. Leaves are used as cattle-fodder. Fruits and inner bark are eaten as vegetables by poor people in villages.

5. HELIOTROPIUM L.

Key to the Species

1a. Calyx divided up to 1/4 of its length; lobes short. Fruit enveloped by calyx. Plant prostrate ... 5. *H. supinum*

1b. Calyx divided nearly to the base; lobes long. Fruit not enveloped by calyx. Plants prostrate, decumbent or erect :

2a. Fruits divided into four 1-seeded nutlets :

3a. Inflorescence ebracteate ... 3. *H. ovalifolium*

3b. Inflorescence partly or wholly bracteate :

4a. Flowers sessile, closely set on the inflorescence. Leaves lanceolate or elliptic ... 2. *H. marifolium*

4b. Flowers usually subsessile to shortly pedicellate, distantly set on the inflorescence. Leaves linear-lanceolate ... 4. *H. strigosum*

2b. Fruits divided into two 2-seeded pyrenes ... 1. *H. indicum*

1. **Heliotropium indicum** L., Sp. Pl. 130. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 152. 1883; Prain, Bengal Pl. 2 : 716. 1903; Haines, Bot. Bihar and Orissa pt. 4 : 578. 1922.

Local names : Hatta-juri, Hatta-sura.

Coarse, succulent, annual, erect herbs, 4-15 cm tall. Branches ascending, densely hirsute. Leaves chartaceous, alternate, or

sometimes subopposite, broadly ovate-elliptic, truncate to attenuate and often unequal-sided at base, obtuse or subacute at apex, with undulate margins, ± hirsute on both sides, 5-10 × 2.5-5 cm; veins impressed above, prominent below; petiole 2-3.5 cm long, ± winged. Spikes ebracteate, mostly leaf - opposed, 5-15 cm long. Flowers 2-ranked, numerous. Calyx 2.5-3 mm long, stiff-hairy externally, deeply divided nearly to base; lobes linear-lanceolate, acute. Corolla 3 mm across, salver-form; tube *ca* 3 mm long, cylindrical; lobes broadly ovate, *ca* 1.5 mm long, obtuse. Filaments very short. Ovary globose, *ca* 0.8 mm across. Fruit ovoid, 2-lobed, each lobe finally dividing into two 1-seeded nutlets; nutlets 2.5-3 mm long, ribbed, beaked.

Fl. & Fr. : Almost throughout the year.

Ecology : Common; in waste places, along railway tracks, roadsides, cultivated lands, sandy river beds, banks of streams, etc.

Distribution : Throughout India. Tropical Himalaya. Myanmar, East to West and South China, Ryu Kyu, Malesia, Africa and America.

Specimen examined : Hazaribagh, 2820.

Uses : Plant is used as a local application to boils, sores and stings of insects and reptiles. Decoction of leaves is used in fever, cough and cold.

2. **Heliotropium marifolium** Retz., Obs. Bot. 2 : 8. 1781; Clarke in Hook. f., Fl. Brit. India 4 : 152. 1883, *p.p.*; Prain, Bengal Pl. 2 : 716. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 579.1922; Backer & Bakh. f., Fl. Java 2 : 462. 1965 Kazmi in J. Arnold Arb. 51 : 154. 1970.

Heliotropium scabrum Retz., Obs. Bot. 2 : 8. 1781; Clarke in Hook. f., Fl. Brit. India 4 : 152. 1883.

Much-branched, decumbent or prostrate, perennial herbs, to 15cm long, with a woody base. Stems and branches usually spreading near

root, strigose-hairy. Leaves sessile to shortly petiolate, chartaceous, lanceolate or ellipte, obtuse or subcuneate at base, acute at apex, with slightly revolute margins, strigose hairy on both surfaces, 8-20 × 2-5 mm; midvein impressed above, prominent below; petiole to 2.5 mm long. Inflorescence a biseriate scorpioid cyme, 1-3.5 cm long. Bracts conspicuous, foliaceous, lanceolate. Pedicels 3 mm long. Calyx 3-4 mm long; lobes obovate to lanceolate, acute, strigose-hairy. Corolla white, 3.5-5 mm across, salver-form, hairy externally; tube *ca* 2 mm long; lobes broadly ovate, acute; throat minutely vilose. Filaments 1.5-2 mm long. Fruits depressed, rounded or lobed, stiff hairy, or sometimes glabrous. Nutlets 4, 1.2-1.3 mm long.

Fl. & Fr. : Oct.- Jan.

Ecology : Common; on exposed rocky slopes, especially on thin layer of soil, along railway tracks, in waste places, etc.

Distribution : Throughout India. Pakistan, Bangladesh and Sri Lanka.

Specimens examined : Telaiya Dam, 191; Satgawan, 590; Simaria, 815.

Note : Here, the treatments of Backer and Bakh. f. (*l.c.*) and Kazmi (*l.c.*) are followed in adopting *H. marifolium* Retz. as correct name and *H. scabrum* Retz. as its synonym.

3. **Heliotropium ovalifolium** Forsk., Fl. Aegypt.-Arab. 38. 1775; Clarke in Hook. f., Fl. Brit. India 4 : 150. 1883; Prain, Bengal Pl. 2 : 716. 1903; Haines, Bot. Bihar and Orissa pt. 4 : 579. 1922; Kazmi in J. Arnold Arb. 51 : 178. 1970.

Ascending or decumbent, annual herbs, 10-30 cm tall. Stems several from a thick woody base, diffusely spreading, covered with greyish indument. Leaves chartaceous, elliptic, obovate or oblanceolate, cuneate at base, obtusely apiculate at apex, entire, appressed hairy, 1-1.5 × 0.5-0.8 cm; lateral nerves obscure; petiole

slender, 0.5-1.3 cm long. Inflorescence ebracteate, terminal, usually in pairs, sometimes solitary or ternate, 4-12 cm long. Flowers small, 2-ranked. Calyx 2.5 mm long, divided almost to base; lobes unequal; one about twice as broad as other 4, obovate-lanceolate, acute, appressed-hairy on both sides, 0.8-1.5 mm long. Corolla white, 2.5-3 mm long, slightly narrowed at throat; limb campanulate, strigose outside; lobes ovate-oblong, 0.6-0.7 mm long. Anthers lanceolate, acuminate, 0.5-0.6 mm long, inserted above corolla base. Style absent; stigma conical, apically bidentate. Fruits rounded, appressed hairy, *ca* 1.5 mm across, breaking into 4 equal nutlets.

Fl. & Fr. : Feb.-May.

Ecology : Common; in waste lands, fallow rice fields, along roadsides, on dry rocks, etc.

Distribution : India : Deccan Peninsula, Bihar, West Bengal, tropical Himalayas. Indo-China, Australia, Arabia and Africa.

Specimens examined : Ghanghree, 1044; Ramgarh, 1134.

Use : Plant is used in syphilic ulcers.

4. **Heliotropium strigosum** Willd., Sp. Pl. 1 : 743. 1798; Clarke in Hook. f., Fl. Brit. India 4 : 151. 1883; Prain, Bengal Pl. 2 : 716. 1903;Haines, Bot. Bihar and Orissa pt. 4 : 579. 1922; Kazmi in J. Arnold Arb. 51 : 152. 1970.

Local name : Chitiphul.

Small, prostrate, procumbent or sometimes erect, annual-perennial herbs, to 30 cm long. Stems many, spreading from woody base, branched, covered with stiff, appressed white hairs. Leaves chartaceous, linear-lanceolate, contracted at base into a 0.15-0.2 cm long petiole, acute at apex, entire, 5-20 × 0.8-2 mm. Spikes bracteate, solitary or in pairs, 3-8 cm long. Bracts 1-2 mm long, much reduced or sometimes absent above. Lower flowers shortly pedicellate, upper sessile. Calyx 2.5-3 mm long, strigose; segments ovate-lanceolate,

acute. Corolla white or pale blue, tubular-funnel form, 2.5-3 mm long, strigose outside; throat glandular-puberulent internally; lobes oblong, involute in bud. Anthers ovate-lanceolate, with thickened tips. Style short; stigmatic disc distinct. Fruits depressed globose, closely appressed-hairy; nutlets 4, *ca* 1.5 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Common; in moist rice-fields, waste places, roadsides, on dry rocks, along railway tracks, etc.

Distribution : Throughout India. Bangladesh, Sri Lanka, Australia, Pakistan, Arabia and Africa.

Specimens examined : Hazaribagh, 282; Jhumri Telaiya, 663.

Uses : Plant is used as laxative and diuretic. Plant-extract is applied to sore eyes; also used in boils, wounds and ulcers.

5. **Heliotropium supinum** L., Sp. Pl. 130. 1753; Clarke in Hook. f., Fl. Brit India 4 : 149. 1883; Prain, Bengal Pl. 2 : 716. 1903; Haines, Bot. Bihar and Orissa pt. 4 : 578. 1922; Kazmi in J. Arnold Arb. 51 : 179. 1970.

H. malabaricum Retz., Obs. Bot. 2 : 9. 1781.

H. supinum L. var. *malabarica* (Retz.) Clarke in Hook. f., Fl. Brit. India 4 : 149. 1883.

Prostrate, softly villous, annual herbs; 15-40 cm long. Stems and branches numerous, spreading, thickly clothed with soft white hairs. Leaves chartaceous, ovate-lanceolate or elliptic, attenuate at base, acute at apex, softly white woolly above, densely so beneath specially on nerves, 1-2.5 × 0.5-1.2 cm; petioles slender, villous 3-4 mm long. Inflorescence 2-6 cm long; flowers uniseriate, closely set when young. Calyx 3-4 mm long, hairy on both sides; lobes oblong-lanceolate, acute. Corolla 2.5-3.5 mm long, hairy outside; lobes broadly ovate, subacute. Anthers linear-lanceolate, shortly apiculate, *ca* 1 mm long, sessile. Stigma conical elongate, hirsute at apex; style

almost equalling stigma. Fruit of usually one developed nutlet, sometimes with 1-2 or 3 abortive ones; nutlets dark brown tuberculate, with strong light brown margins, to 1 cm long.

Fl. & Fr. : Mar.-Nov.

Ecology : Common; in fallow fields, along roadsides, etc.

Distribution : India : Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Deccan Peninsula. Australia, Pakistan, Arabia, Syria, Iraq, South Europe and Africa.

Specimens examined : Telaiya Dam, 190; National Park, 2032.

6. ROTULA Lour.

Rotula aquatica Lour., Fl. Cochinch. 121. 1790; Gamble, Fl. Madras 2 : 893 (627). 1923; Johnston in J. Arnold Arb. 32 : 15. 1951. **(Fig.6).**

Ehretia cuneata Wight, Icon. Pl. Ind. Orient. 4, t. 1385. 1848.

Rhabdia lysioides auct. non Mart. : Clarke in Hook. f., Fl. Brit. India 4 : 145. 1883; Prain, Bengal Pl. 2 : 717. 1903; Haines, For. Fl. Chota Nagpur 475. 1910 & Bot. Bihar & Orissa pt. 4 : 577. 1922.

Shrubs, to 1.5 m tall. Stems ascending or trailing, terete, stiff, virgate, often rooting, appressed-hairy. Leaves subcoriaceous, linear or oblong-oblanceolate,narrowed at base, acute at apex, ciliate on margins, strigose or glabrescent, obscurely-veined, 0.6-2.5 × 0.2-0.9 cm; petiole 0.1-0.3 cm long. Cymes terminating the branchlets. Flowers 6-8 mm across, 5 - merous. Calyx 4-5 mm long; lobes lanceolate, unequal in width, 0.5-1.5 mm broad. Corolla pink to purplish, 0.5-0.7 cm long; tube 1-2 mm long. Stamens attached above middle of corolla-tube. Ovary oblong, 0.8-1 mm long, 2-locular but each locule almost completely 2-locellate; style 4-5 mm long. Drupe subglobose, yellow or orange-red, 3-4 mm in diam.; endocarp

4-lobed, breaking up into 4 single-seeded pyrenes.

Fl. : Oct.-Jan. *Fr.* : Dec.-Feb.

Ecology : Common; among granitic rocks in the dried bed of Damodar River.

Distribution : Almost throughout India in river beds. Southern China, Indo-China, Siam, Myanmar, Sri Lanka and Malesia.

Specimen examined : Ramgarh Cant., 1227.

Uses : Decoction of roots is used as diuretic and laxative, also used for piles, stone in bladder and venereal diseases.

Note : *Rotula lysioides* (Mart.) Johnston (Syn. *Rhabdia lysioides* Mart.) is distributed in tropical West Africa and eastern Brazil. It differs from *R. aquatica* Lour. in having slightly larger flowers, a usually more ample minutely-glandular inflorescence and a noticeably reddish tone in its dried foliage.

7. TRICHODESMA R. Br., *nom. cons.*

Trichodesma indicum (L.) R. Br., Prodr. Fl. Nov. Holl. 149. 1810; Clarke in Hook. f., Fl. Brit. India 4 : 153. 1883; Prain, Bengal Pl. 2 : 720. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 580. 1922; Kazmi in J. Arnold Arb. 52 : 516. 1971. *Borago indica* L., Sp. Pl. 137. 1753.

Local name : Chhotakulpha.

Erect, much-branched, annual herb, to 50 cm long. Branches spreading, densely covered with crisped white trichomes intermixed with long, stiff trichomes. Basal leaves drying at anthesis; cauline ones oblong or lanceolate, ± dilated at base, acute or subacute at apex, entire, densely covered on both surfaces with trichomes, to 7 ×

2.5 cm, middle ones usually larger than lower and upper ones. Inflorescence terminal, lax, few-flowered. Flowers usually nodding; bracts leaf-like; pedicels slender, pubescent, to 2.5 cm long. Calyx divided nearly to base; lobes oblong, sagittate-auriculate at base, acute, grey-or white-villous, to 1.2 cm long, slightly enlarged in fruit. Corolla pinkish-blue, infundibuliform, slightly surpassing the calyx, 1.2-1.4 cm long; lobes semi-orbicular, abruptly narrowed to filiform apices. Anthers densely villous, aristate; awns equalling the anthers. Nutlets ovoid, white, smooth with polished back, obscurely margined, 4 -5 mm long.

Fl. & Fr. : Most of the year, but chiefly during Sept.-Jan.

Ecology : Very common; in waste places, cultivated fields, gardens, river-banks, etc.

Distribution : Throughout India. Pakistan, Afghanistan, Philippines and Mauritius.

Specimens examined : Telaiya Dam, 186; Barkaganwa, 887; Hunterganj, 2135.

Uses : Leaves and flowers are eaten as vegetable. Infusion of leaves is used as depurative. Roots are used in dysentery; they are pounded and applied to swellings of joints.

103. VERBENACEAE

Key to the Genera

1a. Inflorescence spicate, (sub)capitate or racemiform, indeterminate and centripetal :

2a. Inflorescence spicate, or sometimes (sub) capitate during anthesis and elongating in fruit :

3a. Perfect stamens 4 :

4a. Calyx truncate or shallowly toothed. Fruit drupaceous, usually with a fleshy and juicy exocarp and hard endocarp, either 2-loculed or separating into 2,1-loculed pyrenes. ...4. LANTANA

4b. Calyx 2-4-cleft or conspicuously toothed. Fruit dry, with a thin papery exocarp and bony endocarp, separating into 2, 1-loculed pyrenes :

5a. Procumbent or creeping herbs. Spikes usually elongating in fruit. Bractlets not 4-ranked ...7. PHYLA

5b. Erect, bushy undershrubs or shrubs. Spikes not elongating in fruit. Bracts or bractlets ± 4-ranked ...5. LIPPIA

3b. Perfect stamens 2, with a posterior pair of staminodes ...8. STACHYTARPHETA

2b. Inflorescence racemiform :

6a. Woody vines. Drupes composed of 2 (or 1 by abortion), 1-loculed and 1-seeded pyrenes; mature fruits conspicuously 5-winged with stiff net-veined wings. Epicalyx present ...6. PETREA

6b. Shrubs. Drupes composed of 4 pyrenes, each 2-loculed and 2-seeded; mature fruits not winged. Epicalyx absent ... 2. DURANTA

1b. Inflorescence cymose, determinate and centrifugal :

7a. Corolla ± regular. Stamens 5-6, equal ... 9. TECTONA

7b. Corolla irregular. Stamens 4, didynamous :

8a. Drupe with 1, 4-loculed pyrene :

9a. Leaves mostly digitately 3-7-foliolate, rarely 1-foliolate. Corolla tube short, cylindric ...10. VITEX

9b. Leaves simple. Corolla tube long, narrow below, ventricose above ... 3. GMELINA

8b. Drupe with usually 4 (sometimes less through abortion), 1-loculed pyrenes. Leaves simple ...1. CLERODENDRUM

1. CLERODENDRUM L.

Key to the Species

1a. Corolla-tube more than 7 cm long. Leaves mostly in whorls of 3-6 ...*1. C. indicum*

1b. Corolla-tube less than 4 cm long. Leaves normally all decussate :

2a. Twining woody vine. Corolla deep-red to crimson ...4. *C. splendens*

2b. Erect herbs, undershrubs or shrubs, sometimes with straggling or scandent branches. Corolla white or pink :

3a. Leaf-blades entire, obovate or elliptic. Inflorescence on axillary simple cyme ...2. *C. inerme*

3b. Leaf-blades mostly serrate or dentate, broadly ovate. Inflorescence a terminal paniculate cyme :

4a. Corolla doubled. Calyx divided to middle ...3. *C. philippinum* fa. *multiplex*

4b. Corolla single. Calyx divided almost to base ...5. *C. viscosum*

1. **Clerodendrum indicum** (L.) O. Kuntze, Rev. Gen. Pl. 2 : 506. 1891 (as 'Clerodendron'); Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 426. 1983. *Siphonanthus indica* L., Sp. Pl. 109. 1753.

Clerodendron siphonanthus R. Br. in Ait., Hort. Kew. ed. 2, 4 : 65. 1812; Clarke in Hook. f., Fl. Brit. India 4 : 595. 1885; Prain, Bengal Pl. 2 : 836. 1903; Haines, For. Fl. Chota Nagpur 486. 1910 & Bot. Bihar & Orissa pt. 4 : 722. 1922.

Local name : Bharangi.

Erect, perennial herbs or undershrubs, to 3 m tall, with underground stolons. Stems often several from the woody base, simple or sparingly branched, obtusely tetragonal, hollow, subglabrate, with annulate nodes and elongate 2.5-10 cm long internodes. Leaves sessile or subsessile, mostly in whorls of 3-6, narrowly lanceolate or elliptic, shortly acuminate at apex, cuneate at base, entire or sinuate, glabrous, 8-20 × 1-5 cm, with stout midrib. Flowers in 3-7-flowered, lax, widely divaricate axillary cymes of 4 - 6 cm long, combined into a raceme-like panicle, to 45 cm long. Peduncle 1-3 cm long. Pedicel 1-2 cm long. Bracts linear to linear-lanceolate, foliaceous, caducous. Calyx green or red, broadly campanulate, 1.2-1.5 cm long, glandular-pubescent, divided 3/4 way down; lobes 5, spreading, lanceolate, 0.6-1 cm long. Corolla whitish to cream-coloured; tube gland-hairy outside, drooping 7.5-14 cm long; lobes oblong, obtuse, reflexed, 0.8-1.5 cm long. Filaments purple, glabrous. Style purple; stigmatic branches short. Ovary glabrous. Drupe blue-black, of 1-4 connate pyrenes, 1-1.5 cm in diam., enclosed by bright-red accrescent calyx.

Fl. : Feb.-May. *Fr.* : May-July.

Ecology : Common; in forest clearings, waste lands, near habitations, along railway tracks, near water courses, etc.

Distribution : Throughout India. Native from India and Nepal eastward to Burma, Malaya and Indo-China, North to Southern China,

widely cultivated in warm countries of both hemispheres; naturalised in Madagascar, Indonesia, and from Southern United States through West Indies to Guianas.

Specimens examined : Ghanghree, 1007; Koderma, 2003.

Uses : Root is used in asthma, cough and scrofulous affections. Leaves are used as vermifuge.

2. **Clerodendrum inerme** (L.) Gaertn., Fruct. Sem. 1 : 271, t. 75. 1788; Roxb., Fl. Ind. 3 : 58. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 589. 1885; Prain, Bengal Pl. 2 : 835. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 720. 1922. *Volkameria inermis* L., Sp.Pl. 637. 1753.

Local name : Lanjai.

Straggling or scandent, perennial shrub, to 1.5 m tall. Stems much branched, slender, obtusely tetragonal, grey-pubescent. Leaves opposite, chartaceous, obovate or elliptic, obtuse at apex, cuneate at base, entire, dark-green and glabrous on the upper surface, pale and glandular on the lower surface, 3-4 × 1-1.5 cm; petiole 4-10 mm long. Flowers to 2 cm across, borne in axillary, 3-7-flowered puberulous cymes of 4-9 cm long. Peduncle 1.5-3 cm long. Bracts minute, linear-subulate, 2 mm long. Pedicels 4-10 mm long. Calyx 5-6 mm long, enlarged in fruit, cupular, glandular outside, minutely 5-toothed; teeth triangular, 1-1.2 mm long. Corolla white; tube slender, 2.5-4 cm, hairy within, glabrous without; lobes oblong, spreading, 6-8 mm long. Filaments crimson or red to purple, 2 - 2.5 cm long; anthers yellow; styles purple. Drupe obovoid, at first green, turning brown later, 8-12 × 6-8 mm, splitting into 4 woody pyrenes, enclosed by cupuliform calyx.

Fl. & Fr. : Throughout the year, but mostly during Dec.-Apr.

Ecology : Common; along river banks and in shrubberies of the submarshy low-lying areas; also cultivated as a hedge plant.

Distribution : Throughout India. Sri Lanka, China, Myanmar and Australia.

Specimens examined : Chatra, 822; Bishnugarh, 1936.

Uses : Leaves are used as febrifuge. Poultice of leaves is used to resolve buboes.

*3. **Clerodendrum philippinum** Schau. fa. **multiplex** (Sweet) Moldenke in Phytologia 41 : 10. 1978; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 469. 1983. *C. fragrans* (Vent.) Willd. var. *multiplex* Sweet, Hort. Brit. ed. 1, 1 : 322. 1827.

Volkameria japonica Jacq., Hort. Schoenbr. 3 : 48, t. 338. 1798, non Thunb. 1780. (*V. fragrans* Vent., Jard. Malm. 2 : t. 70. 1804.).

Clerodendrum fragrans (Vent.) Willd., Enum. Hort. Berol. 2 : 659. 1809, *nom. superfl. illegit.*; Clarke in Hook. f., Fl. Brit. India 4 : 589. 1885; Prain, Bengal Pl. 2 : 835. 1903; Mooney, Suppl. Bot. Bihar & Orissa 122. 1950.

C. philippinum auct. non Schau. : Howard & Powell in Taxon 17: 53-55. 1968; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 487. 1976.

Local name : Attardana.

Erect undershrub, to 1.5 m tall; branches angled, finely pubescent. Leaves broadly ovate, membranous, cordate to subtruncate at base, shortly acuminate at apex, usually coarsely and irregularly dentate, lightly strigillose-pubescent on both surfaces, usually more densely so on veins beneath, 5-25 × 4-23 cm. Panicle corymbose, terminal, densely many-flowered, 3-6 cm long and 3.5-9 cm wide, usually subtended by a pair of foliaceous, long-stipitate bracts. Bractlets many, foliaceous, oblong or elliptic, subulate-acuminate, pubescent, 1.5-3 × 0.3-1.2 cm. Calyx campanulate, purple or red,with scattered glandular disk near margins externally, 1-1.5 cm long, divided nearly to middle; lobes 5-8, 5-8 mm long, acuminate. Corolla hypocrateriform, usually all 'doubled' by modifications of genitalia, white or pink, glabrous. Stamens and pistil all modified into supernumerary petals. Fruits not produced.

Fl. : Almost throughout the year.

Ecology : Common; cultivated in gardens, parks, etc.; sometimes escapes from cultivation in gardens, waste places, etc. in suitable conditions.

Distribution : Throughout India. Probably native to China and/ or southern tropical Asia, now widespread throughout the tropical Asia, Pacific Oceanica, warmer parts of Africa and America.

Specimens examined : Hazaribagh, 104; Barkagaon, 889.

Uses : Plant is grown as an ornamental for its very fragrant flowers. Leaves with black pepper are used in colic pain.

Note : The nomenclature of this taxon is controversial. Although, Howard and Powel (*l.c.*) proposed *C. philippinum* of Schauer (1847) as being the correct name of this taxon, but according to Moldenke and Moldenke (*l.c.*) Schauer's original description does not match well to the present taxon. In Schauer's description, the leaves almost always entire or only remotely serrate, corollas scarcely twice the length of calyx-tube, the stamens and pistil long-exserted and the fruit baccate, whereas in the present taxon, the leaves being almost always coarsely dentate, stamens and pistil modified into supernumerary petals and fruits not produced. As such, Moldenke and Moldenke suggested that the single-flowered fertile form described by Schauer will be the nomenclaturally typical forma (*i.e.* fa. *philippinum*) and the double-flowered sterile form will be the another forma, *i.e.* fa. *multiplex* (Sweet) Moldenke.

4. **Clerodendrum splendens** G. Don ex James in Edinburgh New Philos. J. 11 : 349. 1824; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 435. 1983.

Shrub or twining woody vine, usually scrambling or climbing, to 5 m. Branchlets ± acutely tetragonal, brownish, finely pubescent. Leaves membranous - subchartaceous, broadly elliptic, elliptic - ovate or elliptic-suborbicular, subcordate or truncate at base,shortly acuminate at apex, entire or undulate, glabrescent on both surfaces, 5-15 × 3-7 cm. Panicle corymbose, supra-axillary and terminal, 7-

11 cm long and 6-8 cm wide, many-flowered. Peduncle ± stout, 1.5-3.5 cm long, puberulent. Pedicels slender, 3-8 mm long, puberulent. Foliaceous bracts absent. Bractlets and prophylla linear-lanceolate or subulate, 2-4 mm long. Calyx elongate-campanulate, glabrescent, *ca* 1 cm long, divided nearly to middle; lobes 4 or 5, triangular, acuminate. Corolla hypocrateriform, deep-red to crimson; tube slender, *ca* 2 cm long; lobes oblong-elliptic, rounded at apex, 1-1.5 × 0.6-0.7 cm. Stamens exserted about 3 cm from corolla-mouth; filaments yellow or pink, glabrous; anthers narrow-elliptic, bluish. Drupe black, shiny. Seeds black, enclosed in an orange pulp. Fruiting-calyx accrescent, red.

Fl. : Nov.-Mar. *Fr.* : Jan.-May.

Ecology : Common; planted along trellis and walls of gardens; also met with as an escape in waste places.

Distribution : India : Major parts of the country. Native of western and central Africa, now widely cultivated in warmer parts of Asia, Africa, Australia, West Indies, Europe and N. America.

Specimens examined : Hazaribagh, 1207; Koderma, 1717.

Uses : Plant is grown as an ornamental for its showy blossoms and dense screen of foliage.

5. **Clerodendrum viscosum** Vent., Jard. Malm. 1 : 25, t. 25. 1803; Santap. in Bull. Bot. Surv. India 3 : 14. 1961; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 473. 1983.

C. infortunatum auct. non L. : Clarke in Hook. f., Fl. Brit. India 4 : 594. 1885, *p.p.*; Prain, Bengal Pl. 2 : 835. 1903; Haines, For. Fl. Chota Nagpur 485. 1910 & Bot. Bihar & Orissa pt. 4 : 721. 1922.

Local name : Bhant.

Erect, much branched, perennial herbs or undershrubs, to 2 m

high.Branchlets outusely tetragonal, densely white-villous. Leaves thickly coriaceous, broadly ovate, shortly acuminate at apex, rounded or subcordate at base, mostly denticulate or serrate, rarely sinuate or entire,sparsely villous-pubescent above, densely so beneath, 10-25 × 7-16 cm; venation sub-palmate; petioles 3-12 cm long. Flowers borne in lax, pubescent, rather few-flowered cymes combined into a terminal panicle of 10-25 cm long. Peduncles red or purplish red, 1-6 cm long. Bracts foliaceous, elliptic, densely villous, usually caducous, 0.8-1.5 cm long. Pedicels 0.6-1 cm long, red or purplish red, bracteolate at middle. Calyx bright-green during anthesis, pubescent lepidota, 1-1.5 cm long, divided nearly to the base; segments ovate-lanceolate, subacuminate. Corolla white, purple-tinged at mouth, white-hairy outside, 2.5-3 cm long; tube 1.2-1.6 cm long; segments ovate-oblong, subequal, obtusely apiculate, 6-1.2 cm long. Filaments purplish; anthers deep purple to black. Ovary glabrous. Drupe nearly globose, to 0.8 cm in diam., at first green, black when mature, composed of 4(or 1-3 by abortion) pyrenes, enclosed by accrescent cupular bright-red calyx.

Fl. : Feb.-May. *Fr.* : May-July.

Ecology : Common; in forest edges, forest clearings, waste places, along roadsides, railway tracks, scrub-jungles and streams.

Distribution : Throughout India. Native from Pakistan and Nepal through Myanmar and Thailand, north into southern China and Hainan island and east to the Philippine Islands, Sumatra, Java and Sarawak; naturalised in Brazil.

Specimens examined : Hazaribagh, 34; Patratu, 1336; Etkhori, 1879.

Uses : Leaves are used as tonic, vermifuge and laxative. Juice of fresh leaves is given for removal of ascarids. Poultice of leaves and roots is applied externally to tumours.

Note : According to Moldenke and Moldenke (*l.c.*), *C. infortunatum* L. seems to be confined to Sri Lanka and Andaman

Isalnds only. However, Yamazaki (in Hara, Fl. E. Himalayay 268. 1966) treated *C. infortunatum* and *C. viscosum* as conspecific.

2. DURANTA L.

Duranta repens L., Sp. Pl. 637. 1753; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 278. 1983.

Duranta plumieri Jacq., Select. Strip. Amer. Hist. 186, t. 176. f. 76. 1763; Clarke in Hook. f., Fl. Brit. India 4 : 560. 1885; Prain, Bengal Pl. 2 : 827. 1903; Haines, For. Fl. Chota Nagpur 489. 1910. & Bot. Bihar & Orissa pt. 4 : 709. 1922.

Shrubs, to 7 m tall. Branches slender, drooping or trailing, often scandent or semi-scandent, spiny or unarmed, terete, usually glabrate, often obscurely appressed-hairy. Leaves chartaceous, decussate, ovate, ovate-ellipitc or obovate, cuneate at base, subacute or obtuse at apex, coarsely serrate above the middle, glabrate on both surfaces, 1.5-6 × 1-4 cm; petioles slender, 3-8 mm long. Racemes terminal and axillary, concentrated at or near the tips of branches, often paniculate, 5-30 cm long. Bractlets minute, subfoliaceous. Pedicels 2-3 mm long. Calyx tubular, angled, appressed-hairy, orange or yellow, 4-5 mm long; teeth 5 minute, triangular-subulate. Corolla violet, hypocrateriform, pubescent, 1.5-2.5 cm long; tube cylindric, curved above; limb spreading, 5-parted. Stamens 4, didynamous, included. Ovary ± completely 8-celled, composed of four 2-celled carpels. Fruit globose, yellow, 0.7-1 cm in diam.; exocarp fleshy, endocarp hard; pyrenes 4, each 2-celled, 2 - seeded.

Fl. & Fr. : Mar.-Aug.

Ecology : Very common; planted in hedges, thickets, fence-rows and roadsides, also runs wild in waste places.

Distribution : Almost throughout the tropical parts of India; widespread in subtropical and tropical America; introduced and often

naturalised in many parts of tropical Africa and Asia, Australia and Oceania; widely cultivated in all warm portions of civilised world.

Specimens examined : Hazaribagh, 216; Hunterganj, 2126.

Uses : Macerated fruits yield a juice which is used to destroy the mosquito larvae. Wood is used for turnery.

3. GMELINA L.

Gmelina arborea Roxb., Pl. Corom. 3 : 41, t. 246. 1819; Clarke in Hook. f., Fl. Brit. India 4 : 581. 1885; Prain, Bengal Pl. 2 : 829. 1903; Brandis, Ind. Tr. 509. 1906; Haines, For. Fl. Chota Nagpur 486. 1910 & Bot.Bihar & Orissa pt. 4 : 719. 1922.

Local name : Kumbhar.

Unarmed tree, to 15 m high. Branches numerous, spreading; branchlets and young parts yellowish-tomentose. Leaves broadly ovate, subcoriaceous, subcordate or truncate and slightly decurrent at base, acute, long-acuminate to caudate at apex, densely tomentose above when young, becoming glabrous above when mature, permanently densely stellate-fulvous-tomentose beneath, 10-20 × 7-15 cm; secondary veins 5-10 pairs, lowest pair sub-basal; petiole 5-12 cm long. Inflorescence terminal and axillary, fulvous-tomentose throughout, erect, 7-30 cm long; flowers arranged in 1-3-flowered cymules on branches. Bracts linear-lanceolate, to 1 cm long. Calyx densely fulvous-tomentose outside, *ca* 5 mm long; rim with 5 small triangular teeth. Corolla showy, brownish-yellow, 2.5-4 cm long; limb 2-lipped, upper lip orange-pink, deeply divided into 2 backwardly curled lobes; lower lip lemon-yellow, 3-lobed, midlobe with irregularly crenulate margin. Style slightly exserted from mouth; stigma shortly 2-fid. Drupe ovoid, 2-2.5 × 1.6-2 cm, orange-yellow when mature, usually 1-2-seeded.

Fl. : Mar.-June. *Fr.* : May-Aug.

Ecology : Very common, in forests, roadsides, parks, etc.

Distribution : Throughout India. Native from Pakistan, Bhutan and India east through Bangladesh, Myanmar and Thailand to Indo-China, Malaya and Indonesia, north to S. China; introduced and cultivated in many parts of tropical Africa, S. America and elsewhere.

Specimens examined : Simaria, 1705; Bishnugarh, 2057.

Uses : Wood is used for furniture, planking, carriages, printing blocks, musical instruments, axles, picture frames, etc.; also employed for paper-making, match - sticks and match-boxes. Fruits are used in fevers and bilious affections.

4. LANTANA L.

Lantana camara L. var. **aculeata** (L.) Moldenke in Torreya 34 : 9. 1934; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 225. 1983. *L. aculeata* L., Sp. Pl. 627. 1753; Haines, For. Fl. Chota Nagpur 488. 1910, *p.p.*

L. camara auct. non L. : Clarke in Hook. f., Fl. Brit. India. 4 : 562. 1885, *p.p.*; Prain, Bengal Pl. 2 : 825. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 705. 1922.

Local name : Putus.

Rambling undershrub to 3 m tall. Stems 4-gonous, much branched, armed with recurved prickles. Leaves opposite, chartaceous, ovate, rounded to subcuneate at base, acute to short-acuminate at apex, cuneate or decurrent on short petiole, crenate-serrate, reticulate-rugose and scabrous above, sparsely pilose beneath with canescent or brownish hairs, 2-9 × 1-6 cm; petiole 0.5-4 cm long. Flowers borne in corymbose-umbellate spikes. Peduncles 3-15 cm long, appressed-pilose. Bractlets lanceolate-oblong, 3-5-nerved, appressed-hairy, 4-6 mm long. Calyx scarious, 2-3 mm long,

truncate, hairy. Corolla orange, pink or red, 0.8-1 cm long; tube slightly curved, enlarged above middle, puberulent outside; limb 6-7 mm wide; upper lip sub-quadrate, similar to lower lip with rounded side lobes. Drupe fleshy,3-4 mm in diam., black when ripe.

Fl. & Fr. : Almost throughout the year, but mostly during June-Oct.

Ecology : Very common; an aggressive weed of disturbed ground covering extensive areas.

Distribution : Throughout India. Widespread in subtropical and tropical America; nuturalised and usually a serious weed in many parts of southern Europe, Africa, Madagascar, Asia, Pacific Islands and Australia.

Specimens examined : Jhumri Telaiya, 145; Bishnugarh, 1114; Simaria, 1630.

Uses : Plant is used as green manure. Leaves yield an oil which is used for itch and as an antiseptic for wounds. Plant is also used as diaphoretic, carminative and antispasmodic; decoction is given in rheumatism and malaria.

5. LIPPIA Houst ex L.

Lippia javanica (Burm. f.) Spreng. in L., Syst. Veg. ed. 16, 2 : 752. 1825; Meeuse in Blumea 5 : 68. 1942; Bennet, Fl. Howrah 309. 1979. *Verbena javanica* Burm. f., Fl. Ind. 12, t. 6. f. 2. 1768.

Lantana alba Mill., Gard. Dict. ed. 8, 8. 1768.

Lippia alba (Mill.) N.E. Br. ex Britt. & Wils. in Sc. Surv. Bot. Porto Rico 6 : 141. 1925; Santap. & Wagh in Bull. Bot. Surv. India 5 : 107.1965.

L. geminata Kunth in H.B.K., Nov. Gen. *et* Sp. 2 : 214. 1817; Clarke in Hook. f., Fl. Brit. India 4 : 563. 1885; Prain, Bengal Pl. 2 :

825. 1903; Haines, For. Fl. Chota Nagpur 488. 1910 & Bot. Bihar & Orissa pt. 4 : 705. 1922.

Erect, aromatic herbs or undershrubs, to 2 m high. Stems and branches numerous, weak, densely puberulent. Leaves thick-chartaceous, elliptic-oblong, gradually tapering to or cuneate at base, acute or obtuse at apex, crenate-serrate or serrulate, rugose and strigose-puberulent above, densely and softly short-pubescent beneath, 4-9 × 2-4 cm; petioles 0.5-1 cm long, pubescent. Inflorescene axillary, capitate, much shorter than subtending leaves, solitary or sometimes paired in all upper leaf axils; heads globose or subglobose, 0.8-1 cm in diam. Bractlets ovate, acuminate, densely hairy, 3-4 mm long. Calyx cupular, 2-toothed, 1.5-1.8 mm long. Corolla hypocrateriform, blue or pinkish; tube 4-5 mm long; upper lip with 2 small rounded lobes, much shorter than deflexed lower lip. Filaments of longer pair curved. Drupes 1.5-2 mm across, ovoid.

Fl. & Fr. : Apr.-Jan.

Ecology : Very common; along river banks, roadsides, wet places, railway tracks, etc.

Distribution : India : Bihar, West Bengal, Assam, Orissa, Madhya Pradesh, Deccan Peninsula. West Indies, Mexico, Central America and subtropical and tropical South America to Argentina; introduced and escaped from cultivation elsewhere.

Specimens examined : Ramgarh Cant., 1905; Jhumri Telaiya, 2219.

Uses : Young leaves are used as vegetables; also as stomachic and nervine.

6. PETREA House. ex L.

Petrea volubilis L., Sp. Pl. 626. 1753; Haines, Bot. Bihar & Orissa pt. 4 : 708. 1922.

Woody vine or undershrub, to 13 m tall; branches slender, lenticellate, densely short-pubescent, obtusely tetragonal or subterete with prominent leaf-scars. Leaves firmly chartaceous, ovate-elliptic or oblong, acute or subacuminate at apex, narrowed at base, entire, often more or less subrevolute at margins, scabrous on both surfaces, 3-12 × 2-9 cm ; petioles 0.8-1.5 cm long, pubescent. Flowers many, in lax, axillary racemes of 8-30 cm long, solitary or often clustered near the tips of branchlets. Pedicels 1-1.5 cm long. Calyx pale blue, densely pubescent, with pubescent scales at the mouth; segments oblong, membranous, rounded apically, glabrous, 1.5-2 cm long. Corolla tube 6-8 mm long, upper 1/3 densely puberulent outside, lower 2/3 glabrous; the anterior lobe elliptic, minutely sinuate, puberulent, 5-6 mm long; the other lobes similar, 3-5 mm long. Stamens inserted above base of corolla tube; staminode obsolete. Ovary glabrous. Fruit drupaceous, of two 1-loculate, 1-seeded pyrenes, enclosed by pubesent tough fruiting calyx.

Fl. & Fr. : Mar.-May.

Ecology : Common; planted as an ornamental vine; also self-grown in roadsides, gardens, etc.

Distribution : India : Throughout the tropical and subtropical parts of India. Native from Mexico through Central America to Panama and in Greater Antilles, introduced in Southern Florida, part of Lesser Antilles, China, Java and elsewhere, widely cultivated in subtropical and tropical countries throughout the World.

Specimens examined : Hazaribagh, 1414; Hunterganj, 2182.

Uses : Plant is cultivated in gardens and houses for its beautiful coloured flowers.

7. PHYLA Lour.

Phyla nodiflora (L.) Greene in Pittonia 4 : 46. 1899; Meeuse in Blumea 5 : 69. 1942; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 236. 1983. *Verbena nodiflora* L., Sp. Pl. 20. 1753.

Lippia nodiflora (L.) A. Rich. in Michx. Fl. Bor. Amer. 2 : 15. 1803; Clarke in Hook. f., Fl. Brit. India 4 : 563. 1885; Prain, Bengal Pl. 2 : 825. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 706. 1922.

Creeping herbs. Stems slender, prostrate, rooting at nodes, 25-80 cm long, tinged with reddish brown, appressed hairy or glabrate. Leaves subsessile, thick-textured, spathulate, oblanceolate or obovate, narrowed into a long or short-cuneate base, obtuse or rounded at apex, sharply serrate above the middle, entire basally, glabrescent to thinly appressed-hairy, 0.7-3 × 0.5-1.2 cm, with inconspicuous venation; petioles 3-6 mm long or obsolete. Spikes 1-2.5 cm long and 5-8 mm in diam when mature, solitary, densely many-flowered; peduncles slender, usually much longer than subtending leaves, 1-8cm long, densely or sparsely appressed hairy. Bractlets closely imbricate, obovate or subrhomboid-cuneate, finely ciliate, subequalling the corolla tube. Calyx hyaline-membranous, flattened, about equalling the corolla tube, deeply 2-cleft. Corolla purple or pink to white, 2-2.5 mm long; upper lip erect, bifid; lower lip 3-lobed with mid-lobe longest. Drupe globose, 1.8-2 mm in diam.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; along roadsides, clayey and sandy river banks, edges of ponds and borders of fields.

Distribution : Throughout India. Subtropical and Tropical portions of both Eastern and Western Hemispheres.

Specimens examined : Hazaribagh, 268; Chatra, 561.

Uses : Plant is used as diuretic and febrifuge. Poultice of fresh plant is applied to boils, swollen glands and ulcers.

8. STACHYTARPHETA Vahl, *nom. cons.*

Stachytarpheta jamaicensis (L.) Vahl, Enum. Pl. 1 : 206. 1804; Meeuse in Blumea 5 : 70. 1942; Moldenke & Moldenke in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 253. 1983. *Verbena jamaicensis* L., Sp. Pl. 19. 1753.

Stachytarpheta indica auct. non (L.) Vahl : Clarke in Hook. f., Fl. Brit. India 4 : 564. 1885, *p.p.*; Prain, Bengal Pl. 2 : 826. 1903; Haines, For. Fl. Chota Nagpur 489. 1910 & Bot. Bihar & Orissa pt. 4 : 707. 1922.

Local name : Kariyartharani.

Erect, annual herbs, 50-100 cm tall, often purplish throughout, slightly woody at base. Stems and branches dichotomous, subtetragonal, usually glabrate except for lanuginous-pilose nodes. Leaves alternate or opposite, rather fleshy when fresh, thin-coriaceous or membranous in drying, elliptic or ovate, gradually narrowed and decurrent at base, subobtuse or acute at apex, coarsely serrate, nearly glabrous on both surfaces, 3-9 × 1.5-5 cm. Spikes terete, stiff, often flexuous, glabrous, 15-50 cm long. Flowers sessile, 0.8-1 cm across, at first erect, later immersed in thickened rachis; bracts lanceolate or oblong-lanceolate, 5-8 mm long, aristate-acuminate at apex, scabridous, with scarious and obscurely ciliolate margins. Calyx compressed, 5-6 mm long; teeth triangular. Corolla hypocrateriform, blue, 0.8-1 cm long; tube slightly curved. Style included. Schizocarp linear-oblong, 5-6 mm long, splitting at maturity into 2 hard, 1 - seeded cocci.

Fl. & Fr. : July-Sept.

Ecology : Very common; along roadsides, gardens and open laterite forests, etc.

Distribution : Throughout the tropical parts of India. Native to tropical and subtropical America, introduced in parts of tropical Africa, Madagascar, Islands of Indian Ocean, tropical Asia, Australia and Oceania.

Specimens examined : Hazaribagh, 476; Hunterganj, 2143.

Uses : Plant is used for venereal diseases, ulcers, dropsy and stomach ailments. Decoction of leaves is used as abortifacient and in cardiac troubles. Infusion of bark is used in diarrhoea and dysentery.

9. TECTONA L. f., *nom. cons.*

Tectona grandis L. f., Suppl. Pl. 151. 1781; Clarke in Hook. f., Fl. Brit. India 4 : 570. 1885; Prain, Bengal Pl. 2 : 828. 1903; Haines, For. Fl. Chota Nagpur 478. 1910 & Bot. Bihar & Orissa pt. 4 : 710. 1922.

Local names : Sagwan, Sagun.

Trees, to 50 m tall. Branches and branchlets stout, densely furfuraceous-tomentose; nodes distinctly annulate. Leaves decussate, very large, drooping, firmly chartaceous, broadly elliptic, abruptly cuneate or long-attenuate and prolonged at base into alate petiole, acute or short-acuminate at apex, entire or repand-denticulate, dark green and shiny above, much lighter and not shiny beneath, densely squamose and rugose above, glabrescent to densely furfuraceous-tomentose beneath, 15-50 × 12-35 cm. Terminal panicles 30-80 cm long; cymes opposite, widely divaricate, densely ochraceous-furfuraceous throughout, each subtended by a large foliaceous bract. Bractlets numerous, linear-lanceolate, 1.2-1.5 cm long. Calyx (in flower) light yellow or light green, 3-4.5 mm ling and 3-3.5 mm wide, furfuraceous-tomentose; teeth ovate or ovate-lanceolate, often reflexed. Corolla white; tube 1.5-2.5 mm long; lobes ovate-elliptic,

2.5-3 mm long, rounded at apex. Filaments white, glabrous, ampliate and flattened below; anthers yellow. Style white, 3.5-5 mm long, pubescent. Drupe subglobose or tetragonally flattened, to 1.5 cm long and wide, densely tomentose. Fruiting calyx to 2.5 cm long and wide, chartaceous, bladder-like, light brown and brittle when dry.

Fl. : July-Aug. *Fr.* : Nov.-Jan.

Ecology : Very common; planted in forests, roadsides, gardens, parks, etc. ; also self-grown.

Distribution : Throughout the tropical mixed forests of India. Native to the tropical S. Asia and Malesia, widely cultivated in other tropical countries of Asia, Africa, America, Europe, Australia and Pacific Oceania.

Specimens examined : Koderma Forest, 291; Hazaribagh, 719; Pratappur, 2104.

Uses : Oil obtained from distillation of wood-chips is used in eczema and ringworm. Wood is used for poles, beams, doors, window-frames, furniture, railway carriages, etc. Kernels yield an oil which is applied to scabies. Flowers are used in biliousness, bronchitis and urinary disorders.

10. VITEX L.

Vitex negundo L., Sp. Pl. 638. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 538. 1885; Prain, Bengal Pl. 2 : 833. 1903; Haines, For. Fl. Chota Nagpur 478. 1910 & Bot. Bihar & Orissa pt. 4 : 711. 1922.

Local names : Nirgandi, Shivari.

Aromatic, deciduous shrubs or small trees, to 8 m tall. Young branches obtusely quadrangular, silvery tomentose. Leaves decussate, 3-5-foliolate; leaflets narrowly oblong or elliptic to lanceolate, cuneate

to short-attenuate at base, acuminate at apex, mostly entire to sinuate or with a very few scattered teeth above middle, darkgreen and glabrous above, greyish-puberulent beneath, 3.5-15 × 1-5 cm, middle one longer and long-petiolulate, lower two smaller, sessile or subsessile; petioles 2.5-6 cm long. Panicles terminal and sometimes from upper leaf axils, to 20 cm long, with opposite or subverticillate cymose branches. Calyx obconic-cyathiform, 1.5-2 mm long and wide, with its rim sinuate or shortly 5-dentate. Corolla hypocrateriform, blue or pale-blue; tube 3-4 mm long, puberulent outside; middle of lower lip larger, with white or yellow patches. Stamens and pistil shortly exserted. Drupe (sub)globose, 3-5 mm long and wide, glabrous, purple or black.

Fl. & Fr. : Almost throughout the year, but chiefly during June-Sept.

Ecology : Very common; in waste grounds, hedges, on banks of rivers and smaller streams, fencings near households, etc.

Distribution : Throughout India. Native from Zangibar, Mozambique and Madagascar through Iran, Afganistan, Pakistan, India and Sri Lanka to Myanmar, Indo-China and Malesia, north into China, Formosa, Japan, Hainan, and Hong Kong, east to Philippines, Sarawak and Guam; widely cultivated in Europe, Asia, N.America, West Indies and Thailand.

Specimens examined : Koderma, 177; Ramgarh, 543; Barhi, 1389.

Uses : Leaves are used as tonic and vermifuge; their decoction is employed for catarrhal and rheumatic affections. Roots are used as febrifuge, diuretic and anthelmintic. Fruits are used in diarrhoea, fever and liver complaints.

104. LAMIACEAE

Key to the Genera

1a. Stamens descending, lying on lower lip or enclosed by it :

2a. Lower lip of corolla concave, boat-shaped or saccate :

3a. Calyx campanulate, subequally 5-toothed. Lower lip of corolla sharply deflexed, equalling or shorter than the upper lip ... 4. HYPTIS

3b. Calyx tubular, distinctly 2-lipped. Lower lip of corolla not sharply deflexed, much longer than the upper lip :

4a. Verticillasters dense, in tetragonal or cylindrical spikes. Upper lip of calyx deflexed over the mouth ... 2. ANISOCHILUS

4b. Verticillasters distinct, in lax racemes or panicles. Upper lip of calyx continuous with the tube ...11.PLECTRANTHUS

2b. Lower lip of corolla ± flat :

5a. Verticillasters few-flowered, combined into lax racemes or spikes. Calyx suberect in fruit ...10. OCIMUM

5b. Verticillasters many-flowered, combined into terminal dense globose or ovoid heads. Calyx deflexed in fruit ...1. ACROCEPHALUS

1b. Stamens suberect or ascending to upper lip or diverging and projecting straight forward :

6a. Stamens 4, perfect :

7a. Stamens suberect, diverging and distant, equal or subequal, not didynamous. Corolla-limb subbilabiate, 4-lobed :

8a. Stamens subequal; filaments bearded at middle. Floral leaves ovate. Bracteoles present ...12. POGOSTEMON

8b. Stamens equal; filaments not bearded. Floral leaves linear. Bracteoles absent ... 8. MENTHA

7b. Stamens ascending to the upper lip, didynamous. Corolla-limb 2-lipped :

9a. Lower pair of the stamens longer :

10a. Leaves, at least the medium and lower ones, deeply palmatifid or pinnatifid. Calyx-tube 5-nerved ...6. LEONURUS

10b. Leaves simple or shallowly incised. Calyx-tube 10- nerved :

11a. Calyx 5-lobed or 5-toothed. Upper pair of the stamens with 1-celled anthers. Upper-lip not galeate ...3. ANISOMELES

11b. Calyx 8-10-toothed. Both pairs of the stamens with 2-celled anthers. Upper lip galeate :

12a. Calyx-teeth spinescent. Corolla orange, lower lip almost half as long as the upper lip ...5. LEONOTIS

12b. Cayx-teeth not spinescent. Corolla white; lower lip equalling or almost twice as long as the upper lip ...7. LEUCAS

9b. Upper pair of the stamens longer. Calyx tubular, 15-nerved, 5-toothed. Stamens included ...9. NEPETA

6b. Stamens 2; anther-cells linear, separated by an elongated connective ... 13. SALVIA

1. ACROCEPHALUS Benth.

Acrocephalus hispidus (L.) Nicols. & Sivadas. in Taxon 29 : 324. 1980. *Gomphrena hispida* L., Sp. Pl. ed. 2, 326. 1762.

Prunella indica Burm. f., Fl. Ind. 130. 1768.

Ocimum capitatum Roth, Nov. Pl. Sp. 276. 1821.

Acrocephalus capitatus (Roth) Benth., Bot. Reg. 1300, sub t. 1282. 1828-1830; Hook. f. in Hook. f., Fl. Brit. India 4 : 611. 1885; Prain, Bengal Pl. 2 : 844. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 733. 1922.

A. indicus (Burm.f.) O.Kuntze, Rev. Gen. Pl. 2 : 511. 1891; Gamble, Fl. Madras 2 : 1115 (780). 1924; Mukerjee in Rec. Bot. Surv. India 14 : 29. 1940.

Erect, slender, small, annual herb, 10-30 cm tall. Stems simple, sometimes branched from the base, obtusely quadrangular, sparingly pubescent. Leaves elliptic to narrowly lanceolate, acute or subobtuse at apex, narrowed into the petiole at base, coarsely serrate, nearly glabrous, glandular beneath, 1.5-5 × 0.5-2 cm; petioles often obscure due to the decurrent leaf-blade. Flowers borne in terminal subglobose or cylindrical heads of 0.8-1.5 cm across being subtended at base with 2 spreading leaves. Bracts suborbicular, whitish, ciliolate, 3-3.5 mm across. Calyx hairy outside, tubular, 2-2.5 mm long in flower, accrescent to 4.5 mm long in fruit; upper lip linearhoblong, rounded at apex; lower lip wit lanceolate teeth, shorter than upper lip. Corolla white or pale-purple, thinly pubescent, 2.5-3 mm long,

inconspicuously 2-lipped; upper lip shortly 4-lobed, lower lip entire, longer than the upper lip. Stamens epicorolline. Nutlets oblong-ellipsoid, compressed, dark brown, smooth, *ca* 7 × 4 mm in size.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in damp and shady places in forests, grassy localities, on rocks, etc.

Distribution : Throughout India, chiefly in hilly regions. Continental S.E.Asia and Malesia.

Specimens examined : Ghanghree, 1001; Chowparan, 1675.

2. ANISOCHILUS Wall.

Key to the Species

1a. Calyx glabrous or pubescent with minute hairs ...1. *A. carnosus*

1b. Calyx glandular-villous or woolly with long white hairs ... 2. *A. eriocephalus*

1. **Anisochilus carnosus** (L.f.) Wall. ex Benth. in Wall., Pl. As. Rar. 2 : 18. 1831; Hook. f. in Hook. f., Fl. Brit. India 4 : 627. 1885; Prain, Bengal Pl. 2 : 847. 1903; Haines, For. Fl. Chota Nagpur 492. 1910 & Bot. Bihar & Orissa pt. 4 : 733. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 58. 1940. *Lavandula carnosa* L. f., Suppl. Pl. 273. 1781.

Erect, annual herbs, 30-60 cm tall. Stems simple, sometimes slighltly branched, obtusely quadrangular, glabrous or appressed-hairy, dull-pinkish red. Leaves ovate, ovate-oblong or rounded, truncate, rounded or sub-cordate at base, subacute or obtuse at apex, crenate-serrate, rugose, glabrous or verrucose above, pubescent beneath, dotted with orange-red on both surfaces, deciduous, 2 -

6.5 × 0.8-5 cm; petiole 0.6-6.5 cm long, puberulous. Flowers sessile, borne in dense and compact, subglobose to cylindrical terminal spike of 1.5-5 × 1-1.5 cm in size becoming large and strobilate in fruit. Peduncles 5-10 cm long. Bracts ovate, acuminate, similarly dotted as leaves, caducous, *ca* 4 × 3.5 mm. Calyx tubular; tube glabrous or pubescent without, with minute hairs, variable in length, to 4 mm long in flower, to 7 mm long in fruit; upper lip triangular-lanceolate, acuminate, to 2.5 × 2 mm, erect in flower but deflexed in fruit; lower lip reduced. Corolla purple, ± 8 mm long; tube narrowly tubular, pubescent and similarly dotted as leaves; upper lip short, erect, with orbicular lobes; lower oblong, concave, constricted at base. Stamens 4, included in lower lip; filaments glabrous. Style branches subequal, glabrous. Nutlets dark brown, compressed, *ca* 1 mm in diam.

Fl. : Oct.-Jan. *Fr.* : Dec.-Mar.

Ecology : Common; in exposed rocks in the shallow moist soil or in the creeks in full sun.

Distribution : Central & South India. Sri Lanka and Myanmar.

Specimens examined : Telaiya Dam, 627; Hunterganj,1650; Ghanghree, 2158.

Uses : Plant is used as stimulant, expectorant and diaphoretic. Plant-extract is given in liver disorders; also used after mixing with sugar-candy for cough and cold. Leaves are eaten by poor people in villages.

Note : The plant becomes fleshy with age. The red colouration of the stem is the distinctive feature of the plant. The spike becomes strobilus-like, enlarging at maturity.

2. **Anisochilus eriocephalus** Benth. in DC., Prodr. 12 : 81. 1847; Hook. f. in Hook. f., Fl. Brit. India 4 : 627. 1886; Haines, Bot. Bihar & Orissa pt. 4 : 734. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 58. 1940.

A. carnosus (L.f.) Wall. ex Benth. var. *eriocephalus* (Benth.) Cooke, Fl. Bombay Pres. 2 : 451. 1908.

Slender, glabrescent or puberulous, annual herb, 30-60 cm tall. Leaves thick, petiolate, orbicular-ovate, cordate at base, shallowly crenate, puberulous on both surfaces, glandular beneath, 2-5 cm in diam. Spikes ovoid or cylindrical, very dense, on slender peduncles. Calyx glandular-villous or woolly with long white hairs; upper lip broadly ovate, acuminate, deflexed in fruit, concealing the mouth and truncate at lower lip; tube inflated in middle and curved. Corolla pale-lilac.

Fl. & Fr. : Nov.-Feb.

Ecology : Not common; on exposed slopes of rocks.

Distribution : India : Deccan Peninsula, Bihar, West Bengal, Uttar Pradesh.

Specimens examined : Ghanghree, 1049; Hunterganj, 1820.

Uses : Some as those of *A. carnosus* (L. f.) Wall. ex Benth.

3. ANISOMELES R. Br.

Anisomeles indica (L.) O. Kuntze, Rev. Gen. Pl. 2 : 512. 1891; Haines, Bot. Bihar & Orissa pt. 4 : 745. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 152. 1940. *Nepeta indica* L., Sp. Pl. 571. 1753.

A. ovata R. Br. in Ait., Hort. Kew. ed. 2, 3 : 364. 1811; Hook. f. in Hook. f., Fl. Brit. India 4 : 672. 1885; Prain, Bengal Pl. 2 : 853. 1903; Haines, For. Fl. Chota Nagpur 492. 1910.

A. ovata R. Br. var. *mollissima* Prain, Bengal Pl. 2 : 853. 1903.

Erect, annual, suffruticose herbs, to 1.5 m tall. Stems acutely 4-angular, grooved on opposite sides, much-branched, densely soft-pubescent. Leaves membranaceous, ovate, shortly acuminate at apex, deeply crenate-serrate, sparsely pubescent to woolly on both surfaces, truncate-subcordate to cuneate at base, 3-8 × 1.5-4 cm; petioles to 3cm long. Flowers sessile, borne in few to many-flowered verticillasters, the whorls distant below, approximate above in a spicate inflorescence; bracts linear, 4-6 mm long, pilose. Calyx campanulate, 5-angular, 10-nerved, hirsute, 5-6 mm long, accrescent to 1 cm in fruit; teeth equal, triangular-lanceolate, 2-3 mm long. Corolla light purple, 1.5 cm long; tube to 8 mm long; upper lip rounded at apex, glabrous, to 6 mm long; lower lip much longer, 3-lobed, with midlobe laterally compressed and notched, to 1.2 cm long, sericeous within. Filaments hirsute. Nutlets ovoid, subcompressed, black when ripe, 1.5-1.8 mm long.

Fl. : Sept.-Nov. *Fr.* : Dec.-Jan.

Ecology : Very common; in waste lands along roads, by banks of rivers, streams, etc., in partial or full sun on dry hard soil.

Distribution : Throughout India. Sri Lanka, Nepal, China, Japan, Ryu Kyu Islands, Taiwan, Malesia, Bismarck Arch. and Fiji Islands.

Specimens examined : Chowparan, 1368; Bishnugarh, 1935; Hunterganj, 2115.

Uses : Plant is used as astringent and carminative. Oil extracted from the plant is useful in uterine affections.

4. HYPTIS Jacq., *nom. cons.*

Hyptis suaveolens (L.) Poit. in Ann. Mus. Hist. Nat. Paris 7 : 472, t. 29. f. 2. 1806; Hook. f. in Hook. f., Fl. Brit. India 4 : 630. 1885; Prain, Bengal Pl. 2 : 848. 1903; Haines, Bot. Bihar & Orissa

pt. 4 : 736. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 63. 1940. *Ballota suaveolens* L., Syst. Nat. ed. 10, 1100. 1759.

Local name : Wilayati tulsi.

Erect, strongly aromatic, annual-perennial herb or undershrub, 0.5-2.5 m tall. Stems much-branched, obtusely 4-angular, patently hirsute. Leaves firmly herbaceous, broadly ovate, ovate-lanceolate or suborbicular, rounded or subcordate at base, subacute or obtuse at apex, irregularly crenate-serrate to serrulate, sparsely hairy above, densely so beneath, 4-5 × 2-3 cm; petioles 1.5-4 cm long. Flowers borne in lax, 2-5-flowered, secund cymes, arranged racemosely in the axils of smaller leaves towards the ends of branches. Peduncles 0.5-1 cm long. Bracts subulate, 1.5-2 mm long. Pedicels to 5 mm long. Calyx campanulate, hairy, 4.5-6 mm long, accrescent to 1.2cm long and strongly ribbed in fruit; mouth villous; teeth setaceous, *ca* 2 mm long. Corolla blue, 4.5-5 mm long; tube subventricose above, puberulous, 3.5-4 mm long; lobes of upper lip erect; midlobe of lower lip saccate at base. Filaments bearded; anthers purple. Style-branches unequal, spathulate, glabrous. Nutlets 2, dark brown, oblong or ovoid, compressed, sometimes emarginate at tip, rugose, *ca* 4 mm long; aborted or rudimentary nutlets 2.

Fl. : Oct.-Nov. *Fr.* : Nov.-Jan.

Ecology : Very common; in waste places, along roadsides, railway tracks, scrub jungles, etc.

Distribution : India : Deccan Peninsula, Western and Central India, Uttar Pradesh, Bihar, West Bengal, Orissa, Assam, Andaman and Nicobar Isalnds. Native of tropical America, naturalised wildly in all tropical countries, New Ireland, Marianas, Carollines, etc.

Specimens examined : Jhumri Telaiya, 293; Raja Rappa, 460; Chatra, 1666.

Uses : Plant is used as carminative and stimulant. Infusion of plant is used in catarrhal condition, uterus affections and cutaneous diseases. Leaf-juice is used in colic. Root is chewed with betel nut as stomachic and its decoction is used as appetiser.

Note : A much fast-spreading weed in open places near roadsides and railway tracks forming a dense thicket.

5. LEONOTIS R. Br.

Leonotis nepetaefolia (L.) R. Br. in Ait., Hort. Kew. ed. 2, 3 : 409. 1811; Hook. f. in Hook.f., Fl. Brit. India 4 : 691. 1885; Prain, Bengal Pl. 2 : 857. 1903; Haines, For. Fl. Chota Nagpur 493. 1910 & Bot. Bihar & Orissa pt. 4 : 752. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 185. 1940. *Phlomis nepetaefolia* L., Sp. Pl. 586. 1753.

Local name : Hejurchei.

Erect, large annual herb, to 2 m tall. Stems obtusely 4-angular, deeply grooved on opposite sides, finely tomentose. Leaves membranaceous, broadly ovate, truncate or cuneate at base, acute to abruptly acuminate at apex, deeply crenate-serrate, glabrous or finely tomentose above, minutely glandular-punctate beneath, 4-8 × 2-5cm; petioles to 7 cm long. Flowers sessile, borne in distant, globose dense verticillasters of 5-8 cm in diam., composed of several many-flowered cincinni. Floral leaves lanceolate, 1-1.2 cm long, deflexed, spinously tipped. Bracts linear, deflexed, spinously tipped. Calyx tube 1-1.5 cm long, hairy, ribbed, incurved; mouth oblique, 8-10 toothed; teeth spinescent, unequal, posterior one the longest. Corolla orange-red, tubular, 2-lipped, 1.5-2 cm long; tube slender, 1-1.4 cm long, with 3-4 transverse rows of hairs at base within; upper lip arched, densely pilose at back; lower lip 3-lobed, with the midlobe bifid and velutinous. Filaments flattened, minutely bearded towards the base. Ovary *ca* 1 mm across; style-branches unequal, linear. Nutlets oblong-obovoid, trigonous, black, *ca* 3 mm long, truncate.

Fl. & Fr. : Oct.-Jan.

Ecology : Very common; in waste places, along roadsides, river-banks, railway tracks, etc.

Distribution : Throughout the hotter parts of India. Native of tropical Africa, naturalised in many parts of the Tropics.

Specimens examined : Hazaribagh, 26; Chatra, 1084; Pratappur, 2091.

6. LEONURUS L.

Leonurus sibiricus L., Sp. Pl. 584. 1753; Hook. f. in Hook. f., Fl. Brit. India 4 : 678. 1885; Prain, Bengal Pl. 2 : 854. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 746. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 193. 1940; Keng in Gard. Bull. Singapore 24 : 98, f. 16. 1969 & in Steenis, Fl. Males. ser. 1, 8 : 336. 1978.

L. tataricus Burm. f., Fl. Ind. 127. 1768, non L. 1753; Roxb., Fl. Ind. 3 : 8. 1832.

L. japonicus Houtt., Nat. Hist. Pl. 9 : 366, t. 57. f. 1. 1779; Hara in J. Jap. Bot. 51 : 226. 1976; Press in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 157. 1982.

Local name : Guma.

Annual herbs, 60-150 cm tall. Stems obtusely quadrangular, grooved on opposite sides,softly pubescent. Lower leaves chartaceous, broadly ovate in outline, palmate-pinnately partite or dissected with linear incised segments, truncate at base, 3.5-10 cm long; upper leaves narrower, with lobes less divided; all glabrescent above, often glaucous and finely pubescent on nerves beneath; petiole

4 cm long. Bracts subulate or spinescent, 4-5 mm long. Calyx puberulous,4-5 mm long in flower, accrescent to 6-7 mm in fruit; teeth subulate. Corolla pink or red, puberulous, 1-1.3 cm long; upper lip obovate, densely pubescent on back; midlobe of lower lip obcordate, pubescent. Filaments included; anthers glandular. Nutlets ellipsoid, brown, *ca* 2 mm long.

Fl. : Sept.-Nov. *Fr.* : Dec.-Jan.

Ecology : Common; waste lands, along roadsides, river banks, railway tracks, etc.

Distribution : India : West Bengal, Bihar, Orissa, Assam, Western Peninsula and elsewhere in the hotter parts of India. Native of temperate Asia, now distributed in many warm and tropical countries.

Specimens examined : Hunterganj, 947; Bishnugarh, 1932.

Uses : Plant is used as tonic, and also employed in menstrual disorders. Leaves and roots are used as febrifuge. Leaf-extract is effective for uterus contraction.

Note : Here, the treatment of Keng (*l.c.*) is followed in adopting *L. sibiricus* L. as the correct name for this taxon and *L. japonicus* Houtt. as its synonym. However, Hara (*l.c.*) and Press (*l.c.*) considered *L. sibiricus* and *L. japonicus* as two distinct species and accepted *L. japonicus* as the correct name and *L. sibiricus* is misidentification for the present taxon. According to Hara, *L. japonicus* is distributed in Amur, Ussuri, Korea, Japan, China, Tibet, India and Malesia, whereas *L. sibiricus* in Siberia, Mongolia, to N. China. *L. sibiricus* differs from *L. japonicus* in the more finely dissected linear leaf-segments, comparatively larger corolla with soft hairs externally, lower corolla-lip being about 1/3 shorter than upper one and calyx being covered with soft hairs. Keng suggested that as these differences are no more than ecotypical, therefore, there is no justification of making any specific distinction unless some new traits are discovered in future to support the segregation into two species.

7. LEUCAS R. Br.

Key to the Species

1a. Calyx-tube curved, with an oblique mouth:

2a. Calyx-mouth glabrous within. Verticillasters both axillary and terminal ...1. *L. aspera*

2b. Calyx-mouth hairy within. Verticillasters exclusively terminal ... 2. *L. cephalotes*

1b. Calyx-tube ± straight; mouth not oblique, glabrous within ... 3. *L. flaccida*

1. **Leucas aspera** (Willd.) Link, Enum. Hort. Berol. 2 : 113. 1822; Hook. f. in Hook. f., Fl. Brit. India 4 : 690. 1885; Prain, Bengal Pl. 2 : 855. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 751. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 166. 1940. *Phlomis aspera* Willd., Enum. Hort. Berol. Handl. 2, 2 : 716. 1809.

Local name : Chota halkusa.

Annual, erect or diffuse herb, 30-60 cm tall. Stems much branched from below, obtusely quadrangular, hispid with spreading hairs. Leaves membranaceous, linear-lanceolate or narrowly oblong to elliptic, cuneate at base, acute-subacuminate at apex, remotely crenate or entire, thinly pubescent on both surfaces, 3-6 × 0.4-0.8cm; petiole 3-5 mm long, densely hispid. Flowers subsessile, borne in terminal and axillary dense-flowered verticillasters; terminal ones together forming a globular head of 2-2.5 mm across. Bracts lanceolate, ciliate on margins, 0.8-1.2 cm long. Calyx tubular with oblique mouth, 0.7-1 cm long, slightly accrescent in fruit, ribbed and scabrid above, smooth below, contracted above the middle; teeth 10, triangular, the posterior one longest. Corolla white, curved, with a ring of hairs inside near middle; upper lip velutinous, *ca* 2.5 mm long; lower lip sparsely pubescent, 6-7 mm long. Anthers red. Nutlets black, *ca* 3 × 1 mm.

Fl. & Fr. : June-Dec.

Ecology : In waste places, railway embankments, waysides, fallow fields, etc.

Distribution : Almost throughout the plains of India. Myanmar, Bangladesh, Indochina, Malesia and Mauritius.

Specimens examined : Ramgarh, 545; Morkachho, 1475; Katkamosandi, 1730.

Uses : Plant is used as pot-herb. Leaf-juice is applied externally in psoriasis, skin eruptions and swellings. Flowers are given with honey for coughs and colds.

2. **Leucas cephalotes** (Roth) Spreng., Syst. 2 : 743. 1825; Hook. f. in Hook. f., Fl. Brit. India 4 : 689. 1885; Prain, Bengal Pl. 2 : 856. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 750. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 168. 1940. *Phlomis cephalotes* Roth, Nov. Sp. 262. 1821.

Local names : Dhurpi sag, Deldona.

Erect, annual herb, 15-60 cm tall. Stems simple or branched, obtusely quadrangular, patently hairy. Leaves membranous, shortly petioled, elliptic-lanceolate, cuneate at base, subacute at apex, crenate-serrate, substrigosely hairy above, softly hairy and gland-punctate beneath, 3-8 × 1-4 cm. Petioles 0.5-1.5 cm long. Flowers sessile, borne in dense, terminal globose whorls of 2.5-5 cm in diam., surmounted by a pair of leaves. Bracts involucrate, lanceolate, acuminate, ciliate, awned, 1.2-1.5 × 0.3-0.35 cm. Calyx tubular, slightly curved, hairy above, with villous mouth, 10-ribbed, 1-1.2cm long; teeth sub-aristate, hispidulous, *ca* 0.25 cm long. Corolla white, 1.5-2 cm long; tube shortly exserted; lower lip slightly longer than the densely white-bearded upper lip. Nutlets smooth, brown, 0.3-0.35 cm long.

Fl. & Fr. : Sept.-Dec.

Ecology : Very common; in dried rice-fields, grassy waste places, along roadsides, railway tracks, etc.

Distribution : Throughout India including Himalaya. Bhutan, Bangladesh, Pakistan, Afganistan.

Specimens examined : Hazaribagh, 210; Ichak, 331; Ramgarh, 541.

Uses : Plant is used as pot-herb; also used as stimulant, diaphoretic, laxative and anthelmintic. Flower-extract is used for coughs and colds.

3. **Leucas flaccida** R. Br., Prodr. 505. 1810; Hook. f. in Hook. f., Fl. Brit. India 4 : 684. 1885; Mukerjee in Rec. Bot. Surv. India 14(1) : 179. 1940; Keng in Gard. Bull. Singapore 24 : 107. 1969 & in Steenis, Fl. Males. ser. 1, 8 : 340. 1978.

L. mollissima Wall. ex Benth. in Wall., Pl. As. Rar. 1 : 62. 1830; Hook. f. in Hook. f., Fl. Brit. India 4 : 682. 1885; Prain, Bengal Pl. 2 : 856. 1903; Haines, For. Fl. Chota Nagpur 493. 1910; Mukerjee in Rec. Bot. Surv. India 14(1) : 183. 1940; Keng in Gard. Bull. Singapore 24 : 106. 1969.

L. montana Spreng. var. *mollissima* (Wall. ex Benth.) Haines, Bot. Bihar & Orissa. pt. 4 : 748. 1922.

Straggling or ascending, much-branched from base, diffuse, annual herb, 30-150 cm long. Stems slender, obtusely quadrangular, softly appressed-hairy, with long internodes. Leaves membranaceous,

shortly petioled, ovate or ovate-lanceolate, rounded, subcordate or cuneate at base, subacute or obtuse at apex, crenate-serrate, appressed-tomentose above, villous beneath, 2-6 × 1.5-5 cm; petioles 3-7 mm long. Verticillasters 6-15-flowered, distant. Pedicels 1.5-2 mm long. Bracts filiform, setose, 3-3.5 mm long. Calyx broadly campanulate, ± straight, 7-8 mm long, densely tomentose without; teeth 10, nearly equal, lanceolate, narrowed at apex; throat glabrous. Corolla white, 1.2-1.5 cm long; tube linear, sparsely villous within above the middle; upper lip densely villous; lower lip orbicular-spathulate, slightly longer than the upper lip. Filaments white; anthers red. Nutlets obovoid, subtruncate above, smooth, brown, 1.5-2 mm long.

Fl. & Fr. : Nov.-Feb. and June-Aug.

Ecology : Common; in rocky places of the forests, waste grounds, grassy localities, fields, along roadsides, etc.

Distribution : India : Subtropical Himalaya, Uttar Pradesh, Bihar, West Bengal, Orissa, Central and Western India and Western Peninsula. Continental S. and S.E.Asia, Formosa, Ryu Kyu Islands, Malesia and N.E. Australia.

Specimens examined : Raja Rappa, 372; Jaynagar, 1520; Hunterganj, 2111.

Use : Leaves are eaten as a pot-herb.

Note : Previously, *L. mollissima* Wall. ex Benth. and *L. flaccida* R. Br. were considered as two distinct allied species which differed mainly in the indumentum of calyx and length of corolla - tube. On close examination of different materials, Keng (*l.c.*) had come to decide the fact that they are conspecific. As the species is very widely distributed, there exist its different ecological forms. As such, according to him, the oldest name *L. flaccida* R. Br. is to be used.

8. MENTHA L.

***Mentha piperita** L., Sp. Pl. 576. 1753; Hook. f. in Hook. f., Fl. Brit. India 4 : 647. 1885.

Decumbent-ascending or erect, strongly aromatic, perennial herb, with subterraneous or superterraneous stolons. Stems 4-angular, suffused with dark purple, glabrous. Leaves ovate-lanceolate, sub-cuneate to rounded at base, acute at apex, serrate, glabrous on both surfaces, gland-punctate, 2-5 × 1.5-2.5 cm; petiole 0.6-1 cm long. Verticillasters combined into a terminal interrupted inflorescence of 10-30 cm long. Pedicels 1-1.5 mm long. Calyx 2.8-3 mm long, glabrous, 13-nerved, gland-punctate. Corolla pale-purple or pink, 3.5-4 mm long; lobes gland-punctate.

Fl. & Fr. : Mar.-Oct.

Ecology : Common; in marshy places, along margins of streams, irrigation canals, etc.; also cultivated in gardens and houses.

Distribution : India : Major parts of India, but chiefly in Maharashtra, Kashmir, Punjab and Uttar Pradesh. Native of Europe, naturalised in different tropical and subtropical countries of the World.

Specimens examined : Hazaribagh, 1435; Patratu, 1736.

Uses : Leaves are used for flavouring purposes. Oil, extracted from leaves, is used in perfume and soap industries; also used medicinally as carminative, stimulant and for allaying nausea, sickness and vomiting.

9. NEPETA L.

Nepeta hindostana (Roth) Haines, Bot. Bihar & Orissa pt. 4 : 744. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 133. 1940. *Glechoma hindostana* Roth, Nov. Pl. Sp. 259. 1821.

Nepeta ruderalis Buch.-Ham. ex Benth. in Wall., Pl. As. Rar. 1: 64. 1829; Hook f. in Hook. f., Fl. Brit. India 4 : 661. 1885; Prain, Bengal Pl. 2 : 857. 1903.

Erect or decumbent-ascending annual herbs, to 45 cm tall. Stems obtusely quadrangular, grooved, often branched from the base, finely pubescent. Leaves ovate-rounded or subreniform, subcordate, rounded or truncate at base, obtuse at apex, crenate, hoary-pubscent, 1-5 × 1-4.5 cm; petioles 0.5-2 cm long. Flowers pedicellate, borne in axillary, long-pedunculate, often 2-branched, many-flowered cymes aggregated at the top of the stem into dense racemes or panicles. Peduncles 0.5-2.5 cm long. Bracts linear-lanceolate, densely ciliate, 2.5-3 mm long. Pedicels 1-1.5 mm long. Calyx 3.5-4.5 mm long in flower, villous, sub 2-lipped; upper lip with 3 triangular aristate teeth, 2.5 mm long; lower lip with 2 filiform subulate teeth, 1.5 mm long. Corolla bluish or purplish, hairy outside, 6-7 mm long; tube inflated at the throat; upper lip *ca* 1.5 mm long, 2-fid with obtuse lobes; lower lip *ca* 3 mm long, with large emarginate and obtusely crenulate midlobe and narrow paler-coloured 2-fid side-lobes. Longer stamens slightly exceeding the upper lip. Nutlets oblong-elllipsoid, light brown, 0.6-0.7 mm long, mucilagenous when moistened.

Fl. & Fr. : Mar.-June.

Ecology : Very common; in grassy, damp and shady waste places, along bank of rivers, roadsides, along railway tracks, etc.

Distribution : India : West Bengal, Bihar, Uttar Pradesh, Kumaon, N.W.Fr. Province, Himalaya, Rajputana, Concan. Bangladesh, Afganistan.

Specimens examined : Ghanghree, 1011; Hazaribagh, 1590; Jhumri Telaiya, 2215.

Uses : Plant is used as cardiac tonic and febrifuge. Decoction of plant is used as gargle.

Note : A strongly aromatic herb, very variable in habit, degree of hairiness, shape and size of leaves and nature of inflorescence.

10. OCIMUM L.

Key to the Species

1a. Pedicels as long as the calyx, finally curved patent, almost transverse to the rachis ... 3. *O. tenuiflorum*

1b. Pedicels shorter than the calyx, finally bent upright, appressed against the rachis :

2a. Corolla 0.7-0.9 cm long, white or violet. Fruiting calyx 0.5-0.9 cm long ...2. *O. basilicum*

2b. Corolla 0.5-0.6 cm long, white. Fruiting calyx 0.4-0.6 cm long ... 1. *O. americanum*

1. **Ocimum americanum** L., Cent. Pl. 1 : 15. 1755; Backer & Bakh. f., Fl. Java 2 : 640. 1965; Keng in Gard. Bull. Singapore 24 : 126. 1969 & in Steenis Fl. Males. ser. 1, 8 : 377. 1978.

O. africanum Lour., Fl. Cochinch. 370. 1790.

O. canum Sims in Curtis Bot. Mag. 51, t. 2452. 1823; Hook. f. in Hook. f., Fl. Brit. India 4 : 607. 1885; Prain, Bengal Pl. 2 : 843. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 728. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 17. 1940.

Local names : Tukmaria, Kala tulsi.

Erect, annual herbs, 30-60 cm tall. Stems much branched, subquadrangular, grooved, glandular-pubescent. Leaves membraneous, oval-lanceolate to elliptic-lanceolate, rounded or cuneate at base, acute at apex, entire to shallowly toothed, gland-dotted, sparsely scaberulous above, pilose along nerves beneath, 2.5-4 × 1-1.5 cm; petiole 1.2-2.5 cm long, hairy. Flowers shortly pedicelled, borne in 5-6-flowered, rather close verticillasters being combined into a simple or branched racemes of 7-15 cm long. Bracts elliptic-lanceolate, ciliate, 2.5-3.5 mm long. Pedicels recurved, closely appressed to rachis, 1.8-2 mm long. Calyx campanulate, pubescent, 2-2.5 mm long in flower, accrescent to 4-6 mm long in fruit, conspicuously gland-dotted; upper lip suborbicular, shortly mucronate, ciliate; lower lip with lanceolate-subulate teeth, two central teeth sharply pointed, longer than lateral two and exceeding the upper lip. Corolla white, 5-6 mm long; tube glabrous; upper lip ovate-oblong, villous at back, 4-toothed; lower lip oblong, longer than upper. Filaments exserted, the posterior ones with appendages at base. Nutlets oblong-ellipsoid, black when ripe, 1.2-1.3 mm long, swelling in water.

Fl. & Fr. : Aug.-Mar.

Ecology : Common; in roadsides, arable lands, open waste places, forest edges, etc.

Distribution : India : N.W.India, Gujarat, Maharashtra, throughout S. India (except Nilgiris), Central India, Uttar Pradesh, Bihar, West Bengal, Orissa, Assam, Meghalaya, Tripura, Nicobar Islands. Continental S.E.Asia and tropical Africa.

Specimens examined : Bishnugarh, 189; Hazaribagh, 1725; Satgaon, 2231.

Uses : Seeds are diuretic and tonic and used in preparation of cooling drink. Fragrant leaves are used in sauces, soups and salads. An oil, extracted from the plant, is used in soaps and cosmetics.

Note : Here, the treatment of Keng (*l.c.*) is followed in adopting *O. americanum* L. as the correct name of this taxon and *O. canum* Sims as its synonym. Mukerjee (*l.c.*), however, adopted *O. canum* Sims as the correct name and kept *O. americanum* L. as its synonym. Morton (in J. Linn. Soc. Bot. 58 : 234. 1962) , althogh accepted *O. canum* Sims as the correct name but placed *O. americanum* L. under *O. basilicum* L. Cramer (in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 115. 1981) entirely followed Morton's treatment.

2. **Ocimum basilicum** L., Sp. Pl. 833. 1753; Hook. f. in Hook. f., Fl. Brit. India 4 : 608. 1885; Prain, Bengal Pl. 2 : 843. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 728. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 63. 1940.

Erect, annual herb, 20-45 cm tall. Stems much branched, obtusely quadrangular and hispidly hairy in upper part, subterete and glabrous in lower part. Leaves membranaceous, ovate-elliptic, cuneate at base, acute at apex, subentire-serrate, puberulous above, appressed-pubescent beneath, gland-punctate, 3-6 × 1-2.5 cm; petioles 1 - 2 cm long. Flowers borne in 6-10 - flowered verticillasters being combined into recemes or panicles of 10-20 cm long; pedicels hairy 2-3 mm long. Calyx hairy outside, 2.5-3 mm long, accrescent to 5 - 9 mm long in fruit; upper lip broadly ovate-orbicular; lower lip 4-toothed; two central teeth longer than upper lip and sharply pointed. Corolla white, 0.7-0.1 cm long; upper lip slightly saccate; lower lip sericeous outside. Posterior filaments with transverse process of tufted hairs. Nutlets ellipsoid, black, 1.5-2 mm long, swelling in water.

Fl. : Oct.-Dec. *Fr.* : Nov.-Feb.

Ecology : Common; in open waste places near villages, roadsides, etc.; also cultivated in gardens, houses, near Hindu temples, etc.

Distribution : Throughout the tropical parts of India. Widespread in Old World Tropics.

Specimens examined : Ichak, 2402; Hazaribagh, 1485; Jhumri Telaiya, 1117.

Uses : The nutlets, which swell and become gelatinous in water, are added to cool sweet drinks. They are also used as stimulant and diuretic and for gonorrhoea, diarrhoea, dysentery and constipation. Leaves are used in a decoction as a carminative and stimulant and as a remedy for coughs, in washing ulcers, and for hiccups. Roots are used for bowel complaints of children.

3. **Ocimum tenuiflorum** L., Sp. Pl. 597. 1753; Keng in Steenis, Fl. Males. ser. 1, 8 : 378. 1978.

O. sanctum L., Mant. Pl. 1 : 85. 1767; Hook. f. in Hook. f., Fl. Brit. India 4 : 609. 1885; Prain, Bengal Pl. 2 : 843. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 729. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 19. 1940; Keng in Gard. Bull. Singapore 24 : 130. 1969; Carmer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 116. 1981.

Local name : Tulsi.

Erect, annual-perennial undershrub, 30-60 cm tall. Stems much-branched, obtusely quadrangular, densely hirsute with reddish-purple hairs above, glabrous and woody below. Leaves membranaceous, oval-oblong, cuneate at base, obtuse or subacute at apex, undulate and distantly and coarsely serrate, pubescent and gland-dotted on both surfaces especially on nerves beneath, 2.5-5×1-3.5 cm; petiole 1.2-2.5 cm long, hairy. Verticillasters in slender racemes or panicles of 8-15 cm long. Pedicels 3-4 mm long. Bracts ovate, acuminate, ciliate, 2.5-3 mm long. Calyx campanulate, *ca* 2.5 mm long, accrescent to 3.5 mm in fruit; tube *ca* 3 mm long, densely gland-dotted; upper lip obovate, hispid, apiculate, reflexed in fruit; lower lip longer than upper, 4 - toothed, the central 2 teeth with long slender awns and 2 lateral teeth with short straight awns. Corolla white, 3.5-4 mm long; tube 2-2.5 mm long; lobes of upper lip oblong - orbicular, puberulous without, lower lip ovate - oblong, sericeous. Filaments of upper stamens bearded at base. Nutlets ellipsoid, minutely warty, smooth, dark brown, 1-1.2 mm long, swelling in water.

Fl. & Fr. : Oct. Jan.

Ecology : Very common; cultivated as a sacred plant in houses, in and around religious temples; also met with as an escape in waste places, roadsides, grassfields, etc.

Distribution : Throughout India including Himalaya; possibly a native of tropical Asia, now pantropical.

Specimens examined : Koderma, 994; Hazaribagh, 1691; Mandu, 2047.

Uses : The extract of leaves and inflorescences is used as a remedy in cough and bronchitis. Decoction of roots is given as a diaphoretic in malarial fevers.

Note : Here, the treatment of Keng (*l.c.*) is followed in adopting. *O. tenuiflorum* L. (1753) as the correct name of this taxon and *O. sanctum* L. (1967) as its synonym. Keng pointed out that it was first Bentham (Lab. Gen. Sp. 11. 1832) and then Merrill (Int. Rump. 461. 1917) who had come to decide the fact that *O. tenuiflorum* and *O. sanctum* are conspecific. There occur diferent forms of this species. According to Domin (Bibl. Bot. 22, Heft. 89 : 1116. 1929), the commonest form has a purple calyx and corolla, few have a green calyx and purple corolla and others have green calyx and white corolla. Mukerjee (*l.c.*) adopted *O. sanctum* as the correct name and kept *O. tenuiflorm* as synonym. Cramer (l.c.) followed Mukerjee in considering the former as the correct name but did not keep the latter as synonym under it.

11. PLECTRANTHUS L'Herit., *nom. cons.*

Key to the Species

1a. Calyx distinctly 2-lipped; upper lip short, entire; lower with 4 acutely pointed teeth, the lower 2 larger than lateral 2. Corolla lilac or purplish-blue, 0.6-0.8 cm long ... 1. *P. mollis*

1b. Calyx shortly and subequally 5-toothed or indistinctly 2-lipped; teeth obtuse. Corolla white with purple spots, 0.45-0.5 cm long. ... 2. *P. striatus*

1. **Plectranthus mollis** (Ait.) Spreng. in L., Syst. Veg. ed. 16, 2: 690. 1825; Santap., Fl. Khandala ed. 3, 216. 1667. *Ocimum molle* Ait., Hort. Kew, 2 : 322. 1789.

P. incanus Link, Enum. Hort. Berol. Alt. 2 : 120. 1822; Hook. f. in Hook. f., Fl. Brit. India 4 : 621. 1885; Prain, Bengal Pl. 2 : 846. 1903; Haines, For. Fl. Chota Nagpur 491. 1910 & Bot. Bihar & Orissa pt. 4 : 735. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 47. 1940.

Erect, softly pubescent, annual herbs, 30-75 cm tall. Stems branched, obtusely quadrangular, scarcely grey, tumid below the nodes, thick and fleshy below. Leaves chartaceous, often succulent, broadly ovate, deeply cordate at base, acute or subacuminate at apex, doubly crenate-serrate, glabrous or slightly pubescent above, gland-punctate beneath, 5-11 × 3.5-10 cm; petiole 2-8 cm long. Flowers borne mostly in opposite, peduncled, 2-flowered cymes in the axils of bracts arranged in lax terminal racemes or panicles of 8-20 cm long; bracts ovate, green, 4-6 mm long; pedicels 3-5 mm long in flower, lengthened to 1 cm in fruit, finely pubescent. Calyx distinctly 2-lipped, 3-4 mm long, conspicuously pubescent on nerves; upper lip ovate-rounded, errect, entire, much shorter than lower lip; lower lip 4-toothed, two lower longer than two lateral. Corolla lilac or purplish-blue, white-pubescent, slightly decurved, 6-8 mm long; tube slightly decurved; upper lip shallowly lobed; lower lip boat-shaped, 4-5 mm long, sparsely hirsute outside. Nutlets subglobose, pale-brown, 2-2.5 mm across. Fruiting Calyx to 1 cm long, lower lip with long pointed teeth.

Fl. : Aug.-Sept. *Fr.* : Sept.-Oct.

Ecology : Very common; in waste lands, along roadsides, near villages under shade, among rocks on exposed slopes, etc.

Distribution : Almost throughout India, particularly in the hilly parts, Himalaya; Nepal, Sri Lanka.

Specimens examined : Hazaribagh, 3; Simaria, 807; Jaynagar, 1492.

Uses : Crushed leaves are used to stop bleeding and as a febrifuge; also used as mosquito-repellent. Leaves and flowering tops yield an oil which is used as respiratory stimulant.

*2. **Plectranthus striatus** Benth. in Wall., Pl. As. Rar. 2 : 17. 1830-1831; Hook. f. in Hook. f., Fl. Brit. India 4 : 618. 1885; Mukerjee in Rec. Bot. Surv. India 14(1) : 43. 1940.

P. gerardianus Benth. in Wall., Pl. As. Rar. 2 : 17. 1830-1831; Hook. f. in Hook. f., Fl. Brit. India pt. 4 : 617. 1885.

P. gerardianus Benth. var. *brachyantha* Hook. f. in Hook. f., Fl. Brit. India 4 : 618. 1885.

P. stocksii Hook. f. in Hook. f., Fl. Brit. India 4 : 618. 1885; Mukerjee in Rec. Bot. Surv. India 14(1) : 43. 1940.

Erect or decumbent-ascending, annual herbs, 30-60 cm tall. Stems simple below, often rooting at the base, branched in upper part, quadrangular, often tinged with reddish-brown, short-hairy. Leaves thinly membranous, broadly ovate, rounded-subcordate or shortly cuneate at base, acute or subacuminate at apex, crenate, thinly hairy above, glabrous or only hairy along nerves beneath, pale-green beneath, 3-10 ×1-6 cm; upper leaves sessile, lower ones on 5-25 mm long petiole. Flowers small, borne in few-flowered cymes, combined into a slender, short-hairy panicles, 15-25 cm long. Bracts ovate-lanceolate, acute. Pedicels 3-6 mm long. Calyx shortly 5-toothed or indistinctly 2-liped, 2-2.5 mm long, accrescent to 4.5 cm in fruit, short-hairy, gland - punctate; teeth ovate, obtuse. Corolla

white with purple spots, 4.5-5 mm long; tube straight; limb gland-punctate, throat purple-doted. Stamens exserted. Nutlets oblong-ellipsoid, glabrous, yellowish brown, 1 mm long.

Fl. & Fr. : Oct. - Jan.

Ecology : Common; along banks of rivers and streams; moist and shady waste places; also cultivated in gardens.

Distribution : Almost throughout India including temperate Himalaya: Bhutan, Myanmar, Indo-China.

Specimens examined : Ghanghree, 1308; Hazaribagh , 2064.

12. POGOSTEMON Desf.

Pogostemon benghalensis (Burm. f.) O. Kuntze, Rev. Gen. Pl. 2 : 517. 1891; Santap. in Rec. Bot. Surv. India (Fl. Khandala ed. 3) 16(1) : 217. 1967. *Origanum benghalense* Burm. f., Fl. Ind. 128, t. 38. f. 3. 1768.

P. plectranthoides Desf. in Ann. Mus. Nat. Hist. Paris 2 : 156, t. 6. 1808; Hook. f. in Hook. f., Fl. Brit. India 4 : 632. 1885; Prain, Bengal Pl. 2 : 849. 1903; Haines, For. Fl. Chota Nagpur 490. 1910 & Bot. Bihar & Orissa pt. 4 : 737. 1922; Mukerjee in Rec. Bot. Surv. India 14(1) : 69. 1940.

Erect, aromatic, much-branched, annual-perennial undershrubs, 1.2-1.8 cm high. Stems hoary-pubescent, obtusely quadrangular, often dart-purple, glabrous downwards. Leaves ovate to ovate-lanceolate, cuneate at base, acute or subacuminate at apex, doubly serrate, glabrous or thinly pilose, 5-12 × 2-7 cm; petiole 0.5-3 cm long. Verticillasters combined into paniculate spikes of about 12 cm long, conspicuously white-tomentose. Bracts ovate-lanceolate, ciliate, glandula - pubescent, 0.6-

1 cm long; bracteoles membranous, falcate-lanceolate, pubescent, 4-6 mm long. Calyx slightly obconic, glandular-pubescent, 3.5-4 mm long; lobes subequal. Corolla purple, gland-punctate, 5-6 mm long; limb obscurely 2-lipped; lower lip narrow, entire; upper lip 3-lobed, middle lobe narrower and longer than 2 lateral lobes. Stamens unequal, 2 longer. Nutlets ellipsoid-ovoid, smooth, shining, brown-black when ripe, 0.7-0.8 mm long.

Fl. : Jan.-Feb. *Fr.* : Mar.-Apr.

Ecology : Very common; in waste places, along roadsides; forest edges, scrub jungles, etc.

Distribution : Western Himalaya, Punjab, Himachal Pradesh, Uttar Pradesh, Bihar, Central and Western India, Deccan Peninsula, Orissa, West Bengal; Nepal, Bangladesh.

Specimens examined : Ichak, 327; Rajderwa (National Park), 2033; Pratappur, 2071.

Uses : Leaf-juice is used in colic and as a febrifuge. Roots are used as stimulant and antihaemorrhagic. Ashes of leaves are used as manure for paddy crop.

13. SALVIA L.

Salvia plebeia R. Br., Prodr. 501. 1810; Hook. f. in Hook. f., Fl. Brit. India 4 : 655. 1885; Prain, Bengal Pl. 2 : 859. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 744. 1922 ('plebeja'); Mukerjee in Rec. Bot. Surv. India 14(1) : 111. 1940.

S. brachiata Roxb., Fl. Ind. 1 : 146. 1820.

Erect, annual-biennial herbs, 15-60 cm tall. Stems branched in the upper part, obtusely quadrangular, grooved, glandular-pubescent. Leaves membranceous, oblong to oblong-lanceolate, cuneate at base, subacute

or obtuse at apex, crenate, rugose, nearly glabrous, hairy along the nerves beneath, gland-punctate, 1.5-3 × 0.6-15. cm; petioles 2-4 cm long. Pseudo-racemes terminal and in upper leaf-axils, often forming large panicles. Flowers 4-10 in a verticillaster, bracts linear-spathulate, 2.5-3mm long; pedicels 1.5-2 mm long, hairy. Calyx campanulate, 2.5-3 mm long, to 5 mm in fruit, glandular hairy; lower lip 2-toothed with triangular teeth; upper lip entire, shorter than the lower, decurrent on the tube. Corolla white, 4-5 mm long, with a ring of hairs within throat, upper lip oblong, obtuse, 2-toothed; mid-lobe of lower lip exceeding the lateral ones. Nutles ovoid, rugose, brown, 0.8-1 mm long.

Fl. & Fr. : Feb.-Apr.

Ecology : Very common; in fallow agricultural fields, along banks of ponds, jheels, roadsides, forest edges, thickets, waste places, etc.

Distribution : Throughout India; Continental S.E.Asia to Australia.

Specimens examined : Hazaribagh,714; Ghanghree, 2153; Barkattwa, 2353.

Uses : Mucilagenous leaves are used in menorrhagia, diarrohoea and hemorrhoids. Plant is diuretic and anthelmintic. Tribals use the mucilaginous plant-extract to hair to make glossy.

105. OLEACEAE

Key to the Genera

1a. Fruits baccate. Seeds erect. Mostly scandent shrubs or undershrubs ... 1. JASMINUM

1b. Fruits capsular. Erect shrubs or trees :

2a. Capsule woody, obovoid or pyriform, loculicidal. Leaves imparipinnate. Seeds pendulous, winged ... 3. SCHREBERA

2b. Capsule thin-walled, compressed. Leaves simple. Seeds erect, not winged ... 2. NYCTANTHES

1. JASMINUM L.

Key to the Species

1a. Leaves all simple :

2a. Calyx pubescent :

3a. Calyx-teeth in flower twice the length of tube or longer :

4a. Leaves nearly glabrous. Cymes 3-5-flowered. Bracts linear-subulate ... 6. *J. sambac*

4b. Leaves pubescent. Cymes many-flowered. Bracts foliaceous ... 5. *J. multiflorum*

3b. Calyx-teeth in flower less than twice the length of tube. Cymes 12-20-flowered. Bracts linear ... 3. *J. arborescence*

2b. Calyx glabrous. Cymes many-flowered ... 3. *J. cordifolium*

1b. Leaves compound :

5a. Leaflets usually 3, lateral ones very small, less than one-fourth the length of terminal leaflet, or sometimes wanting. Calyx-teeth minute, under 0.1 cm long, or 0 ... 2. *J. auriculatum*

5b. Leaflets 5-7 (9), lateral ones more than three-fourth the length of terminal leaflet. Calyx-teeth c. 0.6 cm or more long ... 4. *J. grandiflorum*

1. **Jasminum arborescens** Roxb., Fl. Ind. 1 : 94. 1820; Clarke in Hook. f., Fl. Brit. India 3 : 594. 1882; Prain, Bengal Pl. 2 : 658. 1903; Haines, For. Fl. Chota Nagpur 415. 1910 & Bot. Bihar & Orissa pt. 4 : 525. 1922.

Local names : Bela, Chameli.

Suberect with a thick trunk or scandent shrubs. Young branches pubescence. Leaves simple, broadly ovate, rounded or subcordate at base, acute or acuminate at apex, pubescent when young, glabrous with age, 8-12 × 3.5-5 cm; petiole 0.7-1.2 cm long. Cymes trichotomous, lax, 12 to 20-flowered. Bracts linear, 5-7 mm long. Pedicels 0.5-1.2 cm long. Calyx hairy; teeth linear, subclavate, 2.5-4 mm long; basal sinus wide. Corolla white; tube 1-1.2 cm long; petals usually 6, linear or narrow-oblong, acuminate, 1.2-1.8 cm long. Berry of only solitary carpel, ellipsoid, asymmetric, black, 1-1.2 × 0.6-0.7 cm.

Fl. : Apr.-Jun. *Fr.* : Jun.-Aug.

Ecology : Common; in deciduous forests.

Distribution : India : Tropical north-west Himalaya, Bihar, Orissa, Central India and Deccan Peninsula, Sri Lanka.

Specimens examined : National Park, 967; Ghanghree, 1700.

Uses : Juice of leaves is used in bronchial obstruction. Leaves are astringent, stomachic and tonic.

2. **Jasminum auriculatum** Vahl, Symb. Bot. 3 : 1. 1794; Clarke in Hook. f., Fl. Brit. India 3 : 600. 1882; Prain, Bengal Pl. 1 : 659. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 525. 1922.

Local name : Juhi.

Scandent shrub, pubescent or villous, sometimes nearly glabrous. Leaves 3-foliolate, 2 lateral leaflets very small, less than one-fourth the length of terminal leaflet, sometimes wanting, the terminal leaflet broadly ovate, or sometims orbicular, rounded or truncate at base, acute or obtuse and mucronate at apex, entire, pubescent on nerves beneath and quite glabrescent when young, 1.5-5 × 1-3 cm, petiole to 3 mm long. Cymes terminal, compound, many-flowered. Flowers 1-1.2 cm in diam when spreading; bracts linear, 3.5-4 mm long; pedicels 4-5 mm long. Calyx-teeth minute, narrowly oblong, 0.5-0.7 mm, puberulous, sometimes o. Corolla glabrous; tube 5-6 mm long. Berry globose, black, 5-6.5 mm in diam.

Fl. : Apr.-Aug. *Fr.* : Dec.-Feb.

Ecology : Common; cultivated in gardens and houses as an ornamental, also found to grow wildly in scrub-jungles of foot-hills.

Distribution : India : West Bengal, Bihar, Orissa, Deccan Peninsula, north-west India, Sri Lanka, Bangladesh, Siam, Mauritius, Pakistan.

Specimens examined : National Park, 434; Chatra, 1844.

Uses : Flowers are used for the production of perfumed hair oil and attar.

*3. **Jasminum cordifolium** Wall. ex G. Don, Gen. Syst. 4 : 60. 1838; Clarke in Hook. f., Fl. Brit. India 3 : 596. 1882.

Scandent shrub. Stems glabrous. Leaves simple, ovate-lanceolate, cordate at base, acuminate at apex, glabrous, 6-10 × 2.5-4.5 cm; veins 7 pairs, lowest divaricate, secondary ones obscure. Cymes crowded, many-flowered, shortly repeatedly dichotomous. Bracts linear, 4-5 mm long. Pedicels 2.5-3 mm long. Calyx glabrous.; teeth subulate, 4-8 mm long. Corolla white; tube 2-2.5 cm long; lobes elliptic, acute, 1.5-2 cm long. Berries ellipsoid, 0.8-1.2 × 0.6-0.8 cm.

Fl. : Apr.-Jun. *Fr.* : Aug.-Nov.

Ecology : Rare, in forests.

Distribution : India : Deccan Peninsula.

Specimen examined : National Park, 960.

*4. **J. grandiflorum** L., Sp. Pl. ed. 2, 9. 1762; Clarke in Hook. f., Fl. Brit. India 3 : 603. 1882.

Local names : Chameli, Jali.

Deciduous shrubs, with subpendent angular branches, ± glabrous. Leaves opposite, pinnate; leaflets 5-7(9) rhomboid, broadly ovate, or elliptic, acute or acuminate, 0.5-5 cm long, lateral ones more than three-fourth the length of terminal leaflet, terminal leaflet distinctly petioled.

Flowers showy, fragrant, 2-3.5 cm across, slender-pedicelled. Calyx-teeth linear, *ca* 6 mm or more long. Corolla white; tube 1.5-2 cm long; lobes oblong, 1-1.2 cm long. Berry ellipsoid, 7-8 × 5-6 mm.

Fl. & Fr. : Mar.-June.

Ecology : Very common; planted in gardens and houses.

Distribution : India : Wild in subtropical N.W.Himalaya, planted in major parts of the country. Pakistan, Bangladesh and elsewhere in the world.

Specimens examined : Ichak, 330; Hunterganj, 1643.

Uses : Bulk of harvested flowers is used in making garlands, chaplets and decorative bunches; also used for attar and hair oil. Plant-extracts is used as anthelmintic, diuretic and emmenagogue. Leaves are chewed in ulceration of mouth.

5. **Jasminum multiflorum** (Burm.f.) Andrews, Bot. Repor. 8 : t. 496. 1807; Grohmann in Nasir & Air, Fl. W. Pakistan 59 : 23. 1974. *Nyctanthes multiflora* Burm. f., Fl. Ind. 5, t. 3. f. 1. 1768.

J. pubescens Willd., Sp. Pl. 1 : 37. 1797; Clarke in Hook. f., Fl. Brit. India 3 : 592. 1882; Prain, Bengal Pl. 1 : 659. 1903; Haines, For. Fl. Chota Nagpur 416. 1910 & Bot. Bihar & Orissa pt. 4 : 524. 1922.

Local names : Chameli, Kunda.

Densely pubescent, subscandent shrubs, with drooping branches. Leaves simple, opposite, ovate, truncate or rarely subcordate at base, acute or subacuminate at apex, entire, softly pubescent or tometose at both surfaces, 3.5-7 × 1.5-3.5 cm. Cymes dense, many-flowered. Flowers sessile, 2-2.5 cm across when spreading; bracts foliaceous. Calyx-teeth 5-7, 0.8-1.2 cm long, linear, subulate, covered with spreading yellow hairs. Corolla white, glabrous; tube 1.8-2.2 cm long; lobes 5, oblong, 1-1.2 cm long. Stigma equally 2-fid. Berry ellipsoid, black, 2-4 mm, surrounded by long hairy sepals.

Fl. : Dec.-Mar. *Fr.* : Apr.-May.

Ecology : Common; in scrub-jungles of hills; also cultivated as an ornamental in gardens.

Distribution : Throughout India; Sri Lanka, Myanmar, China.

Specimens examined : National Park, 982 ; Hazaribagh, 1583.

Uses : Flowers are emetic. Dried leaves are soaked in water and made into a poultice which is used in ulcers. Roots are used as antidote to Cobra venom.

6. **Jasminum sambac** (L.) Ait., Hort. Kew. 1 : 8. 1789; Clarke in Hook. f., Fl. Brit. India 3 : 591. 1882; Prain, Bengal Pl. 1 : 659. 1903; Haines, For. Fl. Chota Nagpur 415. 1910 & Bot. Bihar. & Orissa pt. 4 : 523. 1922. *Nyctanthes sambac* L., Sp. Pl. 6. 1753.

Local name : Banmallika, Chamba.

Scandent undershrub, with slightly pubescent branchlets. Leaves opposite or sometimes ternate, thinly membranous, ovate-elliptic or broadly ovate, rounded at base, acute to obtuse at apex, nearly glabrous, entire, 3.5-7.5 × 2-4 cm; petiole 3-5 mm long, pubescent above. Cymes terminal, 3 to 5-flowered. Flowers 2-2.5 cm across when spreading; bracts linear-subulate, to 2-4 mm long. Pedicels 3-7 mm long. Calyx-teeth 5-7, linear, pubescent on edges, 6-7 mm long, curled. Corolla white; tube 1.5-1.8 cm long; lobes 10, in two series, oblong to orbicular, almost as long as tube. Berry globose, 6 mm in diam., black, surrounded by suberect calyx-teeth.

Fl. : Apr.-May; *Fr.* : May-July.

Ecology : Common; planted in gardens as an ornamental, also grows wildly in waste places near villages.

Distribution : Throughout India. Sri Lanka, Myanmar and in Tropics of both Hemispheres.

Specimens examined : National Park, 195; Mandu, 1355.

Uses : Flowers are used for making garlands; also used for production of scented hair oil. Roots and leaves ae used in preparation of eye lotion.

2. NYCTANTHES L.

Nyctanthes arbor-tristis L., Sp. Pl. 6. 1753; Clarke in Hook. f., Fl. Brit. India 3 : 603. 1882; Prain, Bengal Pl. 1 : 660. 1903; Haines, For. Fl. Chota Nagpur 416. 1910 & Bot. Bihar & Orissa pt. 4 : 526. 1922.

Local name : Harsinghar.

Deciduous large shrub to small tree, to 4 m long, rough all over with stiff whitish hairs. Leaves opposite, ovate, acute to subacuminate at apex, rounded or sub-cuneate at base, 5-10 × 2.5-6 cm, with to 7 pairs of secondary veins; petiole 6-8 mm long, not auricled. Flowers *ca* 2.5 cm across, sessile; bracts broadly ovate or suborbicular, apiculate, hairy, 2.3-3 mm long. Calyx narrowly campanulate, glabrous within, hairy outside, 4.5-5 mm long; teeth 5, persistent. Corolla glabrous; tube 6-8 mm long, orange coloured; lobes white, elliptic, 5-6 mm long. Stamens 2, included. Ovary globose, 2-1ocular with one ovule per locule attached basally. Capsule obovoid to nearly orbicular, glabrous, reticulately veined, 2 -2.5 mm across. Seeds orbicular, 1-1.5 cm across.

Fl. : Sept.-Oct. *Fr.* : Dec.-Jan.

Ecology : Common; planted in gardens, also found wildly in hills, specially along steep slopes and rocky ravines.

Distribution : Throughout India. Native to India. Thailand and Indonesia, widely cultivated in warmer parts of both eastern and western hemispheres.

Specimens examined : Jhumri Telaiya, 288; Ghanghree, 1654.

Uses : Decoction of leaves is used in Influenza and Bronchitis. Root is ground with water and decoction is orally administered in loose motion. Seeds yield an oil which is used medicially.

3. SCHREBERA Roxb.

Schrebera swietenioides Roxb., Pl. Corom. 2 : 1, t. 101. 1798; Clarke in Hook. f., Fl. Brit. India 3 : 604. 1882; Prain, Bengal Pl. 2 : 660. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 527. 1922.

Local names : Gae-ka-lundi, Moka, Banpalas.

Moderate-sized tree, 10-15 m tall; bark pale grey, exfoliating in thin scales; blaze pale to brownish-yellow. Branches minutely pubescent or glabrous, pale lenticellate. Leaves 22-30 cm long including 5-8 cm long petiole; rachis finely pubescent; leaflets (3-) 5-7(-9), ovate, oblong or ovate-lanceolate, narrowed and unequal-sided at base, acute or acuminate at apex, pubescent when young, glabrous when mature, 5-10 × 2.5-5 cm, lowest pair usually smaller; secondary veins 6-8, rather strong beneath; petiolule of terminal leaflet 2.5-5 cm long, of lateral leaflets short. Cymes trichotomous, pubescent, 8-18 cm long and broad. Flowers many, 1.2-1.5 cm across when spreading, covered closely with brown scales, bracts linear, pubescent, 4-5 mm long, or rarely obsolete; pedicels 0-1.2 cm long, pubescent. Calyx 3.5-4 mm long, irregularly 5-lobed, somewhat 2-lipped or subtruncate, minutely pilose. Corolla white with brown markings; tube 6-8 mm long; lobes elliptic, glandular-ciliate on margins, with brown glandular speck on centre, 4-5 mm long. Stamens 2, inserted near top of corolla tube. Capsule obtuse, pendulous, to 6 × 3.5 cm, dotted with white specks. Seeds to 3 × 1.2 cm.

Fl. : Apr.-June. *Fr.* : Oct.-Feb.

Ecology : Common; in hilly forests.

Distribution : Tropical Himalaya, Chota Nagpur, Bihar, Central India and Deccan Peninsula, Myanmar, Pegu.

Specimens examined : National Park, 1195; Koderma Forest, 2184.

Uses : Wood is used for beams of weavers' looms, wooden utensils, agricultural implements and posts and poles; also used as fuel and for charcoal making. Leaves are used in enlargement of spleen and in urinary disorders. Roots and fruits are useful in leprosy and hydrocele respectively.

106. SCROPHULARIACEAE

Key to the Genera

1a. Leaves all alternate. Corolla subrotate; lobes 5, subequal, the two upper outermost in bud ... 15. VERBASCUM

1b. Leaves (if not all, at least the lower) decussate or whorled :

2a. Corolla rotate to subrotate or shortly salverform, not bilabiate, slightly actinomorphic :

3a. Fertile stamens 4. Corolla densely pilose at throat. Capsule septicidal ... 12. SCOPARIA

3b. Fertile stamens 2. Corolla not pilose at throat. Capsule loculicidal or both loculicidal-septicidal ... 16. VERONICA

2b. Corolla neither rotate nor salverform, bilabiate to sub-bilabiate, or tubular, zygomorphic :

4a. Upper lip or 2 upper lobes of corolla innermost in bud :

5a. Leaves pinnately dissected; segments linear. Anthers with one cell stipitate and empty ... 13 SOPUBIA

5b. Leaves entire or dentate or reduced to scales :

6a. Calyx spathaceous, split in front. Filaments pilose; anthers with one perfect and one empty or aborted cell ... 3. CENTRANTHERA

6b. Calyx tubular, 5-toothed or 5-fid. Filaments glabrous; anthers 1-locular, vertical :

7a. Corolla tube almost straight; lobes subequal ... 2. BUCHNERA

7b. Corolla tube abruptly incurved near middle; 2 upper lobes smaller than others ... 14. STRIGA

4b. Upper lip or 2 -upper lobes of corolla outermost in bud (corolla-lobes regularly imbricate and calyx 3-4-lobed, e.g. GLOSSOSTIGMA) :

8a. Corolla-throat with 2-lobed or 2-plicate palate :

9a. Anther-cells parallel, stipitate ... 7. LINDENBERGIA

9b. Anther-cells divergent, sessile :

10a. Calyx 5-lobed, widely campanulate, exposing the capsule. Flowers in terminal subsecund racemes ... 9. MAZUS

10b. Calyx 5-angled and 5-toothed, tubular, enclosing completely or a greater part of the capsule. Flowers axillary, solitary ... 11. MIMULUS

8b. Corolla-throat without palate :

11a. Plants minute, tufted herbs. Flowers very minute. Corolla-tube very short, uniform. Stamens usually 2 and without staminodes, rarely 4; anther-cells diverging and confluent at apex. Calyx with 3-4 short obtuse lobes ... 5. GLOSSOSTIGMA

11b. Plants otherwise. Flowers elongate; corolla-tube expanded at throat. Stamens 2 with 2 staminodes or 4; anther-cells mostly parallel, rarely divergent. Calyx 5-partite; lobes acuminate or acute :

12a. Fertile stamens 2, with 2 staminodes, if fertile stamens 4, then the anterior pair attached to corolla-throat :

13a. Fertile stamens 2 with 2 staminodes, all inserted within the corolla-tube. Anther-cells parallel. Capsule loculicidal. ... 4. DOPATRIUM

13b. Fertile stamens if 4 the anterior pair, if 2 the staminodes attached to corolla-throat; the posterior or only perfect pair attached to and inserted within the corolla-tube. Anther-cells divergent. Capsule septicidal ... 8. LINDERNIA

12b. Fertile stamens 4, all inserted within the corolla tube :

14a. Anther cells not stipitate. Leaves entire ... 1. BACOPA

14b. Anther-cells stipitate. Leaves crenate, crenate-serrate, dentate or divided into several capillary segments :

15a. Capsule 2-valved. Calyx-segments equal in length but unequal in width, outer ones much wider. Bracteoles at base of pedicel ... 10. MECARDONIA

15b. Capsule 4-valved. Calyx-segments equal in both length and width or the upper largest. Bracteoles subtending the calyx or absent ... 6. LIMNOPHILA

1. BACOPA Aubl., *nom. cons.*

Bacopa monnieri (L.) Penn., Proc. Acad. Nat. Sci. Philad. 98 : 94.1946; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 421. 1981. *Lysimachia monnieri* L., Cent. Pl. 2 : 9. 1756.

Gratiola monnieria L., Amoen. Acad. 4 : 306. 1759.

G. monnieri L., Syst. Nat. ed. 10, 851. 1759.

Herpestis monnieria (L.) Kunth in H.B.K., Nov. Gen. 2 : 366. 1871, *p.p.*; Prain, Bengal Pl. 2 : 765. 1903.

H. monniera Benth., Scroph. Ind. 30. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 272. 1884; Haines, Bot. Bihar & Orissa pt. 4 : 622. 1922.

Monniera cuneifolia Michx., Fl. Bor. Amer. 2 : 22. 1803; Duthie, Fl. Upp. Gang. Pl. 2 : 142. 1911.

Bramia monnieri (L.) Penn. in Proc. Acad. Nat. Sci. Philad. 71: 243. 1920.

Local name : Brahmi.

Creeping-ascending, rather succulent, perennial herbs. Stems obtuse angular, diffusely branched, rooting at nodes, 10-25 cm long. Leaves sub-sessile, obovate-oblong or spathulate, narrowed at base, obtusely rounded at apex, thick, punctate beneath, penninerved, 1-2.5 × 0.4-1 cm. Pedicels slender, usually longer than leaves, 1-4 cm long. Bracteoles linear, 4.5-5 mm long. Calyx 6-8 mm long, glabrous, divided almost to base; lobes unequal, outer 2 large, ovate, gland-dotted, 6-8 × 3.5 mm; median 1 oblong, 6 × 2 mm; innner 2 linear, 6 × 0.8 mm. Corolla almost white or pale blue, 7-8 mm long; tube 5 mm long; lobes with longitudinal lines. Stamens inserted at top of corolla-tube; filaments glabrous. Style glabrous, slightly deflexed; stigma capitate with a central depression. Capsule oblong-globose, tipped with withered style-base, glabrous, 3-4 × 2-2.5 mm. Seeds ovoid oblong, pale, transversely rugose, 0.4-0.6 mm long.

Fl. & Fr. : July-Dec.

Ecology : Very common; in marshy places, along moist sides off path, margins of ponds, streams and wet lands, etc.

Distribution : Almost throughout India ; Palaeotropical.

Specimens examined : Hazaribagh, 249; Ramgarh, 1128; Telaiya Dam, 1841.

Uses : The plant is used as a nerve tonic and as a cure for epilepsy and insanity. Leaves are used as a diuretic and aperient.

2. BUCHNERA L.

Buchnera hispida Buch.-Ham. ex D. Don, Prodr. Fl. Nepal 91. 1825; Hook. f. in Hook. f., Fl. Brit. India 4 : 298. 1884; Prain, Bengal Pl.2 : 774. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 640. 1922. Money, Suppl. Bot. Bihar & Orissa 102. 1950.

Erect herbs, 5-50 cm high. Stem slender, hispid, usually unbranched, black when dry. Leaves sessile or narrowed into a short petiole, entire or irregularly shallowly toothed, hispid on both surfaces; lower leaves at base of stem crowded, broadly obovate or oblong, obtuse, 2.5-5 × 0.5-1 cm; upper cauline leaves linear oblong or linear-lanceolate, subacute, usually longer, 30 - 65 × 1.5-7 mm; the terminal ones passing into bracts. Flowers distant, axillary and ultimately in lax slender terminal spike one third or less than half the length of plant, bracteoles subulate, hispid, 2-3 mm long. Calyx hispid, 5-6 mm long; lobes very short, subulate. Corolla rose-purple; tube slender, hairy in the upper part, 0.8-1 cm long; lobes obovate, obtuse, 2-3 mm long. Anthers black. Capsule slightly shorter than calyx, 5-5.5 × 2 mm, closely invested by calyx. Seeds irregularly cuneate-oblong, truncate at one end, rounded at other, ± 0.3 mm long.

Fl. & Fr. : Oct.-Nov.

Ecology : Very common; among grasses along roadsides, waste places, borders of cultivated lands, etc.

Distribution : India : western and central Himalaya, Uttar Pradesh, Bihar, central and western India, western Peninsula, Orissa, West Bengal, Nepal, tropical Africa and Madagascar.

Specimens examined : Ghanghree, 1069; Hazaribagh, 1245; Mandu, 1349.

3. CENTRANTHERA R. Br.

Key to the Species

1a. Corolla yellow, often with purple markings in throat. Leaves linear or narrowly oblanceolate ... 2. *C. tranquebarica*

1b. Corolla purplish red. Leaves oblong to ovate-oblong ... 1. *C. indica*

1. **Centranthera indica** (L.) Gamble, Fl. Pres. Madras 971. 1924; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 396. 1981. *Rhinanthus indica* L., Sp. Pl. 603. 1753.

Centranthera hispida R. Br., Prodr. 438. 1810; Hook. f. in Hook. f., Fl. Brit. India 4 : 301. 1885; Prain, Bengal Pl. 1 : 776. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 637. 1922.

C. procumbens Benth. in DC., Prodr. 10 : 525. 1846; Hook. f. in Hook. f., Fl. Brit. India 4 : 302. 1885.

C. cochinchinensis (Lour.) Merr. in Philip. J. Sci. Bot. 12 : 109. 1917; Mooney, Suppl. Bot. Bihar & Orissa 100. 1950.

Stem prostrate and diffusely branched from base, or ascending, to 90 cm long, hispid. Leaves oblong to ovate-oblong, truncate at base, subacute at apex, ciliate on margins, hispid on both surfaces, 1-3 × 0.4-0.7 cm. Flowers axillary, solitary, or in terminal lax racemes of 8-15 cm long; bracts linear-lanceolate, ciliate, 4-8 mm long; pedicels 1-2 mm long; bracteoles oblong, 3-4 mm long. Calyx-tube obtusely 5-angular, hispid, 0.5-1.6 cm long; lobes lanceolate. Corolla purplish-red, 1.5-3 cm long, glandular and puberulous outside. Style glabrous. Capsule ovoid, shorter than calyx, 5-8 × 4-5 mm, dark-brown. Seeds oblong, striate, 0.8-1 mm long.

Fl. & Fr. : Sept.-Nov.

Ecology : Common; in grassy places of wet lands, margins of ponds, jheels, paddy-fields, etc.

Distribution : Throughout India; Sri Lanka, Myanmar, Malesia, China and Australia.

Specimens examined : Chatra, 1444; Barhi, 1817; Katkamosandi, 2188.

Uses : Plant is used as an external application for sore eyes and as a febrifuge.

2. **Centranthera tranquebarica** (Spreng.) Merr. in 150th. Anniv. Vol. Roy. Bot. Gard. Calcutta 55. 1941; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 397. 1981. *Razumovia tranquebarica* Spreng., Mant. Fl. Hal. 45. 1807.

Centranthera humifusa Wall. ex Benth., Scroph. Ind. 50. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 301. 1885; Prain, Bengal Pl. 2 : 776. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 638. 1922.

Delicate, ephemeral, small herbs, to 15 cm. long. Stems slender, erect, diffusely branched from base, glabrous or hispidulous on angles. Leaves opposite below, alternate above, linear or narrowly oblanceolate, narrowed at base, obtuse at apex, scabrid on both surfaces, 8-25 × 2-4 mm. Flowers subsessile, solitary, in the axils of middle and upper leaves. Bracts oblong, 1-1.5 mm long. Bracteoles linear-oblong, 1-1.5 mm long. Calyx-tube 4.5-5 mm long, hispid without, inflated; lobes ovoid, acute. Corolla yellow, tubular, dilated above, often with purple markings in throat, 0.8-1.2 cm long; tube 6-8 mm long; lower lip 7 mm across. Style glabrous. Capsule subglobose, 3.5-4 mm across, slightly shorter than calyx, tipped with wihered style-base, glabrous, brown. Seeds oblong, reticulate, 0.7-0.8 mm long.

Fl. & Fr. : Aug.-Oct.

Ecology : Common; in open grassy places, paddy fields, wet meadow and along borders of rice fields.

Distribution : India : West Bengal, Bihar, Orissa, Deccan Peninsula: Bangladesh, Sri Lanka, Malesia.

Specimens examined : Ghanghree, 1024; Tandwa, 1434.

4. DOPATRIUM Buch.-Ham. ex Benth.

Dopatrium junceum (Roxb.) Buch.-Ham. ex Benth., Scroph. Ind. 30. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 274. 1884; Prain, Bengal Pl. 2 : 766. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 623. 1922. *Gratiola juncea* Roxb., Pl. Corom. 2 : 16, t. 129. 1798.

Stems thick and spongy towards base, gradually becoming thinner and slender upwards, branched from base. Leaves sessile: the lower oblong, elliptic or elliptic-obovate, obtuse, 5-14 × 2-4 mm; the upper much smaller, becoming bracteate towards stem-apex, parallel-nerved. Flowers in axils of lower and upper leaves, lower ones sessile, upper ones on 0.6-1.2 cm long, slender. Calyx 1-1.5 mm long; segments oblong, obtuse. Corolla violet, 5-6 mm long; tube 3.5-4 mm long; lower lip to 4 mm across; lobes rounded, midlobe with a white blotch at base. Stamens 2; anther lobes unequal, bearded. Style very short, glabrous. Stigma broad, 2-lamellate; ovary globose, *ca* 1 mm across, 1-celled with 2 parietal placentas. Capsule globose, slightly grooved over top, glabrous, 2.5-3 mm across. Seeds oblong, blackish-brown, *ca* 0.5 mm long.

Fl. & Fr. : Aug.-Oct.

Ecology : Not common; in swampy grounds, moist water-logged areas, etc.

Distribution : Throughout India : widespread in the eastern Tropics.

Specimens examined : Barkattwa , 504; Ghanghree, 1032.

5. GLOSSOSTIGMA Wight & Arn., *nom. cons.*

Glossostigma diandrum (L.) O. Kuntze, Rev. Gen. Pl. 461. 1891; Santap., Fl. Khandala ed. 3, 186. 1967; Chattopadhyay & Paria in Sci. & Cult. 55 : 456. 1989 (Fig.2). *Limosella diandra* L., Mant. Pl. 252. 1771. **(Fig.7)**

Microcarpaea spathulata Hook., Bot. Misc. 2 : 101. Suppl., t. 4. 1831.

Glossostigma spathulatum (Hook.) Wight & Arn. ex Arn. in Nov. Actorum Acad. Caes. Leop.-Carol. German. Nat. Cur. 18 : 355. 1836; Hook. f. in Hook. f., Fl. Brit. India 4 : 288. 1884; Prain, Bengal Pl. 2 : 772. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 636. 1922.

Weak and marsh annual herbs, to 2 cm long. Stolons inter-woven, rooting at the nodes. Leaves fascicled, 5-7, 0.5-1 cm long and *ca* 1.5 mm broad at apices, succulent, obtuse at apex, with base running down into a flat petiole of variable length; nerves obscure. Flowers 2-2.5 mm across; pedicels slender, 0.5-1 cm long. Calyx 2-2.5 mm long; lobés 3, shallow, broadly ovate-deltoid, subobtuse, 1-1.2 mm long, valvate. Corolla pinkish-white; tube 1 mm long, included in calyx; upper lip shorter, *ca* 0.5 mm, lower *ca* 0.7 mm, obtuse, scabrous. Stamens 2, sub-exserted; filaments filiform, 0.7-0.8 mm; anthers 1-celled, sub-reniform, 0.2 mm, slightly confluent. Ovary globose, 2-celled, 0.8 mm in diam.; style 1 mm long; stigma dilated, spathulate, obtuse, recurved. Capsule globose, 2-2.5 mm in diam. Seeds 0.5-0.6 mm long.

Fl. & Fr. : Jan.-Feb.

Ecology : Not common; on the banks of ponds, tanks and other water sources.

Distribution : India : Upper gangetic plain, Bihar, West Bengal, Orissa, Deccan Peninsula, Rajasthan, Sri Lanka, Australia and tropical Africa.

Specimens examined : Ghanghree, 1021; Ramgarh Cant., 2229.

Note : The plant has a life span of less than one month during which it completes its flowering and fruiting. As such, the plant often escapes notice and is missed in the field and is, therefore, mistaken as rare due to lack of collection.

6. LIMNOPHILA R. Br., *nom. cons.*

Key to the Species

1a. Small (*ca* 20 cm), aromatic herbs; flowers distinctly pedicellate; leaves usually 3-fid (rarely entire) ... 2. *L. indica*

1b. Large (*ca* 60 cm), non-aromatic herbs; flowers sessile or subsessile; leaves of aerial parts of stems usually entire but dissected under water ... 1. *L. heterophylla*

1. **Limnophila heterophylla** (Roxb.) Benth., Scroph. Ind. 25. 1835; Hook. f. in Hook. f., Fl. Brit India 4 : 270. 1884; Prain, Bengal Pl.2 : 764. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 629. 1923; Philcox in Kew Bull. 24 : 124. 1970. *Columnea heterophylla* Roxb., Fl. Ind. 3: 97. 1832.

L. reflexa Benth., Scroph. Ind. 25. 1835.

L. heterophylla (Roxb.) Benth. var. *reflexa* (Benth.) Hook. f. in Hook. f., Fl. Brit. India 4 : 270. 1884.

Annual-perennial, non-aromatic herbs, to 60 cm high. Stems quadrangular, slender, simple or branched, glabrous, rooting at lower nodes. Upper leaves in whorls of 3, sessile, linear-lanceolate or oblong, semi-amplexicaul at base, subacute at apex, crenulate, basally 3-nerved, 6-10 × 2-5 mm, glabrous; intermediate ones pinnatipartite to pinnatisect; lowest ones in whorls of 8-12, capillaceo-multifid, to 4 cm long. Flowers axillary, solitary, sessile or very shortly pedicelled; bracteoles absent. Calyx membranous, 2-4 mm long, hemispheric in fruit, not striate; lobes 5, ovate-lanceolate, glabrous. Corolla pale pink; tube 6-7 mm long, sparsely hairy within; upper lip broadly orbicular, 2-lobed; lower lip with lobes more or less equal. Posterior stamens 1.5-2 mm long, shorter than anterior ones. Capsule ovoid, pale brown, glabrous, 3-3.5 mm in diam. Seeds cuneiform, towny-brown, 0.4-0.5 mm long, 4-5-angular.

Fl. & Fr. : Sept.-Nov.

Ecology : Common ; in shallow water along the banks of ponds and in paddy fields of wet lowlands.

Distribution : Almost throughout India; from Sri Lanka and S.E.Asia through Malesia (except Indonesia) to China.

Specimens examined : Hazaribagh, 739 ; National Park, 1181; Barhi, 1878.

2. **Limnophila indica** (L.) Druce in Rep. Bot. Soc. Exch. Club Brit. Isles 1913, 3 : 420. 1914; Philcox in Kew Bull. 24 : 115. 1970; Cramer in Dassan & Fosb., Rev. Handb. Fl. Ceylon 3 : 432. 1981. *Hottonia indica* L., Syst. Nat. ed. 10, 919. 1759 & Sp. Pl. ed. 2, 208. 1762.

L. gratioloides R. Br., Prodr. 442. 1810; Benth., Scroph. Ind. 25. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 271. 1884; Prain, Bengal Pl. 2 : 764. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 628. 1922.

L. gratioloides R. Br. var. *elongata* Benth., Scroph. Ind. 26. 1835.

L. gratioloides R. Br. var. *intermedia* Hook. f. in Hook. f., Fl. Brit. India 4 : 271. 1884.

Local name : Kuttra.

Annual-perennial aromatic herbs, to 20 cm tall. Stems sub-quadrangular, simple or diffusely branched from base, slender, glabrous or finely glandular-pubescent, rooting at lower nodes. Lower leaves whorled, pinnately dissected; upper ones 3-fid; a few upper most ones often entire, opposite, subsessile, linear-oblong to linear-lanceolate, subacute at apex, tapering to base, serrulate, glabrous, 1-nerved, 6-20 × 1.5-5 mm. Flowers axillary, solitary, in decussate pairs ; pedicels 4-10 mm long in flower, longer in fruit, finely glandular-pubescent. Bracteoles 0

or 2, linear-subulate, 2-3 mm long. Calyx membranous, 4-5 mm long in flower, hemispheric in fruit, thinly glandular, divided less than half way down; lobes 5, subequal, linear-lanceolate, 2.5-3 mm long. Corolla pale-yellow, with a dark purple throat, villous within at throat, 6-7 mm long; upper lip faintly 2-lobed; lower lip with mid-lobe broader than lateral ones. Stamens inserted at middle of corolla; filaments of upper pair bearded at base. Stigma pilose. Capsule subovoid, glabrous, 2.5-3 mm across, tipped by withered style base. Seeds oblong-cuneiform, shining, black, *ca* 0.5 mm long, 4-5-angular.

Fl. & Fr. : Sept.-Feb.

Ecology : Very common; along the banks of tanks, ponds, stagnant pools, marshy places, rice-fields, etc.

Distribution : Throughout India. From S.E.Africa through Iraq, Sri Lanka and S.E.Asia, eastwards to Malesia and China, and southwards to Australia.

Specimens examined : Hazaribagh, 41; Pratappur, 1559; Etkhori, 1877.

Uses : Leaves are eaten as pot-herbs. Infusion of leaves are given in dyspepsia and dysentery. Plant-extract is used as antiseptic and also in elephantiasis.

Note : Highly polymorphic species. In shallow water dissected leaves develop under water and entire leaves above. In deep water, capillaceo-multifid leaves develop in almost throughout the whole plant like a bottle-brush under water and few normal leaves above water. Those plants, growing in moist places, develop all normal leaves.

7. LINDENBERGIA Lehm.

Lindenbergia indica (L.) O. Kuntze, Rev. Gen. Pl. 462. 1891; Santap. in J. Bomb. Nat. Hist. Soc. 49 : 45. 1950. *Dodartia indica* L., Sp. Pl. 633. 1753.

L. urticaefolia Lehm. in Link & Otto, Icon. Pl. Rar. 95, t. 48. 1831; Hook. f. in Hook. f., Fl. Brit. India 4 : 262. 1884; Prain, Bengal Pl. 2 : 760. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 624. 1922.

L. polyantha Royle ex Benth., Scroph. Ind. 22. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 262. 1884; Prain, Bengal Pl. 2 : 760. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 624. 1922.

Erect or decumbent-ascending, simple or much-branched, glandularly villous or glabrate, annual herbs, to 50 cm tall. Leaves ovate-elliptic, attenuate to cuneate at base, rounded or subacute at apex, crenate-serrate, penninerved, patently glandular-pubescent on both surfaces, 1.5-5 × 1-2.5 cm; petiole 0.6-2 cm long. Flowers secund, axillary, solitary or 2-nate or rarely in lax slender racemes; pedicels short, glandular-hairy, 1.5-3 mm long. Calyx 4-5 mm long, glandular-villous, divided less than half-way down; lobes triangular, recurved. Corolla sparsely glandular-hairy, 7-8 mm long; lower lip with midlobe narrower than lateral ones, hairy at throat. Ovary pubescent; style exceeding the stamens, filiform 7-8 mm long. Capsule oblong, 4-5 mm long, hairy above middle, beaked. Seeds oblong.

Fl. & Fr. : Oct.-Mar.

Ecology : Very common; on dilapidated walls, surrounding of buildings, sloping banks, etc.

Distribution : Throughout India including Himalaya. Nepal, China, Afganistan, Pakistan, Bangladesh, Myanmar.

Specimens examined : Hazaribagh, 107; Ichak, 354 ; Ramgarh, 1891.

Uses : Juice of plant is used for chronic bronchitis and skin eruptions.

Note : A highly variable species with regard to the size of plant, size and shape of leaves and size of floral parts.

8. LINDERNIA All.

Key to the Species

1a. Capsule nearly equalling the calyx or shorter :

2a. Flowers solitary in axils of leaves. Flowering calyx cleft to middle or less ... 4. *L. crustacea*

2b. Flowers borne in racemes. Flowering calyx cleft almost to base ... 7. *L. viscosa*

1b. Capsule twice as long as calyx or longer :

3a. Leaves parallel-nerved :

4a. Corolla 3-4 times as long as calyx ... 5. *L. hyssopioides*

4b. Corolla twice as long as calyx or shorter ... 6. *L. parviflora*

3b. Leaves penninerved :

5a. Stamens 4, all fertile. Flowers solitary in axils of leaves ... 1. *L. anagallis*

5b. Fertile stamens 2, staminodes 2 :

6a. Leaves sharply aristate. Flowering calyx cleft to middle ... 3. *L. ciliata*

6b. Leaves serrate or crenate serrate with short blunt teeth. Flowering calyx cleft almost to base ... 2. *L. antipoda*

1. **Lindernia anagallis** (Burm. f.) Penn. in J. Arnold Arb. 24 : 252. 1943; Mukerjee in J. Ind. Bot. Soc. 24 : 133. 1945; Philcox in Kew Bull. 17 : 484. 1964 & 22 : 45. 1968. *Ruellia anagallis* Burm. f., Fl. Ind. 135. 1768.

Gratiola cordifolia Colsm., Prodr. Desc. Grat. 15. 1793.

Vandellia pedunculata Benth., Scroph. Ind. 37. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 282. 1884; Prain, Bengal Pl. 2 : 769. 1903.

V. angustifolia Benth., Scroph. Ind. 37. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 282. 1884; Prain, Bengal Pl. 2 : 769. 1903.

V. cordifolia (Colsm.) G. Don., Gen. Syst. 4 : 549. 1838; Haines, Bot. Bihar & Orissa pt. 4 : 633. 1922.

Lindernia cordifolia (Colsm.) Merr., Enum. Born. Pl. 524. 1921; Mukerjee in J. Ind. Bot. Soc. 24 : 132. 1945; Mooney, Suppl. Bot. Bihar & Orissa 99. 1950.

Suberect to prostrate, annual herbs, 30-50 cm long. Stems rooting at lower nodes, usually branched from base, glabrous or slightly pubescent at nodes. Leaves shortly petiolate to subsessile, ovate to ovate-oblong, rounded or cordate at base, narrowed gradually or abruptly into a 2-4 mm long petiole, subacute or obtuse at apex, obscurely crenate-serrate, glabrous or minutely scabrous on margin, pinnately veined, 0.7-2.2 × 0.4-1.5 cm. Flowers solitary, axillary; pedicels ascending or spreading at maturity, to 3 cm long. Calyx 3-6 mm long, divided almost to base; segments linear-lanceolate. Corolla white to purple, 0.7-1.2 cm long; upper lip entire; lower lip 3-lobed. Stamens 4, all fertile; filaments of lower pair with a spur above base. Capsule linear-lanceolate, 1-1.3 cm long, arcuate with persistent style. Seeds ellipsoid, pale yellow, 3 mm long.

Fl. & Fr. : June-Nov.

Ecology : Very common; in marshy grounds, swamps, paddy fields, riversides, margins of streams, etc.

Distribution : Almost throughout India. Tropical Asia, Malesia and tropical Australia.

Specimens examined : Satgaon, 593 ; Koderma, 1261 ; Barhi, 1811.

Use : Plant is used in gonorrhoea.

Note : Hara (in J. Jap. Bot. 55 : 325. 1980) did not follow Philox (*l.c.*) in treating *V. angustifolia* Benth. as a synonym under *L. anagallis* (Burm. f.) Penn. and included it under a distinct species *L. micrantha* D.Don.

2. **Lindernia antipoda** (L.) Alston in Trimen, Handb. Fl. Ceylon 6 : 214. 1931; Philcox in Kew Bull. 17 : 484. 1964 & 22 : 57. 1968. *Ruellia antipoda* L., Sp. Pl. 685. 1753.

Gratiola grandiflora Retz., Obs. Bot. 4 : 8. 1786.

G. veronicifolia Retz., Obs. Bot. 4 : 8. 1786.

G. verbenifolia Colsm., Prodr. Descr. Grat. 8. 1793.

Bonnaya grandiflora (Retz.) Preng., Syst. Veg. 1 : 41. 1824; Benth., Scroph. Ind. 33. 1835.

B. veronicifolia (Retz.) Preng, Syst. Veg. 1 : 41. 1824; Benth., Scroph. Ind. 33. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 285. 1884; Prain, Bengal Pl. 2 : 770. 1903.

Ilysanthes veronicifolia (Retz.) Urban in Ber. Deutstsch. Bot. Ges. 2 : 436. 1884.

Bonnaya veronicifolia (Retz.) Spreng. var. *verbenifolia* (Colsm.) Hook. f. in Hook. f., Fl. Brit. Inida 4 : 285. 1884; Prain, Bengal Pl. 2 : 770. 1903.

B. veronicifolia (Retz.) Spreng. var. *grandiflora* (Retz.) Hook. f. in Hook. f., Fl. Brit. India 4 : 285. 1884; Prain, Bengal Pl. 2 : 771. 1903.

Vandellia veronicifolia (Retz.) Haines, Bot. Bihar & Orissa pt. 4 : 633. 1922.

V. verbenifolia (Colsm.) Haines, Bot. Bihar & Orissa pt. 4 : 634. 1922, *p.p.* excl. syn. *V. angustifolia* Benth.

Lindernia verbenifolia (Colsm.) Penn. in Acad. Nat. Sci. Phil. Monogr. 5 : 131. 1943; Mukerjee in J. Ind. Bot. Soc. 24 : 133. 1945; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 146. 1955.

L. anagallis (Burm. f.) Penn. var. *grandiflora* (Retz.) Mukerjee in J. Ind. Bot. Soc. 24 : 133. 1945.

Stems decumbent or prostrate,rooting at nodes; branches to 20 cm long. Leaves sessile, linear-elliptic to narrowly or broadly obovate-lanceolate, narrowing at base, obtuse at apex, closely or distantly and shallowly serrate or crenate-serrate with short blunt teeth, glabrous, penninerved, 1-4 ×0.4-1.2 cm. Inflorescene either racemose with each flower subtended by linear-lanceolate bract or flowers solitary in leaf-axils. Pedicels slender, 3-15 mm long, glabrous. Calyx cleft almost to base, 3.5-5 mm long ; lobes linear-lanceolate, with scarious margins. Corolla white to purple, 0.6-1 cm long, shortly pilose internally; posterior lip emarginate. Fertile stamens 2; staminodes 2, clavate, adherent to corolla tube by lower part. Capsule cylindrical, slightly arcuate, 0.8-1.5 cm long, to three times as long as calyx. Seeds yellow, tetragonal, ridged.

Fl. & Fr. : June-Dec.

Ecology : Very common; in riversides, paddy-fields, marshy grounds, moist grassy places, forests, etc.

Distribution : Throughout India. Tropical and subtropical Asia, Malesia, N. Australia and Polynesia.

Specimens examined : National Park, 461 ; Patratu, 566 ; Telaiya Dam, 1854.

3. **Lindernia ciliata** (Colsm.) Penn. in Brittonia 2 : 182. 1936; Mukerjee in J. Ind. Bot. Soc. 24 : 133. 1945; Philcox in Kew Bull. 22 : 51. 1968. *Gratiola ciliata* Colsm., Prodr. Desc. Grat. 14. 1793.

Bonnaya brachiata Link & Otto, Ic. Pl. Select. 25, t. 11. 1820; Hook. f. in Hook. f., Fl. Brit. India 4 : 284. 1884; Prain, Bengal Pl. 2 : 770. 1903.

Gratiola serrata Roxb., Fl. Ind. 1 : 139. 1820.

Ilysanthes serrata (Roxb.) Urb. in Ber. Deutsch. Bot. Ges. 2 : 436. 1884.

Vandellia brachiata (Link & Otto) Haines, Bot. Bihar & Orissa pt. 4 : 632. 1922.

Erect to spreading, annual herbs, 3-20 cm long. Stems much branched, 4-angular, often rooting below, glabrous except short-hairy angles near nodes. Leaves sessile, ovate to elliptic or oblong, rounded to cuneate at base, obtuse or subacute at apex, sharply dentate with aristate-tipped teeth, glabrous above, finely hirsute beneath, pinnately nerved, 1-4 × 0.4-1 cm. Flowers in lax terminal racemes, each subtended by a linear, ciliate bract of 3-6 mm long; pedicels slender, 3-10 mm long. Calyx 3-5 mm long, cleft to middle; segments linear-lanceolate, scarious-margined, ciliate towards apex. Corolla white or pink, 5-8 mm long; upper lip slightly emarginate; lower lip with rounded lobes. Fertile stamens 2; staminodes 2. Capsule cylindrical, linear, 0.7-1.2 cm long, up to more than twice as long as calyx. Seeds yellow, 0.4 mm diam.

Fl. & Fr. : July-Oct.

Ecology : Very common; in waste places, roadsides, paddy-fields, open forests, etc.

Distribution : Throughout India. Sri Lanka, S.E.Asia and Malesia.

Specimens examined : Pratappur, 597 ; Simaria, 795 ; Bishnugarh, 1918.

4. Lindernia crustacea (L.) F. Muell., Syst. Cens. Austral. Pl. 1 : 97. 1882; Mukerjee in J. Ind. Bot. Soc. 24 : 130. 1945; Philcox in Kew Bull. 22 : 17. 1968. *Capraria crustacea* L., Mant. 1 : 87. 1767.

Torenia varians Roxb., Fl. Ind. 3 : 96. 1832.

Vandellia crustacea (L.) Benth., Scrop. Ind. 35. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 279. 1884; Prain, Bengal Pl. 2 : 768. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 631. 1922.

Erect or ascending, annual herbs, to 20 cm long. Stems usually rooting below, much-branched, hairy on angles. Leaves petiolate, ovate, rounded or subcordate at base, obtuse at apex, subentire-crenate to serrate, glabrous or hairy on margins and veins beneath, pinnately veined, 0.5-2 × 0.3-1.2 cm. Flowers axillary, solitary; pedicels slender, 0.6-2 cm long. Calyx 3-4 mm long, cleft to middle or less, finely pubescent or glabrous; segments triangular or shortly lanceolate, acute. Corolla purple, 5-7 mm long; lower lip with a yellow blotch in throat. Stamens 4, fertile; filaments of lower pair with a geniculate knob near base. Capsule oblong-ovoid, equalling or shorter than calyx, 3.5-4 mm long. Seeds ovoid, pale orange, *ca* 0.5 mm long.

Fl. & Fr. : July-Dec.

Ecology : Common; in swamps, roadsides, riversides, marshes, paddyfields, forests, etc.

Distribution : Throughout India. Tropical and subtropical Asia, Australia and Polynesia; also in tropical Africa and America.

Specimens examined : Mandu, 863 ; Chowparan, 1360 ; Satgaon, 1971.

Uses : Plant is used for bilious affections and dysentery ; also used in poultice for boils, sores and ringworm.

5. **Lindernia hyssopioides** (L.) Haines, Bot. Bihar & Orissa pt. 4 : 635. 1922; Mukerjee in J. Ind. Bot. Soc. 24 : 132. 1945; Philcox in Kew Bull. 22 : 50. 1968. *Gratiola hyssopioides* L., Mant. Pl. 174. 1771.

Ilysanthes hyssopioides (L.) Benth. in DC., Prodr. 10 : 419. 1846; Hook. f. in Hook. f., Fl. Brit. India 4 : 288. 1884; Prain, Bengal Pl. 2 : 1277. 1903.

Bonnaya hyssopioides (L.) Benth., Scroph. Ind. 34. 1835.

Erect, simple or diffusely branched from base, glabrous, annual herb, 7-30 cm long. Stem slender, angled and striate, glabrous, often rooting at basal nodes. Leaves sessile, rather thick, oblong or oblong-lanceolate, narrowed to truncate at base, subacute or rounded at apex, entire or minutely serrate, basally 3-nerved, 1-3 × 0.3-0.6 cm. Flowers *ca* 8 mm across, axillary, solitary or rarely 2 together; pedicels filiform, 1.2-2.5 cm long, deflexed in fruit. Calyx 3-3.5 mm long, glabrous, divided almost to base; segments linear-lanceolate. Corolla violate or white with often dark purple markings, 0.9-1.2 cm long; upper lip shallowly notched; lower lip obtuse, with basal appendages. Stamens 2; staminodes 2, glandular, clavate. Ovary *ca* 1.5 mm across. Capsule oblong, glabrous, minutely striate, 6-7 mm long. Seeds oblong, to 0.4 mm long, striate, tawny.

Fl. & Fr. : Aug.-Mar.

Ecology : Not common; in moist waste places, marshy rice-fields, along water courses, arable lands, etc.

Distribution : Deccan Peninsula, Orissa, Bihar, West Bengal, Assam, Bangladesh, Sri Lanka, S.E.Asia, Malesia and China.

Specimens examined : Barkaganwa, 886, Jhumri Telaiya, 1755.

6. **Lindernia parviflora** (Roxb.) Haines, Bot. Bihar & Orissa pt. 4: 635. 1922; Mukerjee in J. Ind. Bot. Soc. 24 : 132. 1945. *Gratiola parviflora* Roxb., Pl. Corom. 3 : 3, t. 203. 1819.

Ilysanthes parviflora (Roxb.) Benth. in DC., Prodr. 10 : 419. 1846 & Scroph. Ind. 34. 1835; Hook. f. in Hook. f., Fl. Brit. India 4 : 283. 1884; Prain, Bengal Pl. 2 : 769. 1902.

Erect or decumbent-ascending, glabrous, annual herbs, to 15 cm long. Stems often branched from base, 4-angular, rooting at lower nodes. Leaves sessile, oblong-lanceolate or oblong-elliptic, rounded at base, acute or subacute at apex, entire, glabrous, 3-nerved from base, 4-15 × 2-6 mm;

upper ones smaller, serrate, passing into bracts. Flowers axillary, usually solitary, rarely 2 per node, forming into a leafy racemes; pedicel filiform, 1-1.5 cm long. Calyx 2-3 mm long, divided almost to base; lobes linear-lanceolate. Corolla pinkish-white, twice as long as calyx or shorter. Fertile stamens 2; staminodes 2-fid. Capsule ellipsoid or ovoid-oblong, apiculate with persistent style-base, 4-6 mm long. Seeds minute.

Fl. & Fr. : July-Jan.

Ecology : Very common; in moist waste places, rice-fields, moist river-banks, etc.

Distribution : Throughout India including Himalaya; Nepal, Indo-China, Myanmar, tropical Africa.

Specimens examined : Hazaribagh, 127 ; Ichak, 318; Keredari, 641 ; Gola, 1539.

7. **Lindernia viscosa** (Hornem.) Boldingh., Zakfl. Landb. Java 165. 1916; Philcox in Kew Bull. 22 : 38. 1968. *Gratiola viscosa* Hornem., Enum. Pl. Hort. Hafn. 19. 1807.

Vandellia hirsuta Buch.-Ham. ex Benth., Scroph. Ind. 36. 1835; Hook. f. in Hook. f., Fl. Brit. Ind. 4 : 280. 1884; Prain, Bengal Pl. 2 : 768. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 632. 1922.

Lindernia hirsuta (Buch.-Ham.ex Benth.) Wettst. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3b : 79. 1891; Mukerjee in J. Ind. Bot. Soc. 24 : 131. 1945.

Erect-ascending, simple or often branched from base, annual herbs, to 10 cm long. Stems 4-angular, sparsely hispid. Leaves ovate, elliptic or oblong, lower ones tapering at base into 3-5 mm long petiole, upper ones subsessile, subacute or obtuse at apex, crenate-serrate, patently hairy on both surfaces, pinnately veined, 0.6-2.5 × 0.4-1.5 cm. Flowers in lax, glandular-pubescent, terminal racemes; bracts ovate, 1-1.2 mm long;

pedicels slender, glandular-pubescent, 0.6-1.2 cm long. Calyx 3-3.5 mm long, hairy outside, divided almost to base; segments linear-lanceolate. Corolla white, 4-5 mm long; upper lip entire, brownish; lower lip with 3 suborbicular lobes. Stamens of lower pair with a short spur or geniculation near base. Capsule globose, equal to or slightly shorter than calyx, 2.5-3 mm long. Seeds cylindric, straw-coloured, 0.3 mm.

Fl. & Fr. : July-Sept.

Ecology : Not common; in shady localities of forests, roadsides, moist places in gardens, riversides, etc.

Distribution : India : Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Sikkim, Deccan Peninsula. Bangladesh, Sri Lanka, Java, Borneo, Philippines, China.

Specimens examined : Hazaribagh, 47; Gola, 765.

9. MAZUS Lour.

Mazus pumilus (Burm. f.) Steenis, Nova Guinea N.S. 9 : 31. 1958; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 445. 1981. *Lobelia pumila* Burm. f., Fl. Ind. 186, t. 60. f. 3. 1768.

Lindernia japonica Thunb., Fl. Japan 253. 1784.

Mazus rugosus Lour., Fl. Cochinch. 358. 1790; Hook. f. in Hook.f., Fl. Brit. India 4 : 259. 1885; Prain, Bengal Pl. 2 : 759. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 462. 1922.

M. japonicus (Thunb.) O. Kuntze, Rev. Gen. Pl. 462. 1891; Mooney, Suppl. Bot. Bihar & Orissa 94. 1950.

Erect-ascending, branched from base, glandular-pubescent, annual herbs, to 15 cm long. Leaves rosulate below, sometimes opposite, or alternate above, obovate-spathulate, narrowed into a 1-2 cm long petiole, rounded at apex, upper alternate leaves sessile, irregularly crenate-serrate,

penni-nerved, glabrous on both surfaces, 1-3 × 0.7-2 cm. Racemes lax, to 6 cm long; peduncles glandular-pubescent. Bracts linear-lanceolate, 2-2.5 mm long. Pedicels 5-7 mm long, accrescent to 1.5 cm long in fruit, glandular-pubescent. Calyx divided half-way down, 5-8 mm long in flower, elongating up to 1.2 cm long afterwards in fruits; segments ovate-lanceolate, acute. Corolla pale-blue or white, 0.6-1 cm long; upper lip concave, with short linear lobes, brown spotted and with clavate hairs; lower lip with mid-lobe narrower than lateral ones; throat with a 2-plicate palate. Lower 2 stamens exserted, upper 2 in the tube; anthers conniving in pairs. Lamellae of stigma broadly orbicular. Capsule obovoid, 3-3.5 mm across, rounded at top, glabrous. Seeds ± 0.5 mm long, pale.

Fl. & Fr. : June-Mar.

Ecology : Common; in moist and shady places, fields, gardens, etc.

Distribution : India : Temperate and subtropical Himalaya, plains of northern India from Kashmir through Himachal Pradesh and Punjab to Uttar Pradesh, Bihar, Orissa, West Bengal, Assam, Meghalaya. Bhutan, Nepal, Afghanistan, China, Bangladesh, Myanmar, Sri Lanka, Japan, Malesia.

Specimens examined : Hazaribagh, 54 ; Simaria, 819; Jaynagar, 1516.

Uses : Infusion of plant is used as tonic, aperient and febrifuge.

10. MECARDONIA Ruiz & Pavon

Mecardonia procumbens (Miller) Small, Fl. SE.U.S. 1065, 1338. 1903; Adams, Fl. Pl. Jamaica 663. 1972; D'Arcy in Ann. Missouri Bot. Gard. (Fl. Panama) 66 : 240. 1979; Hara in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 118. 1982. *Erinus procumbens* Miller, Gard. Dict. ed. 8, no. 6. 1768.

Lindernia dianthera Sw., Prodr. Veg. Ind.Occ. 92. 1788.

Herpestis chamaedroides Kunth in H.B.K., Nov. Gen. Sp. Pl. 2 : 369. 1818, *nom. illegit.* cites *Lindernia dianthera* Sw.; Prain, Bengal Pl. 2 : 765. 1903.

Mecardonia dianthera (Sw.) Penn. in Proc. Acad. Nat. Sci. Philadelphia 98 : 87. 1940; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 136. 1955.

Creeping or ascending, glabrous, ephemeral herbs, branching at base, sometimes rooting at lower nodes. Branches slender, to 15 cm long, sometimes strongly angled. Leaves ovate or ovate-elliptic, cuneate at base, obtuse at apex, serrate on upper 2/3 of margin, glandular-punctate, 0.8-1.5 × 0.6-1 cm; petiole very short or indistinct. Flowers solitary in both axils or two in one axil and solitary in other axil or sometimes only in one axil; pedicel 0.5-1 cm long; bracts linear, 2-4 mm long. Outer 3 sepals ovate, acute, obtuse or rounded at base, 7-8 × 4-5 mm, inner 2 linear, slightly shorter than outer ones, 0.4-0.5 mm wide. Corolla yellow with purple lines, slightly exserted beyond calyx, 0.6-0.8 cm long; lobes recurved, rounded, alike but posterior pair with a short sinus. One rudimentary staminode sometimes present. Ovary longitudinally sulcate. Capsule oblong, 4-6 mm long, dehiscing longitudinally and septicidally from apex. Seeds ovoid, 0.3 mm long.

Fl. & Fr. : Feb.-Nov.

Ecology : Common; in open moist shady places, along roadsides, fields, gardens, etc. forming clumps.

Distribution : India : West Bengl, Bihar, Madhya Pradesh, Assam and Deccan Peninsula. Native of tropical America, introduced and naturalised in almost all warm countries.

Specimens examined : Hazaribagh, 219 ; Chatra, 1080 ; Markochho, 1477.

11. MIMULUS L.

Mimulus strictus Benth., Scroph. Ind. 28. 1835; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 147. 1955; Hara in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 118. 1982.

Mimulus gracilis auct. non R. Br. : Hook f. in Hook f., Fl. Brit. India 4 : 259. 1884, *p.p.*; Prain, Bengal Pl. 2 : 359. 1903; Haines, Bot. Bihar & Orissa, pt. 4 : 623. 1922; Mooney, Suppl. Bot. Bihar & Orissa 96. 1950.

Erect, stoutish herbs, 15-30 cm tall, branched from base. Stems compressed and angular, grooved each side. Leaves sessile, suberect or erect, narrow-oblong, semi-amplexicaul at base, obtuse or subacute at apex, entire or sometimes slightly serrate, glabrous, gland-dotted beneath, basally 3-nerved, lower 2.5-5 cm long, gradually shorter upwards; peduncles stout, longer than leaves, to 2.5 cm or more long. Calyx 5-6 mm long; lobes very small, keeled, acute. Corolla white or pale-blue with brown-spotted throat, 1-1.2 cm long; palate 2-lobed, swollen; mid-lobe of lower lip broadest, papillose. 2 anterior stamens longest. Stigma 2-lamellate, sensitive. Capsule obovoid or oblong, as long as calyx. Seeds smooth, oblong.

Fl. & Fr. : Apr.-Dec.

Ecology : Not common; along banks of streams.

Distribution : India : Western and central Himalaya, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, western Peninsula. Nepal, China, tropical Asia and Africa.

Specimen examined : National Park, 1156.

Use : Plants are used in menstrual disorders.

Note : *M. gracilis* R. Br. is distributed only in Australia.

12. SCOPARIA L.

Scoparia dulcis L., Sp. Pl. 116. 1753; Hook. f. in Hook. f., Fl. Brit. India 4 : 289. 1884; Prain, Bengal Pl. 2 : 772. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 637. 1922.

Annual-perennial herbs, 30-90 cm tall, often with a woody base. Stems divaricately branched, angular-ribbed, glabrous. Leaves decussate to ternately whorled, obovate-oblong to oblanceolate or elliptic, cuneate at base, subacute at apex, coarsely crenate-serrate at upper part, glabrous, penni-nerved, 1-5 × 0.4-2 cm; petioles 2-10 mm long. Flowers 4.5-5 mm across, 1-3 together, often forming leafy racemes; pedicels glabrous, 4-6 mm long. Calyx 2-2.5 mm long, almost divided to base; lobes 4, subequal, oval-oblong, 3-nerved, pubescent without, ciliate along margins. Corolla white; lobes 4, oblong, obtuse, 3-3.5 mm long; throat densely pilose. Stamens 4, exserted; anther-cells divaricate, pale greenish-yellow. Ovary globose, glabrous, 1.2-1.5 mm across. Stigma truncate. Capsule globose, 3-4 mm across, tipped by withered style, pale-brown. Seeds oblong-cuneiform, 0.4-0.5 mm long, dull-brown.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; in waste places, roadsides, along sides of railway tracks, cultivated fields, gardens, dry and wet lowlands, forest edges and forest clearings.

Distribution : Throughout India. Native of tropical America, now pantropical.

Specimens examined : Jhumri Telaiya, 140; Barkattwa, 514; Etkhori 1447.

Uses : Infusion of leaves is used in fever, cough and bronchitis. Decoction of leaves is useful in renal disorders. Extract of leaves and stems is applied in anaemia and different complications related to diabetes. Plants are used as cattle fodder.

13. SOPUBIA Buch.-Ham.

Sopubia delphiniifolia (L.) G.Don, Gen. Syst. 4 : 560. 1837 ('delphinifolia'); Hook. f. in Hook. f., Fl. Brit. India 4 : 302. 1884; Prain, Bengal Pl. 2 : 777. 1903; Haines, Bot. Bihar and Orissa pt. 4 : 638. 1922. *Gerardia delphiniifolia* L. in Juslenius, Cent. I. Pl. 21. 1756.

Erect, pubescent, annual herbs, 30-90 cm tall. Stem quadrangular, grooved, much branched above with erecto-patent branches, somewhat woody. Lower leaves in verticels of 3-5, pinnatisect, 2-6 cm long; segments unequal, filiform, flexuous, spreading; upper ones 3-fid to linear, passing into bracts. Flowers 6-7 mm across, axillary, solitary, becoming racemose above ; bracts 1-2.5 cm long; pedicels slender, 3-6 mm long ; bracteoles filiform, 2-3 mm long. Calyx scabrous, 10-nerved, 0.4-0.6 cm long; lobes 5, subulate. Corolla white to purple, puberulous outside, 1.5-2 cm long; tube 0.8-1 cm long; lower lip with suborbicular midlobe larger than the lateral ones. Stamens inserted in middle of corolla tube; filaments pinkish, sparsely strigose; sterile anther-lobes linear, shortly acuminate. Style minutely strigose. Capsule oblong-ellipsoid, rounded at top, apiculate by withered style base, black, glabrous, 4-6 mm long. Seeds oblong, truncate, black, striate, 0.5-0.8 mm long.

Fl. & Fr. : July-Oct.

Ecology : Not common; in open grassy places, along borders of ricefields, etc.

Distribution : India : Bihar, Chota Nagpur, Uttar Pradesh, Gujarat, Western Ghats and Deccan Peninsula, Sri Lanka, Bangladesh.

Specimens examined : Ghanghree, 1298 ; Ramgarh, 1928.

Use : Plant-juice is applied to sores on feet.

14. STRIGA Lour.

Striga angustifolia (D.Don) Saldan. in Bull. Bot. Surv. India 5 : 70. 1963; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 401. 1981. *Buchnera angustifolia* D. Don, Prodr. Fl. Nepal 91. 1825.

Buchnera euphrasioides auct. non Vahl : Roxb., Fl. Ind. 3 : 32. 1832; Benth., Scroph. Ind. 41. 1835.

Striga euphrasioides auct. non (Vahl) Benth. (excl. basionym) : Hook. f. in Hook. f., Fl. Brit. India 4: 299. 1884, *p.p.*; Prain, Bengal Pl. 2 : 775. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 640. 1922.

Herbs, to 30 cm tall. Stems obtusely quadrangular, often branched. Leaves sessile, linear, scabrid on both surfaces, ciliolate and purplish along margins, 1-nerved, 10-50 × 1.5-4 mm. Flowers sessile or shortly pedicellate ; pedicels 0 to 1.5 mm long; bracteoles subulate, strigose, *ca* 2.5 mm long. Calyx 6-8 mm long, campanulate, with 15 strong scabrous ribs, 5-fid; lobes linear-lanceolate, acuminate, each 3-ribbed with lateral ribs converging at apex. Corolla white, exceeding calyx, 1.2-1.5 cm long; tube 0.8-1 cm long, strigose at upper half; upper lip broadly orbicular, much shorter than lower; lower lip with midlobe broadly obovate. Anthers oblong. Ovary oblong, 2.5-3 mm long; style glabrous; stigma entire, thick. Capsule oblong-elliptic, rounded at top, apiculate by withered syle base, glabrous, 6-7 mm long. Seeds oblong, longitudinally ribbed, glabrous, black, 0.8-1 mm long.

Fl. & Fr. : July-Nov.

Ecology : Common; in open grasslands, among short grasses along roadsides, open pasture lands, etc.

Distribution : Throughout India including Himalaya. Nepal, Sri Lanka, Myanmar, Indonesia, Malesia.

Specimens examined : Ghanghree, 1012 ; Hunterganj, 2080.

Use : Plant is used to improve appetite.

15. VERBASCUM L.

Verbascum chinense (L.) Santap., Fl. Purandhar 90. 1958; Cramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 390. 1981. *Scrophularia chinensis* L., Mant. Pl. 250. 1771.

Celsia coromandeliana Vahl, Symb. Bot. 3 :79. 1794; Hook. f. in Hook. f., Fl. Brit. India 4 : 251. 1885; Prain, Bengal Pl. 2 : 759. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 619. 1922.

Verbascum coromandelianum (Vahl) O. Kuntze, Rev. Gen. Pl. 1 : 468. 1891; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 129. 1955.

Local name : Gadartambaku.

Erect, annual herbs, 30-100 cm tall. Stems glandular-pubescent, stout, branched above. Basal leaves in rosette, lyrato-pinnatifid; lower cauline ones alternate, long-petiolate, oblanceolate, obovate-oblong, lyrate, compound or pinnatisect, with several small leaflets or segments at base and a large ovate-oblong acute terminal lobe; petiole to 8 cm long; upper ones sessile, ovate, obtuse at apex, crenate-denate; all leaves pubescent on both surfaces, penninerved, 3-9 × 1.5-3 cm; higher ones small, passing into bracts. Flowers 1-1.5 cm across, in lax, simple or branched terminal racemes to 50 cm long. Rachis glandular-pubescent. Bracts sessile, ovate, foliaceous, gradually becoming smaller upwards. Pedicels to 1 cm long. Bracteoles 0. Calyx glandular-pubescent, deeply divided, 3-4.5 mm long; segments subequal, oblong or ovate, hispid outside, entire or serrate. Corolla yellow; lobes unequal, broad, shortly united, 6 mm. Filaments hairy; anthers confluent at apex. Ovary globose, externally 2-lobed. Capsule subglobose, septicidal, 2-valved, punctate, 6-7 mm in diam. Seeds oblong, rugose, 0.4 mm long.

Fl. & Fr. : Feb.-May.

Ecology : Not common ; in waste places, fields, along river beds, etc.

Distribution : Throughout India. Afghanistan, China, Myanmar, Sri Lanka.

Specimens examined : Raja Rappa, 364 ; Hazaribagh, 760 ; Chatra 1104.

Uses : Leaf-extract is used in diarrhoea and dysentery. Plant-juice is used as a febrifuge and for eruptions on skin.

16. VERONICA L.

Veronica angallis-aquatica L., Sp. Pl. 12. 1753; Hook. f. in Hook. f., Fl. Brit. India 4 : 293. 1884; Prain, Bengal Pl. 2 : 773. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 636. 1922.

Local name : Titlokia.

Erect or decumbent-ascending, succulent, annual-perennial herbs, 7-40 cm tall. Stems glabrous below, patently glandular-hairy towards apex. Leaves sessile, oblong or oblong-lanceolate, with a semi-amplexicaul base, subacute or obtuse at apex, entire or irregularly serrate, penni-nerved, glabrous, 5-7 × 0.7-1 cm. Flowers in lax, axillary, slender racemes. Rachis patently glandular-hairy. Bracts linear-oblong, 3-4 mm long, shorter than pedicels. Pedicels filiform, glandular-hairy, 3-4 mm long. Calyx 2-3 mm long, divided almost to base; segments ovate or lanceolate-oblong,subacute. Corolla white, pink or purplish, 1.5-2.5 mm long; tube very short; lobes rounded. Stamens 2, adnate to corolla-tube by sides of upper lobe, exserted. Capsules orbicular-oblong, compressed, glandular-hairy, 3.5-4 mm across. Seeds ellipsoid-oblong, biconvex, ± 0.6 mm long. Fuiting calyx 0.4-0.45 cm long.

Fl. & Fr. : Nov.-Mar.

Ecology : Very common; in wet waste places, along sandy banks of rivers, marshy places, etc.

Distribution : Throughout India including Himalaya. Asia, Europe, N. and S. Africa, N. America.

Specimens examined : Hazaribagh, 48 ; Ghanghree, 1310 ; Jhumri Telaiya, 1751 ; Ichak, 1835.

Uses : Leaves are used as salads. Plant is used as antiscorbutic and for bladder troubles.

107. ACANTHACEAE

Key to the Genera

1a. Climbers. Leaves palmately veined. Calyx minute, annular or 10-15-toothed. Bracteoles subconnate as a spathaceous epicalyx ... 15. THUNBERGIA

1b. Erect, prostrate or stragglers, but not climbers. Leaves pinnately veined. Calyx distinct. Bracteoles not subconnate :

2a. Perfect stamens 4 :

3a. Corolla-segments imbricate in bud. Bracts and bracteoles similar, spine-tipped ... 10. LEPIDAGATHIS

3b. Corolla-segments twisted in bud. Bracts and bracteoles usually dissimilar, not spine-tipped :

4a. Ovules 2 in each cell. Capsule 4-or fewer-seeded ... 5. DYSCHORISTE

4b. Ovules 3-12 in each cell. Capsule 6 or more-seeded :

5a. Corolla distinctly 2-lipped ... 7. HYGROPHILA

5b. Corolla not distinctly 2-lipped, subequally 5-lobed :

6a. Corolla linear or linear-oblong, seed-bearing throughout. Bracteoles small, narrow, or obsolete :

7a. Flowers sessile, mostly in heads ... 6. HEMIGRAPHIS

7b. Flowers pedicelled, in lax axillary cymes or in terminal large cymose panicles ... 13. RUELLIA

6b. Capsule clavate, with solid sterile base, seed bearing upwards. Bracteoles large, leafy, exceeding calyx. Flowers 1-3 in axils of leaves ... 4. DIPTERACANTHUS

2b. Perfect stamens 2; obsolete or reduced stamens, or staminodes present or absent :

8a. Obsolete or reduced stamens, or staminodes present :

9a. Corolla distinctly 2-lipped. Calyx-lobes 5, subequal ... 7. HYGROPHILA

9b. Corolla not distinctly 2-lipped, subequally 5-lobed. Calyx-lobes 4, the two opposite outer ones larger than the inner ones ... 2. BARLERIA

8b. Obsolete or reduced stamens, or staminodes absent :

10a. Seeds not supported on retinacula. Bracts herbaceous ... 11. NELSONIA

10b. Seeds supported on retinacula. Bracts not herbaceous :

11a. Ovules 2 in each cell. Anther-cells divaricate or superposed :

12a. Placentas separating elastically from valves from the base upwards :

13a. Bracts arranged in unilateral spikes ... 14. RUNGIA

13b. Bracts arranged in axillary clusters or paniculate cymes ... 3. DICLIPTERA

12b. Placentas not separating elastically from valves :

14a. Anther-cells, atleast the lower one, spurred or minutely apiculte at base ... 9. JUSTICIA

14b. Anther-cells muticous. Bracts in opposite pairs ... 12. PERISTROPHE

11b. Ovules 4-6 in each cell, if 2 (e.g.Indoneesiella) then anther-cells neither divaricate nor superposed :

15a. Capsule 4-seeded. Flowers 1-sided, borne on branches of exclusively axillary panicles ... 8. INDONEESIELLA

15b. Capsule 8-12-seeded. Flowers borne on all sides of branches of both axillary and terminal panicles ... 1. ANDROGRAPHIS

1. ANDROGRAPHIS Wall.

Andrographis paniculata (Burm.f.) Wall. ex Ness in Wall., Pl. As. Rar. 3 : 116. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 501. 1884; Prain, Bengal Pl. 2 : 809. 1903; Haines, For. Fl. Chota Nagpur 458. 1910 & Bot. Bihar & Orissa pt. 4 : 699. 1922. *Justicia paniculata* Burm. f., Fl. Ind. 9. 1768.

Andrograhis subspathulata Clarke in Hook. f., Fl. Brit. India 4 : 502, 1884.

Local name : Kalmeg, Kirayat.

Erect, annual herbs, 30-90 cm tall. Stems glabrous below, glandular-pubescent above. Leaves sessile or subsessile, linear- lanceolate or lanceolate, narrowed at both ends, paler beneath, 3.5-8 × 1.2-2 cm. Panicle-branches divaricate, 6-15 cm long. Pedicel 3-5 mm long, distant, pubescent. Bracts linear, 1.2-1.5 mm long. Bracteoles smaller or 0. Sepals linear-lanceolate, pubescent, 2.5-3 mm long. Corolla white with purple spots, 0.8-1.2 cm long, glandular - hairy outside. Filaments ciliate upwards. Anther cells muticous, bearded at base. Ovary thinly hairy. Capsule oblong, slightly glandular-hairy when young, glabrous when mature, apical pointed, 15-18 × 2-3 mm. Seeds subquadrate, yellow or deep brown.

Fl. & Fr. : Sept.-May.

Ecology : Very common; in open waste places, roadsides, forests, etc., also cultivated in gardens.

Distribution : Almost throughout India. Sri Lanka, cultivated in E. & W. Indies.

Specimens examined : Raja Rappa. 369 ; Etkhori, 1459 ; Telaiya Dam, 1850.

Uses : Infusion of plant is used in fever and an extract as a medicine for liver and jaundice.

2. BARLERIA L.

Key to the Species

1a. Plants armed. Corolla orange-yellow. Capsule with a solid beak ... 2. *B. prionitis*

1b. Plants unarmed. Corolla rose-coloured or white. Capsule without a solid beak ... 1. *B. cristata*

1. **Barleria cristata** L., Sp. Pl. 636. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 488. 1884; Prain, Bengal Pl. 2 : 812. 1903; Haines. For. Fl. Chota Nagpur 453. 1910 & Bot. Bihar & Orissa pt. 4 : 683. 1922.

Erect or diffuse, perennial herbs or undershrubs, 30-90 cm tall. Stems 4-gonous, appressedly yellow-hairy, densely hairy at nodes. Leaves subsessile, elliptic or oblong-lanceolate, cuneate at base, acute to shortly acuminate at apex, ciliolate, appressed-hairy, lineolate, 5-10×2-3 cm; petiole 4-8 mm long. Flowers subsessile, 1-3 together in leaf-axils or forming dense capitate spikes on branchlets; bracteoles linear-lanceolate, with spinule-tipped apices, 0.8-1.5 cm long. Outer calyx-segments ovate-oblong, toothed, softly

hairy, subspinescent, 1.8-2.5 cm long; inner ones linear-lanceolate, acuminate, ciliate, 0.8-1 cm long. Corolla rose-coloured or white, 3-5 cm long; lobes oblong, 1-2 cm long. Capsule glabrous, compressed, 1.5-2 cm long, without a solid beak, 4-seeded. Seeds suborbicular, 4-5 mm accross.

Fl. & Fr. : Sept.-Jan.

Ecology : Very common; on rocks of hills, forest edges, along borders of fields, etc., also grown in gardens.

Distribution : Throughout India including Himalaya. Bangladesh, Myanmar, China, Pakistan, Nepal, Philippines.

Specimens examined : National Park, 94, 426; Ichak, 1311; Koderma Forest, 1980.

Uses : Leaves and roots are used for cough and inflammation.

2. **Barleria prionitis** L., Sp. Pl. 636. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 482. 1884; Prain, Bengal Pl. 2 : 812. 1903; Haines, For. Fl. Chota Nagpur 453, 1910 & Bot. Bihar & Orissa pt. 4 : 681. 1922.

Local name : Katsareya, Jhinti.

Armed, bushy undershrubs, 60-150 cm tall. Stems terete or obtusely 4-angled, pubescent in young parts. Leaves elliptic, narrowed towards base, acuminate at apex, spine-tipped, entire, glabrous, or sometimes sericeous beneath, 6-10 × 2-3.5 cm; petiole 1-2 cm long. Flowers 1-3 together in axils and in terminal spikes ; bracts elliptic or elliptic-oblong, spine-tipped, 1.2-2.5 cm long, the lower larger ; bracteoles converted into linear-lanceolate spines. Outer 2 calyx-segments elliptic-oblong, spine-tipped, 1.5-2 cm long; inner 2 linear-lanceolate, 1-1.2 cm long, mucronate. Corolla orange-yellow, 2.5-3.5 cm long, pubescent outside. Capsule 1.5-2.5 cm long, with a solid beak, 2-seeded. Seeds ovate, 6-8 mm in diam.

Fl. & Fr. : Dec.-June.

Ecology : Common; cultivated as an ornamental in gardens, sometimes met with as an escape in vacant lots, waste places, scrub jungles near habitational sites, etc.

Distribution : Throughout India. Sri Lanka, tropical Asia and Africa.

Specimens examined : Hazaribagh, 723 ; Mandu, 839; Barkattwa, 1695.

Uses : Juice of leaves with honey is used in catarrhal affections of children. Paste of root is applied to glandular swellings. Leaves are used to relieve toothache.

3. DICLIPTERA JUSS., *nom. cons.*

Dicliptera bupleuroides Nees in Wall., Pl. As. Rar. 3 : 111. 1832; Haines, Bot. Bihar & Orissa 4 : 698. 1922; Hara in J. Jap. Bot. 55 : 324. 1980 & in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 139. 1982.

Dicliptera roxburghiana auct. non Nees : Clarke in Hook. f., Fl. Brit. India 4 : 553. 1884; Prain, Bengal Pl. 2 : 822. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 697. 1922.

D. roxburghiana Nees var. *bupleuroides* (Nees) Clarke in Hook. f., Fl. Brit. India 4 : 554. 1885; Prain, Bengal Pl. 2 : 822. 1903.

Annual-perennial herbs, often rooting at lower nodes, with stout woody rootstock. Stems 4-gonous, glabrous below, hairy towards apex, to 40 cm long. Leaves elliptic or rhomboid-lanceolate, cuneate at base, acuminate at apex, subentire to crenate, thinly hairy or puberulous above, glabrous beneath, 3.5-9 × 2.5-5 cm; petiole 5-7 mm long. Flowers in 2-4 flowered, sessile or shortly peduncled, axillary and terminal clusters; bracts obovate-cuneate to cuneate-elliptic, mucronate, ciliate, 0.8-1.5 cm. Calyx 6-7 mm long; segments linear, ciliate. Corolla purplish, 1.5-2 cm long; anterior lip 3-toothed; posterior lip entire, with recurved margins. Stamens 2; anther-cells 2, at unequal level, muticous; staminodes

0. Ovules 2 per ovary - locule. Capsule puberulous, clavate with solid base, 6-8 mm long. Seeds 2, discoid, glandular-papillose, conspicuously verrucose.

Fl. & Fr. : Mar.-June.

Ecology : Not common; in shaded waste places, scrub jungles, forest edges, etc.

Distribution : India : Throughout the plains of N. India, Himalaya, Uttar Pradesh, Bihar, Orissa, West Bengal. Bangladesh, Bhutan, Thailand, Indo-China, W. China, Afganistan, Neptal.

Specimens examined : Barkaganwa, 881 ; Markachho, 1462.

Use : Plant is used as tonic.

4. DIPTERACANTHUS Nees emend. Bremek.

Dipteracanthus prostratus (Poir.) Nees in Wall., Pl. As. Rar. 3 : 81. 1832; Santap. in Bot. Mem. Univ. Bombay 2 : 24. 1951. *Ruellia prostrata* Poir. in Lam., Encycl. 4 : 439. 1804 ; Clarke in Hook. f., Fl. Brit. India 4 : 411. 1884 ; Prain, Bengal Pl. 2 : 803. 1903; Haines, For. Fl. Chota Nagpur 450. 1910 & Bot. Bihar & Orissa pt. 4 : 673. 1922.

Ruellia prostrata Poir. var. *dejecta* (Nees) Clarke in Hook. f., Fl. Brit. India 4 : 412. 1884; Prain, Bengal Pl. 2 : 803. 1903.

Prostrate or decumbent-ascending, perennial herbs, often rooting at basal nodes, with woody rootstock. Stems much-branched, terete with thickened and purplish nodes and long internodes, glabrous except at nodes below, patently hairy towards apex, to 40 cm long. Leaves ovate to ovate-lanceolate or elliptic, narrowed at base, subacute to obtuse at apex, subentire-repand, ciliate along margins, nearly glabrous or sparsely appressed hairy, 1.5-7.5 × 1-4 cm ; petioles 0.6-2 cm long. Flowers subsessile, axillary, solitary or sometimes few together ; bracteoles spathulate-elliptic, petioled, 0.8-2 cm long. Calyx 0.8-1 cm long; lobes lanceolate, hairy, 5-7 mm long. Corolla blue, 3.5-5 cm long, narrowly

tubular below, ventricose above; lobes rounded-suborbicular, to 1 cm across. Stamens 4, didynamous; anther-cells 2, muticous; staminodes 0. Ovary pubescent; style linear, to 1.5 cm long. Capsule densely pubescent, 1.8-2 cm long. Seeds 2-3 mm across.

Fl.: July-Sept. *Fr.* : Nov.-Feb.

Ecology : Very common; in forest edges, arable lands, banks of rivers, dry and moist shady localities near habitations, etc.

Distribution : Almost throughout India. Sri Lanka, E. Africa.

Specimens examined : Hazaribagh, 269 ; Simaria, 816; Markachho, 1476.

Use : Local people use the plant-extract in ear troubles.

5. DYSCHORISTE Nees

Dyschoriste depressa Nees in Wall., Pl. As. Rar. 3 : 81. 1832; Haines, Bot. Bihar & Orissa pt. 4 : 676. 1922

Dipteracanthus nagchana Nees in Wall.., Pl. As. Rar. 3 : 82. 1832.

Calophanes nagchana (Nees) Nees in DC., Prodr. 11 : 109. 1847; Clarke in Hook. f., Fl. Brit. India 4 : 410. 1885; Prain, Bengal Pl. 2 : 806. 1903.

Dyschoriste erecta (Burm.f.) O. Kuntze, Rev. Gen. Pl. 485. 1891, excl. type; Santap., Acanth. Bombay 31. 1951.

D. nagchana (Nees) Bennet in Ind. For. 109 : 220. 1983.

Prostrate, glabrescent herbs. Stems numerous, branched, lineolate, somewhat woody at base, 4-angular above, 10-40 cm long. Leaves obovate or spathulate-elliptic, attenuate at base into a 0-5 mm long petiole,

obtuse at apex, densely and minutely lineolate above, 1-4 × 0.6-2.5 cm. Flowers usually axillary clustered or sometimes on very short axillary peduncles with a pair of small leaves; bracts spathulate-elliptic; bracteoles linear, 2.5-3 mm long. Calyx 7-9 mm long, minutely strigillose or lineolate; sepals 4-5 mm long, with setaceous tips. Corolla blue, somewhat shorter than or slightly exceeding calyx; lobes rounded. Stamens 4, didynamous; anther-cells 2, minutely spurred to mucronate at base; filaments glabrous; one short and one long from each pair of stamens connate at base into a flattened pubescent palate. Capsule 0.8-1.2 cm long.

Fl. & Fr. : Mar.- July.

Ecology : Not common; in waste places, roadsides, etc.

Distribution : India : Deccan Paninsula, Bihar. Sri Lanka.

Specimens examined : Hazaribagh, 1563 ; Ramgarh, 1923.

6. HEMIGRAPHIS Nees

Key to the Species

1a. Corolla tubular-ventricose. Longer filaments glabrous in their upper half. Leaves 1-2.5 cm long ... 1. *H. hirta*

1b. Corolla narrowly tubular-funnel-shaped. Longer filaments densely bearded in their upper half. Leaves 3.5-10 cm long. ...2. *H. latebrosa*

1. **Hemigraphis hirta** (Vahl) T. Anders. in J. Linn. Soc. Bot. 9 : 462. 1867; Clarke in Hook. f., Fl. Brit. India 4 : 422. 1884; Prain, Bengal Pl. 2 : 805. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 672. 1922; Mooney, Suppl. Bot. Bihar & Orissa 108. 1950. *Ruellia hirta* Vahl, Symb. Bot. 3 : 84, t. 67. 1794.

Prostrate, softly hirsute, small herbs. Stems 4-gonous, 15-40 cm long, creeping in grass. Leaves (sub) sessile, ovate, cuneate or obtuse or rounded at base, acute or obtuse at apex, crenate, 1-2.5 × 0.7-1.5 cm; petiole

0-4 mm long. Spikes 2-6-flowered. Bracts elliptic, 0.8-1.2 cm long. Bracteoles 0. Sepals linear or spathulate in fruit, 5-6 mm long. Corolla pale blue, 1-1.2 cm long, tubular-ventricose; ventricose portion nearly as long as cylindrical portion. Longer filaments laxly hairy below, glabrous above. Capsule 6-8 mm long, 12-seeded.

Fl. & Fr. : Mar.-June.

Ecology : Not common; along roadsides, railway tracks, waste places, gardens, scrub jungles, etc.

Distribution : Upper Gangetic Plains, West Bengal, Orissa. Bangladesh.

Specimens examined : Hazaribagh, 1601; Jhumri Telaiya, 1759.

2. **Hemigraphis latebrosa** (Roth) Nees in DC., Prodr. 11 : 723. 1847; Clarke in Hook. f., Fl. Brit. India 4 : 423. 1884; Prain, Bengal Pl. 2 : 805. 1903; Haines, For. Fl. Chota Nagpur 452. 1910 & Bot. Bihar & Orissa pt. 4 : 672. 1922; Mooney, Suppl. Bot. Bihar & Orissa 108. 1950. *Ruellia latebrosa* Heyne ex Roth, Nov. Pl. Sp. 307. 1821.

Diffuse or erect, softly hairy herbs, 30-50 cm long. Branches weak, 4-angled. Leaves long-petiolate, ovate, with base suddenly contracted on 2.5-4.5 cm long petiole, acuminate at apex, crenate-dentate, 3.5-10 × 2.5-6 cm. Bracts petiolate, ovate or elliptic, to 8 × 2 mm. Bracteoles 0. Sepals subequal, linear-lanceolate, hairy, pale, 5-6.5 mm long. Corolla blue, 1.5-1.8 cm long, narrowly tubular-funnel-shaped. Shorter filaments glabrous, longer filaments densely bearded by white papillose hairs in their upper half. Capsule 6-8 mm long, minutely patently hairy, 6-seeded.

Fl. & Fr. : Nov.-Feb.

Ecology : Very common; in dry shaded places of Sal forests, ravine slopes, forest edges, scrub jungles, etc.

Distribution : India : West Bengal, Bihar, Orissa, Deccan Peninsula.

Specimens examined : Raja Rappa, 371; National Park, 2035.

7. HYGROPHILA R. Br.

Key to the Species

1a. Unarmed. Calyx-lobes or teeth 5. Seeds more than 8 :

2a. Leaves pinnatifid or sharply crenate-serrate. Retinacula minute, conical, soft,straight. Plants glandular ... 2. *H. difformis*

2b. Leaves entire. Retinacula acute, hardened, curved. Plants not glandular :

3a. Flowers in terminal, dense, oblong spikes. Fertile stamens 2, posterior 2 reduced to teeth ... 3. *H. polysperma*

3b. Flowers in axillary whorls. Stamens 4, all fertile ... 4. *H. salicifolia*

1b. Armed. Calyx-lobes 4. Seeds 4-8 ... 1. *H. auriculata*

1. **Hygrophila auriculata** (Schum.) Heine in Kew Bull. 16 : 172. 1962; Babu, Herb. Fl.Dehra Dun 385.1972. *Barleria auriculata* Schum. in Schum. & Tonn., Beskr. Guin. Pl. 285. 1827.

Barleria longifolia L. in Torner, Cent. II. Pl. 22. 1756, non *H. longifolia* Nees 1847.

Ruellia longifolia Roxb., Fl. Ind. 3 : 50. 1832, *non Hygrophila longifolia* Nees 1847.

Asteracantha longifolia (L.) Nees in Wall., Pl. As. Rar. 3 : 90. 1832; Haines, Bot. Bihar & Orissa pt. 4 : 671. 1922.

Hygrophila spinosa Anders. in Thwaites, Enum. Pl. Zeyl. 225. 1860; Clarke in Hook. f., Fl. Brit. India 4 : 408. 1884; Prain, Bengal Pl. 2 : 802. 1903; Haines, For. Fl. Chota Nagpur 452. 1910.

Local name : Talimakhana.

Erect or decumbent-ascending, strigose-hispid, perennial herbs, to 120 cm long, with 1.5-4 cm long, straight, axillary spines. Stems sub-quadrangular, simple or branched, thickened at nodes. Leaves in whorls of 6, subsessile, oblong-lanceolate, narrowed at base, subacute or obtuse at apex, minutely dentate, sparsely hispid-hairy, 3-15 × 0.5-1.5 cm. Flowers borne in many-flowered axillary whorls; bracts involucrate, 1.2-2.5 cm long, lanceolate, hispidly hairy; bracteoles 6-8 mm long, narrow, sometimes absent. Calyx-lobes 4, unequal, lanceolate, hispid, 3-15 mm long, outer longest. Corolla blue, 2.5-3 cm long; tube 1.2-1.5 cm long; upper lip 2-lobed, lower lip deeply 3-lobed; palate yellow with 2 orange ridges. One long filament and one short filament of each pair united at base; anther cells unequal, oblong. Ovary oblong, 2-2.5 mm long, apically ciliate. Capsule shorter than sepals. Seeds 4-8, *ca* 3 × 2 mm.

Fl. & Fr. : Oct.-Dec.

Ecology : Common; in marshy grounds, around ditches, ponds and puddles.

Distribution : Throughout India including tropical Himalaya. Myanmar, Nepal, Indo-China, Malesia.

Specimens examined : Hazaribagh, 14, 259 ; Markachho, 1484.

Uses : Roots, leaves and seeds are diuretic, used in jaundice, leprosy, rheumatism and urino-genital diseases.

2. **Hygrophila difformis** (L.f.) Blume, Bijdr. 803. 1826; Sreemadh. & Bennet in Bull. Bot. Surv. India 1 : 222. 1969. *Ruellia difformis* L. f., Suppl. 289. 1781.

Ruellia triflora Roxb., Fl. Ind. 3 : 52. 1832.

Cardanthera triflora (Roxb.) Buch.-Ham ex Voigt, Hort. Suburb. Calc. 482. 1845; Clarke in Hook. f., Fl. Brit. India 4 : 405. 1884; Prain, Bengal Pl. 2 : 799. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 699. 1922.

Synnema triflora (Roxb.) O. Kuntze, Rev. Gen. Pl. 500. 1891; Raizada in Ind. For. 94 : 462. 1968.

Decumbent, annual herbs. Stems 20-40 cm long, rooting at base, glandular-hairy. Leaves membranous, glandular-hairy on both surfaces, highly variable; lower ones usually pinnatifid, in water large, pectinate; upper ones ovate or rounded, decurrent at base in a short petiole, rounded at apex, closely and sharply crenate-serrate, 1.5-3 × 1.2-2.5 cm. Flowers 1-3 in axillary whorls forming terminal spikes by gradual reduction of leaves; bracteoles oblong, 5-6 mm long. Sepals linear-subulate, glandular-hairy, acute, one larger than others. Corolla 0.8-1.2 cm long, pubescent outside, purple; upper lip erect, inflated below shortly 2-lobed limb; lower lip broad, sparsely hairy within, with darker veins. Capsule 6-8 mm long, pubescent, 30-60-seeded. Retinacula minute, conical, soft, straight.

Fl. & Fr. : Nov.-Feb.

Ecology : Not common; in rice-fields, field-borders and margins of ponds.

Distribution : West Bengal, Bihar, Orissa, Assam, Tropical Himalaya. Bangladesh, Nepal, Singapore.

Specimens examined : Gola, 789 ; Chowparan, 1380.

3. **Hygrophila polysperma** (Roxb.) Anders. in J. Linn. Soc. Bot. 9: 456. 1867; Clarke in Hook. f., Fl. Brit. India 4 : 406. 1884; Prain, Bengal Pl. 2 : 801. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 670. 1922; Hara in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 141. 1982. *Justicia polysperma* Roxb., Fl. Ind. 1 : 119. 1820.

Hemiadelphis polysperma (Roxb.) Nees in Wall., Pl. As. Rar. 3 : 80. 1832.

Hemiadelphis polyspermus (Roxb.) Nees var. *joshianus* Rao & Biswas in Ind. For. 94 : 657-658. 1968.

Prostrate or decumbent-ascending, slender, annual herbs. Stems creeping, much branched, sending up erect shoots, to 15 cm long, rooting below, terete or somewhat angled above, glabrous or hairy towards apex. Leaves subsessile, elliptic, oblong or ovate, narrowed at base, subacute to obtuse at apex, nearly entire, puberulous, 0.5-5 × 0.3-1.5 cm; upper ones narrower, passing into bracts. Flowers sessile, borne in terminal, dense, oblong spikes of 3-10 cm long; bracts elliptic-oblong, hairy, 6-8 mm long; bracteoles linear, pubescent, 5-6 mm long. Calyx tubular, 3-5 mm long, pubescent, divided more than half-way down; lobes linear, ciliate. Corolla pale blue, 4-6 mm long, pubescent. Fertile stamens 2, posterior 2 stamens reduced to teeth; anthers of fertile ones oblong, with divaricate lobes. Ovary hairy at apex. Capsule apiculate, 6-8 mm long. Seeds 20-30, orbicular; retinacula nearly straight.

Fl. & Fr. : Nov.-Feb.

Ecology : Common; in marshy and swampy localities.

Distribution : Throughout India. Pakistan, China, Nepal, Afghanistan, Bangladesh.

Specimens examined : Hazaribagh, 10 ; Joynagar, 1494.

4. **Hygrophila salicifolia** (Vahl) Nees in Wall., Pl. As. Rar. 3 : 81. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 407. 1884; Prain, Bengal Pl. 2 : 801. 1903; Haines, For. Fl. Chota Nagpur 452. 1910. *Ruellia salicifolia* Vahl, Sym. Bot. 3 : 84. 1794.

H. angustifolia auct. non R. Br. : Haines, Bot. Bihar & Orissa pt. 4: 670. 1922.

Local name : Matham arak.

Erect or decumbent-ascending, annual or perennial herbs, to 1 m long. Stems obtusely quadrangular, nearly glabrous, finely appressed-pubescent towards apex. Leaves lanceolate, obovate or oblong, narrowed at base, acute or obtuse at apex, entire, minutely appressed-pubscent on both surfaces, 4-10 × 1-1.5 cm ; petiole to 1 cm long. Flowers sessile, borne in distant, axillary whorls. Bracts oblong-lanceolate, hairy, 4-5 mm long; bracteoles narrow-lanceolate, hairy, 2.5-3 mm long. Calyx 0.8-1.2 cm long, divided halfway down in flower; lobes unequal, lanceolate, ciliate. Corolla pale purple, hairy without, 1.2-1.5 cm long; upper lip ovate-oblong, shortly 2-lobed ; lower lip oblong, with 3 subequal, rounded lobes. Stamens 4, all fertile ; filaments hairy at base. Capsule somewhat compressed, 1.2-1.5 cm long, 20-30-seeded. Seeds orbicular ; retinacula curved.

Fl. : July-Nov. *Fr.* : Sept.-Dec.

Ecology : Common; in marshy places, along margins of streams, etc.

Distribution : Almost throughout India including Himalaya. Sri Lanka, Indo-China, S. China, Nepal, Japan, Malesia.

Specimens examined : Barkagawan, 893 ; Hazaribagh, 1577.

Uses : Leaves are eaten as pot-herb and are strongly diuretic. Seeds and leaves are used in poultices.

8. INDONEESIELLA Sreemadh.

Indoneesiella echioides (L.) Sreemadh. in Phytologia 15 : 271. 1967; Rani & Matthew in Matthew, Fl. Tamilnadu Carnatic pt. 2 : 1181. 1983. *Justicia echioides* L., Sp. Pl. 16. 1753.

Andrographis echioides (L.) Nees in Wall., Pl. As. Rar. 3 : 117. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 505. 1884; Prain, Bengal Pl. 2 : 809. 1903; Haines, For. Fl. Chota Nagpur 458. 1910 & Bot. Bihar & Orissa pt. 4 : 699. 1922.

Local name : Birkubat.

Erect, annual herbs, 25-60 cm tall. Stems closely pubescent and with patent long hairs. Leaves sessile, oblong or subelliptic, cuneate at base, obtuse at apex, hairy on both sides, purple-spotted, 3.5-8 × 1.5-2.5 cm. Racemes usually as long as leaves, divaricate or recurved, often one from each axil about middle of stem; rachis glandular - hairy. Bracts minute. Pedicels very short. Sepals linear, glandular-hairy, 4-6 mm long. Corolla pink or white, with dark purple lower lip, pubescent outside. Stamens 2, attached at throat, exserted ; filaments flattened, thinly hairy; anthers dark-purple, densely white-bearded. Ovary puberulous, 4-ovuled ; style hairy; stigma curved. Capsule ellipsoid-oblong, acute at both ends, hairy, 0.6-1 cm long. Seeds ± oblong, twice as long as broad.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; in waste places, roadsides, along railway lines, forests, etc.

Distribution : Drier parts of tropical India. Sri Lanka.

Specimens examined : National Park, 84; Jhumri Telaiya, 1758.

Use : Juice of plant is used in fever by poor people.

9. JUSTICIA L.

Note : Here, the treatment of Santapau (Fl. Khandala, ed. 3, 1967) and Stern (in J. Arnold Arb. 52 : 636. 1971) is followed in treating *Justicia* L. in broader sense including the genera *Rostellularia* Reichenb., *Adhatoda* Fabr. and *Gendarussa* Nees which are sometimes considered as distinct genera.

Key to the Species

1a. Anther-cells not spurred, but apiculate at base. Corolla more than 2 cm long ... 1. *J. adhatoda*

1b. Anther-cells, at least the lower, with white, basal, spur-like appendage. Corolla less than 1.5 cm long :

2a. Calyx-lobes 5, ± equal :

3a. Bracts broad, ovate, white, green-nerved ... 2. *J. betonica*

3b. Bracts narrow, linear, green ... 4. *J. gendarussa*

2b. Calyx-lobes 4, if 5, one rudimentary or much smaller :

4a. Bracts shorter than calyx. Sepals minutely scabrous at tip, otherwise glabrous ... 3. *J. diffusa*

4b. Bracts as long as or longer than calyx :

5a. Plants ± glabrous. Bracts obtuse. Internodes long. ... 7. *J. quinque-angularis*

5b. Plants hairy. Bracts acute :

6a. Bracts elliptic, clothed with glistening jointed hairs ... 5. *J. japonica*

6b. Bracts linear-lanceolate, clothed with simple hairs ... 6. *J. procumbens*

1. **Justicia adhatoda** L., Sp. Pl. 15. 1753; Stern in J. Arnold Arb. 52 : 640. 1971.

Adhatoda zeylanica Medic. in Hist. Comm. Acad. Elect. Sci. Theod. Palat. 6 : 393. 1790.

A. vasica Nees in Wall., Pl. As. Rar. 3 : 103. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 540. 1885; Prain, Bengal Pl. 2 : 819. 1903; Haines, For. Fl. Chota Nagpur 455. 1910 & Bot. Bihar & Orissa pt. 4 : 694. 1922.

Local name : Vasaka, Arusha.

Bushy perennial shrub, to 1.5 m tall, with opposite ascending branches. Branchlets grey-pubescent. Leaves elliptic or elliptic-lanceolate, thin-coriaceous, cuneate to attenuate at base, acuminate at apex, entire, minutely puberulous when young, glabrous when mature, dark-green above, paler beneath, 10-16 × 3-5 cm; petioles to 1 cm long. Flowers borne in short dense spikes of 2.5-7.5 cm long at ends of branchlets; bracts leafy, broadly elliptic or ovate, pubescent, to 2.5 × 1 cm ; bracteoles falcate-oblong, to 15 × 4 mm. Calyx 0.8-1.2 cm long, puberulous, deeply 5-lobed ; lobes lanceolate, equal. Corolla cream-white, 2.5-3 cm long, pubescent without, 2-lipped ; tube inflated above, 1.5 cm long, with villous throat; upper lip erect, galeate, notched; lower lip as long as upper, with midlobe broadest. Stamens 2, attached at throat of tube, exserted; filaments hairy below, declinate; anther-cells basally apiculate. Ovary oblong, pubescent; style-base minutely hairy. Capsule clavate, shortly pointed, pubescent, 1.8-2.2 × 0.7-0.8 cm, 4-seeded. Seeds orbicular-oblong, tubercular-verrucose, glabrous, to 5 mm in diam.

Fl. : Feb.-Apr. *Fr.* : Apr.-June.

Ecology : Common; grown as a hedge plant in villages, sometimes planted along fences.

Distribution : Throughout India including subtropical Himalaya. Indo-China, Nepal, Malesia.

Specimens examined : Hazaribagh, 995 ; Chatra , 1670.

Uses : Fresh or dried leaves are used in bronchial troubles. Leaf-juice also used in diarrhoea, dysentery and glandular tumours. Powdered leaves are used for skin affections.

2. **Justicia betonica** L., Sp. Pl. 15. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 525. 1885; Prain, Bengal Pl. 2 : 817. 1903; Haines, For. Fl. Chota Nagpur 455. 1910 & Bot. Bihar & Orissa pt. 4 : 691. 1922; Santap., Fl. Khandala ed. 3, 208. 1967.

J. ramosissima Roxb., Fl. Ind. 1 : 129. 1820.

J. betonica L. var. *ramosissima* (Roxb.) Clarke in Hook. f., Fl. Brit. India 4 : 525. 1885; Prain, Bengal Pl. 2 : 817. 1903.

Local name : Had-pat.

Erect, diffuse, perennial, suffruticose herbs, to 1.2 m tall. Stems many from a perennial rootstock, striate, with swollen nodes, glabrous, pubescent towards apex. Leaves ovate-lanceolate, cuneate to shortly attenuate at base, acuminate at apex, entire to somewhat crenate-dentate, glabrous, 7-15 × 4-7 cm ; petiole 1-2 cm long. Flowers in terminal or subterminal 1-3-nate spikes of 8-15 cm long ; bracts and bracteoles similar, ovate-lanceolate, acuminate, foliaceous, membranous, white, unequal-sided, green-veined, to 1.5 × 0.7 cm. Calyx-lobes 5, ± equal, linear-lanceolate, 3-ribbed, pubescent, 3.5-4 mm long. Corolla white, with pink patches, pubescent, 1.2-1.5 cm long; tube cylindric, 4.5-5 mm long; upper lip erect, emarginate; lower lip with 3 unequal, rounded lobes. Stamens curved, 5-6 mm long; ovary oblong, pubescent, *ca* 2 mm long. Style hairy. Capsule stoutly clavate, pubescent, 4-seeded, 0.8-1.2 cm long. Seeds ovoid.

Fl. & Fr. : Nov.-Mar.

Ecology : Common; in rocky places, forest edges, roadsides, margins of ditches, hedges, etc., sometimes cultivated in gardens.

Distribution : Almost throughout India. Old World Tropics.

Specimens examined : Raja Rappa , 440 ; National Park, 1073; Pratappur, 1545.

Uses : Plants are used in applications for boils and swellings; and also in diarrhoea.

3. **Justicia diffusa** Willd., Sp. Pl. 1 : 87. 1797; Clarke in Hook. f., Fl. Brit. India 4 : 538. 1885; Prain, Bengal Pl. 2 : 818. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 693.1922.

Rostellularia diffusa (Willd.) Nees in DC., Prodr. 11 : 369. 1847.

Stems quadrangular, much-branched, minutely pubescent, 30-60 cm long. Leaves ovate-elliptic, cuneate at base, acute to subacuminate at apex, lineolate and sparsely hairy on both sides, 2.5-4 × 1.2-2 cm ; petioles 0.6-1 cm long. Spikes very slender, sparsely hairy, axillary and terminal, to 10 cm long. Bracts linear-lanceolate or ovate, with green midrib and scarious margins, shorter than calyx, 1.5-2 mm long. Bracteoles similar to bracts, narrower. Calyx-lobes 4, lanceolate, acute, minutely scabrous at tip, 3-3.5 mm long. Corolla pinkish or white, 5-7 mm long, pubescent outside; upper lip slightly notched. Lower part of style pubescent. Capsule oblong, with a very short solid base, shortly pointed, glabrous, 4-5 mm long. Seeds *ca* 1 mm long, concentrically rugose.

Fl. & Fr. : July-Jan.

Ecology : Very common; in grassy localities, along roadsides, borders of rice fields, railway embankments, etc.

Distribution : Almost throughout India including Himalaya. Nepal, Sri Lanka, Bangladesh, Myanmar, Thailand.

Specimens examined : Raja Rappa, 449 ; Ghanghree, 1008; Satgaon, 1981.

4. **Justicia gendarussa** Burm. f., Fl. Ind. 10. 1768; Clarke in Hook. f., Fl. Brit. India 4 : 532. 1885; Prain, Bengal Pl. 2 : 818. 1903; Haines, For. Fl. Chota Nagpur 456. 1910 & Bot. Bihar & Orissa pt. 4 : 692. 1922.

Gendarussa vulgaris Nees in Wall., Pl. As. Rar. 3 : 104. 1832.

Local name : Nilinargandi, Udisanbhalu.

Erect, perennial undershrub, to 1.2 m tall. Stems much branched, often rooting at lower nodes, subterete, with raised lines of pubescence, dark violet when young, brown when mature, thickened at the nodes. Leaves elliptic-oblong to lanceolate, acuminate at apex, cuneate at base, subentire-crenulate, dark-green, glabrous, 5-12 × 0.7-3 cm; petiole 0.5-1 cm long. Flowers borne in axillary or terminal interrupted spikes, 5-12 cm long, often forming a panicle. Bracts linear, 3 mm long. Calyx 3.5-5 cm long; lobes 5, almost free, nearly equal, glabrous, linear. Corolla white with purple spots, nearly glabrous, 1.2-1.5 cm long; tube cylindric, 1 cm long; lower lip slightly longer than the upper lip. Stamens 2, 5 mm long; lower anther - cell orbicular, distinctly tailed. Style puberulous, to 1 cm long. Capsule clavate, glabrous, 1-1.2 cm long, 4-seeded.

Fl. & Fr. : Jan.-July.

Ecology : Common; planted in gardens as a hedge plant; sometimes grows wildy along streams, moist waste places and at foot of small hills.

Distribution : Throughout India. Sri Lanka, Malacca, Malesia, China, Philippines.

Specimens examined : Pratappur, 933; Churchu, 1282; Jaynagar, 1815.

Uses : Juice of leaves stops internal haemorrhage. Infusion of leaves given in cephalagia, hemiplegia and facial paralysis. Young leaves are used topically in oedema of beriberi and rheumatism.

5. **Justicia japonica** Thunb., Fl. Japan 20. 1784.

J. simplex D. Don, Prodr. Fl. Nepal 118. 1825; Clarke in Hook. f., Fl. Brit. India 4 : 539. 1885; Prain, Bengal Pl. 2 : 818. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 693. 1922.

Rostellularia procumbens (L.) Nees var. *β* in DC., Prodr. 11 : 372. 1847.

Justicia procumbens L. var. *simplex* (D.Don) Yamazaki in Hara, Fl. E. Himalaya 302. 1966; Hara in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 142. 1982.

Rostellularia japonica (Thunb.) Ellis in Bull. Bot. Surv. India 22 : 196. 1980.

Erect, prostrate or procumbent-ascending, slender, annual herbs. Stems much-branched from base, rooting at lower nodes, angled, swollen above nodes, zig-zag, strigose-hairy towards apex, to 30 cm long. Leaves subsessile, ovate-lanceolate to elliptic, rounded or subcuneate at base, subacute at apex, subentire-crenulate, strigose along nerves beneath, 1-4 × 0.5-1.8 cm. Spikes terminal and axillary, densely hairy, 2-8 cm long. Bracts elliptic, acute, scarious-margined, clothed with glistening jointed hairs, 4.5-5 mm long. Bracteoles similar as bracts, narrower. Calyx 3-5 mm long, hairy; segments 4, bracteolate-like with green midrib and scarious margins. Corolla pale-purple, 5-7 mm long, pubescent without; upper lip concave below, subquadrate, 2-fid; lower lip suborbicular with 3 short, rounded lobes. Capsule elliptic-oblong, ciliate at top, 4-4.5 mm long. Seeds suborbicular-cordate, brown-black, 0.7-1 mm across.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; in moist grassy localities, gardens, along borders of rice-fields, etc.

Distribution : Almost throughout India including Himalaya. Nepal, Bangladesh, Sri Lanka, Myanmar, Thailand, Japan, Malesia, E. Africa.

Specimens examined : Mandu, 849 ; Chatra, 1087; Ramgarh Cant., 1892.

Uses : Plant is used as laxative, diaphoretic, diuretic, anthelmintic and expectorant. Infusion of the plant is used in asthma, cough, rheumatism and flatulence.

6. **Justicia procumbens** L., Sp. Pl. 15. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 539. 1884; Mooney, Suppl. Bot. Bihar & Orissa 231. 1950.

Rostellularia procumbens (L.) Nees in DC. Prodr. 11 : 371. 1847.

Stems diffuse, slender, with divaricate branches, rooting at lower nodes. Leaves elliptic or lanceolate, obtuse at both ends, softly pubescent on both sides, 1.2-3.5 × 0.6-0.8 cm; petioles 4-10 mm long. Spikes terminal, densely hirsute, 1-2.5 cm long. Bracts linear-lanceolate, clothed with simple hairs, scarious-margined, 4-6 mm long. Bracteoles similar to bracts. Calyx-lobes linear-subulate, with scarious, ciliate margins, 4-5 mm long, narrower than bracteoles. Corolla pale, violet or pink, 5-6 mm long; upper lip shortly emerginate; lower lip puberulous outside. Capsule oblong, shortly pointed, sparsely pubescent, 3-4 mm long. Seeds *ca* 0.1 mm long.

Fl. & Fr. : July-Dec.

Ecology : Common; in waste places, along roadsides, gardens, etc.

Distribution : India : Deccan Peninsula, Bihar. Sri Lanka, Malesia, Australia.

Specimens examined : Patratu, 567; Ghanghree, 2161.

Uses : Same as those of *J. japonica* Thunb.

7. **Justicia quinqueangularis** Koen. ex Roxb., Fl. Ind. 1 : 133. 1820; Clarke in Hook. f., Fl. Brit. India 4 : 536. 1855; Prain, Bengal Pl. 2 : 818. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 692. 1922.

Rostellularia quinqueangularis (Koen. ex Roxb.) Nees in DC., Prodr. 11 : 375. 1847.

Justicia peploides Anders. var. *angustifolia* Anders. in J. Linn. Soc. Bot. 9 : 511. 1867.

Stems 4-5-angular, geniculate, nearly glabrous, 30-50 cm long, with long internodes. Leaves linear-oblong or linear-lanceolate, subacute or obtuse, minutely lineolate above, glabrous, 2.5-7 × 0.3-1 cm; petioles puberulous, 0-3 mm long. Spikes terminal, much elongate, glabrous, 2.5-15 cm long. Bracts linear-oblong, obtuse, scarious-margined, 4-6 mm long; bracteoles similar to bracts, smaller and narrower. Calyx-lobes linear-oblong, obtuse, 4-5 mm long. Corolla white with pink markings, 0.7-1 cm long; upper lip 2-fid. Capsule oblong, narrowed into a short stalk, acutely pointed, 6-8 mm long, glabrous, 4-seeded. Seeds *ca* 1.5 mm in diam., concentrically tuberculate-rugose.

Fl. & Fr. : Aug.-Nov.

Ecology : Very common; along borders of fields, open waste places, etc.

Distribution : India : Tropical Himalaya, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Central India and Western Peninsula. Nepal, Indo-China, Taiwan.

Specimens examined : Hazaribagh, 702 ; Keredari, 649 ; Chowparan, 1361.

Use : Leaves are eaten as pot-herb.

10. LEPIDAGATHIS Willd.

Key to the Species

1a. Capsule 4-seeded. Leaves with crenate-serrate margins ... 1. *L. fasciculata*

1b. Capsule 2-seeded. Leaves with entire or ciliate margins :

2a. Calyx-lobes spinescent. Spikes always aggregated at base of stems ... 2. *L. hamiltoniana*

2b. Calyx-lobes not spinescent. Spikes mostly axillary and solitary, rarely aggregated at base of stems ... 3. *L. trinervis*

1. **Lepidagathis fasciculata** (Retz.) Nees in Wall., Pl. As. Rar. 3 : 95. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 522. 1885; Prain, Bengal Pl. 2 : 816. 1903; Haines, For. Fl. Chota Nagpur 454. 1910 & Bot. Bihar & Orissa pt. 4 : 688. 1922. *Ruellia fasciculata* Retz., Obs. Bot. 4: 28. 1786-87.

Diffuse, perennial, viscous-hairy, aromatic herbs, 30-60 cm long, much-branched from creeping rootstock. Stems with 4 raised green lines. Leaves ovate or ovate-lanceolate, decurrent at base on 0.5-0.7 cm long petiole, acuminate at apex, crenate-serrate, glabrescent on both sides, 3-8 × 1-3 cm. Spikes softly sericeous, subcapitate, 0.6-1 cm in diam., or sometimes elongate, interrupted below with lower flowers in opposite pairs. Bracts 6-8 mm long, ovate-elliptic, 3-nerved, hairy. Bracteoles shorter than bracts, falcate-oblong. Outer upper sepal longest, broad, oblong-lanceolate, 3-nerved; lower two sepals linear-oblong; lateral 2 sepals shorter, setaceous. Corolla white, 6-8 mm long; upper lip shortly 2-lobed. Anther-cells bearded, one attached higher up than the others. Capsule 5-6 mm long, pubescent at tip, 4-seeded. Seeds suborbicular, brownish.

Fl. & Fr. : Dec.-Mar.

Ecology : Not common; among rocks in 'Sal' forests, on gravelly soil of forest edges, etc.

Distribution : Tropical and subtropical India including N.W.Himalaya, Bangladesh, Tenasserim, Sri Lanka.

Specimens examined : Ghanghree, 1037 ; National Park, 1182.

2. **Lepidagathis hamiltoniana** Wall. ex Nees in Wall., Pl. As. Rar. 3 : 96. 1832; Clarke in Hook. f., Brit. India 4 : 516. 1885; Prain, Bengal Pl. 2 : 815. 1903; Haines, For. Fl. Chota Nagpur 455. 1910 & Bot. Bihar & Orissa pt. 4 : 686. 1922.

Erect or diffuse herbs, with a perennial rootstock, 15-50 cm long. Stems 4-angled. Leaves subsessile, linear or narrowly oblong, acute, nearly glabrous except minutely scabrid-ciliate margins, 5-10 × 2-4 cm. Spikes congested at base of branches. Bracts lanceolate, spinescent, patently ciliate upwards. Bracteoles similar to bracts. Calyx-segments lanceolate, acuminate and ending in a spine. Corolla 0.8-1.2 cm long, silky-hairy; lower lip with mid-lobe somewhat shovel-shaped. Capsule narrowly conical or lanceolate, somewhat compressed, glabrous, 2-seeded, 5-7 mm long.

Fl. & Fr. : Dec.-Feb.

Ecology : Common; on dry slopes of hills, banks of rivers, etc.

Distribution : Bihar, Chota Nagpur, Maharashtra.

Specimens examined : Pratappur, 624; Churchu, 1293.

Use : Extract of plant is used for skin troubles.

3. **Lepidagathis trinervis** Nees in Wall., Pl. As. Rar. 3 : 96. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 517. 1885; Prain, Bengal Pl. 2 : 815. 1903; Haines, For. Fl. Chota Nagpur 455. 1910 & Bot. Bihar & Orissa pt. 4 : 687. 1922.

Diffuse herb, with a woody rootstock. Stems numerous, quadrangular, 12-25 cm long. Leaves sessile, linear or linear-lanceolate, narrowed at base, subacute at apex, entire, glabrous, 3-nerved from base, 2.5-4.5 × 0.4-0.7 cm. Spikes ovoid, usually 1-sided, axillary and sometimes aggregated at base of stem, 1-1.6 cm long. Bracts 1.2-1.6 cm long, ovate or obovate-oblong, spinose-cuspidate. Bracteoles as long as bracts, linear-lanceolate, membranous, aristate-acuminate. Calyx-segments

lanceolate, very acute, not spinescent, 3 outer ones nearly equal in length, inner 2 lateral ones shorter and narrower. Corolla white, 6-8 mm long, densely hairy in bud. Capsule ovoid-lanceolate, compressed, 5-7mm long, 2-seeded. Seeds oblong, 2-2.5mm long.

Fl. & Fr. : Nov.-Feb.

Ecology : Not common; among rocks in forests, margins of streams, etc.

Distribution : India : N.W.Himalaya, dry hills of central India from Maharastra and Gujarat to Chota Nagpur and Sikkim.

Specimens examined : Pratappur, 923 ; Jaynagar, 1491.

Use : Plant is considered as a bitter tonic.

11. NELSONIA R. Br.

Nelsonia canescens (Lam.) Spreng., Syst. Veg. 1 : 42. 1825; Bremek in Reinwardtia 3(2) : 248. 1955. *Justicia canescens* Lam.,Tab. Encycl. Meth. Bot. 1 : 41. 1791.

N. campestris R. Br., Prodr. Fl. Nov. Holl. 1 : 481. 1810; Clarke in Hook. f., Fl. Brit. India 4 : 394. 1884; Prain, Bengal Pl. 2 : 797. 1903; Haiens, Bot. Bihar & Orissa pt. 4 : 667. 1922.

Erect or decumbent-ascending, diffuse, perennial herbs, with tuberous roots. Stems much-branched from woody base, to 15 cm long. Leaves elliptic-oblong to elliptic-obovate, decurrent at base, subacute or obtuse at apex, softly villous on both surfaces, basal and lower cauline ones long petioled, to 20 cm long, higher ones subsessile, 2-5 × 1.2-3 cm. Spikes 2-10 cm long. Bracts ovate, glandular-villous, 0.5-0.8 cm long. Bracteoles represented by 2 opposite tufts of hairs. Calyx 0.5-0.6 cm long; segments lanceolate, glandular-villous; the largest one 2-fid.

Corolla purple, 0.7-0.8 cm long; throat and palate with curled villi; upper lip erect, 2-fid; lower spreading, with 3 subequal, rounded lobes. Stamens 2, inserted above middle of tube. Capsule 0.5-0.6 cm long, oblong, seed-bearing below. Seeds ellipsoid, yellow, with brown granulations.

Fl. & Fr. : Nov.-Mar.

Ecology : Not common; in shady places of the forests, roadsides, railway tracks, etc.

Distribution : Throughout India except in western desert part. Indo-China, Malaya Peninsula, Australia, Nepal, Sri Lanka, Thailand, tropical Africa, America.

Specimens examined : Pratappur, 2076 ; National Forest, 2277.

Uses : Plant is used as a fodder for goats and sheep.

12. PERISTROPHE Nees

Peristrophe bicalyculata (Retz.) Nees in Wall., Pl. As. Rar. 3 : 113. 1832; Clarke in Hook. f., Fl. Brit. India 4 : 554. 1885; Prain, Bengal Pl. 2 : 820. 1903; Haines, For. Fl. Chota Nagpur 457. 1910 & Bot. Bihar & Orissa pt. 4 : 696. 1922. *Dianthera bicalyculata* Retz. in Kongl. Ventensk. Acad. Handl. 36 : 297. t. 9. 1775.

Local name : Atrilal.

Annual-perennial suffruticose herbs, to 1 m tall. Stems much-branched, sharply 4-6-angled, with swollen nodes and long internodes, thinly and patently hairy. Leaves ovate-lanceolate, rounded to subcuneate at base, acute-subacuminate at apex, subentire-crenulate, ciliate, pilose beneath or on both sides, 1.5-6 × 0.5-2.5 cm; upper ones smaller, subtending inflorescences; petiole 0.6-1 cm long. Flowers in 1-few-flowered small cymules combined to form a lax divaricate panicles. Bracts 2, linear or linear-spathulate, subequal, glandular-pubescent, 0.6-1 cm long.

Bracteoles linear-lanceolate in 2 rows, scarious-margined. Pedicels to 7 mm long. Calyx segments shortly connate at base, ciliate, 4.5-5 mm long. Corolla pink, 1-1.2 cm long, pubescent without; tube cylindric, 3.5-4 mm long; lips subequal, upper lip shortly 2-fid; lower lip deflexed. Stamens 2, attached at juncture of 2 lips. Ovary oblong-conic, 0.8-1 mm long. Capsule oblong, compressed, beaked, stipitate, 0.8-1 cm long, hairy. Seeds orbicular, 2.5-3 mm across.

Fl. & Fr. : Dec.-Mar.

Ecology : Common ; in grassy localities, waste places, along roadsides, ditches, etc.

Distribution : Throughout India including subtropical Himalaya. Pakistan, Nepal, Indo-China, Malesia, Tropical Africa.

Specimens examined : Jhumri Telaiya, 287 ; Barhi, 1391; Ghanghree, 2180.

Uses : Plant is used as a fodder for cattle, goats, horses, etc. An essential oil is extracted from the plant that has some antituberculous activity.

13. RUELLIA L., emend. Bremek.

Ruellia tuberosa L., Sp. Pl. 635. 1753; Prain, Bengal Pl. 2 : 803. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 675. 1922.

Erect herbs, to 50 cm tall, with tuberous root-stock. Stems much-branched from woody base, 4-gonous, glabrous below, hairy towards apex, with purplish nodes. Leaves obovate to elliptic-lanceolate, attenuate to cuneate at base, obtuse to subacute at apex, undulate-crenulate, glabrous or sparsely hairy, 4-10 × 2-4 cm; petiole 0.5-1.2 cm long. Flowers solitary or in few-flowered terminal and/or axillary peduncled cymes; bract linear-spathulate, 3-5 mm long; bracteoles narrow, sometimes absent; pedicel 0.5-1.5 cm long. Calyx 1.5-2.5 cm

long, divided almost to base; lobes subequal, ciliate, reflexed. Corolla blue or violet, 5-5.5 cm long and 3.5-4 cm across, hairy without; lobes subequal, orbicular, sinuate-dentate, 1.2-1.5 mm across. Filaments hirsute below; anthers minutely pubescent; staminodes linear. Stigma 2-lamellate, flattened, fimbriate. Capsule clavate, beaked above, scabrous, 2-3 cm long. Seeds orbicular 1.5-2 mm across.

Fl. & Fr. : Almost throughout the year, but chiefly during July-Nov.

Ecology : Common; in shady waste places, gardens, along roadsides, railway tracks, etc.

Distribution : Throughout the tropical parts of India. Native of tropical America, now pantropical.

Specimens examined : Satgawan, 582 ; Ramgarh Cant., 1241 ; Hunterganj, 1819.

Use : The plant is emetic, used as a substitute for Ipecac.

14. RUNGIA Nees

Rungia pectinata (L.) Nees in DC., Prodr. 11 : 469. 1847; Santap. in Bot. Mem. Univ. Bombay 2 : 77. 1951. *Justicia pectinata* L. in Torner, Cent. II. Pl. 3. 1756.

R. parviflora Nees var. *pectinata* (L.) Clarke in Hook. f., Fl. Brit. India 4 : 550. 1885; Prain, Bengal Pl. 2 : 821. 1903; Haines, For. Fl. Chota Nagpur 456. 1910 & Bot. Bihar & Orissa pt. 4 : 690. 1922.

Prostrate or decumbent or ascending, spreading, much branched, annual herbs. Stems terete below, faintly 4-angled above, sometimes rooting at lower nodes. Leaves oblong or elliptic-lanceolate, cuneate at

base, obtuse or subacute at apex, glabrous, 4-40 × 2-10 mm; petiole 3-5 mm long. Spikes 0.5-2 cm long. Bracts dimorphic : sterile ones in two rows, ovate-oblong, cuspidate, scarious-margined, ciliate, 4-5 × 2-3 mm; fertile ones obovoid-orbicular, cuspidate, ciliate, 3.5-4 × 2-3 mm. Bracteoles elliptic-oblong, scarious margined, concave, 2.5-3 mm long. Calyx-lobes acuminate, ciliate, 2-2.5 mm long. Corolla blue, pubescent without, 2.5-3 mm long; upper lip broadly ovate. Stamens 2. Ovules 2 in each ovary-locule; stigma minutely 2-fid. Capsule ovoid-oblong, compressed, glabrous, 1.8-2 × 1.2-1.5 mm. Seeds yellow, *ca* 0.5 mm in diam.

Fl. & Fr. : Most of the year, but chiefly during July-Sept.

Ecology : Very common; in grassy localities, waste places, roadsides, along forest edges and forest clearings.

Distribution : Throughout India including Himalaya. Sri Lanka, Bangladesh, Nepal.

Specimens examined : Hazaribagh, 118 ; Ghanghree, 2185.

Uses : Juice of leaves is used as refrigerant and aperient. Bruished leaves are applied to contusions. Roots are used as febrifuge.

15. THUNBERGIA Retz., *nom. cons.*

Key to the Species

1a. Flowers pure white, axillary, solitary. Calyx 12-16-toothed ... 1. *T. fragrans*

1b. Flowers purple, usually in terminal racemes. Calyx a subentire ring ... 2. *T. grandiflora*

1. **Thunbergia fragrans** Roxb., Pl. Corom. 1 : 47, t. 67. 1796 ; Clarke in Hook. f., Fl. Brit. India 4 : 390. 1884; Prain, Bengal Pl. 2 : 795. 1903; Haines, For. Fl. Chota Nagpur 447. 1910 & Bot. Bihar & Orissa pt. 4 : 665. 1922.

Slender, perennial climber with retrorsely hairy or glabrous branches. Leaves ovate-lanceolate, acute or shortly acuminate at apex, rounded, truncate or subcordate or hastate at base with angular lobes, entire or toothed, glabrous, 5-10 × 4-6 cm; petiole 1.2-3.5 cm long, narrowly margined. Flowers axillary, usually solitary or 2 together; pedicels to 7 cm long; bracteoles falcate-oblong, acute, hairy without, 1.5-1.8 cm long. Calyx bowl-shaped, divided almost half-way down into 12-16 teeth; teeth linear-subulate, glandular-pubescent, 1.5-2.5 mm long. Corolla pure white, 3-3.5 cm long, pubescent without; tube 2-2.5 cm long, cylindric; lobes 5, subequal, spreading. Capsule glabrous, shining, 1.8-2.5 cm long, with 4 rounded excavate seeds.

Fl. : Oct.-Nov. *Fr.* : Dec.-Jan.

Ecology : Not common; in edges of deciduous forests, in thickets, hedges, etc.

Distribution : Throughout India. Sri Lanka, Nepal, Myanmar, Indo-China, W. China, Malesia, Australia.

Specimens examined : Hazaribagh, 513; Mandu, 1342.

Use : Plant is grown for its elegant pure white flowers.

2. **Thunbergia grandiflora** Roxb. ex Edw. in Bot. Reg. 6 : t. 495. 1820; Clarke in Hook. f., Fl. Brit. India 4 : 392. 1884; Prain, Bengal Pl. 2 : 796. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 666. 1922.

Flemingia grandiflora Roxb. ex Rottl. in Ges. Naturf. Fr. Berlin Neue Schr. 4 : 202. 1803.

Local name : Mulluta.

Large, perennial, woody climbers. Leaves subcoriaceous, deltoid to ovate-lanceolate, acute to subacuminate at apex, subcordate to deeply cordate at base with angular lobes, toothed, pubescent on both surfaces, rarely glabrate, 8-15 × 4-7cm; uppermost ones lanceolate, often passing into bracts; petiole to 7 cm long. Flowers borne usually in terminal racemes, rarely axillary, solitary or in axillary clusters, upper bract small,

deciduous; inner bract often petioled, leaf-like; pedicels 1.2-7 cm long; bracteoles falcate-elliptic, velvety, sometimes connate on one margin, 1.8-3.5 cm long. Calyx reduced to a subentire, velvety ring, to 1.5mm long. Corolla light-blue, 5-7 cm long; tube to 2.5 cm long; lobes subequal, spreading, 2-3 cm long. Filaments thick, flattened below; anthers subsimilar, bearded; one lobe of shorter stamens and both lobes of longer stamens spurred. Capsule upcurved, with 4-quetrous beak, on clavate pedicels of pendulous branches, 3-5 cm long.

Fl. : Sept.-Oct. *Fr.* : Nov.-Dec.

Ecology : Not common; planted in the garden as an ornamental; sometimes allowed to grow on the boundary walls, the numerous branches often hanging on it, forming dense masses.

Distribution : India : West Bengal, Bihar, Sikkim, Assam, Himalaya. Myanmar, Indo-China, Nepal and S. China.

Specimens examined : Hazaribagh, 1570 ; Bishnugarh, 1962.

Use : Decoction of leaves given in stomach complaints.

108. PEDALIACEAE

Key to the Genera

1a. Flowers solitary in axils of higher leaves. Perfect stamens 4, didynamous; staminode minute or absent. Fruit a capsule, not crowned by hooks ... 2. SESAMUM

1b. Flowers borne in short raceme. Perfect stamens 2, subequal; staminodes 3. Fruit a drupe, crowned by 2 strong claw-like sharp hooks ... 1. MARTYNIA

1. MARTYNIA L.

Martynia annua (Houstoun in Martyn) L., Sp. Pl. 618. 1753, non L. Syst. Nat. 1113. 1759; Backer in Steenis, Fl. Males ser. 1, 4 : 221. 1951; Hevly in Taxon 18 : 527-532. 1969.

Martynia diandra Gloxin, Obs. 14, t. 1. 1785 ; Clarke in Hook. f., Fl. Brit. India 4 : 386. 1884; Prain, Bengal Pl. 2 : 791. 1903; Haines, For. Fl. Chota Nagpur 445. 1910 & Bot. Bihar & Orissa pt. 4 : 662. 1922.

Local name : Baghnokh, Hathajori.

Widely branched, 0.5-1.5 m tall. Stem subterete, fistular. Leaves herbaceous, broadly ovate from a cordate base, subacute to obtuse at apex, irregularly repand-dentate, pale green, 15-30 cm across; petiole stout, fistular, 10-25 cm long. Racemes 6-15 cm long, 10 to 20-flowered. Flowers showy, 2.5-3 cm across; bracts pale-pink, ovate, clawed, prominently veined, 1.5-3 cm long; pedicels 1-2.5 cm long; bracteoles pale green, apiculate, 1.5-2.5 cm long. Calyx yellowish-white or greenish white, 1.5-2 cm long. Corolla pale pink without, on anterior side within with stalked glands and yellow or purple dots, 5.5-6.5 cm long; segments pink with dark-purple blotch. Perfect stamens 2; anthers cohering; cells widely divergent; filaments white, 1.5-1.7 cm long; staminodes 3, lateral staminodes 4-6 mm long and posterior one 1-2 mm long. Drupe green, ovoid, 2-4 cm long, with upturned beak; pericarp 2-valvate, deciduous; endocarp persistent, crowned by 2 strong claw-like sharp hooks, strongly 8 - ribbed. Testa of seeds thick, rugose.

Fl. : June-Aug. *Fr.* : July-Feb.

Ecology : Very common; in waste places, along roadsides, refuse damps, etc.

Distribution : Throughout India. Native of Mexico, introduced and naturalised in Queensland and Malesia.

Specimens examined : Gola, 780 ; Etkhori, 1458 ; Satgawan, 1986.

Uses : Leaves are easten as vegetable by poor people in villages. Leaf-extract is used for epilepsy and applied to tubercular glands of neck; also as girgle for sore throat.

Note : According to Hevly (*l.c.*), the correct citation of this taxon should be *Martynia annua* (Houstoun in Martyn) L., Sp. Pl. 618. 1753, non L. Syst. Nat. 1113. 1759 which is *Proboscidea lousianica* (Mill.) Thellung. The genus MARTYNIA was named by Willian Houstoun in 1731 in honour of his friend John Martyn and in Martyn's "Historia Plantarum" (*ca* 1731, p. 42. t. 42) its first published description and illustration were appeared. In 1735, Linnaeus first used the generic name *Martynia* in his *Systemae naturae*, ed. 1 and in 1753 (*Species Plantarum*, p. 618). Linnaeus first validly published the genus MARTYNIA by reference to a prestarting point description and illustration by Houstoun in Martyn's book. Linnaeus indicated the derivation of the generic name MARTYNIA and of the species *M.annua* from the work of Martyn by the citation "Mart. cent. 42. t. 42" with the basionym below *M. annua*. According to the ICBN (Lanjouw *et al.*, 1966, Art. 32) since prestarting point description must be used for purposes of typification and as Linnaeus has done this so, the words 'Houstoun in Martyn' will be included in parenthesis.

2. SESAMUM L.

Sesamum orientale L., Sp. Pl. 634. 1753; Steenis in Steenis, Fl. Males. ser. 1, 7 : 829. 1976.

S. indicum L., Sp. Pl. 634. 1753; Clarke in Hook. f., Fl. Brit. India 4 : 387. 1884; Prain, Bengal Pl. 2 : 792. 1903; Haines, For. Fl. Chota Nagpur 445. 1910 & Bot. Bihar & Orissa pt. 5 : 792. 1924; Backer in Steenis, Fl. Males. ser. 1, 4 : 217. 1951.

Local name : Til.

Erect, often branched, strongly smelling, annual herb, to 1.5 cm long. Stems obtusely quadrangular with furrowed sides above, terete below.

Lower leaves opposite, long-petioled, with rounded or obtuse base and acute or obtuse apex, usually 3-lobed, sometimes 3-partite or palmately 3-foliolate; higher ones gradually shorter petioled, ovate-lanceolate to oblong, acute or rounded at base, subacute at apex; all leaves mucilagenous-hairy on lower surface, subentire to coarsely serrate-dentate. Pedicels 2-5 mm long, inserted between two small sessile glands. Calyx deeply divided, 4.5-7 mm long, thickened and obconical in fruit; lobes unequal, glandular-pubescent, lanceolate. Corolla usually white, or with violet marks, glandular-pubescent outside, purple spotted inside and with light yellow blotch on inner side at base, 2.5-4 cm. Stamens 4, didynamous; anther-cells parallel; anthers glabrous or thinly hairy along margins; connective gland-tipped; staminode minute, reflexed or wanting. Ovary densely pilose. Capsule 1.5-3 cm long, abruptly contracted into a subulate beak, 2-valved, splitting down to base. Seeds pale yellow, brown or black, finely reticulate or almost smooth, 2.8-3 × 1.8-2 mm.

Fl. : Oct.-Dec. *Fr.* : Dec.-Jan.

Ecology : Common; cultivated in fields, especially in unirrigated areas of the district, also naturalised widely in waste places, along roadsides, gardens, on fields as a relic of cultivation, in grassy localities, etc.

Distribution : Throughout the warmer part of India. Probably native of Africa or Asia, now cultivated throughout the warmer countries of the world.

Specimens examined : Hazaribagh, 36 ; Chatra, 551.

Uses : Seeds yield a fatty oil called sesame oil which is utilised for edible purposes; also used as an ingredient of confectionery and in manufacture of soaps, cosmetics, perfumes, etc. Cake is used as animal feed. Fresh leaves are used in affections of kidneys and bladder.

109. BIGNONIACEAE

Key to the Genera

1a. Fruits broadly ellipsoid-orbicular. Flowers purplish blue. Staminode longer than fertile stamens ... 1. JACARANDA

1b. Fruits elongated :

2a. Leaves pinnately compound :

3a. Calyx spathaceous ... 5. SPATHODEA

3b. Calyx cupular or companulate :

4a. Fruits indehiscent, sausage-shaped. Seeds wingless ... 2. KIGELLIA

4b. Fruits dehiscent, flat, terete or 4-angular. Seeds winged :

5a. Staminode absent :

6a. Stamens 5, subequal ... 4. OROXYLUM

6b. Stamens 4, didynamous ... 3. MILLINGTONIA

5b. Staminode present. Fertile stamens 4, didynamous :

7a. Mature leaflets serrate, crenate or pinnatifid ... 8. TECOMA

7b. Mature leaflets entire ... 6. STEREOSPERMUM

2b. Leaves simple, 1-foliolate or digitately compound ... 7. TABEBUIA

1. JACARANDA JUSS.

Jacaranda mimosifolia D. Don, Bot. Reg. 8, t. 631. 1822; Haines, Bot. Bihar & Orissa pt. 4 : 659. 1922; Chatterjee in Bull. Bot. Soc. Bengal 2 : 77. 1948 ; Steenis in Steenis, Fl. Males. Ser. 1, 8 : 183. 1977.

J. ovalifolia R. Br. in Curtis, Bot. Mag. 49, t. 2327. 1822.

Local name : Nili gulmohur.

Tree, to 20 m tall. Leaves opposite, distant, 30-40 cm long, resembling those of the Acacias; pinnae 15-31, 5-10 cm long, with winged rachis; leaflets sessile, narrowly elliptic, acute, with slightly revolute margins, 0.3-1.2 × 0.1-0.4 cm. Calyx reduced, campanulate, 5-denticulate. Corolla purplish-blue, 4-5 cm long; tube slender and curved below, inflated above; limb 2-lipped, the posterior 2-lobed, the anterior 3-lobed. Stamens 4, didynamous; anterior filaments 1.4-1.8 cm long, posterior filaments 1-1.4 cm long; staminode 2-2.5 cm long. Ovary 3-3.5 mm long. Capsule broadly ellipsoid-orbicular, 3-6 cm long, compressed at right angle to septum, loculicidal. Seeds 1-1.2 × 1.1-1.5 cm, thin, winged.

Fl. : Mar.-May. *Fr.* : Throughout the year.

Ecology : Common; planted along roadsides, in parks, on railway platforms, forests, etc.

Distribution : Major parts of India. Native of tropical America, Bolivia to N.W.Argentina, also distributed in W.Java, Hawaii, S. Africa, Madagascar, Congo.

Specimens examined : Hazaribagh, 243 ; Telaiya Dam, 636.

Uses : Bark and leaves are used for syphilis and blenorrhagia. Infusion of leaves is used as a pectoral. Wood is used as tool-handles.

2. KIGELIA DC., *nom. cons.*

Kigelia africana (Lam.) Benth. in Hook., Niger Fl. 463. 1849 ; Steenis in Steenis, Fl. Males ser. 1, 8 : 183. 1988. *Bignonia africana* Lam., Encycl. 1 : 424. 1785.

Crecentia pinnata Jacq., Coll. 3 : 203, t. 18. 1789.

Kigelia pinnata (Jacq.) DC., Prodr. 9 : 247. 1845; Haines, Bot. Bihar & Orissa pt. 4 : 660. 1922; Chatterjee in Bull. Bot. Soc. Bengal 2 : 77. 1948.

Spreading tree, to 20 m tall. Bark rough, greyish-brown. Leaves decussate, or in whorl of 3-4, to 50 cm long; leaflets 5-7, elliptic-oblong or obovate, coriaceous, obliquely cuneate, rounded or subcordate at base, obtusely subacute at apex, glabrous, or slightly pubescent on nerves, entire or distally serrate, 6-12 × 4-8 cm; lateral leaflets subsessile, terminal petiolate. Racemes to 1.5 m long. Calyx 2-lipped, thick, 2.5-3 × 1-1.5 cm. Corolla dark liver-coloured with yellow stripes, bilabiate, ventricose, wrinkled, 5-6 cm across; tube 3-3.5 cm long; lobes 5, broadly triangular-ovate, 4.5-5 cm long. Stamens 4, didynamous, the 5th present as staminode; filaments pubescent at base, longer pair 4.5-5 cm long, shorter pair 4-4.5 cm long; staminode 0.4-0.5 cm long. Ovary lepidote, 1-1.2 cm long, 1-locular with 2 bifid parietal placentae at top, 2-locular with 2 axile placentae for most part; ovules *ca* 10-seriate in each locule; style 9-11 cm long; stigma ovoid. Fruit obtuse, sausage-shaped, pendulous on a 100-500 cm long peduncle, indehiscent, 30-40 × 10-16 cm. Seeds flat wingless.

Fl. : Apr.-June. *Fr.* : Present in plant throughout the year.

Ecology : Not common; in gardens, parks, roadsides, on railway platforms, etc.

Distribution : Throughout the tropical parts and elsewhere in India. Native of Africa, now widely cultivated throughout the tropics.

Specimes examined : Hazaribagh, 1589 ; National Park, 2038.

Uses : Bark is used in rheumatism, dysentery and venereal diseases.

3. MILLINGTONIA L. f.

Millingtonia hortensis L. f., Suppl. Pl. 291. 1781; Clarke in Hook. f., Fl. Brit. India 4 : 377. 1884; Prain, Bengal Pl. 2 : 788. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 650. 1922.

Bignonia suberosa Roxb., Pl. Corom. 3 : 11, t. 214. 1811, *nom. illegit.*

Local name : Akas-nim.

Evergreen tree, to 20 cm tall. Leaves opposite, imparipinnate at apex, 2-3 pinnate at base, 30-70 cm long; leaflets ovate-lanceolate, obliquely rounded at base, acuminate at apex, sinuate or crenate or entire, pubescent when young, 3-7 × 2-4 cm ; lateral nerves 4 pairs, impressed above, raised below; petiolule 0.7-1 cm long. Thyrses puberulous, erect, 10-40 cm long. Calyx puberulous without, 2-4 mm long; teeth 5, equal, with revolute margin. Corolla white; tube 6-8 cm long, widened to *ca* 2.5 cm in diam. mouth; lobes ovate, with crateriform gland outside, even-margined, 1-1.5 × 0.6-0.9 cm. Stamens 4, didynamous, shortly exserted ; anthers with 1 fertile cell, other cell spur-like, barren; filaments 0.8-1 cm and 1.2-1.4 cm long. Ovary to 0.3 cm across; style 0.7-0.9 cm long; stigma ovate. Capsule elongated, linear, compressed parallel to septum, acute at both ends, 20-30 ×1.5-2 cm, septicidal. Seeds 1.5-3.5 × 1-1.5 cm including hyaline wings.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; in forests, also planted as an avenue tree along roadsides and in gardens.

Distribution : Throughout India. S.E.Asia, Myanmar, Thailand, Indo-China, Yunnan and Malesia; probably native in E.Java, Madura and Kangean Islands, Lesser Sunda Islandia and S.Celebes.

Specimens examined : Hazaribagh, 483; Barkagawan, 1278; Joynagar, 1515.

Uses : Wood is suitable for furniture, ornamental work, drawing boards, etc.

4. OROXYLUM Vent.

Oroxylum indicum (L.) Vent., Dec. Gen. Nov. 8. 1808; Clarke in Hook. f., Fl. Brit. India 4 : 378. 1884; Prain, Bengal Pl. 2 : 787. 1903; Haines, For. Fl. Chota Nagpur 443. 1910 & Bot. Bihar & Orissa pt. 4 : 650. 1922. *Bignonia indica* L., Sp. Pl. 871. 1753.

Local name : Sona, Ullu.

Small, sparingly branched, soft wooded deciduous tree, to 20 m tall, with grey bark and large leaf-scars. Leaves tufted at twig-ends, 0.5-1.5 m long, imparipinnate at apex, bipinnate to tripinnate at base; leaflets ovate to oblong, obliquely subcuneate, rounded or subcordate at base, acuminate at apex, pubescent when young, basally 3-nerved, 4-10 × 3-8 cm; petiolule short, 0.6-1.5 cm long. Racemes 30-60 cm long or more. Pedicels 0.8-2.5 cm long with a few bracteoles in lower part. Calyx 2-3 × 1.2-1.5 cm, brown, becoming woody in fruit, truncate or irregularly shallow-toothed. Corolla reddish-purple to liver violet outside, yellowish to pinkish inside, fleshy, 6-10 cm long; basal tube widened to base; mouth 5-7 cm. in diam.; lobes crisped or undulate-crenate. Stamens 5, shortly exserted in throat, one a little shorter than other 4; filaments hairy at their bases. Disc large, fleshy, dark violet. Style 4-6 cm long, dark-violet; stigma of 2 semicircular plates. Capsule pendent, 40-120 × 6-10 cm, flat, sword-shaped, very large, with woody valves. Seeds 5-9 × 2.5-4 cm including white papery wing.

Fl. : July-Aug. *Fr.* : Dec.-Mar.

Ecology : Common; along streams and ravines, and cooler parts of the hilly forests.

Distribution : Almost throughout India including Himalaya. S. China, Sri Lanka, S.E.Asia, Malesia, eastwards to Philippines, Celebes and Timor.

Specimens examined : National Park, 1159, Koderma Forest, 1816.

Uses : Roots and barks are used as astringent, tonic and also useful in diarrhoea and dysentery. Bark-powder with 'Haldi' is used in sore-backs of horses. Infusion of the bark is useful in acute rheumatism. Stem is used by local people in scorpion-sting.

5. SPATHODEA P. Beauv.

Spathodea campanulata Beauv., Fl. Oware Benin 1 : 47, t. 27. 1805; Haines, Bot. Bihar & Orissa pt. 4 : 659. 1922.

Local name : Rugtoora.

Evergreen trees, branching widely at top, to 25 m tall. Bark light grey, smooth. Leaves imparipinnate, 30-45 cm long; leaflets 9-19, elliptic-oblong to ovate-lanceolate, rounded at base, abruptly acuminate at apex, entire, glabrous above, paler beneath, shortly petiolate, 5-9 × 3-4.5 cm. Racemes dense, terminal. Pedicels 3-4 cm long, articulate at base, glabrous. Bracts oblong-lanceolate, 1.5 -2 cm long. Calyx golden brown, vellutinous outside, 5-6 × 2-2.5 cm. Corolla orange-crimson with red spots and stripes, thick, 7-9 × 5-6 cm; tube glandular, cylindrical portion 1.5-2 × 0.8-0.9 cm, inflated portion 6-7 × 5-6 cm ; lobes ovate-oblong, 3-5 × 3-4 cm. Stamens 4, subequal; anthers brown, 0.7-0.8 cm long. Style 5-7 mm long; stigma ovate-lanceolate, 4-5 mm long. Capsule erect, linear-lanceolate, flattened parallel to septum, acuminate at both ends, brownish-black, 15-24 × 2.5-3 cm. Seeds white-papery, winged all round, to 2.5 × 2 cm.

Fl. : May.-July. *Fr.* : Jan.-Apr. (of the following year).

Ecology : Not very common; planted in gardens and parks, and also along roadside as an avenue tree.

Distribution : Throughout the tropical parts of India. Native of tropical Africa, introduced and widely cultivated in Tropics.

Specimens examined : Keredari, 648; Hazaribagh, 1612.

Uses : Wood is useful for carpentary work. Seeds are edible. Pulverised bark is used for skin diseases. Decoction of bark is given in dysentery, and renal and gastro-intestinal troubles. Decoction of fruit is used by tribals to poison animals and birds.

6. STEREOSPERMUM Cham.

Stereospermum chelonoides (L.f.) DC., Univ. Geneve II, 17 : 125. 1838, *Pro comb.*, excl. ref. Rheede t. 26; Clarke in Hook. f., Fl. Brit. India 4 : 382. 1884; Prain, Bengal Pl. 2 : 790. 1903; Haines in Kew Bull. 121. 1922 & Bot. Bihar & Orissa pt. 4 : 656. 1922 ; Chatterjee in Bull. Bot. Soc. Bengal 2 : 70. 1948; Steenis in Steenis, Fl. Males. ser. 1, 8 : 147. 1977. *Bignonia chelonoides* L.f., Suppl. 282. 1781, *Pro typ. excl. ref.* Rheede, non *auct. al.*

Bignonia suaveolens Roxb., Fl. Ind. 3 : 104. 1832.

Stereospermum suaveolens DC., Prodr. 9 : 211. 1845; Clarke in Hook. f., Fl. Brit. India 4 : 382. 1884; Prain, Bengal Pl. 2 : 790. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 656. 1922; Chatterjee in Bull. Bot. Soc. Bengal 2 : 70. 1948.

Local name : Pader.

Moderate-sized to large, deciduous tree, 10-18 m tall. Bark grey, nearly smooth. Branches glandular-hairy in younger parts. Leaves opposite, imparipinnate, 30-60 cm long; leaflets 5-9, coriaceous, broadly

elliptic, obliquely rounded at base, shortly acuminate at apex, entire or fine-dentate, glabrescent, rough above, 7-20 × 4-10 cm; lateral veins 6-8 pairs, hirsute beneath; petiolules thick, 0.2-0.3 cm long. Thyrses to 20 cm across, viscidly hairy. Calyx 0.8-1 cm long, campanulate, viscid-pubescent; lobes 5, acute. Corolla dull crimson with yellow streaks within, infundibuliform, pubescent outside, bearded within on lower side; limb oblique; lobes rounded, crisped-crenate, 3 lower lobes longer than 2 upper. Stamens 4, didynamous, included, the 5th rudimentary; filaments with small granular glands towards insertion. Ovary 4-ribbed. Capsule dark-grey or purple, smooth or obscurely 3-ribbed, lenticellate, rough with elevated whitish specks, loculicidally 2-valved, 30-60 × 1.5-2 cm.; valves woody. Seeds trigonous, wedge-shaped, with a cross groove, thinly winged on both surfaces, to 3.5 × 0.8 cm.

Fl. : Apr.-May. *Fr.* : Sept.-Feb.

Ecology : Common ; in forests of hilly regions.

Distribution : Throughout the moisture parts of India. Continental Tropical S.E.Asia, Myanmar and Malesia.

Specimens examined : National Park, 65; Koderma Forest, 1260.

Uses : Wood is employed for constructional work, planks and beams, furniture, cabinet-work, etc. Decoction of roots is used for fever, inflammatory chest affections and affections of brain. Leaves are lopped for fodder.

7. TABEBUIA Gomes ex DC.

***Tabebuia chrysantha** (Jacq.) Nichols., Dict. Gard. 4 : 1. 1887; Steenis in Steenis, Fl. Males. ser. 1, 8 : 185. 1977. *Bignonia chrysantha* Jacq., Hort. Schoenbr. 2 : 45, t. 211. 1797.

Tree, to 25 cm tall. Leaves digitately 5-7-foliolate; petiole 5-20 cm long; leaflets broadly elliptic or oblong-obovate, obtuse to truncate or

asymmetrically subcordate at base, abruptly acuminate at apex, entire or serrate, lepidote, stellate-pubescent along veins beneath, 4-20 × 2-10cm, lateral ones smaller than others; petiolules 0.5-8 cm long, lateral ones much smaller. Panicles contracted, stellate-pubescent. Calyx campanulate, 0.5-1.2 × 0.4-1 cm, with 5 reflexed lobes, stellate-pubescent. Corolla yellow, 3-7 cm long, glabrous outside, with 4 lines of trichomes extending inside; lobes 1-2.5 cm long. Stamens 4, didynamous, included ; longer filaments 1.5-2 cm long and shorter 1-1.5 cm long; anther-thecae divaricate; staminodes 4-8 mm long. Ovary 4-5 mm long; ovules 8-10-seriate in each locule. Disk pulvinate. Capsule linear-cylindric, tapering at both ends, shortly stellate-pubescent, to 40 cm long. Seeds 4-8 × 1.5-3 mm.

Fl. : Apr.-June. *Fr.* : Aug.-Mar.

Ecology : Common; planted in gardens, parks, roadsides, etc.

Distribution : Major parts of India. Throughout the tropics.

Specimens examined : Hazaribagh, 1210 ; Katkamosandi, 1712.

Uses : Planted as an ornamental for its beautiful coloured flowers. Wood is used for general construction, furniture, cabinet work and tool-handles.

8. TECOMA Juss.

Tecoma stans (L.) Juss. ex H.B.K., Nov. Gen. Sp. Pl. 3 : 144. 1819; Prain, Bengal Pl. 2 : 788. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 654. 1922. *Bignonia stans* L., Sp. Pl., ed. 2, 871. 1763.

Stenolobium stans (L.) Seem. in Ann. Mag. Nat. Hist. 10 : 30. 1862.

Large, shrubs to small trees, to 5 m tall. Leaves decussate, imparripinate, to 15 cm long; leaflets 5-11, sessile, serrate or subpinnatifid, narrow-elliptic, acuminate at apex, wedge-shaped at base, glabrous,

5-10 cm long, the terminal one much longer than lateral ones. Racemes 5-15 cm long. Calyx 6 mm long, with few glands in middle part of upper half. Corolla bright yellow, 5-7 cm long; lobes rounded. Stamens 4, didynamous; anthers pubescent. Capsule linear, compressed, acuminate, 10-15 cm long, green at first, later turning brownish. Seeds to 2 × 0.5 cm including wings, insterted in two rows.

Fl. : Apr.-Aug. *Fr.* : Dec.-Mar.

Ecology : Very common ; planted in gardens, park, roadsides, on railway platforms, etc.

Distribution : Throughout India. Indigenous from S.Florida to W.Indies and S.America, introduced and naturalised in almost all parts of Tropics.

Specimens examined : Jhumri Telaiya, 300 ; National Park, 396.

Uses : Roots are used as diuretic, vermifuge and tonic.

110. LENTIBULARIACEAE

UTRICULARIA L.

Key to the Species

1a. Foliar organs conspicuous and numerous at anthesis, divided into linear to capillary segments, the ultimate segments bearing solitary or fasciculate setulae :

2a. Primary foliar segments many, verticillate, on stolons with stipule segments at base. Scales on peduncle absent :

3a. Peduncle with a whorl of inflated ellipsoid floats at base. Basal segments of foliar organs hyaline ... 4. *U. stellaris*

3b. Peduncles without floats at base. Basal segments of foliar organs foliose ... 1. *U. aurea*

2b. Primary foliar segments 1-2, without stipule-like segments at base ... 3. *U. exoleta*

1b. Foliar organs simple, never setulose, usually not conspicuous at anthesis ... 2. *U. caerulea*

1. **Utricularia aurea** Lour., Fl. Cochinch. 26. 1790; Taylor in Steenis, Fl. Males. ser. 1, 8 : 296. 1977.

U. flexuosa Vahl, Enum. 1 : 198. 1804; Clarke in Hook. f., Fl. Brit. India 4 : 329. 1884; Prain, Bengal Pl. 1 : 780. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 644. 1922; Santap. in J. Bomb. Nat. Hist. Soc. 49 : 218. 1950.

Aquatic. Rhizoids verticillate, fusiform, inflated, 2-6 cm long and 1.5-3 mm thick, with filiform branches bearing botryform clusters of ellipsoid segments. Stolons to 50 cm long, terete, branched, glabrous or short-hairy. Foliar organs numerous, 2-6 cm long; primary segments 3-4, semi-verticillate, each pinnately repeatedly divided from base into numerous segments; ultimate segments capillary, setulose; stipule-like clusters of short capillary setulose segments present at base of primary segments. Traps numerous, lateral on or in angle between foliar segments, obliquely ovoid, 0.15-0.4 cm long, with lateral mouth; upper lip usually with 2 branched setiform appendages. Inflorescence erect, 6-20 cm long; peduncle filiform, glabrous. Flowers 5-10; scales absent; bracts orbicular, 1.5-2 mm long; bracteoles absent; pedicels filiform, dorsiventrally flattened, 0.5-2 cm long, erect at anthesis, reflected in fruit. Calyx-lobes subequal, ovate, with strongly inflexed margins, 3-4 mm long, accrescent to 7-9 mm in fruit. Corolla yellow, glabrous or sparsely hairy, 1-1.5 cm long; upper lip broadly ovate, twice as long as upper calyx-lobe; lower lip larger, transversely elliptic, with raised gibbous palate and cylindrical obtuse spur slightly shorter than and parallel with lower lip. Filaments expanded above. Ovary glandular; lower lip of stigma orbicular, with hyaline ciliate margin; upper lip shorter, with glabrous margin. Capsule globose, to 5 mm in diam., circumscissile; style greatly enlarged. Seeds numerous, lenticular-prismatic, 5-angled, 1.5-2 mm, narrowly-winged.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; in still water of lakes, rice-fields, swamps, ponds, tanks, jheels, etc.

Distribution : Throughout India. China, Japan, Australia and Malesia.

Specimes examined : Ramgarh Cant., 1233; Ghanghree, 1660.

Use : Plant is useful horticulturally in aquatic part of a rockery.

2. **Utricularia caerulea** L., Sp. Pl. 18. 1753, non sensu Clarke in Hook. f., Fl. Brit. India 4 : 331. 1884; Haines, Bot. Bihar & Orissa pt. 4: 645. 1922; Taylor in Steenis, Fl. Males. ser. 1, 8 : 287. 1977.

U. nivea Vahl, Enum. 1 : 203. 1804.

U. racemosa Wall. ex Walp. in Meyen, Obs. Bot. Nov. Acat 19 : 410. 1843 ; Clarke in Hook.f., Fl. Brit. India 4 : 333. 1884 ; Prain, Bengal Pl. 1 : 780. 1903.

U. racemosa Wall. ex Walp. var. *filicaulis* Clarke in Hook. f., Fl. Brit. India 4 : 333. 1884; Prain in J. Asiat. Soc. Bengal 74. 373. 1905.

Terrestrial. Rhizoids few to numerous, capillary, simple. Stolons capillary, branched. Foliar organs rosulate and on stolons, narrowly obovate-spathulate, rounded at apex, 1-nerved, to 7 mm long and 1.5 mm wide. Traps few on vegetative organs, dimorphic, ovoid, with terminal oblique mouth; larger traps to 1.5 mm long including a long carinate beak on upper lip; smaller traps about half as long, with shorter beak; mouth of both types stipitate-glandular. Inflorescence erect, 5-25 cm long; peduncle 0.5-1.5 mm thick, glabrous; scales many, similar to bracts; bracts narrowly rhombic, acuminate, 2-2.5 mm long ; bracteoles similar but shorter and narrower. Pedicels 0.6-1 mm long, erect at anthesis, reflexed in fruit. Calyx-lobes unequal, papillose ; upper ovate-oblong, cucullate, 2-3 mm long; lower shorter, transversely elliptic, with inrolled margins. Corolla pink, purple or blue, 0.4-1 cm long ; upper lip ovate-oblong, longer than upper calyx-lobe, lower lip larger, orbicular, with transversely crested raised palate and conical spur longer than and parallel with lower

lip. Lower lip of stigma orbicular, upper minute, deltoid. Capsule globose, 1.8-2 mm in diam., opaque, dehiscing by slit. Seeds numerous, oblong-ellipsoid, *ca* 0.3 mm long.

Fl. & Fr. : Sept.- Dec.

Ecology : Common ; in damp or wet situations.

Distribution : Khasia mountain, Chhota Nagpur, West Bengal, Deccan Peninsula. China, Japan, Australia and Malesia.

Specimens examined : Patratu, 568 ; Etkhori, 1456.

Use : Plant is useful for dressing wounds.

3. **Utricularia exoleta** R. Br., Prodr. Nov. Holl. 430. 1810; Clarke in Hook. f., Fl. Brit. Ind. 4 : 329. 1884 ; Prain, Bengal Pl. 1 : 781. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 645. 1922; Taylor in Steenis, Fl. Males. ser. 1, 8 : 295. 1977. **(Fig. 8).**

U. gibba L. ssp. *exoleta* (R. Br.) Taylor, Mitt. Bot. Staats. Munch. 4 : 101. 1961 & in Kew Bull. 18 : 204. 1964.

Aquatic. Rhizoids few, filiform, with short botryform branches. Stolons filiform, terete, to 20 m long and 1 mm thick, much-branched, mat-forming. Foliar organs numerous on stolons, to 1.5 cm long, dichotomously divided, with few capillary glabrous or setulose ultimate segments. Traps numerous, lateral on foliar segments, obliquely ovoid, 1-1.5 mm long, with lateral mouth ; upper lip with 2 branched setiform appendages. Inflorescence erect, solitary or fasciculate, 4-12 cm long; peduncle filiform, glabrous; scale usually 1, similar to bracts, near middle of peduncle; bracts transversely oblong or semi-orbicular, *ca* 1 mm long; bracteoles absent ; pedicels filiform, 3-10 mm long. Calyx-lobes subequal, orbicular. Corolla yellow, 4-7 mm long; upper lip ovate-orbicular, rounded at apex, twice as long as upper calyx-lobe; lower lip with raised palate and straight cylindrical spur slightly longer than and parallel with lower lip. Filaments curved. Lower lip of stigma distinct, semiorbicular, upper lip much shorter or obsolete. Capsule globose, laterally bivalvate, 2-3 mm long. Seeds few, lenticular, 1-1.4 mm long.

Fl. & Fr. : July - Dec.

Ecology : Very common ; in shallow still water of lakes, swamps, marshes, etc.

Distribution : Throughout India. Tropical Africa, Portugal, China, Japan, N. Australia and Malesia.

Specimens examined : Churchu, 693; Simaria, 809; Markochho, 1486.

4. **Utricularia stellaris** L. f., suppl. 86. 1781; Roxb., Fl. Ind. 1 : 143. 1820; Clarke in Hook. f., Fl. Brit. Ind. 4 : 328. 1884; Prain, Bengal Pl. 2 : 780. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 644. 1922; Taylor in Steenis, Fl. Males. ser. 1, 8 : 278. 1977.

U. inflexa Forsk. var. *stellaris* (L.f.) Taylor in Mitt. Bot. Staats. Munch. 4 : 96. 1961 & in Kew Bull. 18 : 189. 1964.

Local name : Jhangi.

Aquatic, free-floating. Stolons submerged, usually very slender, sometimes filiform, not much branched. Foliar organs numerous, all submerged, usually in whorls of 4, auricled at base, repeatedly divided into numerous capillary pectinate segments and ultimate segments setulose; auricles with ciliate segments. Traps numerous, globular-ovoid. 1.5-2 mm in diam., with lateral mouth; upper lip with 2 branched appendages. Inflorescence erect, to 12 cm long; peduncle with a whorl of 5-7 inflated, ellipsoid floats of 1-2.5 cm long, with tuft of reduced filiform pinnae at apex; bracts broadly ovate, obtuse, 1.5-2 mm long; bracteoles absent; pedicels 3-5 mm long, thickened, usually deflexed in fruit. Calyx-lobes subequal, suborbicular, veined, 2.5-3 mm, enlarged in fruit; upper lobe with rounded apex, lower lobe truncate or emarginate. Corolla yellow, 5-6 mm across; upper lip broadly ovate, truncate-emarginate, larger than upper calyx-lobe; lower lip oblong, truncate, crenate, to 1.8 cm long; palate prominently raised; spur appressed to lower lip, blunt. Capsule globose, 3.5-4 mm in diam. Seeds prismatic, 4-6-angled, narrowly winged, 0.7-0.9 mm in diam.; frruiting sepals 0.7-1 cm long.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common ; in tanks, ponds, ditches near railways, rice-swamps, jheels, etc.

Distribution : Throughout India. Malesia, Sri Lanka, S.E.Asia, Australia, tropical and S.Africa.

Specimens examined : Jhumri Telaiya, 678 ; Gola, 776 ; Hazaribagh, 1598.

Use : Plant is used against cough.

111. SPHENOCLEACEAE

SPHENOCLEA Gaertn.

Sphenoclea zeylanica Gaertn., Fruct. 1 : 113. t. 24. f. 5. 1788; Roxb., Fl. Ind. 2 : 116. 1824; Clarke in Hook. f., Fl. Brirt. India 3 : 438. 1881 ; Prain, Bengal Pl. 1 : 635. 1903; Haines, Bot. Bihar & Orissa pt. 4:503. 1922.

Erect, simple or divaricately branched, annual herbs, 25-125 cm long, with fibrous roots. Stems terete, fistulous, thickened towards base, glabrous. Leaves oblong to lanceolate-oblong, narrowed at both ends, entire, membranous, glaucous, 2.5-12 × 0.8-5 cm; petiole 0.5-3 cm long. Flowers sessile, greenish, rhomboid or hexagonal in outline, crowded, in dense, terminal, cylindric, peduncled spikes of 1-5 cm long. Peduncles to 5 cm long. Bracts spathulate, 2.5 mm long, acuminate, arched over the calyx by their apices. Bracteoles lateral to bracts, linear, 2 mm long. Calyx-tube cupular, shortly adnate to ovary; lobes 5, deltoid-suborbicular, concave, obtuse, pale-green with white margins, 1.2-1.5 mm long, ultimately accrescent to 2.5 mm and connivent. Corolla white, campanulate, perigynous, 3-4 mm long and 3-3.5 mm across, caducous; segments 5, ovate-triangular, obtuse

or acute, united more than halfway. Stamens 5, epipetalous, inserted halfway upon tube of corolla; filaments slightly dilated at base. Ovary obovoid, 2.5 mm long with truncate top; style short, stigma capitate or obscurely 2-lobed. Capsule depressed-globose, 4-4.5 mm in diam.

Fl. : Dec.-Apr. *Fr.* : Feb.-June.

Ecology : Common ; in swampy and marshy localities, margins of ponds, ditches and other water courses.

Distribution : Throughout India. Indigenous to the Old World Tropics, introduced into tropical America and the southern part of North America ; widespread from tropical Africa to tropical Asia.

Specimens examined : Ramgarh, 1912; Barkattwa, 2352.

Uses : Young plant is cooked and eaten by poor people in village.

112. CAMPANULACEAE

Key to the Genera

1a. Corolla zygomorphic, with a dorsal slit mostly to or near base ... 2. LOBELIA

1b. Corolla actinomorphic, without any dorsal slit :

2a. Capsule dehiscing above the calyx-lobes with apical valves ... 3. WAHLENBERGIA

2b. Capsule dehiscing below the calyx-lobes by lateral pores or basal valves ... 1. CAMPANULA

1. CAMPANULA L.

Campanula canescens Wall. ex DC., Monogr. Campan. 292. 1830; Clarke in Hook. f., Fl. Brit. India 3 : 439. 1885 ; Prain, Bengal Pl. 1 : 634. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 503. 1922.

Erect, thinly hirtellous, annual herbs, 20-50 cm tall. Stems usually simple or sometimes several from rootstock, slender, subangular. Leaves 1.5-6 × 0.25-1.3 cm, subrosulate and cauline, distantly crenate-serrate, hirsute above, finely scabrid beneath; the former ones obovate-spathulate, subobtuse-rounded at apex, narrowed to base into a ± 1 cm long petiole; the upper cauline ones sessile, linear-lanceolate, acute at apex ; the lower cauline ones elliptic or oblanceolate-spathulate, contracted at base into a very short petiole, subacute at apex. Flowers dimorphic, one form complete, the other smaller without corolla or stamens, borne in terminal, lax, racemose panicles; bracts 0.8-1 cm long, linear-spathulate; pedicels minutely bristrly, 4-6 mm long, accrescent to 1 cm long in fruit. Calyx-tube globose, minutely bristly without, 1.5-2 mm ; lobes 5, ovate-lanceolate, acute, 1-1.2 mm. Corolla broadly campanulate, grey-purple, 5-7 mm long ; lobes short. Stamens 5, free ; filaments dilated at base. Ovary 3-celled, *ca* 1.2 mm across. Stigma 3-lobed. Capsule globose, 4-5 mm across, dehiscing by basal valves; seeds minute, ovoid-elliptic, pale-brown *ca* 0.4 mm long.

Fl. & Fr. : Feb.-Apr.

Ecology : Not common; on banks of temporary canals, swamps, etc.

Distribution : India : Throughout northern India, from the Himalaya to central India. Sri Lanka, Myanmar.

Specimens examined : National Park, 1163 ; Mandu, 1348.

2. LOBELIA L.

Lobelia alsinoides Lam., Encycl. Meth. 3 : 588. 1792; Moeliono and Tuyn in Steenis, Fl. Males. ser. 1, 6 : 126. 1960; Haridasan & Mukherjee in Nayar *et al.* Fl. India. Fasc. 19 : 42. 1988.

L. trigona Roxb., Fl. Ind. 2 : 111. 1824; Clarke in Hook. f., Fl. Brit. India 3 : 423. 1881; Prain, Bengal Pl. 1 : 633. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 500. 1922.

Decumbent-ascending or erect, simple or much-branched, annual herbs, 5-35 cm tall. Stems sharply trigonous or trialate, glabrous, rooting at lower nodes. Lower leaves petiolate, upper subsessile; all ovate or ovate-rounded, contracted or narrowed or subcordate at base, subacute or obtuse at apex, crenulate-denticulate, glabrous, 1-2 × 1-1.8 cm. Flowers 5-7 mm across, axillary, solitary, often forming a lax, leafy, terminal raceme; pedicel 1.5-4 cm long, 3-angled, glabrous; bracteoles basal, linear, *ca* 2 mm long. Calyx-lobes triangular-subulate, 2.5-3 mm long, glabrous, or strigose at apex. Corolla 4-6 mm long, blue or violet, hairy within,with 2 gibbocites, dorsally split to base; dorsal lobes 1-3 mm long, falcate-oblong or falcate-ovate, connate with lateral ones for 3-4 mm ; lateral and ventral lobes oblong or ovate, 1-2.5 mm long, former ones connate with lateral ones for 3.5-6 mm. Filaments 3-5 mm long, free, or half-way up or higher connate, the two anterior ones twice as broad as anthers, patent-hairy outside; anthers tuft-hairy at base. Stigma shortly 2-fid. Capsule obconic to obovoid, 3-4 mm long. Seeds 3-gonous, brown, *ca* 0.5 mm long.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; in moist, shady grassy localities, rice-fields, river-banks, near ponds, nallahs, muddy swamps, etc.

Distribution : Throughout India including tropical Himalaya. Nepal, China, Bangladesh, Myanmar, Sri Lanka, Malesia.

Specimens examined : Hunterganj, 931 ; Satgawan, 1977.

Use : Leaves are used as pot herb.

3. WAHLENBERGIA Schrad. ex Roth, *nom. cons.*

Wahlenbergia marginata (Thunb.) DC., Monogr. Campan. 143. 1830; Moeliono & Tuyan in Steenis, Fl. Males. ser. 1, 6 : 115. 1960. *Campanula marginata* Thunb., Fl. Jap. 89. 1784.

Wahlenbergia gracilis sensu DC., Monogr. Camp. 142. 1830, non *Campanula gracilis* Frost. 1786; Clarke in Hook. f., Fl. Brit. India 3 : 429. 1881; Prain, Bengal Pl. 1 : 636. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 503. 1922.

Erect or decumbent-ascending, simple or divaricately branched, glabrous or sparingly hirsute, annual-biennial herbs, to 30 cm long. Leaves lanceolate-linear to obovate-oblong, chartaceous, sessile, narrowed at base, acute at apex, entire to denticulate, glabrous above, strigose-hairy below, 1-nerved, 15-25 × 3-8 mm. Flowers *ca* 6 mm across, terminal, solitary, or sometimes in 2 to few-flowered inflorescences. Bracts small, linear-lanceolate; pedicel 4-10 mm long, elongating in fruit. Calyx-lobes linear-lanceolate, acute, entire or often sparsely dentate, 1-3 mm long, persistent and erect in fruit. Corolla white or light-purple, campanulate, 4-5 mm long; lobes shortly adnate to ovary, narrow-ovate or elliptic, 2-3 mm long. Filaments pentagonal or obtrapezoid at basal part, filiform at upper part, free from corolla, 0.8-1.5 mm long; anthers narrow, 1-2 mm long. Ovary *ca* 2 mm across; stigma 2-3-fid, recurved. Capsule obconical to bell-shaped, glabrous, 2-3-valved, 4-10 mm long. Seeds slightly compressed, ellipsoid, yellowish-brown, *ca* 0.6 mm long.

Fl. & Fr. : June - Jan.

Ecology : Very common; in harvested, moist, paddy fields, grassy areas, along the river beds, etc.

Distribution : Throughout India. East Africa, Sri Lanka, continental south-east Asia, China, Japan, Malesia, Australia and New Zealand.

Specimens examined : Hazaribagh, 132; Patratu, 1335 ; Hunterganj, 2134.

Uses : Plant is crushed and used for skin diseases; also used for strengthening loose teeth. Roots are used for pulmonary infections.

Note : Very variable in habit, and different morphological characters, *viz.* size and shape of leaves, margins, size and colour of flowers and size of capsules.

113. RUBIACEAE

Key to the Genera

1a. Ovule 1 in each ovary-cell :

2a. Corolla-lobes valvate in bud :

3a. Small trees, or erect or twining shrubs :

4a. Flowers collected in dense irregular capituliform inflorescences. Calyx-tubes entirely connate. Fruits together forming a fleshy syncarp ... 17. MORINDA

4b. Flowers free. Fruits together never forming a syncarp :

5a. Twining foetid shrubs. Styles 2, filiform, intertwisted. Fruit a drupe of 2, 1-seeded pyrenes ... 20. PAEDERIA

5b. Small trees or erect shrubs :

6a. Flowers axillary, in fascicles or corymbose cymes. Ovary 2-celled; style simple, not papillose. Fruit a drupe of 1-2, 1-seeded pyrenes ... 2. CANTHIUM

6b. Flowers in terminal paniculiform cymes. Ovary at first 5-celled, later 1-celled; style 5-fid, papillose. Fruit a capsule, 5-valved at apex ... 24. SPERMADICTYON

3b. Herbs :

7a. Ovary 3-locular; stigmas 3. Fruits with 3 indehiscent mericarps. Flowers in terminal dense heads subtended by involucral leaves ... 22. RICHARDIA

7b. Ovary 2-locular; stigma(s) 2, or 1, capitate or with 2 short lobes. Fruits with 2 indehiscent mericarps or 2-valved capsule or circumscissile :

8a. Flowers borne in terminal, corymbiform or umbelliform inflorescences with paniculiform circinoid branches. Fruits with 2 indehiscent mericarps ... 13. KNOXIA

8b. Flowers in termial and axillary branches. Fruit a 2-valved capsule or circumscissile :

9a. Fruit a 2-valved capsule dehiscing either from base to apex or in reverse direction, or sometimes with cocci, 1 or both ± dehiscent ... 23. SPERMACOCE

9b. Fruit circumscissile about its middle, the top lifting off like a lid. Flowers minute, clustered in sessile, globose inflorescences at nodes and apex. Seeds with ventral face divided into 4 distinct areas ...15. MITRACARPUS

2b. Corolla-lobes contorted in bud :

10a. Flowers in terminal or axillary, many-flowered, corymbose cymes or panicles :

11a. Bracts membranous, the lower sheathing. Style long-exserted, twice as long as corolla-tube ... 21. PAVETTA

11b. Bracts coriaceous, not sheathing. Style slightly exserted, much less than twice the length of corolla-tube ... 12. IXORA

10b. Flowers in short-peduncled 1-3-flowered cymes in axils of leaf-pairs or terminal ... 5. COFFEA

1b. Ovules few to many in each ovary-cell :

12a. Flowers collected in dense globose heads :

13a. Corolla-lobes imbricate in bud. Calyx-tubes or hypanthia coherent ... 1. ANTHOCEPHALUS

13b. Corolla-lobes valvate in bud. Hypanthia not coherent :

14a. Calyx-tube angled; limb distinctly 5-lobed. Corolla-throat glabrous. Anthers obtuse ... 8. HALDINIA

14b. Calyx-tube cylindrical; limb entire or very shortly 5-dentate. Corolla-throat hairy. Anthers apiculate ... 16. MITRAGYNA

12b. Flowers axillary, solitary or fascicled, or in axillary or terminal cymes, racemes or panicles, but never in dense globose heads :

15a. Corolla-lobes valvate in bud :

16a. One of calyx-lobes transformed into a short leafy structure ... 18. MUSSAENDA

16b. Calyx-lobes all normal :

17a. Trees or large shrubs. Inflorescence a panicled cyme or raceme with 2 foliaceous bracts. Seeds winged all round ... 11. HYMENODICTYON

17b. Herbs or undershrubs. Seeds angular :

18a. Petals toothed. Stipules entire. Fruit indehiscent ...6. DENTELLA

18b. Petals not toothed. Stipules not entire, with 1-several fimbriae. Fruits dehiscent or indehiscent :

19a. Calyx-teeth contiguous on capsule ... 10. HEDYOTIS

19b. Calyx-teeth distant on capsule :

20a. Corolla-tube very slender, longer than lobes. Stigmas always overtopped by anthers ... 14. KOHAUTIA

20b. Corolla-tube not slender, shorter than lobes. Stigmas not over-topped by anthers. ... 19 OLDENLANDIA

15b. Corolla-lobes contorted or imbricate in bud :

21a. Fruit a septicidal 2-valved capsule. Flowers in terminal dense panicled cymes ... 25. WENDLANDIA

21b. Fruit an indehiscent drupe or berry :

22a. Stamens inserted at base of corolla- tube. Corolla-lobes imbricate in bud ... 9. HAMELIA

22b. Stamens inserted near mouth of corolla-tube. Corolla-lobes contorted in bud :

23a. Ovary 2-celled. Stipules not amplexicaul ... 3. CATUNAREGAM

23b. Ovary 1-celled. Stipules not amplexicaul :

24a. Armed. Leaves and flowers dimorphic. Placentae 5. Seeds smooth. ... 4. CERISCOIDES

24b. Unarmed. Leaves and flowers monomorphic. Placentae 2-6. Seeds rugose ... 7. GARDENIA

1. ANTHOCEPHALUS A. Rich. emend. Haviland

Anthocephalus chinensis (Lam.) A. Rich. ex Walp., Repert. 2 : 491. 1843; Ridsd. in Blumea 24 : 334. 1978. *Cephalanthus chinensis* Lam., Encycl. 1 : 678. 1785.

Nauclea cadamba Roxb., Fl. Ind. 2 : 121. 1824.

Anthocephalus cadamba (Roxb.) Miq., Fl. Ind. Bat. 2 : 135. 1856; Hook. f. in Hook. f., Fl. Brit. India 3 : 23. 1880; Prain, Bengal Pl. 1 : 551. 1903; Haines, For. Fl. Chota Nagpur 496. 1910 & Bot. Bihar & Orissa pt. 4 : 421. 1922.

Breonia chinensis (Lam.) Capuron in Adansonia II, 13 : 472. 1973, *p.p.*; Ridsd. in Blumea 22 : 551. 1975.

Local name : Kadamba.

Large tree, to 20 m tall. Branches horizontal, widely spreading, subwhorled; younger parts pubescent. Leaves coriaceous, elliptic-oblong or ovate-oblong, rounded or subcordate, shortly acuminate, glabrous and shining above, pubescent beneath, 12-25 × 6-10 cm; petioles 2-5 cm long. Stipules linear, 1.2-1.5 cm long. Heads 2-4 cm in diam., on 2.5-3.5 cm long stout peduncles. Calyx 5-6 mm long; lobes 5, narrowly oblanceolate. Corolla 6-8 mm long, orange, glabrous; tube slender, infundibuliform; lobes 5, 0.2-0.25 cm long, oblong, acute, slightly pubescent without. Stamens 5, inserted in throat; anthers mucronate. Pseudocarp large, fleshy, the size of a small orange, 5-7 cm in diam., yellow when ripe. Seeds muriculate, not winged.

Fl. : May-July. *Fr.* : Aug.-Oct.

Ecology : Common; cultivated along roadsides, gardens, parks, etc.; also wild in jungles of hilly areas.

Distribution : Throughout India. Nepal, Sri Lanka, Myanmar, Thailand to Vietnam, S. China and Malesia.

Specimens examined : Koderma, 180; Hazaribagh, 1606; Barhi , 1821.

Uses : Wood is used for light constructional work. Inflorescence-receptacle is edible. Bark is used as tonic and febrifuge.

2. CANTHIUM Lam.

Canthium dicoccum (Gaertn.) Teysm. & Binnend., Cat. Hort. Bog. 113. 1866; Hara & Gould in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 200. 1979. *Psydrax dicoccos* Gaertn., Fruct. 1 : 125, t. 26. 1788.

C. didymum Gaertn. f., Fruct. 3 : 94, t. 196. 1806 ; Hook.f., in Hook.f., Fl. Brit. India 3 : 132. 1880; Prain, Bengal Pl. 1 : 574. 1903; Haines, For. Fl. Chota Nagpur 507. 1910 & Bot. Bihar & Orissa pt. 4 : 438. 1922.

Unarmed, small, evergreen tree, to 12 m high. Branchlets spreading or drooping, flattened above, glabrous. Leaves coriaceous, ovate-lanceolate or suborbicular, cuneate, obtuse or subcordate at base, obtusely caudate-acuminate at apex, polished above, 5-15 × 1.2-10 cm; nerve-axils eglandular. Petiole 4-8 mm long. Cymes corymbose, compressed, shortly peduncled, 0.7-2.5 cm long. Flowers greenish-white, 5-merous. Bracts short or 0. Calyx truncate or obscurely toothed, pubescent outside. Corolla campanulate, 5.5-6 mm in diam.; tube 3-6 mm long, woolly within; lobes lanceolate, subacute. Disk annular, short. Style glabrous; stigma subquadrate, notched or 2-fid. Drupe globose, ellipsoid or obovoid, compressed-subdidymous, green when young, black when ripe, 6-8 mm in diam.; pyrenes rugose.

Fl. : Feb. - Apr. *Fr.* : May-June.

Ecology : Very common; along banks of rivers, streams, slopes of hills, etc.

Distribution : India : Assam, Sikkim Himalaya, West Bengal, Bihar, Uttar Pradesh, Orissa, Central and Western India and Deccan Peninsula. Nepal, Sri Lanka, Indo-China, China, Malesia.

Specimens examined : Patratu, 879 ; Telaiya Dam, 1930 ; Pratappur 2354.

Uses : Wood is used for agricultural implements, combs, toys, posts and rafters. Bark is employed as a febrifuge and applied externally to fractures.

3. CATUNAREGAM Wolf

Catunaregam spinosa (Thunb.) Tirvengad. in Bull. Mus. Nation. Hist. Nat. (Paris) 3 ser. Bot. 35 : 13. 1978 & in Taxon 27 : 515. 1978; Vardc. in Kew Bull. 36 : 503. 1981. *Gardenia spinosa* Thunb., Diss. Gard. n. 7, t. 2. f. 4. 1780.

Gardenia dumetorum Retz., Obs. Bot. 2 : 14. 1781.

Randia dumetorum (Retz.) Lam., Encycl. 2 : 227. 1794 & Tabl. Encycl. t. 156. f. 4. 1792; Hook. f. in Hook. f., Fl. Brit. India 3 : 110. 1880; Prain, Bengal Pl. 1 : 567. 1903; Haines, For. Fl. Chota Nagpur 501. 1910 & Bot. Bihar & Orissa pt. 4 : 432. 1922.

**R. spinosa* (Thunb.) Poir. in Lam., Encycl. Suppl. 2 : 829. 1812.

Xeromphis spinosa (Thunb.) Keay in Bull. Jard. Bot. Brux. 28 : 37. 1958; Maheshw. in Bull. Bot. Surv. India 3 : 91. 1961.

Local name : Mainphal.

Deciduous shurb, to 4 m tall, armed with shout, straight, nearly opposite and decussate, axillary spines of 2.5-3.5 cm long. Branches horizontal, rigid; lateral ones very short. Leaves clustered, obovate-spathulate or oblanceolate, chartaceous, obtuse or shortly acuminate at apex, cuneate to attenuate at base, wrinkled, puberulous above, pubescent beneath, 2.5-5 cm long ; petioles to 5 mm long; stipules ovate, acuminate, 1.5-2 mm long. Flowers fragrant, 5-merous, solitary or in fascicles at ends of sort leaf-bearing branchlets, sometimes on axillary spines. Calyx strigose, cupular, 1-1.2 cm long ; tube broadly campanulate; lobes broadly ovate or obovate-oblanceolate, foliaceous, 4-5 mm long, sometimes with small intermediate teeth between. Corolla 1.2-2 cm across, yellow or nearly white; tube *ca* 5 mm long, hairy outside; lobes suborbicular, to 1 cm long, spreading, pubescent outside. Berry globose or ovoid, 1.5-2 cm across, crowned by semi-persistent calyx-teeth, yellow, glabrous. Seeds many, flat, smooth, embedded in gelatinous pulp.

Fl. : Apr.-June. *Fr.* : Aug.-Jan.

Ecology : Common; in forests, valleys of low hills, etc.

Disribution : Throughout India including tropical and subtropical Himalaya. Nepal, Indo-China, S. China, Bangladesh, Sri Lanka, Malesia.

Specimens examined : National Park, 425; Ghanghree, 2163.

Uses : Fruits are eaten after roasting or cooking. They are used as expectorant and diaphoretic. Unripe fruits and roots are used as fish poison. Bark is used in diarrhoea and dysentery. Wood is used for walking-sticks, umbrella-handles, ploughs and mathematical instruments.

Note : Tirvengadum (*l.c.*) re-established the name *Catunaregam* Wolf (1776) as it is earlier than XEROMPHIS Raf. (1838).

4. CERISCOIDES (Hook.f.) Tirvengadum

Key to the Species

1a. Corolla salver-shaped. Fruit beaked, smooth ... 2. *C. turgida*

1b. Corolla campanulate. Fruit not beaked, obscurely 5-ridged ... 1. *C. campanulata*

1. **Ceriscoides campanulata** (Roxb.) Tirvengadum in Bull. Mus. Nation. Hist. Nat. (Paris) 3 ser. Bot. 35 : 16. 1978. *Gardenia campanulata* Roxb., Fl. Ind. 2 : 556. 1824; Hook. f. in Hook. f., Fl. Brit. India 3 : 118. 1880; Prain, Bengal Pl. 1 : 565. 1903; Haines, For. Fl. Chota Nagpur 503. 1910 & Bot. Bihar & Orissa pt. 4 : 429. 1922.

Local name : Dekamali.

Shrub, 4-6 m tall; branches puberulous; spines straight, 1.2-3.5 cm long. Leaves obovate or broadly elliptic, membranous, narrowed at base into a short petiole, glabrous, faintly veined. 3.5-8 × 1.2-3.5 cm; stipules triangular, caducous. Male flowers : 1-1.2 cm in diam.; calyx 7-8 mm long, urn-shaped, with truncate, dilated mouth ; corolla campanulate, 6-7 mm long, white; lobes short, obtuse. Female flowers : sessile; calyx-limb campanulate; teeth oblong or subspathulate; corolla similar to male. Fruits ellipsoid or subglobose, obscurely 5-ridged, not beaked, 2-3 cm in diam.; pericarp very thick, endocarp woody; placentas 5. Seeds compressed, smooth.

Fl. : Mar.-Apr. *Fr.* : Oct.-Nov.

Ecology : Rare, in forest.

Distribution : India : Sikkim Himalaya, Assam, Bihar. Bangladesh, Java.

Specimen examined : National Park, 2044.

Uses : Fruits and leaves are eaten after cooking. Fruits are used as cathartic and anthelmintic. Plant-extract is used as fish poison.

2. **Ceriscoides turgida** (Roxb.) Tirvengadum in Bull. Mus. Nation. Hist. Nat. (Paris) 3 ser. Bot. 35 : 15. 1978. *Gardenia turgida* Roxb., Fl. Ind. 2 : 557. 1824; Hook. f. in Hook. f., Fl. Brit. India. 3 : 118. 1880; Prain, Bengal Pl. 1 : 565. 1903; Haines, For. Fl. Chota Nagpur 502. 1910 & Bot. Bihar & Orissa pt. 4 : 429. 1922.

Local name : Dhauuk, Ghurgia.

Small deciduous tree, to 8 m tall; bark white or pale-grey, smooth, soft; branches numerous, thick and stout ; thorns strong, straight. Leaves crowded at ends of branchlets, obovate or semi-orbicular, obtuse, acute- or abruptly subacuminate at apex, narrowed into a short, marginate petiole, glabrous above, velvety-tomentose beneath, 5-8 × 3-6 cm; veins inconspicuous; stipules triangular, cuspidate, caducous. Male flowers : calyx 4-5 mm long, turbinate; teeth minute; corolla 1.5-2.5 cm long, white, glabrous; lobes 0.5-1.2 cm long, oblong; anthers 5-6, linear, sessile, attached by their back, included. Female flowers : calyx flask-shaped, 0.8-2 cm long; teeth narrowly linear; corolla as in male; style 7-8 mm long; stigma cylindric, grooved, 2-lobulate. Fruits subglobose, grey, with fleshy pericarp and woody endocarp, 2.5-7 cm in diam., often bluntly pointed. Seeds angular, hard.

Fl. : Apr.-May. *Fr.* : Dec.-Mar.

Ecology : Very common; in dry forests, slopes of hills, etc.

Distribution : Throughout India, particularly in deciduous forests including forests of tropical Himalaya. Myanmar, Nepal.

Specimens examined : National Park, 139, 968 ; Koderma Forest, 2240.

Uses : Wood is used for boot-lasts, musical instruments, walking sticks and small turnery articles. Fruits are eaten after cooking. Immature fruit-extract is used in affections of mammary glands.

5. COFFEA L.

Coffea arabica L., Sp. Pl, 172. 1753; Hook. f. in Hook. f., Fl. Brit. India 3 : 153. 1880; Prain, Bengal Pl. 1 : 572. 1903; Haines, For. Fl. Chota Nagpur 507. 1910 & Bot. Bihar & Orissa pt. 4 : 436. 1922.

Local name : Kafi.

Shrub, to 2 m tall ; branchlets spreading, compressed. Leaves oblong or elliptic-oblong, rounded or subcuneate at base, shortly acuminate at apex, glabrous and shining, 10-20 × 2-8 cm; secondary veins 5-7 pairs, with large gland-pits in their axils; petiole 0.6-1 cm long; stipules broadly lanceolate, with a subulate deciduous cusp. Flowers 1-3-nate or in abbreviated 1-2-nate axillary cymes, subsessile, subtended by short, amplexicaul green bracts. Corolla trumpet-shaped; corolla tube 0.8-1.2 cm long; petals 5, 1-1.5 cm long. Stamens inserted in throat or lower; anthers usually twisted after anthesis. Ovule 1 per ovary-locule, peltately attached to septum; style-branches 2. Drupe oblong, 0.8-1.5 cm long; pyrenes 2, plano-convex, grooved on flat side.

Fl. : Mar.-May. *Fr.* : Sept.-Nov.

Ecology : Not common; cultivated in the plateau, gardens, etc.; also escapes from cultivation.

Distribution : Cultivated in different parts of India, particularly in the South. Native of Ethiopia, introduced into the East early.

Specimens examined : Hazaribagh, 1610; Pratappur, 2066.

Uses : Roasted beans are used for preparation of coffee; also used for flavouring ice-creams and pasties. Dried ripe seeds are used as a stimulant, nervine and diuretic.

6. DENTELLA J.R. & G. Forst.

Dentella repens J.R.& G. Forst., Char. Gen. Pl. 25, t. 13. 1776; Hook. f. in Hook. f., Fl. Brit. India 3 : 42. 1880; Prain, Bengl Pl. 1 : 555. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 443. 1922; Subram. & Sharma in Bull. Bot. Surv. India 10 : 386. 1969.

Oldenlandia repens L., Mant. Pl. 40. 1767, *nom. illegit.*, non Burm. f. 1768.

Key to the Varieties

1a. Corolla < 0.5 cm long. Fruit densely covered with hyline setae ... 1. var. *repens*

1b. Corolla > 0.5 cm long. Fruit glabrous ... 2. var. *serpyllifolia*

1. var. **repens**; Verdc. in Kew Bull. 37 : 545. 1983.

Slender, strigose, sub-dichotomously branched, annual herb, rooting at nodes. Leaves narrow-elliptic or oblanceolate, membranous, acute to rostrate at apex, cuneate at base, bristly hairy along margins, 1-nerved, 4-7 × 1.5 - 3 mm ; petiole almost obscure, to 2 mm long; stipules 0.6-0.8 mm long. Flowers (sub)sessile, 5-merous, in one axil only of a pair of leaves or in forks of branches. Calyx campanulate; lobes equal, linear, subacuminate, hairy outside, *ca* 2 mm long. Corolla white, 4-5 mm long; lobes ovate, acute, each 3-partite, 1.2-1.5 mm long. Staminal filaments 0.4-0.5 mm long; anthers oblong, 1-1.2 mm long. Style - branches with long stigmatic glands on all sides. Fruit dry, indehiscent, asymmetrically sub-globose,densely covered with hyaline setae, 2.5-3 mm across, crowned by persistent calyx. Seeds angular.

Fl. & Fr. : Oct.-Feb.

Ecology : Very common; in wastelands, dilapidated walls, roadsides, railway tracts, cultivated fields and field borders, drying beds of tanks, low lying areas, etc.

Distribution : Throughout India. Sri Lanka, China, Malesia, N.Australia and Polynesia.

Specimens examined : Jhumri Telaiya, 170 ; Hazaribagh, 992, 1619.

Use : Plant is used for poulticing sores.

2. var. **serpyllifolia** (Wall. ex Craib) Verdc. in Kew Bull. 37 : 545. 1983.

Dentella serpyllifolia Wall. ex Craib, Fl. Siam. Enum. 2 : 27. 1932; Airy Shaw in Kew Bull. 1932 : 289. 1933; Merrill in J. Arnold Arb. 35 : 155. 1954; Subram. & Sharma in Bull. Bot. Surv. India 10 : 389. 1969.

Fl. & Fr. : Sept.-Feb.

Ecology : Very common; found in the same places and usually in association with the type variety.

Distribution : Same as the type variety.

Specimens examined : Jhumri Telaiya, 168 ; Hazaribagh, 989.

Use : Same as the type variety.

7. GARDENIA Ellis, *nom. cons.*

Key to the Species

1a. Leaves broadly elliptic or suborbicular, 12-15 × 8-18 cm. Fruits without ribs. Corolla-lobes 5-9, in 1 or 2 whorls ... 2. *G. latifolia*

1b. Leaves obovate or oblanceolate, 8-15 × 4-6.5 cm. Fruits strongly 5-ribbed. Corolla-lobes many, in several whorls ... 1. *G. angusta*

1. **Gardenia angusta** (L.) Merr., Interp. Herb. Amb. 485. 1917; Tirvengadum in Bull. Mus. Nation. Hist. Nat. (Paris) 3 ser. Bot. 35 : 17. 1978. *Varneria angusta* L., Amoen. Acad. 4 : 136. 1759.

G. jasminoides Ellis in Phil. Trans. Lond. 51 (2) : 935, t. 23. 1761.

G. florida L., Sp. Pl. ed. 2, 305. 1762; Hook. f. in Hook. f., Fl. Brit. India 3 : 115. 1880; Prain, Bengal Pl. 1 : 565. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 431. 1922.

Local name : Gandharaj.

Large evergreen shrubs, to 4 m tall; shoots and buds resinous, puberulous. Leaves opposite or in whorls of 3, obovate or oblanceolate, acuminate at apex, cuneate at base, coriaceous, entire, subglabrous, shining, dark-green, strongly nerved, 8-15 × 4-6.5 cm; petiole 0.5-1 cm long; stipules spathaceous or 2-cleft, 1-1.2 cm long. Flowers fragrant, solitary, to 7 cm across, near ends of branchlets. Peduncles 0.8-1.2 cm long. Calyx 3-3.5 cm long, green, 5-6-ridged with ridges ending in long subulate sepals. Corolla white; tube stout, 2-2.5 cm long, wider above; lobes many, in several whorls, obovate or oblanceolate, 3-4cm long. Berry ellipsoid, strongly 5-ribbed, orange when ripe. Seeds many, surrounded by orange-coloured pulp.

Fl. : Sept.-Apr. *Fr.* : Nov.-June.

Ecology : Very common; planted in gardens, parks, etc.

Distribution : Throughout India. Native of China and Japan, now cultivated widely in warm and temperate countries of the world.

Specimens examined : Hazaribagh, 1608 ; Ramgarh, 2192.

Uses : Roots are used in dyspepsia and nervous disorders. Fruits are used in jaundice and pulmonary and renal troubles. Flowers are used in perfumery.

2. **Gardenia latifolia** Ait., Hort. Kew 1 : 294. 1789; Roxb., Fl. Ind. 2 : 552. 1824; Hook. f. in Hook. f., Fl. Brit. India 3 : 116. 1880; Prain, Bengal Pl. 1 : 564. 1903; Haines, For. Fl. Chota Nagpur 504. 1910 & Bot. Bihar and Orissa pt. 4 : 431. 1922.

G. enneandra Koen. ex Wight & Arn., Proodr. Fl. Ind. Orient. 394. 1834.

Local name : Papra, Paphar.

Small, deciduous tree, to 10 m tall, with divergent branches. Bark pale-grey, smooth, flaking off in small round pieces. Young part coated with resinous exudation. Leaves opposite or in threes, broadly elliptic or suborbicular, obtuse, acute or shortly acuminate at apex, narrowed at base into a short petiole, greenish above, paler beneath, glabrous or minutely pubescent, 12-25 × 8-18 cm; secondary veins 16-22 pairs, parallel, with small gland in axils on the underside; petiole 0.8-2 cm long. Flowers solitary, or 2-nate, fragrant, 7-10 cm across, sub-sessile. Calyx tubular-campanulate, densely pubescent, 1.5-2.5 cm long; lobes 7-8, lanceolate subulate, unequal, recurved, with ciliate margins; corolla white, turning yellow or orange when fading; tube 2-3 cm long, hirsute; lobes 5-9, obliquely oblong-obovate, thin-fleshy, 2-3 × 1-1.5 cm. Stamens subexserted, 1.5-2 cm long. Stigma 2-lamellate. Berry subglobose, 3-5 cm in diam., appressedly pubescent when young, grey or speckeled greenish-yellow when ripe. Seeds numerous, pale-brown, in purplish-grey pulp.

Fl. : Mar.-Apr. *Fr.* : Nov.-June.

Ecology : Very common; in dry deciduous forests.

Distribution : Throughout India, particularly in the hilly regions. Myanmar.

Specimens examined : National Park, 430, 970 ; Pratappur, 615; Koderma Forest, 1767.

Uses : Wood is used as substitute for box wood; also used for combs and turnery, camp beds and other light furniture, toys, mathematical instruments, etc.

8. HALDINIA Ridsd.

Note : According to Ridsdale (*l.c.*), because of the presence of some differential morphological features, *Adina cordifolia* (Willd. ex Roxb.) Hook. f. ex Brandis (syn. *Nauclea cordifolia* Willd. ex Roxb. and *N. sterculiaefolia* A. Rich) should not be placed in ADINA Salisb. and therefore, he created a new monotypic genus HALDINIA Ridsd. The diagnostic features between ADINA and HALDINIA are as follows :

1a. Terminal vegetative bud ill-defined, not flattened, loosely surrounded by stipules. Stipules ± free in bud, deeply bifid. Ovules 4 in each ovary-locule ... ADINA

1b. Terminal vegetative bud distinct, flattened. Stipules appressed in bud, entire, pubescent, keeled. Ovules many ... HALDINIA

Haldinia cordifolia (Willd. ex Roxb.) Ridsd. in Blumea 24 : 361. 1978. *Nauclea cordifolia* Willd. ex Roxb., Pl. Corom. 1 : 40, t. 53. 1795 & Fl. Ind. 1 : 122. 1824.

Adina cordifolia (Willd. ex Roxb.) Hook. f. ex Brandis, Fl. N.W. & C. India 263, t. 33. 1874; Hook. f. in Hook. f., Fl. Brit. India 3 : 24. 1880; Prain, Bengal Pl. 1 : 552. 1903; Haines, For. Fl. Chota Nagpur 497. 1910 & Bot. Bihar & Orissa pt. 2 : 421. 1922.

Nauclea sterculiaefolia A. Rich, Mem. Fam. Rub. 209. 1830.

Local name : Haldu.

Deciduous tree, 10-30 m tall, with sympodial branching; branchlets with conspicuous petiolar scars; bole buttressed and fluted; bark reddish-brown; stipules ovate-oblong, strongly keeled, pubescent, 1-2 × 0.5-1 cm. Leaves broadly ovate, subcoriaceous, cordate at base, abruptly acuminate at apex, sparsely hirsute above, densely pubescent beneath, 8-25 × 7-22 cm; lateral veins 6-10 pairs; axils with hairy domatia; petioles 2-10 cm long, pubescent. Flowering axes 2-6, to 10 cm long; flowering heads yellowish, 1-2.5 cm in diam. Interfloral bracteoles 1.8-2 mm long, with swollen, pubescent apical part. Hypanthia 1.5-2 mm long, densely hairy. Calyx 1.5-2 mm long; tube very short; lobes 1.3-1.8 mm long, ovate-oblong, attenuate at base into filiform shaft. Corolla 7-9 mm long; tube 5-6 mm long, finely hairy outside; lobes oblong, 0.15-0.2 cm long, hairy outside, papillose inside. Anthers 1-2 mm long. Style 5-7 mm, exserted; stigma ovoid to subglobose. Fruiting head 1-1.5 cm in diam.; fruitlets 4-5 mm long, pubescent. Seeds obovoid, apically with 2 claw-like short projections.

Fl : May.-July. *Fr.* : Feb.-May.

Ecology : Common; in deciduous forests, roadsides, etc.

Distribution : Dry forests and throughout the hilly parts of India. Sri Lanka, eastwards to S. China, Vietnam, Southwards to Peninsular Thailand.

Specimens examined : Barkaganwa, 1266 ; National Park, 2054.

Uses : Wood is used for flooring and panelling railway carriages, and for bobbins; also used in manufacture of wrapping, writing and printing paper. Leaves are used as cattle fodder. Bark is used as febrifuge.

9. HAMELIA Jacq.

***Hamelia patens** Jacq., Enum. Syst. Pl. 16. 1760; Prain, Bengal Pl. 1 : 563. 1903.

Large shrub, to 5 m tall. Leaves opposite and decussate, or sometimes whorled, subcoriaceous, elliptic-obovate or oblanceolate, cuneate at base, obtusely acute at apex, entire, glabrous, with 6-8 pairs of lateral veins, 8-11 × 2-4 cm ; petiole 1-2 cm long; stipules subulate. Cymes to 10 cm long. Flowers shortly pedicellate. Calyx-tube turbinate; lobes 5, valvate, puberulous. Corolla tubular, yellowish-orange, 4-5 mm across; tube to 2.5 cm long ; lobes 5. Stamens 5 ; staminal filaments 3.5-4 mm long, flattened; anthers 5-7 mm long, oblong-linear. Ovary oblong, 3-3.5 mm long; style 1.4-1.6 cm long. Berry oblong, grooved and ribbed, sparsely pubescent, glossy black, 0.8-1 cm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; planted in gardens, parks, near temples, etc., also subspontaneous near villages.

Distribution : Almost throughout the tropical parts of India. Native to tropical America, now commonly cultivated in all the tropical countries of the World.

Specimens examined : Ramgarh, 1930 ; Hazaribagh, 2248.

Uses : The plant is grown as an ornamental for yellowish-orange flowers. Fruits are used in the treatment of dysentery.

10. HEDYOTIS L.

Hedyotis pinifolia Wall. ex G. Don, Gen. Syst. 3 : 525. 1837; Hook. f. in Hook. f., Fl. Brit. India 3 : 60. 1880; Prain, Bengal Pl. 1 : 556. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 445. 1922.

Oldenlandia pinifolia (Wall. ex G. Don) K. Schum. in Engl., Pflanzenfam. 4, 4 : 25. 1891.

Erect, simple or sparingly branched, annual herbs, 8-25 cm tall. Stems often brown-tinged, acutely 4-angled, scabrid. Leaves subsessile, acicular-linear, mostly decussate, sometimes ternate, acute at apex, with revolute margins, scabrid above, 1-nerved, 2-4 × 0.1-0.2 cm; stipule-segments 3-6, 3-5 mm long. Cymes sessile, capitate, axillary and terminal, mostly 2-4-flowered, or sometimes many-flowered, 6-8 mm in diam. Calyx-segments 4, lanceolate-linear, 2-3 mm long, hispid. Corolla 2-2.5 mm long, white or tinged with purple outside, divided half-waydown; tube hairy inside, 0.8-1.2 mm long; lobes 4, glabrous, oblong, obtuse, *ca* 1 mm long. Stamens 4, exserted; filaments 1.2-1.5 mm long; anthers oblong, *ca* 0.5 mm long. Style filiform, 1.2-1.5 mm long; stigma 2-lobed. Capsule ovoid, 2-lobed, hispid, 3-3.5 mm long, many-seeded, loculicidal on crown only. Seeds small brownish, triangular, 0.1-0.2 mm long.

Fl. : July-Sept. *Fr.* : Oct.-Dec.

Ecology : Not common; underneath of the forests.

Distribution : India : Himalaya, Uttar Pradesh, Bihar, Chota Nagpur, Orissa, Andaman Islands. Nepal, Indo-China, Thailand, Malesia.

Specimens examined : National Park, 878 & 2021.

Use : Plant, in form of poultice, is used for aches.

11. HYMENODICTYON Wall.

Hymenodictyon orixense (Roxb.) Mabb. in Taxon 31 : 66. 1982. *Cinchona orixensis* Roxb., Bot. Descr. Swietenia 21. 1793.

Cinchona excelsa Roxb., Pl. Corom. 2 : 3, t. 106. 1798.

Hymenodictyon excelsum (Roxb.) Wall. in Roxb., Fl. Ind. 2 : 149. 1824; Hook. f. in Hook. f., Fl. Brit. India 3 : 35. 1880; Prain, Bengal Pl. 1 : 555. 1903 ; Haines, For. Fl. Chota Nagpur 498. 1910 & Bot. Bihar & Orissa pt. 4 : 425. 1922.

Local name : Bhaulan, Kukurkat.

Deciduous tree, 9-12 m tall; bark smooth. Leaves at end of branches, membranous, ovate to broadly elliptic or suborbicular, narrowed at base into a 2.5-7.5 cm long petiole, abruptly acuminate, finely pubescent on both surfaces, 10-25 × 7-15 cm; lateral veins 7-10 pairs; stipules broadly oblong, recurved, glandular-serrate. Panicle large, 7-15 cm or more long, spreading, pubescent. Bracts long-petioled, strongly nerved, 7-12 cm long. Flowers many, crowded on abbreviated branches of panicles. Calyx 2-2.2 mm long, narrowly campanulate, pubescent. Corolla 5-6 mm long ; lobes 5, short, acute. Stamens 5 ; filaments dilated upwards. Styles very long. Capsule ellipsoid or ovoid, 1.6-2 cm long, on shout, decurved, 0.6-1 cm long pedicel.

Fl. : June-Aug. *Fr.* : Nov.-Feb.

Ecology : Common; in deciduous forests usually in dry rocky situations, in valleys, etc.

Distribution : Western Himalaya, Deccan Peninsula, Central India, Orissa, Bihar. Nepal, Bangladesh, Myanmar, Thailand, Vietnam, Malesia.

Uses : Wood is used for picture and slate frames, mathematical instruments, toys, match-splints. Inner bark is used as febrifuge and antiperiodic. Leaves are used for dyeing and cattle fodder.

12. IXORA L.

Key to the Species

1a. Corolla white. Cymes not jointed at ramifications, brachiate ... 2. *I. pavetta*

1b. Corolla bright scarlet. Cymes jointed at ramifications, corymbiform ... 1. *I. coccinea*

1. **Ixora coccinea** L., Sp. Pl. 110. 1753; Hook. f. in Hook. f., Fl. Brit. India 3 : 145. 1880; Prain, Bengal Pl.1 : 571. 1903; Hains, Bot. Bihar & Orissa pt. 4 : 434. 1922.

Local name : Rangan, Rajana.

Shrub, to 4 m high. Leaves sessile or subsessile, coriaceous, elliptic-ovate or oblong, subacute and apiculate at apex, rounded or subcordate at base, glabrous, pale when dry, 5-10 × 3-6 cm; lateral nerves 8-12 pairs, slender. Stipules ovate, with a long cuspidate point. Cymes jointed at ramifications, sessile, corymbiform, dense-flowered. Flowers 4-merous; pedicels very short; bracts and bracteoles lanceolate-subulate, acute. Calyx to 2.5 mm long; lobes triangular, 1-2 mm long. Corolla 1.3-1.5 cm across, bright-scarlet; tube slender, to 3.5 cm long ; lobes elliptic-oblong, subacute. Stamens 4; anthers *ca* 3 mm long, acuminate. Ovary *ca* 1.5 mm across. Fruit globose, smooth, crowned with persistent calyx teeth, 0.8-1 cm across, purple when ripe.

Fl. : Throughout the year.

Ecology : Very common; planted in gardens, sometimes grows wild in waste places.

Distribution : Throughout India. Native of western Peninsula, now widely cultivated throughout the Tropics.

Specimens examined : Hazaribagh, 758 ; Koderma, 2000.

Uses : Root is used in loss of appetite, diarrhoea and dysentery. They are also applied to sores and chronic ulcers. Flowers are used in dysentery, dysmenorrhoea and catarrhal bronchitis, their decoction is given in eye troubles.

2. **Ixora pavetta** Andrews, Bot. rep. t. 78. 1799; Matthew & Rani in Matthew, Fl. Tamilnadu Carnatic pt. 2 : 712. 1983.

I. parviflora Vahl, Symb. 3 : 11, t. 52. 1794, non Lam. 1791; Roxb., Fl. Ind. 1 : 383. 1832; Hook. f. in Hook. f., Fl. Brit. India 3 : 142. 1880; Prain, Bengal Pl. 1 : 571. 1903; Haines, For. Fl. Chota Nagpur.505. 1910 & Bihar & Orissa pt. 4 : 435. 1922.

I. arborea Roxb. ex J.E.Smith in Rees, Cyclop. 19 : 5. 1811; Santap., Fl. Khandala ed. 3, 119. 1967.

Local name : Kota Gandhal, Loha jangia.

Evergreen shrub or small tree, to 8 m tall; bark pale grey, nearly smooth. Leaves subsessile, elliptic-lanceolate, elliptic-obovate to oblanceolate, coriaceous, subacute at apex, cuneate-rounded at base, entire, glabrous, shining, pale when dry, 8-14 × 4-7 cm, lateral nerves 8-14 pairs; petiole 3-8 mm long, rugose. Stipules 4-5 mm long, broadly ovate, with a cuspidate point of about 2.5 mm long. Cymes sessile, brachiate, not jointed at ramifications, 9-14 cm across. Flowers 4-merous; pedicels very short or 0, lowest bracts like stipules, upper ones lanceolate-subulate; bracteoles minute, subulate. Calyx 0.8-1.2 mm long; teeth almost obscure, triangular. Corolla white; tube 8 mm long; lobes linear-oblong, obtuse, 0.3 mm long. Anthers *ca* 2.5 mm long, basally tailed. Style hairy. Drupe didymous, red, 6-7 mm across.

Fl. : Mar.-May. *Fr.* : May-June.

Ecology : Common ; in forests, hill-slopes, near streams, etc.

Distribution : Throughout the hilly parts of India. Sri Lanka, Bangladesh, Myanmar.

Specimens examined : Ramgarh, 538 ; National Park, 1178 ; Simaria 1623.

Uses : Decoction of bark is used for anaemia. Leaves are used as cattle fodder. Wood is used for furniture and building purposes.

13. Knoxia L.

Knoxia sumatrensis (Retz.) DC., Prodr. 4 : 569. 1830; Santap. & Merchant in Bull. Bot. Surv. India 3 : 108. 1961. *Spermacoce sumatrensis* Retz., Obs. Bot. 4 : 23. 1786.

K. corymbosa auct. non Willd. : Hook. f. in Hook. f., Fl. Birt. India 3 : 128. 1880; Prain, Bengal Pl. 2 : 578. 1903; Haines, For. Fl. Chota Nagpur 510. 1910 & Bot. Bihar & Orissa pt. 4 : 452. 1922.

Erect, sparingly branched, slender, annual herb, 30-120 cm tall. Stem obtusely 4-angled, with long internodes, softly hairy. Leaves lanceolate or linear-lanceolate, acute or shortly acuminate at apex, tapering at base into a short petiole, entire, hairy on both surfaces, 5-10×1.2-2.5 cm; lateral nerves 8-12 pairs, conspicuous on lower surface; stipules ovate-rounded, 2-3 mm long, with 3-4 filiform hairy bristles. Flowers 4-merous, small, numerous, on sides of slender pubescent branches of large lax corymbose cymes; pedicels very short, 1-2 mm long, sometimes 0.Calyx 0.8-1 mm long; lobes subequal, minute, triangular. Corolla to 4 mm long, purplish; lobes short, triangular-oblong, 1-1.5 mm long. Stamens included. Fruit 1.5-2 mm long, sessile or shortly pedicellate, 4-angled, ellipsoid, perforate at base; mericarps remain united, separate from persistent columella with least pressure. Seeds black, flat on one face, keeled on other.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; at top and slopes of low hills, grassy places, edges of forests under shade, etc.

Distribution : India : Throughout the tropical parts of India including Garhwal in the Western Himalaya, eastwards to Sikkim and in the Khasia mountains. Sri Lanka, Nepal, China, Malesia.

Specimens examined : Ghanghree, 1003 ; National Park, 2055.

Note : Here, the treatment of Santapau and Merchant (*l.c.*) is followed in adopting *K. sumatrensis* (Retz.) DC. as the correct name for *K. corymbosa* auct. non Willd. However, Hara & Gould (in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 203. 1979) accepted *K. corymbosa* Willd. as the correct name of this taxon.

14. KOHAUTIA Cham. & Schlecht., *nom. cons.*

Kohautia gracilis (Wall.) DC., Prodr. 4 : 430. 1830; Santap. & Merchant in Bull. Bot. Surv. India 3 : 108. 1961. *Hedyotis gracilis* Wall. in Roxb., Fl. Ind. 1 : 371. 1820.

Oldenlandia gracilis (Wall.) Hook. f. in Hook. f., Fl. Brit. India 3 : 68. 1880; Prain, Bengal Pl. 1 : 559. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 449. 1922 ('gracillis'); Mooney, Suppl. Bot. Bihar & Orissa 72. 1950.

Slender, simple or sparingly branched, annual-perennial herbs, 20-45 cm tall. Stem terete, with long internodes, glabrous upwards, scabrid below. Leaves erect, grass-like, linear or narrowly-oblong, acuminate at apex, narrowed at base into a short petiole, with revolute margins, glabrous, 20-70 × 0.5-2.5 mm; stipules minute, 1.5-2 mm long, with 2-4 segments. Flowers in terminal, cymose, corymbiform panicles;

branches spreading in flower, erect in fruit; pedicels slender, 0.6-1.2 cm long. Calyx 3-4 mm long,glabrous, lobes subulate, 1.2-1.5 mm long. Corolla pale-brown or green-purple; 0.8-1 cm long; tube slender, 5-6 mm long; lobes 3-5 mm long, linear-oblong, obtuse. Fruits ellipsoid, 4-5 × 3-3.5 mm, glabrous, slightly protruded beyond calyx. Seeds angular, somewhat alveolate.

Fl. & Fr. : Feb.-June.

Ecology : Common; in open grassy places, underneath of forest, etc.

Distribution : Hilly regions of India including tropical Himalaya. Nepal, Bangladesh, Myanmar.

Specimens examined : National Park, 1189; Koderma Forest, 1985.

15. MITRACARPUS Zucc.

***Mitracarpus villosus** (Sw.) DC., Prodr. 4 : 572. 1832; Verdc. in Kew Bull. 30 : 317-322. 1975 (Pl. 5 : Fig. 15). *Spermacoce villosa* Sw., Prodr. Veg. Ind. Occ. 29. 1788.

Spremacoce hirta L., Sp. Pl. ed. 2, 148. 1762, non *Mitracarpus hirtus* (Sw.) DC.

Staurospermum verticillatum Schumach. & Thonn., Beskr. Guin. Pl. 73. 1827.

Mitracarpus vertieillatus (Schumach. & Thonn.) Vatke in Linnaea 40 : 196. 1876; Verdc. in Kew Bull. 7 : 360. 1952 ; Sebastine & Ramamurthy in Bull. Bot. Surv. India 9 : 291. 1968 ; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 581. 1976 ; Sikdar & Ghosh in Geobios 6 : 237-238. 1979.

M. hirtus sensu K. Schum in Mart., Fl. Bras. 6(6) : 84. 1888, non (Sw.) DC.

Erect or spreading, annual herb, 9-40 cm tall, with unbranched or sparsely branched stems; branches pubescent with short, curled, ± appressed hairs. Leaves elliptic, cuneate at base, subacute at apex, glabrescent to scabrid-pubescent above, glabrescent or glabrous beneath, with scabrid margins, 1-5 × 0.3-2 cm; petiole 1.5 mm long, usually densely pubescent; stipute-sheath 1-3 mm long, divided into 6-10, usually colleter-tipped, ciliate fimbriae of 1.5-5 mm long. Inflorescences mostly present in the axils, 0.8-1.8 cm in diam. Flowers ± sessile, slightly heterostylous. Bracteoles filamentous, white, 1-2 mm long. Calyx-tube 1-1.5 mm long; lobes 4; 2 oblong-lanceolate, green, with hyaline margins, rather thick, 1.3-2.5 mm long; other 2 hyaline, triangular-lanceolate, narrower, 0.5-1.5 mm long; all with ciliate margins. Corolla white, glabrous, or slightly hairy outside; tube 1.4-2 mm long; lobes 4, ovate, 0.6-1 mm long. Anthers varying in their degree of exsertion. Style 1-1.5 mm long; stigma 0.3-0.5 mm long. Capsule straw-coloured, thin, circumscissile, upper part splitting off together with calyx-lobes, ± 1.5 mm long and wide. Seeds pale yellow-brown, compressed, ellipsoid-rectangular, *ca* 0.8 × 0.5 mm, ventrally separated into 4 distinct areas by 4 impressed lines.

Fl. & Fr. : Dec.-Apr.

Ecology : Common; as a weed in cultivated fields; also in roadsides, river banks, cleared areas of forests, waste places, etc.

Distribution : India : Kerala, Karnataka, Tamil Nadu, Orissa, N. Bengal and NEFA; Native of West Indies, introduced and naturalised in India, Myanmar, Selangor, New Guinea, Marianas Islands, tropical Africa and tropical S. America.

Specimens examined : Ramgarh Cant., 1351, 2351; Hazaribagh, 2190.

16. MITRAGYNA Korth., *nom. cons.*

Mitragyna parvifolia (Roxb.) Korth., Obs. Naucl. Ind. 19. 1839; Haines, For. Fl. Chota Nagpur 497. 1910 & Bot. Bihar & Orissa pt. 4 : 442. 1922; Ridsd. in Blumea 24 : 63. 1978. *Nauclea parvifolia* Roxb., Pl. Corom. 1. 40, t. 52. 1795.

Stephegyne parvifolia (Roxb.) Korth., Verh. Nat. Ges. Nedere 161. 1840; Hook. f. in Hook. f., Fl. Brit. India 3 : 25. 1880; Prain, Bengal Pl. 1 : 552. 1903.

Mitragyna parviflora sensu Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 581. 1976.

Local name : Kaim, Kalmi.

Medium-sized to large, deciduous tree, to 25 m tall. Bark smooth, light-coloured. Leaves variable in shape and size, oblong-suborbicular, broadly ovate or obovate-oblong, subcoriaceous, rounded, cuneate or sometimes subcordate at base, obtuse or rounded at apex, glabrous on both sides except densely hairy nerve-axils on lower surface, 5-15 × 4-10 cm; petiole 1-2 cm long; stipules foliaceous, oblong-spathulate, obtuse, parallel-nerved, 1-1.5 cm long. Heads 2-2.5 cm across; peduncle solitary, to 3 cm long, each carrying one head. Bracts caducous. Bracteoles many, linear, clavate. Calyx to 2 mm long, funnel-shaped. Corolla creamy-yellow; tube 4-5 mm long; lobes 5, equal, triangular, 2-2.5 mm long, recurved. Stamens 5 ; filaments 2.5-3 mm long; anthers apiculate, *ca* 1 mm long. Ovary obconic, *ca* 1.5 mm across; stigma mitriform. Fruiting heads *ca* 1.2-1.5 cm across; capsules oblong, 3-4 mm long, verrucose, with blunt rounded tops, splitting into 2 cocci. Seeds many, *ca* 0.1 cm long, winged all round.

Fl. : May-June. *Fr.* : Mar.-May (of the following year).

Ecology : Common; planted in gardens, along roadsides, railway platforms, etc.; also self-grown in deciduous forests.

Distribution : Dry forests of tropical Himalaya and throughout the drier parts of India. Sri Lanka, Myanmar, Nepal.

Specimens examined : Hazaribagh, 711; Koderma Forest, 2007.

Uses : Wood is used in construction of buildings and for furniture and agricultural implements; also used for match-boxes, calicoprinting blocks, etc.

Note : Ridsdale (*l.c.*) recognised 2 varieties, *viz.* var. *parvifolia* and var. *microphylla* (Kurz) Ridsd. The specimens of this area is referable to type variety *i.e.* var. *parvifolia*. Var. *microphylla* is characterised by interfloral bracteoles being apically glabrous or sparsely hairy in contrast to apically densely pubescent interfloral bracteoles in type variety.

17. MORINDA L.

Morinda pubescens Sm. in Rees, Cyclop. 24 no. 3. 1813; Verdc. in Kew. Bull. 37 : 543. 1983.

M. tomentosa Roth, Nov. Pl. Spec. 147. 1821; Santap. & Merchant in Bull. Bot. Surv. India 3 : 108. 1961.

M. tinctoria Roxb., Fl. Ind. 1 : 543. 1832, non Noronha 1790; Hook. f. in Hook. f., Fl. Brit. India 3 : 156. 1880; Haines, For.Fl. Chota Nagpur 509. 1910 & Bot. Bihar & Orissa pt. 4 : 423. 1922.

M. tinctoria Roxb. var. *tomentosa* (Roth) Hook. f. in Hook. f., Fl. Brit. India 3 : 156. 1880; Prain, Bengal Pl. 1 : 573. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 424. 1922.

Local name : Al, Ach.

Small tree, 4-8 m tall; young branches, 4-angled, tomentose. Leaves ovate, obovate or elliptic, cuneate at base, acute or shortly acuminate at apex, glabrous, or tomentose on both surfaces especially beneath,

10-15 × 5-8 cm; petioles 1.5-3 cm long; stipules ovate, acute or acuminate, sometimes accrescent and foliaceous. Flowers in peduncled, capituliform, irregularly globose or ovoid inflorescences. Peduncles 2-3 cm long, tomentose, solitary or 2-nate, leaf-opposed, or terminal. Calyx 3-4 mm long; limb hairy outside. Corolla-tube 1.5-2 cm long, hairy outside; lobes oblong, 1-1.2 cm long. Syncarp globose or ellipsoid, whitish-green, 1.8-2.5 cm in diam., with boundaries of separate drupes usually marked by lines; drupes 1-pyrenous, 1-seeded.

Fl. : May-Aug. *Fr.* : Dec.-Feb.

Ecology : Very common; in forests.

Distribution : Throughout India. Sri Lanka, Malay Archipelago.

Specimens examined : Koderma Forest, 1779; Pratapur, 2227.

Uses : Root-bark is used for dyeing. Wood is used for making plates and dishes. Fruits are eaten.

18. MUSSAENDA L.

Mussaenda incana Wall. in Roxb., Fl. Ind. 2 : 229. 1824; Hook. f. in Hook. f., Fl. Brit. India 3 : 87. 1880; Haines, For. Fl. Chota Nagpur 499. 1910 & Bot. Bihar & Orissa pt. 4 : 424. 1922.

Erect undershrub, 50-90 cm tall, simple or branched, covered with soft, shining appressed hairs. Leaves nearly sessile, elliptic, ovate or oblong, stiff, cuneate or rounded at base, acute or subacute at apex, softly tomentose or villous, 10-15 × 4-7 cm, with 9-10 pairs of strong secondary nerves; stipules tapering from a broad base, bifid. Cymes subsessile, corymbose, small, tomentose or villous. Calyx-teeth filiform, twice as long as ovary; leafy calyx-lobe cream-coloured, pubescent. Corolla chrome-yellow, silky, 1.5-2 cm long; tube slender; lobes ovate, acuminate. Berry globose, 6-8 mm in diam., appressed-hairy at first, becoming glabrous later, with subpersistent calyx-teeth; aerola small.

Fl. : July-Aug. *Fr.* : Sept.-Nov.

Ecology : Not common; in forests.

Distribution : India : Tropical Himalaya, Bihar, Orissa, Sikkim, Assam, Meghalaya. Nepal.

Specimens examined : Patratu, 2201; Gola, 2355.

19. OLDENLANDIA L.

Key to the Species

1a. Seeds angled, smooth. Calyx-teeth subulate :

2a. Upper flowers in open terminal dichotomous panicled inflorescences. Corolla-tube much longer than calyx-teeth ... 1. *O. affinis*

2b. All flowers axillary, solitary or in 2-6-flowered-inflorescences. Corolla-tube as long as or slightly exceeding calyx-teeth :

3a. Stamens and style included. Flowers mostly in 2-6-flowered long-peduncled umbel-like inflorescences. Leaves without recurved margins ... 3. *O. corymbosa*

3b. Stamens and style (sub)exserted. Flowers solitary, sessile or subssile, rarely 2-3 together on short peduncle. Leaves with recurved margins ... 4. *O. diffusa*

1b. Seeds subglobose, but never angled, pitted. Calyx-teeth broadly triangular ... 2. *O.biflora*

1. **Oldenlandia affinis** (Roem.& Schult.) DC., Podr. 4 : 428. 1830; Verdc. in Kew Bull. 30 : 293. 1975. *Hedyotis affinis* Roem. & Schult., Syst. Veg. 3 : 194. 1818.

Hedyotis dichotoma Heyne ex Roth, Nov. Pl. Sp. 93. 1821.

Oldenlandia dichotoma (Heyne ex Roth) Hook. f. in Hook. f., Fl. Brit. India 3 : 67. 1880, non Sprengel 1815; Prain, Bengal Pl. 1 : 559. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 448. 1922.

Slender, erect, annual herb, 20-45 cm tall. Stems terete, glabrous, paniculately branched; branches with 2-raised hispidulous lines on each side, the ultimate ones filiform like fine hairs. Leaves linear or linear-lanceolate, acuminate at apex, decurrent at base, glabrous on both surfaces, subsessile, 20-50 × 3-6 mm, the lower ones larger than the upper ones; stipules small, truncate, 2-3 mm long. Flowers minute, solitary, axillary or terminal on long filiform pedicels, or 2-3-nate on axillary peduncles and in terminal, lax, slender dichotomous panicles. Pedicels 1-2 cm long, filiform. Calyx 1 mm long in flower; tube *ca* 0.7 mm long; teeth very minute, *ca* 1 mm long, subulate, distant in fruit. Corolla bluish white, 4-5 mm long and 2.5-3 mm across, tubular; tube narrowly cylindric, 1.5-2 mm long; lobes obovate-oblanceolate, nearly as long as tube. Stamens inserted in throat of corolla; filaments very minute; anthers oblong, *ca* 0.6 mm long. Style filiform; stigma hairy, linearly 2-fid; ovary, *ca* 0.7 mm across. Capsule 1.5-2 mm in diam., globose, loculicidal, splitting with hypanthium to base. Seeds globose-oblong, granulate, angled, smooth.

Fl. & Fr. : Aug.-Mar.

Ecology : Common; in open places, under trees, on rocks, etc.

Distribution : India : Deccan Peninsula, Chota Nagpur, Bihar. Malay Peninsula.

Specimens examined : National Park, 481; Koderma Forest, 1857b.

Note : Verdcourt (*l.c.*) recognised two subspecies, *viz.* ssp. *affinis* and ssp. *fugax* (Vatke) Verdc. The specimen of India and Malay Peninsula is referable to ssp. *affinis*. Ssp. *fugax* is a coarser plant with stouter shorter pedicels, more evident bracts, thicker-walled more globose capsules and widespread in tropical Africa.

2. **Oldenlandia biflora** L., Sp. Pl. 119. 1753; Hook. f. in Hook. f., Fl. Brit. India 3 : 70. 1880.

Hedyotis biflora (L.) Lam., Tab. Encycl. 1 : 272. 1792.

Oldenlandia paniculata L., Sp. Pl. ed. 2 : 166-7. 1763; Hook. f. in Hook. f., Fl. Brit. India 3 : 69. 1880; Prain, Bengal Pl. 1 : 560. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 449. 1922.

Hedyotis paniculata (L.) Kurz in J. Asiat. Soc. Bengal 46(2) : 134. 1877.

Local name : Daman-papra.

Erect, decumbent, ascending or prostrate, annual-biennial herbs, to 40 cm long. Stem obtusely 4-angled, glabrous, much branched from base. Leaves broadly-elliptic or elliptic-oblong, acute or obtuse at apex, cuneate at base, entire, 1.5-4 × 1-2 cm; lateral veins 3 pairs, faint; petiole 0.8-1 cm long; stipules truncate, with usually 2 points. Flowers *ca* 5 mm across, 4-merous, sub-sessile, in 3-8 flowered, axillary and terminal cymes. Pedicels 2-5 mm long, elongating in fruits. Calyx 4-angled, 2.2-2.5 mm long; teeth minute, broadly triangular, decurrent, 1.2-1.5 mm long. Corolla white, campanulate; tube short, *ca* 1 mm long, villous at throat; lobes obovate, spreading, 2-2.5 mm long. Stamens (sub) exserted; anthers oblong. Ovary 1-1.2 mm long; stigma fusiform. Capsule turbinate, didymous or hemispheric, terete or 4-angled, loculicidal, with top usually ridged and projecting beyond sepals, to 3 × 2.5 mm. Seeds subglobose, pitted.

Fl. & Fr. : Almost throughout the year, but chiefly during Aug.-Dec.

Ecology : Very common; in moist waste places, field-borders, road-sides, gardens, etc.

Distribution : India : Assam, West Bengal, Bihar, Orissa, Sikkim, eastern Peninsula. Nepal, Bangladesh, Sri Lanka, Myanmar, Malay Peninsula, Philippines, China, Polynesia, Pegu.

Specimens examined : Ramgarh, 1149; Koderma Forest, 1857; Ichak, 2294.

Uses : Plant is used in fever, gastric irritation and nervous depression.

3. **Oldenlandia corymbosa** L., Sp. Pl. 119. 1753; Hook. f. in Hook. f., Fl. Brit. India 3 : 64. 1880; Prain, Bengal Pl. 1 : 559. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 446. 1922.

Local name : Daman-papra.

Annual herb, sparsely to densely branched near base; stems prostrate to ± erect, 2-30 cm long, ridged. Leaves linear or elliptic, acute and apiculate at apex, narrowed at base, glabrous, or sparsely scaberulous above and on margin beneath, 6-35 × 0.5-6 mm; stipule-sheath 0.5-2 mm long, produced at middle with 3-5 unequal fimbrae of 0.5-2 mm long. Flowers not heterostylous, variously arranged, either 1-several single flowers in axils or in 2-6 - flowered peduncled umbel-like inflorescences. Peduncles 0.5-2 cm long. Pedicels 3-6 mm long. Calyx-tube 0.7-1 mm long; lobes triangular, setulose on margins, 0.5-1.5 mm long. Corolla white, or pink or purple; tube 0.6-1 mm long; lobes ovate-oblong, 0.5-1.2 mm long. Stamens and style included. Style 0.5-1.5 mm long. Capsule ovoid, 1.2-2 × 1.5-2.5 mm. Seeds pale brown, ellipsoid or depressed-conic, reticulate, *ca* 0.3 mm long.

Key to the Varieties

1a. Inflorescences all 2-6-flowered :

2a. Leaves elliptic, to 0.7 cm wide ... 1. var. *corymbosa*

2b. Leaves linear, 0.1-0.2 cm wide ... 3. var. *linearis*

1b. Infloescences all 1-flowered ... 2. var. *caespitosa*

1. var. **corymbosa** Verdc. in Kew Bull. 30 : 296. 1975.

Hydyotis corymbosa (L.) Lam. Tab Encycl. 1 : 272. 1792.

Plants erect or prostrate. Leaf-blades elliptic. Inflorescences all 3-6-flowered. Style glabrous.

Fl. & Fr. : June-Dec.

Ecology : Very common; in grassy places, roadsides, margins of ponds, nalas, irrigation canals, fallow fields and field borders, railway tracks, forest edges, etc.

Distribution : Throughout India. Probably native or tropical Africa and India, distributed widely in most of the tropical parts of the world.

Specimens examined : Hazaribagh, 785; Telaiya Dam, 1745; Patratu, 2286.

Uses : Plant is used as stomachic. Decoction of plant is used in remittent fever with gastric irritability and nervous depression; also used in jaundice and other liver troubles.

*2. var. **caespitosa** (Benth.) Verdc. in Kew Bull. 30 : 298. 1975. *Oldenlandia herbacea* (L.) Roxb. var. *caespitosa* Benth. in Hook., Niger Fl. 403. 1849.

O. caespitosa (Benth.) Hiern in Fl. Trop. Africa 3 : 61. 1877.

A small herb, 2-30 cm tall, with several prostrate stems. Leaf blades small and narrowly elliptic, 7-20 × 1.5 -3 mm. Flowers all solitary at nodes. Style usually sparsely hairy.

Fl. & Fr. : July-Nov.

Ecology : Common ; in open grasslands, shallow crevices of rocks, cultivated grounds, etc.

Distribution : India : Sikkim, West Bengal, Uttar Pradesh, Maharashtra, Andaman Islands. Africa.

Specimens examined : Ghanghree, 1929; Chouparan, 2288.

Uses : Same as the type variety.

*3. var. **linearis** (DC.) Verdc. in Kew Bull. 30 : 296. 1975. *Oldenlandia linearis* DC., Prodr. 4 : 425. 1830.

Plants mostly strictly erect. Leaves held more erect, linear, and longer, 1-2 mm wide. Inflorescences 2-3-flowered. Style glabrous. Capsule smaller than var. *corymbosa*.

Fl. & Fr. : June-Nov.

Ecology : Common ; on short grasslands, shallow soil over rocks, along roadsides, ditches, in cultivated fields, etc.

Distribution : Throughout India including Himalaya. Nepal, Bhutan and Africa.

Specimens examined : Koderma, 192 ; Gola, 1927.

Uses : Same as type variety.

4. **Oldenlandia diffusa** (Willd.) Roxb., Fl. Ind. 1 : 144. 1820; Hook. f. in Hook. f., Fl. Brit. India 3 : 65. 1880 ; Prain, Bengal Pl. 1 : 559. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 446. 1922. *Hedyotis diffusa* Willd., Sp. Pl. 556. 1797.

Key to the Varieties

1a. Stems slender. Leaves to 5 × 0.5 cm. Flowers solitary, sessile or subsessile ... 1. var. *diffusa*

1b. Stems robust, as thick as crow-quill. Leaves to 6.5 × 0.6 cm. Flowers 2-3 together on a distinct peduncle ... 2. var. *extensa*

1. var. **diffusa**

Diffuse annual. Stems slender, glabrous, not shining, to 30 cm long. Leaves (sub)sessile, linear, linear-lanceolate or linear-oblong, chartaceous, with decurrent base, acute at apex, with recurved margins, 1-nerved, 15-50 × 2-5 mm. Flowers axillary, solitary, sessile or subsessile. Calyx-teeth subulate, shorter than tube, 1.5-2 mm long. Corolla white, 4-5 mm long; lobes ovate, acute, glabrous, 1.5-1.6 mm long. Stamens (sub) exserted; filaments 0.6-0.7 mm long. Stigma linearly 2-fid, hairy. Capsule glabrous, didymous, nodding, 3-4 mm across.

Fl. & Fr. : July-Oct.

Ecology : Very common ; in waste places, roadsides, moist grassy localities, agricultural fields and field-borders, water sides, etc.

Distribution : Throughout India. Tropical and subtropical E. Asia, Nepal, China, Japan, Malesia.

Specimens examined : Hazaribagh, 786 ; Jhumri Telaiya, 1965; Patratu, 2287.

Uses : Plant-extract is useful in weakness, biliousness, fever and gonorrhoea.

2. var. **extensa** R. Br. ex Hook. f. in Hook. f., Fl. Brit. India 3 : 65. 1880

Hedyotis extensa R. Br. in Wall. Cat. no, 869. 1829, *nom. nud.*

Stems robust, as thick as a crow-quill, shining, to 60 cm long. Leaves larger than type variety, to 6.5 × 0.6 cm. Flowers mostly 2, rarely 3 together on 2-5 mm long peduncle. Capsule 4-5 mm across.

Fl. & Fr. : July-Oct.

Ecology : Common ; in field-borders, water sides, moist waste places, etc.

Distribution : Same as the type variety.

Specimens examined : Hazaribagh, 895; Telaiya Dam, 1743.

Uses : Same as the type variety.

20. PAEDERIA L., *nom. cons.*

Paederia foetida L., Mant. Pl. 1 : 52. 1771; Hook. f. in Hook. f., Fl. Brit. India 3 : 195. 1881; Prain, Bengal Pl. 1:578. 1903; Haines, For. Fl. Chota Nagpur 510. 1910 & Bot. Bihar & Orissa pt. 4 : 442. 1922.

Local name : Gandhali.

Leaves opposite, long-petiolate, ovate or lanceolate, subcuneate, rounded or subcordate at base, acute or acuminate at apex, glabrous or glandular on vein-axils beneath, 5-15 × 2-7 cm; petiole 1.2-2.5 cm long. Panicle 8-15 cm long, puberulous; branches in distant pairs, cymose at extremity. Bracts minute, ovate or subulate, ciliolate. Flowers sessile or shortly pedicellate, 5-merous. Calyx-tube campanulate; teeth short, triangular. Corolla dingy-purple, 1.2-1.8 cm long, pubescent; lobes oblong, one-fourth the length of tube. Stigmas intertwisted. Drupe broadly ellipsoid, compressed, polished, crowned by conical disk and minute calyx-teeth, 6-9mm long ; pyrenes black, broadly winged.

Fl. : Aug.-Oct. *Fr.* : Nov.-Dec.

Ecology : Common ; in hedges, forest-edges, etc.; also grown in gardens.

Distribution : Himalaya, central and eastern India. Nepal, Indo-China, Malesia.

Specimens examined : Gola, 770 ; Barkattwa, 1697.

Uses : Plant is used internally and externally for rheumatism. Leaves are used in soups and other food preparations for invalids and convalescents, particularly those suffering from bowel trounbles. Poultice of leaves is applied to abdomen to relieve flatulence. Juice of roots is used in piles, inflammation of spleen and pain in chest and liver.

21. PAVETTA L.

Pavetta tomentosa Roxb. ex Smith in Rees, Cyclop. 26, no. 2. 1819; Fischer, Fl. Madras 2 : 1880 (1301). 1936; Hara & Gould in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 149. 1979.

Ixora tomentosa Roxb., Fl. Ind. 1 : 396. 1820.

Pavetta indica L. var. *tomentosa* (Roxb. ex Smith) Hook. f. in Hook. f., Fl. Brit. India 3 : 150. 1880; Prain, Bengal Pl. 1 : 570. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1241. 1924.

P. indica L . ssp. *tomentosa* (Roxb. ex Smith) Bennet, Fl. Howrah 356. 1979.

Local name : Kankra, Kathachampa.

Bushy large shrub to small tree, 1-4 m tall; young branches terete, tomentose. Leaves membranous, elliptic or obovate, cuneate at base, obtuse, acute or acuminate at apex, glabrous or softly or harshly puberulous above, tomentose or softly villous beneath, 7-15 × 2.5-6 cm; secondary veins 8-10 pairs; petiole 0.6-1 cm long. Stipules broader than long, with cuspidate tips. Panicles trichotomous, 10-20 cm in diam., tomentose or villous. Flowers 4-merous ; pedicels slender, 4-6 mm long. Bracts broad, lower cupular. Calyx densely tomentose, 2.5-3 mm long; teeth triangular, 1-1.2 mm long, slightly reflexed. Corolla white; tube 1-1.2 cm long; lobes oblong-lanceolate, 5-6 mm long. Anthers sagittate at base; connective slightly prolonged. Stigma green, puberulous. Drupe globose, black, 1-pyrenous, 2-seeded, 7-8 mm in diam.

Fl. : June-Aug. *Fr.* : Sept.-Jan.

Ecology : Very common; in forests, slopes of low hills, etc.

Distribution : Throughout India. Sri Lanka, Bhutan, Nepal, S. China, Myanmar, Bangladesh, Malay Archipelago, N. Australia.

Specimens examined : Pratappur, 936 ; Etkhori, 1865 ; National Park, 2278

Uses : Fruits are eaten raw or pickled. Infusion of flowers is used as cosmetic. Roots are used in visceral obstructions, urinary diseases, jaundice and dropsical affections.

22. RICHARDIA L.

***Richardia scabra** L., Sp. Pl. 330. 1753; Lewis & Oliver in Brittonia 26 : 282. 1976; Babu, Herb. Fl. Dehra Dun 230. 1977, *quoad nom. cit.* **(Fig.9)**

R. pilosa Ruiz. & Pavon, Fl. Per. Chil. 3 : 50, t. 3. 1802.

Richardsonia pilosa (Ruiz. & Pavon) H.B.K., Nov. Gen. Sp. Pl. 3 : 350, t. 279. 1819.

Richardia brasiliensis auct. non Gomes : Srivastava in J. Ind. Bot. Soc. 43 : 262. 1964, *p.p.*; Chattopadhyay & Paria in Sci. & Cult. 55 : 457. 1989, *p.p.*

Erect or decumbent annual. Stems 5-50 cm long, loosely branched, hirsute. Leaves ovate to elliptic-lanceolate, attenuate at base, obtuse to acute at apex, ± glabrous on upper surface except scabrid margins and marginal areas, scabrous especially on nerves beneath, 1-5.5 × 0.4-2.3 cm; petiole 2-8 mm long; stipular sheath 2-3 mm wide; fimbriae 3-7, 2-5 mm long. Heads 0.6-1.5 cm in diam.; involucral leaves 1-2 paired, ovate-oblong or oblong-lanceolate; longer pair 1-2.5 × 0.6-1.5 cm, shorter pair, when present, 5-15 × 3-9 mm.

Calyx-lobes 6, lanceolate, ciliate on margins, 1.8 - 2.3 × 0.8 -1 mm; basal united part *ca* 1 mm wide. Corolla white or pale pink, funnel-form to salver-form; tube 5-6.5 mm long; lobes ovate-triangular, 1.5-2.5 × 1-1.5 mm, with few hairs at apex. Stamens 6. Ovary 3-celled ; style 5-7.5 mm long; stigmas spathulate, *ca* 0.7 mm long. Mericarps oblong to narrowly obovoid-oblong, grey brown, 2.5-2.8 ×1.3-1.5 mm; adaxial face with narrow smooth depressed area; abaxial face verrucose. Seeds brown, oblong. ca 2.5 ×1.3 mm; fruiting calyx erect.

Fl. & Fr. : Dec.-Apr.

Ecology : Rare ; as a weed in cultivated fields and field-borders.

Distribution : India : Tamil Nadu, Bihar, Uttar Pradesh and Rajasthan. Rhodesia, S. Africa, S. and C. America, Jamaica, Cuba and U.S.A.

Specimens examined : Ramgarh Cant., 1228; Ghanghree, 1655.

Note : Closely allied to *R. brasiliensis* Gomes in morphological characters and it is difficult to distinguish them in absence of fruits. *R. brasiliensis* is characterised by reflexed fruiting-calyx and the adaxial face of mericarps having broad depressed area in contrast to the erect fruiting-calyx and the adaxial face of mericarps having narrow depressed area in *R. scabra* L.In India, *R. brasiliensis* is distributed in Kerala, Tamil Nadu, West Bengal, Assam and Meghalaya.

23. SPERMACOCE L.

Note : Here, the reasoning of Verdcourt (in Polhill, Fl. Trop. E. Africa Rubiaceae 1 : 341. 1976) is followed in placing the following taxa under Spermacoce L. (1753) rather than Borreria Meyer (1818), the latter although conserved (ICBN, 1983, 1988) against TARDAVEL Adans. (1763) and BORRERIA Acharius (1810), but not against SPERMACOCE L.(1753). The difference between BORRERIA Meyer and SPERMACOCE L. lies on the nature of dehiscence of capsule only in former, the capsule-septum usually detached from the valves, or if not detached then

it splits longitudinally, whereas in latter, the capsule-septum attached to one valve with the other valve being detached from the septum and open on ventral side. Hooker f. (*l.c.*) did not give any importance on the above difference and considered the two as congeneric. Bremekamp (Rec.Trav.Bot.Neerland. 31 : 305. 1934) is also not in favour of giving any importance in making any generic separation following the insufficient difference only. Verdcourt (*l.c.*) followed the reasoning of Bremekamp and reduced BORRERIA as a section (in Kew Bull. 30 : 366. 1975) and placed the Tropical East African species of it under SPERMACOCE L.

Key to the Species

1a. Prostrate or diffuse. Flowers usually 4-6 in each cluster. Stigmas 2, distinct. Capsule dehiscing ventrally leaving a persistent septum ... 1. *S. articularis*

1b. Erect. Flowers more than 20 in each cluster. Stigma obscurely 2-lobed. Capsule dehiscing ventrally without any septum ... 2. *S. ramanii*

1. **Spermacoce articularis** L. f., Suppl. Pl. 119. 1782; Wall. in Roxb., Fl. Ind. 1 : 378. 1820; Sivarajan & R.V.Nair in Taxon 35 : 366, f. 5-10. 1986.

Borreria articularis (L.f.) F.N.Williams, Bull. Herb. Boissier ser. 2, 5 : 956. 1905; Santap. & Merchant in Bull. Bot. Surv. India 3 : 107. 1961.

Spermacoce hispida auct. non L. : Roxb., Fl. Ind. 1 : 373. 1820; Hook. f., in Hook. f., Fl. Brit. India 3 : 200. 1881, *p.p.*; Prain, Bengal Pl. 1 : 580. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 450. 1922 ; Deb & Datta in J. Econ. Tax. Bot. 5 : 1046. 1984, *p.p.*

Borreria hispida sensu Gamble, Fl. Pres. Madras 2 : 654(461). 1922, non (L.) K. Schum. (1981), nec. Spruce ex Schum. (1988).

Local name : Guthari.

Prostrate or diffuse, annual-perennial herb with a stout tap root. Stems sharply 4-angled, often many from the woody base, hispidly hairy, or subglabrous, with long internodes. Leaves subsessile, elliptic-oblong or obovate, acute, apiculate at apex, truncate or attenuate at base, with generally flat margin, scabrid on both surfaces, 1.2-5 × 0.8-2 cm; lateral veins 4 pairs; stipules membranous, with a few bristles. Flowers 4-6 in whorl within the stipular cup; bracts lanceolate-subulate, hyaline. Calyx oblong-globose, hispid, 3-4 mm long; lobes 4, (sub) equal, lanceolate, reflexed, hairy, 2-2.5 mm long. Corolla funnel-shaped, whitish or pale-purple, with a ring of hairs just above the base of tube; lobes oblong, acute-apiculate, 2-2.5 mm long. Stamens exserted; filaments 1.2-1.5 mm; anthers acuminate, *ca* 1.5 mm long. Style 5-6 mm long, shortly pubescent; stigmas 2, narrow or broad. Capsule globose or obovoid, hispidly hairy at top, to 5 × 3.5 mm; septum of fruit detaching from valves when spreading; finally splitting in 2 entire halves. Seeds to 2.5 × 1 mm, narrowly oblong, smooth, shining, with reticulate tests.

Fl. : July-Sept. *Fr.* : Sept.-Nov.

Ecology : Very common; in waste places, roadsides, sandy grassy places, railway tracks, fallow fields and field-borders, forest edges, etc.

Distribution : Throughout India including Himalaya. Nepal, Bhutan, China, Indo-China, Malesia.

Specimens examined : Telaiya Dam, 187; Patratu, 1338; Hunterganj, 2123.

Uses : Plant is used as fodder, also consumed as vegetable by poor people in villages. Extract of leaves is given for gall-stones. Seeds are used in diarrhoea and dysentery.

Note : Closely-similar to *Spermacoce hispida* L., but it differs by its prostrate or diffuse habit, sharply 4-angled stem covered with minute scabrid hairs, leaves with flat margins, funnel-shaped corolla, smaller fruits and narrowly oblong, shining, smooth seeds with reticulate testa in contrast

to the erect or decumbent habit, terete or obtusely 4-angled stem covered with long spreading pilose hairs, leaves with invariably highly flexuous margins, turbinate-capanulate corolla, larger fruits and broadly ellipsoid, coarse, black, pitted seeds in *S. hispida* (Sivarajan & Nair, *l.c.*).

2. **Spermacoce ramanii** Sivarajan & R.V.Nair in Taxon 35 : 367, f. 11-18. 1986.

S. stricta auct. non L. f. : Hook. f. in Hook. f., Fl. Brit. India 3 : 200. 1881, *p.p.*; Prain, Bengal Pl. 1 : 580. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 450. 1922.

Spermacoce pusilla auct. non Wall. : Deb & Datta in J. Econ. Tax. Bot. 5 : 1057. 1984.

Borreria stricta sensu Gamble, Fl. Madras 2 : 654(461). 1921, non (L.f.) K. Schum. 1981, nec. Mayer 1881.

B. pusilla auct. non (Wall.) DC. : Gandhi in Saldan. & Nicols., Fl. Hassn Dist. 574. 1976; Mani. & Sivar., Fl. Calicut 136. 1982.

Erect, annual herbs, 30-50 cm tall. Stems highly branched, quadrangular, with long internodes, stout, prominently hairy. Leaves subsessile, narrowly elliptic to lanceolate, narrowed at base, acute at apex, glabrous or with scabrid veins beneath, with hardly revolute margin, 2-6 × 0.5-1.5 cm; stipules hairy, with numerous long, filiform bristles. Flowers many in axillary and terminal globose, dense-flowered (usually more than 20) clusters; bracts filiform, 3-3.5 mm long. Calyx 2.5-3 mm long; tube densely pubescent in upper part, glabrous near base; lobes linear- lanceolate, acute, mucronate, 1-1.5 mm long. Corolla white, 2.5-3 mm across; tube salver-shaped or somewhat funnel-shaped, filiform; lobes ovate, obtuse, 1-1.2 mm long. Stamens much-exserted; filaments slender, *ca* 1.5 mm long. Style *ca* 2 mm long, slender; stigma obscurely 2-lobed, papillose. Fruits 3-3.5 mm long, obovoid, densely pubescent, hispidly hairy at top, dehiscing ventrally with completely disappearing septum. Seeds ellipsoid, deep-brown, *ca* 2.5 × 1 mm, floccose.

Fl. : July-Sept. *Fr.* : Sept.-Dec.

Ecology : Common ; in waste lands, open shady places, road-sides, sandy grassy localities, bank of ponds, nalas, irrigation canals, river-beds, forest-edges, etc.

Distribution : Throughout India including tropical Himalaya. Tropical Asia to Japan and Malesia, tropical Africa and Madagascar.

Specimens examined : National Park, 93 ; Patratu, 1445 ; Koderma Forest, 1769; Hunterganj, 2285.

Note : *Spermacoce ramanii* is similar to *S. pusilla* Wall., but differs by its larger habit (30-50 cm tall), comparatively stout and prominently hairy stem, narrowly elliptic or lanceolate leaves with distinct lateral veins and hardly revolute margins, white flowers and densely pubescent fruits in contrast to the smaller habit (10-25 cm tall), slender and sparsely hairy stem, linear-lanceolate leaves with hardly visible lateral veins and strongly revolute margins, pink flowers and glabrescent or apically sparsely hairy fruits in *S. pusilla* Wall. (Sivarajan & Nair, *l.c.*).

24. SPERMADICTYON Roxb.

Spermadictyon suaveolens Roxb., Pl. Corom. 3 : 32, t. 236. 1815; Santap. & Merchant in Bull. Bot. Surv. Ind. 3 : 110. 1962.

Hamiltonia suaveolens (Roxb.) Roxb., Fl. Ind. 2 : 223. 1820; Hook. f. in Hook. f., Fl. Brit. India 3 : 197. 1881, *p.p.*; Prain, Bengal Pl. 1 : 577. 1903; Haines, For. Fl. Chota Nagpur 509. 1910 & Bot. Bihar & Orissa pt. 4 : 442. 1922.

Local name : Meda punp.

Small shrub, 1-4 m tall; branches terete, divaricate. Leaves rigid, elliptic-lanceolate, cuneate at base, acute at apex, hairy above,

± pubescent especially on veins beneath, 10-23 × 4-8 cm; secondary veins 10-16 pairs, arcuate ; petioles 1.2-2.5 cm long. Stipules triangular, hairy, 0.4-0.5 cm long. Panicles trichotomous, pubescent. Flowers sessile or subsessile. Bracts and bracteoles subulate, glandular-hairy. Sepals 0.2-0.25 cm long, linear-lanceolate, with gland-tipped hairs. Corolla white; tube 1.2-1.5 cm long; lobes ovate, 0.3-0.35 cm long. Ovary at first 5-celled, later 1-celled; ovules 5; style 5-fid, papillose. Capsule ellipsoid, 0.3-0.4 cm long, 5-valved at apex. Seeds triquetrous, with a loose arillate lace-lilke covering.

Fl. : Aug.-Jan. *Fr.* : Dec.-Mar.

Ecology : Common; on dry rocky slopes of low hills, along road-sides, forests, etc.

Distribution : India : Tropical and subtropical Himalaya, central India, Bihar, West Bengal, Orissa, Deccan Peninsula. Bhutan, Nepal, China, Java.

Specimens examined : Hazaribagh, 1206, 1566 ; Koderma, 2232.

Uses : Root is used in diarrhoea and cholera by local people. Wood is used for making charcoal.

25. WENDLANDIA Bartl. ex DC., *nom. cons.*

Key to the Species

1a. Stipules recurved. Corolla-lobes longer than tube ... 1. *W. heynei*

1b. Stipules erect. Corolla-lobes much shorter than tube ... 2. *W. tinctoria*

1. **Wendlandia heynei** (Roem. & Schult.) Santap. & Merchant in Bull. Bot. Surv. India 3 : 110. 1961. *Rondeletia heynei* Roem. & Schult., 5 : 234. 1819.

Randeletia thyrsiflora Roth, Nov. Pl. Sp. 142. 1821.

R. exerta Roxb., Fl. Ind. 2 : 135. 1824.

Wendlandia exerta (Roxb.) DC., Prodr. 4 : 411. 1830; Hook. f. in Hook. f., Fl. Brit. India 3 : 37. 1880; Prain, Bengal Pl. 1 : 554. 1903; Haines, For. Fl. Chota Nagpur 498. 1910 & Bot. Bihar & Orissa pt. 4 : 426. 1922.

Local name : Tillia, Chila.

Small crooked tree, to 8 m tall, softly tomentose or pubescent all over; bark brown, rough; branches terete. Leaves coriaceous, opposite, oblong or ovate-lanceolate, cuneate, acuminate, entire, glabrate above, grey-tomentose or grey-pubescent beneath, 8-25 × 3-9 cm; lateral veins 10-18 pairs, arched; petioles 1.2-2.5 cm long; stipules ovate, acute, recurved. Panicles sessile, pyramidal, 15-25 cm long and broad. Bracts rhomboid-lanceolate, 0.4-0.5 cm long. Flowers sessile, 4-4.5 mm in diam. Calyx hairy, *ca* 2.5 mm long; lobes 5, ovate or subulate. Corolla white; tube 1.2-1.5 mm long; lobes ovate-oblong, reflexed, to 2.5 mm long, conspicuously veined. Filaments nearly as long as corolla-lobes. Capsule 2-2.5 mm in diam., hoary pubescent, crowned by erect sepals. Seeds minute, black.

Fl. : Mar.-May. *Fr.* : Apr.-June.

Ecology : Common; in dry deciduous forests, banks of rivers, streams, on hill-slopes, etc.

Distribution : India : Dry forests of Tropical Himalaya, Sikkim, Orissa, West Bengal, Bihar, Central India and western Peninsula. Nepal, Sri Lanka, Bangladesh.

Specimens examined : National Park, 1152; Koderma Forest, 1839.

Uses : Leaves are used as fodder. Bark-extract is employed in urinary complaints. Wood is used for buildings, house posts, and agricultural implements.

2. **Wendlandia tinctoria** (Roxb.) DC., Prodr. 4 : 411. 1830; Hook. f. in Hook. f., Fl. Brit. India 3 : 38. 1880; Prain, Bengal Pl. 1 : 554. 1903; Haines, For. Fl. Chota Nagpur 499. 1910 & Bot. Bihar & Orissa pt. 4 : 426. 1922. *Rondeletia tinctoria* Roxb., Fl. Ind. 2 : 134. 1824.

W. tinctoria var. *normalis* Hook. f. in Hook. f., Fl. Brit. India 3 : 38. 1880.

Large shrub to small tree, to 7 m tall, densely branched. Bark brown stringy. Leaves elliptic or obovate-lanceolate, acute or subacuminate at apex, narrowed at base into 1.2-2 cm long petiole, glabrous, shining above, pubescent along nerves beneath, 10-20 × 5-8 cm; lateral nerves 10-15, flattened above, obscure beneath; stipules ovate-orbicular, erect, stiff, terminating in a subulate point, 0.6-1 cm long. Panicles 15-25 cm long, spreading, pubescent. Flowers sessile, fascicled, 0.5-0.6 mm in diam. Bracts subulate, 1.5-2 mm long. Calyx hairy; lobes minute, 0.7-0.8 mm long. Corolla white; tube 0.5-1.5 cm long; lobes much shorter than the tube. Capsule reddish, 1.5-2 mm in diam., crowned by minute sepals.

Fl. : Jan.-Mar. *Fr.* : Mar.-Apr.

Ecology : Common; in semi-deciduous forests, on slopes of low hills, forest edges, etc.

Distribution : India : Tropical Himalaya, Uttar Pradesh, Bihar, West Bengal, Assam, Meghalaya, Orissa, Bangladesh, Java.

Specimens examined : National Park, 959 ; Etkhori, 1448 ; Pratappur, 1552.

Uses : Bark is used as mordant in dyeing; also employed for cramps in cholera patients.

114. ASTERACEAE (COMPOSITAE)

Key to the Genera

1a. Corolla of all the florets of heads tubular, or sometimes ligulate in outer florets of radiate heads. Plants non-laticiferous :

2a. Heads homogamous, unisexual; female heads 2-flowered. Phyllaries of female heads connate into an ellipsoid, firm, bilocular body covered with hooks or spines and bearing a bidentate beak on apex of each cell ... 44. XANTHIUM

2b. Heads heterogamous, but if homogamous, then florets hermaphrodite. Phyllaries not connate, or slightly so only at base :

3a. Heads discoid of disciform. Both inner and outer florets tubular :

4a. Heads each consisting of 1 to few florets and aggregated into glomerules or compound heads :

5a. Plants thistle-like. Leaves and phyllaries spinescent. Heads each 1-flowered. Glomerules dense, spherical ball-like ...16ECHINOPS

5b. Plants not thistle-like. Leaves and phyllaries not spinescent. Heads each 1- to few-flowered. Glomerules dense, globose or ovoid but not as above :

6a. Heads heterogamous. Florets dissimilar; outer ones filiform and female, inner ones stouter and hermaphrodite. Stems and peduncles interruptedly winged. Pappus absent ... 35. SPHAERANTHUS

6b. Head homogamous. Florets all similar and hermaphrodite. Stems and peduncles not winged. Pappus absent, or of stiff hairs dilated below, or chaff-like :

7a. Heads each 1-flowered. Corolla-lobes not secund. Leaves alternate. Pappus absent. Glabrous, marsh herbs ... 8. CAESULIA

7b. Heads each 2- to 5-flowered. Corolla-lobes secund. Leaves mostly radical. Pappus present. Strigose, terrestrial, stiff herbs :

8a. Glomerules terminal, as broad as long, globose or campanulate ... 18. ELEPHANTOPUS

8b. Glomerules subsessile, on an elongate spike, narrow, ellipsoidal ... 31. PSEUDELEPHANTOPUS

4b. Heads separate, few-to many-flowered, not surrounded by a common receptacle :

9a. Heads homogamous, discoid. Florets all similar and hermaphrodite :

10a. Plants thistle-like. Leaves and phyllaries spinescent ... 9. CARTHAMUS

10b. Plants not thistle-like. Leaves and phyllaries not spinescent :

11a. Pappus of bristles or scales ... 2. AGERATUM

11b. Pappus of hairs or absent :

12a. Phyllaries 1-2-seriate :

13a. Scandent herbs. Heads each 4-flowered, greenish-white ... 29. MIKANIA

13b. Erect or decumbent herbs. Heads each more than 10-flowered, purple or yellow :

14a. Receptacle flat, naked. Florets purple. Pappus of abundant capillary hairs ... 19. EMILIA

14b. Receptacle conical, elevated, paleaceous. Florets yellow. Pappus absent or of 2-3 weak bristles ... 36. SPILANTHES

12b. Phyllaries multi-seriate :

15a. Leaves opposite. Anther-bases obtuse. Style-branches obtuse or clavate at apex ... 11. CHROMOLAENA

15b. Leaves alternate. Anther-bases sagittate. Style-branches acuminate at apex ... 41. VERNONIA

9b. Heads heterogamous, disciform. Florets dissimilar, outer ones filiform and female, inner ones stouter and hermaphrodite :

16a. Pappus absent or insignificant :

17a. Creeping herbs, usually caespitose. Outer florets without corollas ... 33. SOLIVA

17b. Prostrate, or decumbent-ascending to erect herbs; but never caespitose. Outer florets with minute or prominent corollas :

18a. Leaves pinnatisect to pinnatipartite. Pappus absent. Decumbent-ascending to erect ... 15. CYATHOCLINE

18b. Leaves dentate-lobed. Pappus a minute corona, obscurely toothed at margin. Prostrate ... 10. CENTIPEDA

16b. Achenes at least those of hermaphrodite florets, bearing a distinct pappus :

19a. Pappus cupulate, fimbriate at margin ... 25. GRANGEA

19b. Pappus of distinct bristles or hairs :

20a. Leaves and phyllaries spinescent ... 3. AMBERBOA

20b. Leaves and phyllaries not spinescent :

21a. Phyllaries scarious ... 24. GNAPHALIUM

21b. Phyllaries herbaceous or leathery :

22a. Corollas of female florets much shorter than those of hermaphrodite florets ... 13. CONYZA

22b. Corollas of female florets almost as long as those of hermaphrodite florets :

23a. Anther-cells tailed at base ... 6. BLUMEA

23b. Anther-cells not tailed at base ... 7. BLUMEOPSIS

3b. Heads radiate. Inner florets tubular, outer florets ligulate :

24a. Receptacle paleaceous :

25a. Style of disc florets undivided. Disc achenes sterile :

26a. Leaves opposite. Heads in axils and forks of stems. Achenes echinate, with numerous short, hooked, lateral spinules and 2-hooked or straight, divergent apical spines ...1. ACANTHOSPERMUM

26b. Leaves alternate. Heads solitary or in terminal corymbs or panicles. Achenes not echinate ... 30. PARTHENIUM

25b. Style of disc florets branched. Disc achenes fertile :

27a. Mature achenes epappose or bearing a pappus of minute weak scales or corona or withered cup :

28a. Phyllaries 4, foliaceous. Aquatic or marsh herbs ... 20. ENYDRA

28b. Phyllaries few to many, not foliaceous. Terrestrial herbs :

29a. Ray florets white. Receptacle flat or convex ... 17. ECLIPTA

29b. Ray florets yellow :

30a. Receptacle elongated, conial :

31a. Ray florets as long as disc florets .. 36. SPILANTHES

31b. Ray florets much longer than disc florets ... 26. GUIZOTIA

30b. Receptacle flat or subconvex :

32a. Leaves opposite, subentire or toothed ... 43. WEDELIA

32b. Leaves alternate, pinnatifid ... 12 CHRYSANTHELLUM

27b. Mature achenes, atleast those of disc florets, bearing a pappus of bristles or awns or scales :

33a. Pappus of bristles or awns :

34a. Pappus-bristles or awns retrorsely barbed :

35a. Achenes rostrate ... 14. COSMOS

35b. Achenes erostrate :

36a. Annuals. Leaves opposite. Pappus-bristles or awns straight ... 4. BIDENS

36b. Perennials. Leaves mostly basal from root-stock, cauline ones on stem few, alternate. Pappus-bristles or awns divergent ... 23. GLOSSOGYNE

34b. Pappus-bristles or awns not retrorsely barbed :

37a. Ray florets white or cream-coloured :

38a. Pappus-bristles or awns 2-5, smooth ... 5. BLAINVILLEA

38b. Pappus-bristles or awns numerous, plumose ... 40. TRIDAX

37b. Ray florets yellow :

39a. Leaves alternate, 1- to 2-pinnatisect. Achenes without lacerate, winged margins ... 22. GLOSSOCARDIA

39b. Leaves opposite, subentire or toothed. Achenes with lacerate and winged margins ... 37. SYNEDRELLA

33b. Pappus of flattened scales, 1 or 2 of them longer and aristate :

40a. Peduncles hollow. Pappus-scales persistent ... 39. TITHONIA

40b. Peduncles solid. Pappus-scales deciduous ... 27. HELIANTHUS

24b. Receptacle not paleaceous :

41a. Ray florets yellow or orange or red :

42a. Phyllaries 1-seriate ... 38. TAGETES

42b. Phyllaries few- to several-seriate :

43a. Leaves sessile, cordate-auriculate at base and usually stem-clasping :

44a. Pappus-hairs all slender, those of ray florets few or none ... 42. VICOA

44b. Pappus of outer florets scaly, of inner florets hair-like ... 32. PULICARIA

43b. Leaves narrowed or petiolate at base. Pappus-hairs all slender ... 13. CONYZA

41b. Ray florets violet-blue. Phyllaries 2-3-seriate. Leaves sessile. Pappus of 1-2 rows of soft, stigulose bristles ... 21. ERIGERON

1b. Corolla of all the florets of heads ligulate. Plants laticiferous :

45a. Plants stoloniferous. Achenes rostrate at apex ... 28. LAUNAEA

45b. Plants non-stoloniferous. Achenes erostrate :

46a. Pappus-hairs uniform in thickness, bristly. Achenes fusiform ... 45. YOUNGIA

46b. Pappus-hairs of two distinct thickness, thin, soft hairs and coarser bristles. Achenes compressed ... 34. SONCHUS

1. ACANTHOSPERMUM Schrank

Acanthospermum hispidum DC., Prodr. 5 : 522. 1836; Mooney, Suppl. Bot. Bihar & Orissa 77. 1950.

Annual herbs, 20-50 cm tall. Stems diffusely much branched, covered with spreading hirsute hairs and smaller glandular hairs. Leaves simple, opposite, obovate or oblanceolate, chartaceous, cuneate or sub-attenuate at base, acute or obtuse at apex, coarsely serrate, whitish pilose on both surfaces, 2-8 × 1-3 cm; petiole 0.5-1.5 cm long. Heads homogamous, radiate, 5-6 mm in diam., 1-1.5 cm in fruit. Outer phyllaries 5, lanceolate, pubescent outside, 3-4 mm long; inner ones connate, 2.5-3 mm long. Receptacle convex, paleaceous; paleas concave. Ray-florets 5-8; ligules elliptic, pale yellow, 1.2-1.5 mm long. Disc florets 5-7; corollas yellow, thinly papillose below, 1.8-2 mm long. Paleae spathulate, ciliate at apex, 1.7-2 mm long. Achenes obovate-cuneate, 5-6 mm long, covered with hooked, stiff bristles and with two ± straight divergent spines of 3-4 mm long at apex.

Fl. & Fr. : Jan.-May.

Ecology : Very common; along roadsides, wastelands, fallow fields, margins of streams and canals, forest edges, etc.

Distribution : Throughout India. Native of S. America, introduced into tropical and South Africa, Sri Lanka, Nepal, Hawaiian Islands.

Specimens examined : Barkattwa, 524; Hazaribagh, 731; Jhumri Telaiya, 2233.

Uses : Plant is used in dermatological medicaments. An oil is extracted which shows antibacterial and antifungal activity.

2. AGERATUM L.

Ageratum conyzoides L., Sp. Pl. 839. 1753; Clarke, Comp. Ind. 30. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 243. 1881; Prain, Bengal Pl. 1 : 591. 1903; Haines, For. Fl. Chota Nagpur 514. 1910 & Bot. Bihar & Orissa pt. 4 : 462. 1922.

A. cordifolium Roxb., Fl. Ind. 3 : 415. 1832.

Local name : Koobhi.

Erect, aromatic, annual herbs, 10-100 cm tall. Stems white-pilose, often decumbent and rooting at base. Leaves all opposite, broadly ovate, or rhomboid-ovate, subcordate, rounded or truncate at base, subacute or obtuse at apex, crenate-serrate, hirsute thinly with long spreading hairs, palmately 3-nerved from base, 2-10 × 1.5-6 cm; petioles 0.5-3 cm long. Heads in corymbs of about 5-15 together, 4-6 mm across, homogamous, discoid, 50 to 80 flowered; peduncles pubescent, 0.5-2 cm long. Phyllaries linear-lanceolate, abruptly acuminate, 2-3-nerved, sparingly hairy, 3-4.5 mm long. Corollas white, blue or pale-purple, 1.5-2 mm long. Achenes narrowly oblong, black, glabrous or minutely hirsute on angles, 1.6-1.8 cm long. Pappus scales 5, lanceolate, acuminate into a bristle-like point, scabrous on margins, 1.8-2 mm long.

Fl. & Fr. : Almost throughout the year; but chiefly during Oct.-Jan.

Ecology : Very common; in waste places, garden lands, cultivated grounds, along roadsides, etc.

Distribution : Throughout India; probably of American origin, now naturalised widely in all warm countries.

Specimens examined : Jhumri Telaiya, 310; Hazaribagh, 495; Ramgarh, 1924.

Uses : Juice of plant is used as a nervine tonic. Decoction or infusion of plant is used in diarrhoea, dysentery, colic with flatulence and other gastrointestinal ailments.

3. AMBERBOA (Pers.) Less., *nom. cons.*

Amberboa ramosa (Roxb.) Jafri in Scientist 3 : 29. 1959. *Carduus ramosus* Roxb., Fl. Ind. 3 : 407. 1832. **(Fig.10)**

Microlonchus divaricatus DC., Prodr. 6 : 562. 1837.

Volutarella divaricata (DC.) Benth. in Benth. & Hook. f. Gen. Pl. 2 : 476. 1873, *p.p.*; Clarke, Comp. Ind. 242. 1876, *p.p.*; Hook.f. in Hook.f., Fl. Brit. India 3 : 383. 1881; Prain, Bengal Pl. 1 : 625. 1903; Haines, Bot. Bihar & Orissa pt. 4 :493. 1922.

V. ramosa (Roxb.) Santap., Fl. Saurashtra 22. 1953.

Oligochaeta ramosa (Roxb.) Wagenitz in Verroff. Geobot. Inst. 37: 323. 1962; Bhandari, Fl. Ind. Desert 206. 1978; Singh in Shetty & Singh, Fl. Pakistan 425. 1987.

Erect or straggling herbs. Stems sub-dichotomously branched, spreading, angled, scabrid, thinly cottony, 30-60 cm long. Leaves sessile, alternate,oblong or obovate, entire, toothed, or pinnatifid with spinule-tipped lobes, usually undulate or crisped, glabrescent, 3-8 × 0.6-1.8 cm. Heads heterogamous, disciform, ovoid-oblong, pale-purple, 1.2-2.5 × 0.6-1.2 cm. Outermoust phyllaries ovate with reflexed spines, inner linear-lanceolate, green, 1.5-1.8 cm long with erecto-patent yellow spines, inner with soft spines. Receptacular bristles short, 4-5 mm long. Corollas 1.2-1.8 cm long including 1-1.2 mm long linear lobes. Filaments minutely papillose; anther-tails ± adnate to filaments. Style-arms linear-subulate, recurved. Achenes acutely 4-5-angled, striate and punctate between angles, 4.5-6 mm long. Pappus-bristles scaberulous, silvery-brown, 1-1.2 cm long.

Fl. & Fr. : Feb.-Apr.

Ecology : Not common; in river- beds, margins of ponds, waste places, etc.

Distribution : India : N.W.Himalaya, Uttar Pradesh, Bihar, West Bengal, Orissa, central, southern and western India. Pakistan, Afganistan, Beluchistan.

Specimens examined : National Park, 961; Ichak, 1718.

Uses : Plant is used as tonic and laxative; also for fever and cough.

4. BIDENS L.

Bidens biternata (Lour.) Merr. & Scherff ex Scherff in Bot. Gaz. 88 : 293. 1929 ; Ramamoor. in Saldan. & Nicols., Fl. Hassan Dist. 602. 1976; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 229. 1980, *p.p. Coreopsis biternata* Lour., Fl. Cochinch. ed. 1, 508. 1790.

B. pilosa auct. non L. : Clarke, Comp. Ind. 140. 1876 ; Hook. f. in Hook. f., Fl. Brit. India 3 : 309. 1881, *p.p.* ; Prain, Bengal Pl. 1 : 616. 1903 ; Haines, For. Fl. Chota Nagpur 517. 1910 & Bot. Bihar & Orissa pt. 4 : 483. 1922.

Annual, erect herbs, 1 m tall. Stems angular, sparsely hairy when young. Leaves opposite, 5-10 cm long including 1-3 cm long petioles, imparipinnate and partly bipinnate ; lateral leaflets ovate, 1.5-3 × 0.5-2 cm, deeply dentate or pinnatifid, attenuate at base, acute at apex; terminal leaflet elliptic, 2-6 × 1-2.5 cm, with 3-5 pinnatifid lobes, attenuate to a winged petiolule, acuminate at apex. Heads several, borne on dichotomously branched peduncles, 4-7 mm long and 3-6 mm in diam.; ray-florets 2-4, or wanting. Outer phyllaries linear-oblanceolate, ciliate, 4-5 mm long; inner ones elliptic, glabrous, 5-6 mm long. Receptacle paleaceous, paleas curved around ovaries. Ligules of ray-florets whitish

or yellow, 2 to 3-dentate, 4-5 mm long. Corollas of disc-florets 3-3.5 mm long. Receptacular scales linear-lanceolate, 1-1.2 cm long in fruit. Achenes linear, ± tetragonous, blackish, 0.7-1.8 cm long. Pappus bristles or awns paler, 3.5-4 mm long, persistent, straight, retrorsely barbed.

Fl. & Fr. : Sept.-Jan.

Ecology : Very common; on roadsides, waste places, vacant plots, forests, railway embankments, on old walls, etc.

Distribution : Throughout India. Tropical Africa, Malesia, E. Asia, Australia and Sri Lanka.

Specimens examined : Hazaribagh, 241; Ghanghree, 1076 ; Gola , 1748.

Uses : Shoots are eaten raw or steamed. Plants are relished by livestock. Plant-extract is used in leprosy and other skin diseases and in eye and ear troubles. Seeds are used as anthelmintic.

5. BLAINVILLEA Cass.

Blainvillea acmella (L.) Philipson in Blumea 6 : 350. 1950; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 213. 1980. *Verbesina acmella* L., Sp. Pl. 901. 1753.

Eclipta latifolia L. f., Suppl. 378. 1781.

Blainvillea latifolia (L.f.) DC. in Wight, Contrib. 17. 1834; Clarke, Comp. Ind. 135. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 305. 1881; Prain, Bengal Pl. 1 : 611. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 480. 1922.

Blainvillea rhomboidea Cass. in Dict. Sci. Nat. 29 : 493. 1823.

Erect, coarse, annual herbs, 20-100 cm tall. Stems much branched above, hispidly pubescent, straw-coloured. Leaves chartaceous, ovate-lanceolate or rhomboid-ovate, rounded or cuneate at base, acuminate, serrate-dentate, 3-nerved, appressed pubescent on both surfaces, 3-15 × 1-8 cm; petiole 0.8-1.5 cm long. Heads 5-7 mm across, heterogamous, radiate, solitary, terminal or at forks of dichotomy. Phyllaries ovate-oblong, acute, pubescent, 5-7 mm long. Receptacle convex, paleaceous. Ray-florets 3-5, white ; basal tube 1.2-1.5 mm long, ligule 1-1.5 mm long, 2-dentate. Corollas of disc florets white, 2.5-3 mm long. Paleas folded, ciliate, 5-6 mm long. Achenes curved, brown or black, rugose, 3.5-4 mm long; pappus-bristles 0.8-1 mm long, connate at base to form a shallow cup.

Fl. & Fr. : Oct.-Feb.

Ecology : Very common; in cultivated fields, gardens, sandy waste places, etc.

Distribution : Almost throughout India. Native of S. America, now pantropical.

Specimens examined : Hazaribagh, 716 ; Keredari, 1215 ; Barkatta, 2279.

6. BLUMEA DC., *nom. cons.*

Key to the Species

1a. Florets purple to lilac. Leaves finely and irregularly serrate but never lobed ... 4. *B. mollis*

1b. Florets yellow. Leaves, at least the lower ones, lyrate-runcinate :

2a. Heads in lax panicles with divaricate branches :

3a. Leaves on upper part of stem few, large, laciniate. Receptacle pubescent .. 2. *B. lacera* var. *blumei*

3b. Leaves on upper part of stem many, small, serrate-dentate. Receptacle glabrous ... 3. *B. membranacea*

2b. Heads in dense oblong spikes or contracted panicles. Leaves on upper part of stem dentate-serrate. Receptacle glabrous ... 1. *B. lacera*

1. **Blumea lacera** (Burm. f.) DC. in Wight, Cotrib. Bot. Ind. 14. 1834; Clarke, Comp. Ind. 76. 1876; Hook. f. in Hook. f., Fl. Brit. India 2 : 263. 1881; Prain, Bengal Pl. 1 : 598. 1903; Haines, For. Fl. Chota Nagpur 516. 1910 & Bot. Bihar & Orissa pt. 4 : 469. 1922; Randeria in Blumea 1: 264. 1960. *Conyza lacera* Burm. f., Fl. Ind. 180, t. 59. f. 1. 1768.

B. subcapitata DC., Prodr. 5 : 439. 1836; Hook. f. in Hook. f., Fl. Brit. India 3 : 261. 1881.

Local name : Kakranda.

Erect, simple or branched, ribbed, tomentose to densely vellutinous, minutely glandular, annual herbs, 20-80 cm tall. Leaves sessile or subpetiolate, alternate, oblong, shortly acuminate, acute or rounded at apex, dentate-serrate, minutely glandular on both surfaces, whitish villous and somewhat scabrid above, densely whitish villous beneath; lower ones obovate-oblong, shortly or long-tapering at base, or lyrate, usually runcinate, sometimes subrosulate at base, 3-15 × 1.2-5 cm; upper ones spathulate-oblong or elliptic, truncate at base, much smaller than lower ones. Panicles terminal or axillary, dense; peduncles to 1.5 cm long, villous, usually with a minute bract. Heads 5-6.5 mm in diam., heterogamous, disciform. Phyllaries 5-6-seriate, linear to lanceolate, reflexed at maturity, villous, minutely glandular, 2-6 mm long. Receptacle convex, alveolate, glabrous. Corollas yellow, tubular; those of female florets 3-4 mm long, glabrous, 2-3-lobed; those of hermaphrodite ones 3.5-4.5 mm long, with 5 triangular, papillate lobes. Anther-tails shorter than thickened portion of filament. Achenes brown, oblong, sparsely hairy, 0.6-0.7 mm long. Pappus hairs 3.5-4.5 mm long.

Fl. & Fr. : Mar.-July.

Ecology : Very common ; on roadsides, waste places, agricultural fields, gardens, grassy open lands, etc.

Distribution : Throughout the plains of India. Sri Lanka, Thailand, Cambodia, Vietnam, Nepal, Japan, Formosa, Solomon Islands, Malesia, Marianas, Australia, New Caledonia, China and Africa.

Specimens examined : Ichak, 337; Chatra, 565; Katkamosandi; 1878.

Uses : Juice of leaves are used as an anthelmintic, particularly against thread worms. Plant is also used as febrifuge and diuretic.

2. **Blumea lacera** (Burm. f.) DC. var. **blumei** DC., Prodr. 5 : 436. 1836 ; Koster in Blumea 20 : 223. 1972.

Conyza laciniata Roxb., Fl. Ind. 3 : 427. 1832.

B. laciniata (Roxb.) DC. Prodr. 5 : 436. 1836; Clarke, Comp. Ind. 78. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 264. 1881; Prain, Bengal Pl. 1 : 598. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 470. 1922; Randeria in Blumea 1 : 258. 1960.

Blumea sinuata (Lour.) Merr. in Trans. Amer. Phil. Soc. n.s. 24(2) : 388. 1935 ; Singh in Bull. Bot. Surv. India 18 : 216. 1979.

Herbs, 20-180 cm tall. Stems to 1 cm in diam., hollow, branched usually from base ; branches glabrous to pilose with hairs and stipitate glands particularly in younger parts. Leaves both radical and cauline, 4.5-36.5 × 0.8-21 cm, upper smaller and passing into bracts, lower runcinate-lyrate, petiolate, upper less lobed, sessile, all glabrate to pilose on both surfaces, apiculate at apex, with tapering base, dentate with broadly triangular apiculate teeth on margins. Heads 6-8 mm in diam., heterogamous, disciform, in large, terminal, pedunculate panicles; peduncles to 1.5 cm long, glandular pubescent. Phyllaries usually tinged with purple, reflexed at maturity, oblong-lanceolate, 2-7 mm long, villous. Receptacle 2.5-5 mm in diam., alveolate, pilose around alveolae. Corollas

yellow, tubular; those of female florets 3.5-4.5 mm long, 2-3-lobed ; those of hermaphrodite ones 4-5 mm long, with 5 papillate lobes. Anther-tails shorter than thickened portion of filament. Achenes ribbed, brown, sparsely pubescent, 1.2-1.5 mm long.

Fl. & Fr. : Mar.-Nov.

Ecology : Very common ; on roadsides, waste places, vacant plots, gardens, fields and field borders, forest edges, etc.

Distribution : India : Punjab, Uttar Pradesh, Upper Gangetic Plain, Madhya Pradesh, Bihar, West Bengal, Eastern Himalaya, Sikkim, Orissa, Deccan Peninsula. Nepal, China, Thiland, New Guinea, Solomon Islands and Hawaii, Malesia, Vietnam, Marianus, Australia, Caledonia.

Specimens examined : Jhumri Telaiya, 659; Chatra, 981; Etkhori, 1855.

Note : Koster (*l.c.*), from revision of Compositae of new Guinea, came to the decision that the proper taxonomic status for this taxon should be a variety under *B. lacera* (Burm. f.) DC.

3. **Blumea membranacea** Wall. ex DC., Prodr. 5 : 440. 1836; Hook. f. in Hook. f., Fl. Brit. India 3 : 265. 1881, *p.p.*, Prain, Bengal Pl. 1 : 598. 1903; Randeria in Blumea 1 : 270. 1960. Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 172. 1980.

B. hispidula DC. ex Hook. f. in Hook. f., Fl. Brit. India 3 : 267. 1881.

B. virens sensu Haines, Bot. Bihar & Orissa pt. 4 : 471. 1922, *p.p.*, *quoad syn.* cit., non Wall. ex DC. 1834.

Herbs, 15-100 cm tall. Stems simple or branched from base, erect, terete, pilose in younger parts. Leaves 4-18 × 1.5-6 cm, upper sessile,

alternate, serrate-dentate, lower on to 2 cm long petiole, ovate-lanceolate to obovate-lanceolate, lyrately lobed, pilose on both surfaces, narrowed at base, acute at apex, with serrate-dentate margins. Heads 5-8 mm in diam., heterogamous, disciform, in terminal lax panicles. Peduncles to 3 cm long, pilose, bracteolate. Phyllaries purplish-tinged, slightly longer than florets, reflexed at maturity, linear, pubescent, 2-7 mm in long, inner ones scarious-margined. Receptacle 2-4 mm in diam., flat or slightly convex, alveolate, glabrous. Corollas yellow, tubular, those of bisexual florets 4-5 mm long, with triangular papillate lobes; those of female florets filiform, 4-4.5 mm long, 2-3-lobed, glabrous. Anther-tail equal to or slightly longer than thickened portion of filament. Achenes oblong, brown, ribbed, pubescent. Pappus white, to 5 mm long.

Fl. & Fr. : Sept.-Dec.

Ecology : Very common; along roadsides, forest glades, river-banks, railway tracks, hill-slopes, shady waste places, etc.

Distribution : India : Sikkim, West Bengal, Bihar, Chota Nagpur, Orissa, Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Rajasthan, Mysore, Tamil Nadu, Andaman Islands. Nepal, Indo-China, China, Indonesia, Myanmar, Sri Lanka, Malesia, Siam, Formosa and Pakistan.

Specimens examined : Pratappur, 605; Ghanghree, 1005; Koderma, 1983.

4. **Blumea mollis** (D.Don) Merr. in Philipp. J. Sci. 5 : 395. 1910; Randeria in Blumea 10 : 261. 1960; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 169. 1980. *Erigeron molle* D. Don, Prodr. Fl. Nepal 172. 1825.

Blumea wightiana DC. in Wight, Contrib. Bot. India 14. 1834; Clarke, Comp. Ind. 74. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 261. 1881; Prain, Bengal Pl. 1 : 597. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 469.1922.

B. neilgherrensis Hook. f. in Hook. f., Fl. Brit. India 3 : 261. 1881.

Erect, simple or branched from base, softly pilose, glandular, annual herbs, 10-80 cm high. Leaves alternate, 1-10 × 0.6-5 cm; lower with 1-2 cm long petiole, ovate-oblong, tapering at base, acute to apiculate at apex, finely and irregularly serrate, densely silky villous on both surfaces, glandular; upper ones smaller and passing into bracts. Panicles spiciform, dense, terminal, subsessile to pedunculate ; peduncles to 7 mm long, villous. Heads 3-4 mm in diam., heterogamous, disciform. Phyllaries linear, reflexed at maturity, soft-villous, glandular, usually purplish tinged, 1.5-4.5 mm long. Receptacle ± flat, alveolate, glabrous, 1-1.5 mm in diam. Corolla purple to lilac, tubular; those of female florets 2-4 mm long, 2-4-lobed, glabrous; those of hermaphrodite ones 3-5 mm long, with 5 triangular papillate lobes. Anther-tails shorter than thickened portion of filament. Achenes oblong, brown, pubescent, 0.5-0.6 mm long. Pappus-hairs whitish, 2-4 mm long.

Fl. & Fr. : Feb.-June.

Ecology : Very common; in open waste lands, grassy fields, slopes of low hills, roadsides, on old walls, forest edges, etc.

Distribution : Throughout the plains of India. Tropical Africa, Pakistan, Nepal, Indo-China, China, Myanmar, Philippines, Indonesia, New Caledonia, Sri Lanka.

Specimens examined : Pratappur, 909 ; Ichak, 1831.

7. BLUMEOPSIS Gagnep.

Blumeopsis flava (DC.) Gagnep. in Bull. Mus. Hist. Nat. Paris 26: 76. 1920; Ludlow & Raven in Kew Bull. 17 : 71. 1963; Nair in Bull. Bot. Surv. India 9 : 278. 1968. *Blumea flava* DC., Prodr. 5 : 439. 1836; Haines, Bot. Bihar & Orissa pt. 4 : 467. 1922.

Laggera flava (DC.) Benth. ex Clarke, Comp. Ind. 90. 1876; Hook. f. in Hook. f., Fl. Brit. Ind. 3 : 270. 1881; Prain, Bengal Pl. 1 : 599. 1903; Haines, For. Fl. Chota Nagpur 515. 1910.

Blumeopsis falcata Merr. in J. Arnold Arb. 19 : 70. 1938, non *Erigeron falcatum* D. Don, 1825.

Erect, 10-90 cm tall. Basal leaves obovate-oblong, sharply dentate or incised, attenuate at base, rounded at apex, to 15 × 6 cm ; cauline ones few, lanceolate-oblong, with scaberulous margins, to 3 × 1 cm. Heads golden-yellow, heterogamous, disciform, 4-4.5 mm across and 5-6 mm long; peduncle 0.6-1 cm long. Phyllaries 4-seriate, ovate-oblong, acute to acuminate at apex, glabrous, 1-6 mm long, inner ones 1-nerved, with hyaline tips. Receptacle flat, naked. Corollas of outer florets 2-2.5 mm long, with 4-toothed papillose mouth ; those of disc florets 3-3.5 mm long, with minutely papillose lobes. Anther-cells gradually attenuate in filaments. Achenes glabrous, 0.5-0.6 mm long. Pappus-hairs white, deciduous.

Fl. & Fr. : Nov.-Feb.

Ecology : Common; in open forests, roadsides, grassy localities, river-banks, etc.

Distribution : India : Outer Himalaya from Punjab throughout Himachal Pradesh, Uttar Pradesh, Bihar to Sikkim, West Bengal, Orissa, central and South India. Bhutan, Bangladesh, Myanmar, Malay Peninsula, China, Thailand, Indo-China.

Specimens examined : National Park, 1433; Telaiya Dam, 1742; Chatra, 2189.

Use : Plant is used with mustard oil for dropsy.

Note : Several workers (*viz.*, Ramamoorthy in Saldan. & Nicols., Fl. Hassan Dist. 619. 1976; Rani & Matthew, in Matthew, Fl. Tamilnadu Carnatic pt. 2 : 806. 1983, etc.) adopted *Laggera flava* (DC.) Benth. ex Clarke as the correct name of this taxon.

8. CAESULIA Roxb.

Caesulia axillaris Roxb., Pl. Corom. 1 : 64, t. 93. 1798; Clarke, Comp. Ind. 116. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 291. 1881; Prain, Bengal Pl. 1 : 603. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 475. 1922; Kitamura & Gold in Hara *et al.* Enum. Fl. Pl. Nepal 3 : 18. 1982.

Erect or decumbent-ascending, succulent, annual herbs, 15-45 cm tall. Stems brown-streaked, flexuous above, terete, glabrous. Leaves alternate, lanceolate-oblong, with a scarious, semi-amplexicaul, dilated, sheathing base, subacute at apex, remotely denticulate, 4-15 × 0.4-1.5 cm. Compund heads globose, 1-2 cm in diam., consisting of 3-4 simple homogamous sessile heads. Phyllaries broadly ovate or orbicular, crenulate or denticulate, 0.8-1.2 cm in diam., with a dorsal apiculus near apex. Paleae linear, acute. Receptacle flat, glabrous. Corolla 3-4 mm long, lobes glabrous. Anthers dark-brown. Achenes brown, obovoid, notched and with few small teeth on either side of notch, ribbed, winged, 2.5 -3 × 1.5-2 mm. Pappus-scales 2, ovate-lanceolate, 1.8-2 mm long.

Fl. & Fr. : Sept.-Jan.

Ecology : Very common; in rice-fields and field-borders, margins of water courses of irrigational canals, ponds, river-banks, etc.

Distribution : Throughout India including Himalaya but excepting eastern part of Peninsula. Bangladesh, Myanmar, Nepal.

Specimens examined : Hazaribagh, 113; Jhumri Telaiya, 301; Tondwa, 2168.

9. CARTHAMUS L.

Carthamus tinctorius L., Sp. Pl. 830. 1753; Clarke, Comp. Ind. 244. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 386. 1881; Prain, Bengal Pl. 1 : 625. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 494. 1922.

Local name : Kusum, Karrah.

Erect, annual herb, to 30-90 cm tall. Branches glabrous or pubescent. Leaves alternate, oblong or oblong-lanceolate, lower shortly spinulose-serrate, upper with semi-amplexicaul base. Heads 2-3 cm across, homogamous, orange-yellow, surrounded by a cluster of leafy bracts. Outer phyllaries ovate-oblong, constricted above base, green, spinous or not; inner ones ovate-oblong, acute, spine-tipped. Receptacle flat, densely bristly. Corolla-segments linear. Anthers with sagittate base, connate auricles and short fimbriate tails. Achenes 4-angled, truncate at top, white and shining. Pappus absent.

Fl. & Fr. : Feb.-Apr.

Ecology : Very common; cultivated in the fields; also met with as an escape in waste places, roadsides, etc.

Distribution : Throughout India, Nepal, W. Asia, Europe.

Specimens examined : Hazaribagh, 1510 ; Ramgarh, 2069.

Uses : Flowers are used as dye for colouring food and cloth. Seeds yield an edible oil which is used for soap, paints, varnishes, linoleum and as illuminant; also used for edible purposes and applied to sores and rheumatic swellings. Oil-cake is used as cattle feed.

10. CENTIPEDA LOUR.

Centipeda minima (L.) A. Br. & Aschers., Ind. Sem. Hort. Berol. App. 6. 1867; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 235. 1980. *Artemisia minima* L., Sp. Pl. 849. 1753.

C. orbicularis Lour., Fl. Cochinch. 493. 1790; Clarke, Comp. Ind. 151. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 317. 1881; Prain, Bengal Pl. 1 : 620. 1903; Haines, Bot Bihar & Orissa pt. 4 : 488. 1922.

Stems prostrate, minutely glandular papillate, otherwise glabrous, 5-15 cm long. Leaves alternate, oblanceolate or spathulate, slightly fleshy, attenuate and subpetiolate at base, acute at apex, 3-5-dentate, minutely puberulous and glandular on lower surface, 5-10 × 2-4 mm. Heads subglobose, solitary, axillary, heterogamous, disciform, 2.5-4 mm in diam. Phyllaries spathulate, glabrous, 1.2-1.5 mm long. Receptacle naked. Florets yellowish-green ; female ones numerous, 0.4-0.5 mm long, with minute tubular corollas; corollas of hermaphrodite ones 0.6-0.7 mm long. Achenes 4-5-angled, narrowly oblanceolate, puberulent on ribs, 0.7-1 mm long including apical corona.

Fl. & Fr. : Mar.-Jan.

Ecology : Very common ; in waste places, paddy fields, gardens, margins of irrigation channels, river-banks, etc.

Distribution : Throughout the plains of India. Tropical Asia, Australia and Africa.

Specimens examined : Keredari, 484; Gola, 769 ; Chouparan, 1863; National Park, 2280.

Uses : Powdered leaves and seeds are used in preparation of snuff. Infusion of herb is used in ophthalmia. Seeds are considered vermifuge.

11. CHROMOLAENA DC.

***Chromolaena odorata** (L.) King & Robinson in Phytologia 20 : 204. 1970; Woodson *et al.* in Ann. Missouri Bot. Gard. (Fl. Panama) 62 : 925. 1975; Ramamoor. in Saldan. & Nicols., Fl. Hassan Dist. 608. 1976. *Eupatorium odoratum* L., Syst. Nat. ed. 10, 2 : 1205. 1759; Clarke, Comp. Ind. 30. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 244. 1881; Prain, Bengal Pl. 1 : 592. 1903.

Erect or scrambling, perennial shrubs, 1-2.5 m high. Stems terete, often much branched from base, often decumbent below, sparsely pubescent. Leaves opposite, petiolate, deltoid-ovate to ovate-lanceolate, cuneate at base, acute or acuminate, subentire or crenate-serrate, gland-punctate on the lower surface, 2-10 × 0.5-3 cm, subpalmately 3-veined; petiole 1-2 cm long. Heads homogamous, discoid, cylindrical-campanulate, 3-4 mm across, 0.8-1 cm long, 16-24- flowered. Peduncles shorter than heads. Phyllaries 3-5-seriate, outer ones ovate, intermediate ones oblong, inner ones narrow, short-acute, whitish with 3 distinct green lines on each, 1-7 mm long. Receptacle glabrous. Corolla white to purple, 5-6 mm long. Achenes slender, 4-4.5 mm long, blackish, 4-5-ribbed; ribs paler, scabrid. Pappus-hairs 5-6 mm long, whitish or pale-brown.

Fl. & Fr. : Apr.-Aug.

Ecology : Not common; in roadsides, waste places, etc.

Distribution : India : Sub-Himalayan Plains and foot-hills, Assam, West Bengal, Bihar, Uttar Pradesh, Central and South India. Native of Central & South America, now naturalised in Nepal, Myanmar, Malesia and Thailand.

Specimens examined : Hazaribagh, 1216; Morkocho, 1963.

12. CHRYSANTHELLUM Rich.

Chrysanthellum americanum (L.) Vatke in Abh. Nat. Ver. Brem. 9 : 122. 1887; Milne-Redhead in Kew Bull. 1948 : 466. 1948. *Artemisia americana* L., Sp. Pl. 895. 1753, non L. f. Suppl. 378. 1781.

C. indicum DC., Prodr. 5 : 631. 1836; Clarke, Comp. Ind. 142. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 310. 1881; Prain, Bengal Pl. 1 : 617. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 485. 1922.

Prostrate or decumbent, spreading, annual herbs. Stems sparingly much-branched, 3-gonous, purple-tinged, glabrous, to 15 cm long. Leaves alternate, 1 to 2-pinnatifid, 3-8 cm long; segments linear-lanceolate or linear-oblong, acute, mucronate, glabrous, 2.5-5 × 1.2-1.5 mm. Heads heterogamous, radiate, 5-6 mm across, solitary; peduncle ascending, slender, 0.5-1.5 cm long. Phyllaries of 2 dissimilar series; outer ones subulate,2-2.2 × 0.4-0.5 mm; inner ones oblong, reddish-brown when dried, with hyaline margins, 3-5 × 1.2-1.5 mm. Marginal florets 8-12, yellowish, 4-5 mm long. Corollas of disc florets yellow,0.25-0.3 cm long. Paleas 2.5-3 mm long with a dark coasta and hyaline margins. Achenes 2.5-3 × 1-1.8 mm. Pappus a minute corona.

Fl. & Fr. : Oct.-Jan.

Ecology : Not common; in grassy sandy localities of wet, sunny spots and near margins of canals in low lands.

Distribution : India : North-western Himalayas, Punjab, Uttar Pradesh, Bihar, Chota Nagpur, West Bengal, Orissa, Central India. New and Old World Tropics.

Specimens examined : Ghanghre, 1000 ; Pratappur, 2051.

Note : Here, the treatment of Milne-Redhead (*l.c.*) is followed in considering *C. americanum* (L.) Vatke and *C. indicum* DC. as conspecific and adopting the former as the correct name for this taxon. But, Hooker f. (*l.c.*) considered the two as distinct on the ground that the achenes of *C. indicum* are smaller and never broadly winged as in *C. americanum*. Kitamura and Gould (in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 19. 1982) followed Hooker f.

13. CONYZA Less., *nom. cons.*

Conyza bonariensis (L.) Cronq., Bull. Torrey Bot. Club. 70 : 632. 1943; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 158. 1980. *Erigeron bonariensis* L., Sp. Pl. 863. 1753.

Erigeron linifolius Willd., Sp. Pl. 3 : 1955. 1803; Clarke, Comp. Ind. 50. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 254. 1881.

Conyza ambigua DC., Fl. Franc. Suppl. 6 : 468. 1815; Haines, Bot. Bihar & Orissa pt. 4 : 463. 1922.

Erect, annual herbs, 25-75 cm tall. Stems striate, branched above, clothed with a mixed indumentum of short appressed hairs and coarser spreading trichomes. Leaves alternate, sessile, linear, linear-lanceolate or oblanceolate-spathulate, attenuate at base, acute at apex, entire or coarsely serrulate-denticulate, pubescent on both surfaces with few hirsute trichomes beneath, 2-10 × 0.2-0.6 cm. Heads heterogamous, disciform, 4-6 mm across; peduncle slender, 1-1.5 cm long, hairy. Phyllaries 2-3-seriate, densely pilose, linear, 3-5 mm long, purplish tipped. Corollas of female florets yellowish, filiform, 3-4 mm long, usually without a distinct ligule, sometimes minutely ligulate. Receptacle naked. Corollas of hermaphrodite florets yellow, 2.5-3 mm long, pubescent towards the top. Achenes much compressed, pubescent towards base, 0.8-1 mm long, brown. Pappus-hairs brownish, 2.5-3.5 mm long.

Fl. & Fr. : Apr.-Jun.

Ecology : Common; along roadsides, waste places, fields, gardens, etc.

Distribution : India : Western Himalayas, Punjab, Uttar Pradesh, West Bengal, Bihar, Orissa, central and southern India. Indigenous to South America, introduced into several countries, now almost Pantropical.

Specimens examined : Hazaribagh, 240; Ichak, 351; Tondwa : 1883.

Uses : Leaves are used for lumbago and rheumatism.

14. Cosmos Cav.

Cosmos sulphureus Cav., Icon Descr. Pl. 1 : 56, t. 79. 1791; Hook. f. in Hook. f., Fl. Brit. India 3 : 310. 1881; Prain, Bengal Pl. 1 : 616. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 484. 1922.

Erect, much-branched, annual herb, to 80 cm tall. Stems sulcate, glabrescent. Leaves opposite, 2-3-pinnatipartite or pinnate; segments or leaflets lanceolate-oblong, obtuse and apiculate at apex, entire, glabrescent, 7-8 cm long; petiole 1.5-5 cm long. Heads 5-8 cm across, heterogamous, radiate, usually solitary, sometimes combined into corymbs. Peduncle 10-15 cm long. Outer phyllaries linear-lanceolate, acute, smaller, 4-5 mm long; inner ones oblong-lanceolate. Ray-florets with 1.8-2 cm long golden-yellow ligules. Corollas of disc-florets yellow, 1.2-1.5 cm long. Achenes fusiform, 4-angular, hispidulous, 1.2-1.5 cm long. Pappus-awns 2-3. Paleas linear, acute.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; cultivated in gardens. Also found as escape from cultivation near streams, roadsides, waste places, etc.

Distribution : Throughout India. Native of Mexico, now naturalised in all the tropical and subtropical countries of the World.

Specimens examined : Hazaribagh, 1514; Ghanghree, 2289.

Uses : Cultivated as an ornamental for bright yellow flowers. Flowers yield an orange-red dye.

15. Cyathocline Cass.

Cyathocline purpurea (D. Don) O. Kuntze, Rev. Gen. Pl. 1 : 338. 1891; Ramamoor. in Saldan. & Nicols., Fl. Hassan Dist. 610. 1976; Babu, Herb. Fl. Dehra Dun 259. 1977. *Tenacetum purpureum* D. Don, Prodr. 181. 1825.

Cyathocline lyrata Cass., Ann. Soc. Sci. Nat. ser. 1, 17 : 420. 1829; Clarke, Comp. Ind. 37. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 246. 1881; Prain, Bengal Pl. 1 : 593. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 463. 1922.

Erect, strongly aromatic, glandular-hairy, annual or biennial herbs, 30-60 cm tall. Stems branched, reddish purple-tinged, grooved, glandular-pubescent. Leaves alternate, sessile, 1 to 2-pinnatipartite, 5-15 cm long; segments serrate-dentate to lobed, acute, glabrescent or thinly hairy. Heads heterogamous, disciform, small, 4-5 mm accross, in terminal corymbose panicles; peduncles 2-5 mm long. Phyllaries pilose, linear-lanceolate, acute, 2-2.5 mm long, with scarious and densely ciliate margins. Receptacle elevated, with a contracted base and naked concave tip. Corolla of ray florets 1.2-1.5 mm long. Corolla of disc florets 2 mm long, with gland-hairy lobes. Achenes fusiform-oblong, minute, smooth, 0.3 mm long. Pappus absent.

Fl. & Fr. : Dec.-Mar.

Ecology : Common; in wet places, banks of rivers, rice-fields and field borders, on rocks in streams, etc.

Distribution : Throughout India. Nepal, Myanmar, Thailand, Vietnam.

Specimens examined : National Park,395; Barkattwa, 505; Bishnugarh, 1931.

16. ECHINOPS L.

Echinops echinatus Roxb., Fl. Ind. 3 : 448. 1832; C.B.Clarke, Comp. Ind. 211. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 358. 1881; Prain, Bengal Pl. 1 : 622. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 490. 1922.

Much branched, spreading, rigid, annual, woody herbs, 30-65 cm. tall; branches cottony pubescent. Leaves 7-15 × 2-6 cm (including spine tips), alternate, sessile, lanceolate, amplexicaul, pinnatisect with

crenations and lobes ending in sharp spines, white-woolly below; the spines 0.8-2 cm long; heads on a common receptacle, 1-flowered, agrregated in globose involucrate balls; white, 2.5-4 cm in diam., densely bearded. Involucre surrounded by strong white bristles resembling pappus-hairs; outer phyllaries oblanceolate, glabrous, pungent; intermediate ones often produced into sharp spines sometimes exceeding 2.5 cm long, causing the balls frequently to bristles with many spines. Innermost ones 5-8, 1.2-1.4 cm long, connate for more than half of their length into a tube round the achenes, the free segments acute, or obtuse and laciniate at the apex, ciliate, and with scarious margins. Segments of corolla-limb 5-6 × 0.8-1 mm, linear, acute. Anther-tails fimbriate. Achenes obconic, densely villous, 3.5-4 mm long. Pappus-bristles short, yellowish, forming a brush above achenes.

Fl. & Fr. : Apr.-June.

Ecology : Very common; in roadsides, waste lands, along railway tracks, on roacks, etc.

Distribution : India : Western Himalayas, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, central India and Deccan Peninsula. Myanmar, Pakistan and Afganistan.

Specimens examined : Hunterganj, 927; Pratappur, 937; Simaria, 1671.

Uses : Plant is a tonic and diuretic. Powdered root is applied to destroy maggots, and also lice.

17. ECLIPTA L., *nom. cons.*

Eclipta prostrata (L.) L., Mant. Pl. 2 : 286. 1771; Roxb., Fl. Ind. 3 : 438. 1832; Santap. in J. Bomb. Nat. Hist. Soc. 54 : 475-476. 1957; Koyama in Taxon.30 : 505. 1981. *Verbesina prostrata* L., Sp. Pl. 902. 1753.

Verbesina alba L., Sp. Pl. 902. 1753.

Eclipta erecta L., Mant. Pl. 2 : 286. 1771, *nom. illegit.*; Duthie, Fl.

Upp. Gang. Pl. 1 : 468. 1918.

E. alba (L.) Hassk., Pl. Jav. Rar. 528. 1848; C. B. Clarke, Comp. Ind. 134. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 304. 1881; Prain. Bengal Pl. 1 : 610. 1903 ; Haines, Bot. Bihar & Orissa pt. 4 : 480. 1922.

Local name : Mochrand, Bhangra, Babri.

Prostrate, decumbent-ascending or erect herbs, 5-40 cm long. Stems reddish, much-branched, often rooting at lower nodes, stiffly appressed pilose. Leaves opposite, subsessile, elliptic-lanceolate, narrowed at base, acute or subacute at apex, subentire or faintly serrate, stiffly appressed pilose on both surfaces, strongly 3-nerved from base, 1.5-5 × 0.6-2 cm. Heads heterogamous, radiate, 0.6-1 cm across; peduncles 0.5-3 cm long. Phyllaries about 8, ovate-lanceolate, herbaceous, appressed pilose, outer ones 3-6 mm long, inner ones 2-4 mm long. Florets white. Ligulate corollas of ray-florets 2.5-3 mm long, 2-dentate, minutely hairy at apex. Corollas of disc-florets 1.5-2 mm long. Paleas subulate, 2.5-3 mm long. Achenes obovate-oblong, 3-3.5 mm long, minutely pubescent at top. Pappus scales *ca* 0.3 mm long.

Fl. & Fr. : Aug.-Feb.

Ecology : Very common; in damp wastelands, low water-logged areas, margins of tanks, pools, ponds and canals, river banks, paddy fields, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Koderma, 163 ; Hazaribagh, 478; Jhumri Telaiya, 666; Mandu, 1350.

Uses : Plant is a tonic and deobstruent, used in hepatic and spleen enlargements and in skin troubles. The plant extract is used for darkening of hair.

Note : The name *E. prostrata* (L.) L. was first used by Roxburgh

(1832) when he combined *E. alba* and *E. prostrata*. According to the Artilcle 57(1) of ICBN (1983) Roxburgh's choice of *E. prostrata* for the combined taxon must be followed, although in an example given under that article of Code it is stated that Hasskarl (1848) was the first to unite these two taxa and *E. alba* (L.) Hassak. is cited as the correct name. However, Roxburgh's choice of *E. prostrata* predates Hasskarl by 16 years. As such, Koyama (*l.c.*) proposed to change this example in Article 57. Koyama's proposal has been accepted in Article 57(1), ex 5 of ICBN (1988) and *E. prostrata* has been accepted as the correct name.

18. ELEPHANTOPUS L.

Elephantopus scaber L., Sp. Pl. 814. 1753; Clarke, Comp. Ind. 28. 1876; Hook. f. in Hook. f.,Fl. Brit. India 3 : 242. 1881; Prain, Bengal Pl. 1 : 590. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 461. 1922 ;

Local name : Samdulan, Gobhi.

Subscapose herbs, 10-50 cm tall, with creeping rhizomatous rootstock. Stems terete, simple below, dichotomously branched at the top, appressed-strigose. Radical leaves chartaceous, oblanceolate or obovate-oblong, tapering at base into an obscure petiole, subacute to obtuse at apex, subentire or coarsely crenate-serrate, ciliate, glabrescent above, densely appressed-pubescent and glandpunctate beneath, 3-20 × 0.5-7 cm; cauline leaves shorter, sessile, ovate or oblong, semiamplexicaul at base. Glomerules of heads terminal, 2-3 cm across, subtended at base by 3 carinate, cordate bracts of 1-1.5 cm long and 0.7-1 cm broad; heads homogamous, with 2-4 florets. Involucres 0.8-1 cm long; phyllaries whitish hirsute. Corolla pale-violet or reddish-violet; tube 5-5.5 mm long; lobes linear-lanceolate, 2.5-3 mm long. Achenes 3-4 mm long, obovoid, slightly flattened, 10-ribbed, hairy between the ribs. Pappus bristles 5, 4.5-5 mm long, dilated at base.

Fl. & Fr. : Sept.-Dec.

Ecology : Very common; in grassy localities, waste places, along roadsides, in forests, etc.

Distribution : Throughout India. Nepal, Indo-China, W. China, Myanmar, Malay Peninsula, Philippines, Australia and tropical Africa.

Specimens examined : Raja Rappa, 414; National Park, 975; Keredari, 2249.

Uses : Decoction of roots and leaves is used as an emollient in diarrhoea, dysentery, swelling and stomach pains. Root is used to arrest vomiting. Root-powder with pepper is applied in tooth-ache. Leaves are used in applications for eczema and ulcers.

19. EMILIA Cass.

Emilia sonchifolia (L.) DC. in Wight, Contrib. Bot. Ind. 24. 1834; Hook. f. in Hook. f., Fl. Brit. India 3 : 336. 1881; Prain, Bengal Pl. 1 : 605. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 489. 1922. *Cacalia sonchifolia* L., Sp. Pl. 835. 1753.

Local name : Hirankhuri.

Erect to weakly spreading, annual-perennial, glabrescent to sparsely pilose herbs, 15-40 cm long. Stems much-branched at base, often decumbent-ascending, with internodes to 4.5 cm long. Leaves evenly distributed along stems; lower leaves toothed to deeply and irregularly lyrato-pinnatifid, tapering at base to a weekly distinct petiole, ovate-triangular, orbicular or reniform, crenate-dentate on upper part, acute at apex, spreading-hairy, 5-15 × 1.5-4 cm; upper cauline leaves broad, auriculate-clasping, acute at apex, dentate, glabrous or nearly so,

1-4 × 0.4-1.5 cm. Heads homogamous, discoid, 0.8-1.2 cm long; peduncle slender, glabrous, 2-4 cm long. Phyllaries 8-10, linear-lanceolate, weakly connate along margins, almost equalling or shorter than florets, 6-8 mm long. Corollas purple or reddish purple, 0.8-1 cm long. Achenes brown or reddish brown, 2.5-3 mm long, with scabrid ribs. Pappus hairs copious, white, soft, 0.5-0.7 mm long.

Fl. & Fr. : July-Sept.

Ecology : Very common; in cultivated grounds, grassy fields along roadsides, forest edges, etc.

Distribution : Throughout India. Probably native to tropical and subtropical regions of Asia and Africa, now pantropical.

Specimens examined : Hazaribagh, 119; National Park, 199; Raja Rappa, 385; Simaria, 1969.

Uses : Leaves are cooked and eaten as vegetable. Decoction of plant is used as febrifuge and in bowel complaints. Juice of leaves is used in eye-sore and night blindness.

20. ENYDRA Lour.

Enydra fluctuans Lour., Fl. Cochinch. 511. 1790; Hook. f. in Hook. f., Fl. Brit. India 3 : 304. 1881; Prain, Bengal Pl. 1 : 610. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 479. 1922.

Local name : Harhuch.

Stems erect-ascending from a creeping and rooting base, simple or divaricately branched, glabrous or slightly puberulent, rooting at nodes. Leaves opposite, sessile, linear-oblong acute or obtuse at apex, with truncate base, entire or subcrenate, glabrous abvoe, sparsely puberulent

beneath, 2.5-7.5 × 1-2 cm. Heads heterogamous, (sub)radiate, 0.7-1.5 cm in diam. Phyllaries 4 pale yellowish-green, rounded at apex,to 1.2 cm. Paleae glandular at apex. Corollas of ray-florets 3-lobed at one side. Achenes oblong, enclosed in rigid paleas, with a pale top, glabrous, balck, 2.5 mm long. Pappus absent.

Fl. & Fr. : Dec.-Jan.

Ecology : Common; along edges of ponds, ditches, canals and marshy localities.

Distribution : India : Western Himalaya, Uttar Pradesh, Bihar, West Bengal, Orissa, North-eastern India. Asia and Tropical Africa.

Specimens examined : Hazaribagh, 46 ; Jhumri Telaiya, 1720 ; Gola, 2281.

Uses : Leaves are edible, laxative, antibilious and demulcent, and used in nervous affections.

21. Erigeron L.

Erigeron sublyratus DC. in Wight, Contrib. 9. 1834; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 153. 1980.

E. asteroides Roxb., Fl. Ind. 3 : 432. 1832, non Link. 1822; Hook. f. in Hook. f., Fl. Brit. Ind. 3 : 254. 1881; Prain, Bengal Pl. 1 : 594. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 462. 1922.

E. hispidus DC. in Wight, Contrib. 9. 1834; Clarke, Comp. Ind. 54. 1876.

Prostrate to erect-ascending, annual herbs, 30-60 cm. tall. Stems minutely puberulous and patently glandular hairy, much branched, terete,striate. Basal leaves shortly petioled, obovate; cauline ones alternate, sessile, obovate-oblong or oblanceolate, semi-amplexicaul and auriculate at base, acute or obtuse at apex, coarsely toothed to

dentate-lobulate, puberulous on both surfaces with spreading hairs along veins beneath. Heads 0.6-1 cm in diam., heterogamous, radiate, solitary and axillary or few to several in subcorymbs; Peduncles slender, 0.5-1.5 cm long. Phyllaries 2-3-seriate, linear-lanceolate, puberulous along midrib, scarious-margined, 4.5-5 mm long. Ray florets numerous, violet-blue; basal tube 2.2-2.5 mm long; ligule 2-3 mm long. Disc florets 15-20; corolla yellow, 3.5-4 mm long. Achenes minute, compressed, narrowly obovoid, puberulous, 0.7-0.8 mm long. Pappus bristles pinkish-white, 3-4 mm long.

Fl. & Fr. : Oct.-Apr.

Ecology : Very common; in cultivated grounds, waste places, vacant lands, etc.

Distribution : Throughout India . Nepal, Sri Lanka.

Specimens examined : Jhumri Telaiya, 685; Barkagaon, 1272 ; National Park, 2010.

Uses : Plant is used as a stimulating diuretic in febrile conditions.

22. GLOSSOCARDIA Cass.

Glossocardia bosvallea (L.f.) DC. in Wight, Contrib. Bot. Ind. 19. 1834; Clarke, Comp. Ind. 139. 1876; Gamble, Fl. Madras 2 : 709. (499). 1921. *Verbesina bosvallea* L. f., Suppl. 379. 1781.

Glossocardia linearifolia Cass. in Dict. Sci. Nat. 19 : 62. 1821; Hook. f. in Hook. f., Fl. Brit. India 3 : 308. 1881; Prain, Bengal Pl. 1 : 615. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 485. 1922.

Local name : Seri.

Prostrate or decumbent-ascending or sometimes erect, much branched, small herbs, 3-15 cm long. Stems and branches glabrous, deeply grooved. Leaves alternate 1-2-pinnatisect, 1.5-5 cm long;

segments linear, acute,apiculate, 3-7 × 0.5-0.7 mm; petioles slender, 0.5-2.5 cm long. Heads heterogamous, radiate, 0.8-1 cm long. Outer phyllaries 3, ovate-lanceolte, acute, with membranous ciliate margins and a green midrib, 2.5-3 × 1-1.2 mm ; inner ones subobtuse,longitudinally folded, 6-8 × 2-2.5 mm. Paleas scarious, linear-lanceolate, 4-6 mm long. Ligulate corollas yellow, 3-3.5 mm long, papillose outside. Corollas of hermaphrodite florets yellow, 2-2.2 mm long. Achenes black or dark-brown, narrowly oblong, dorsally compressed, bearded on faces, 7-12 × 1.2-2 mm. Pappus-awns 4-6 mm long, divaricate, dark-brown.

Fl. & Fr. : Sept.-Oct.

Ecology : Not common; on thin gravelly soil in scrub forests, along stream-margins, etc.

Distribution : India : Chota Nagpur, western, central and southern India.

Specimens examined : Pratappur, 921; Ghanghree, 1062.

Uses : The plant is eaten as vegetable by poor people; also used as an emmenagogue.

23. GLOSSOGYNE Cass.

Glossogyne bidens (Retz.) Alston in Trim., Handb. Fl. Ceylon Suppl. 6 : 168. 1938; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 230. 1980. *Zinnia bidens* Retz., Obs. Bot. 5 : 28. 1788.

Glossogyne pinnatifida DC.in Wight, Contrib. Bot. Ind. 19. 1834; Clarke, Comp. Ind. 141. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 310. 1881; Prain, Bengal Pl. 1 : 617. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 484. 1922.

Local name : Barangom, Tej raj.

Erect or decumbent-ascending herbs, 10-35 cm tall. Stems numerous from woody base, simple or widely branched in upper parts. Basal leaves petiolate, 1- to 2-pinnatipartite or -pinnatisect, 4-10 cm long; petioles 3-6 cm long; segments linear-lanceolate or linear-oblong, subacute, mucronate, 5-25 × 1.5-4 mm; cauline leaves similar, alternate, smaller, upermost simple, scale-like. Heads heterogamous, radiate, 5-7 mm in diam., elongating in fruit; peduncles 2-5 cm long, grooved. Phyllaries ± 12, linear-oblong, subacute, 3-4 mm long, connate at base. Ray-florets 10-12; ligulate corollas yelow, broadly ovate, 3-lobed, 2-2.5 mm long. Corollas of disc-florets 2.5-3 mm long, with 4-lobed limb. Paleas 3-4 mm long. Achenes linear-oblong, blackish or dark brown, dorsally compressed, grooved, 4-7 mm long. Pappus-bristles or awns brown, retrorsely barbed, divergent, 2-3 mm long.

Fl. & Fr. : Apr.-Nov.

Ecology : Rare; in grassy, sandy localities of dry regions.

Distribution : India : Base in Himalayas from Punjab Plain through Uttar Pradesh, Bihar to West Bengal, Central and South India . Nepal, Myanmar, Thailand, China, Indo-China, Philippines, Polynesia, New Calendonia, Australia.

Specimens examined : Pratappur, 903.

Uses : A preparation made from root is applied to snake bites and scorpion stings. Roots are used in tooth-ache.

24. GNAPHALIUM L.

Key to the Species

1a. Pappus-hairs free :

2a. Heads in leafy spicate inflorescence ... 3. *G. polycaulon*

2b. Heads in leafless corymbose clusters ... 1. *G. luteo-album*

1b. Pappus-hairs connate at base in a ring ... 2. *G. pensylvanicum*

1. **Gnaphalium luteo-album** Linn., Sp. Pl. 851. 1753; Clarke, Comp. Ind. 114. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 288. 1881; Prain, Bengal Pl. 1 : 602. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 474. 1922.

Erect or decumbent-ascending, multicauline, annual herbs, sometimes woody at base. Stem simple or branched from base, appressed-woolly. Leaves alternate, sessile, 2.5-6.5 × 0.3-1.2 cm, oblanceolate or spathulate-obovate, narrowed at base, apiculate, cottony woolly, 1.5-5 × 0.35-0.6 cm; upper ones semi-amplexicaul at base, smaller than lower; entire, or sometimes obscurely toothed. Heads heterogamous, disciform, 2.5-3 mm long, in terminal, dense leafless, corymbose clusters. Peduncles *ca* 3 mm long. Phyllaries 2 to 3 seriate, golden-yellow, shirting, ovate-oblong, obtuse, to 3 mm long. Ray florets *ca* 3 mm long. Disc florets *ca* 3 mm long, with 2-2.5 mm long corollas. Achenes ellipsoid, brown, 0.4-0.5 mm long. Pappus-hairs whitish, 1.8-2 mm long, free.

Fl. & Fr. : Feb.-May.

Ecology : Common; in damp places, margins of ponds, on river-beds, agricultural fields, along roadsides, etc.

Distribution : Throughout India. Most of the warm and temperate countries of Old World, adventive in N. America.

Specimens examined : National Park,53 ; Koderma, 183 ; Mandu, 2236.

Use : Leaves are astringent.

Note : Hillard and Burtt (in Bot. J. Linn. Soc. 82 : 206. 1981), proposed PSEUDOGNAPHALIUM Hillar & Burtt and transferred to it *Gnaphalium luteo-album* L. (1753) as *Pseudognaphalium luteo-album* (L.) Hillard & Burtt.

2. **Gnaphalium pensylvanicum** Willd., Enum. Hort. Berol. 867. 1890; Grierson in Notes Roy. Bot. Gard. Edinburgh 31 : 137. 1971 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 197. 1980.

Gnaphalium spathulatum Lam., Encycl. 2 : 758. 1786, non Burm. f. 1768.

G. purpureum auct. non Linn. : Hook. f. in Hook. f., Fl. Brit. India 3 : 289. 1881; Haines, Bot. Bihar & Orissa pt. 4 : 474. 1922; Mooney, Suppl. Bot. Bihar & Orissa 76. 1950.

Annual, cottony herbs, 15-45 cm tall. Stems simple or branched from base, erect, sometimes decumbent below. Leaves alternate, obovate-spathulate, attenuate at base, rounded or sub-obtuse and apiculate at apex, entire, cottony above, greyish tomentose or woolly beneath, 2-8 ×0.5-2.2 cm. Heads heterogamous, disciform, 2.5-3 mm in diam., many in axillary clusters forming a more or less interrupted and leafy spicate panicles. Phyllaries light brown, 2-3 seriate, woolly at base; outer ones ovate-lanceolate, scarious, 2-2.5 mm long; inner ones oblong-lanceolate, 2.5-3 mm long. Florets greenish-white. Corollas of female ones 2-2.2 mm long; those of hermaphrodite ones 2-2.3 mm long. Achenes elliptic, brown, minutely glandular, 3-4 mm long. Pappus hairs white, coherent at base, deciduous, 2.2-2.5 mm long.

Fl. & Fr. : Oct.-Dec.

Ecology : Very common; in cultivated fields, waste lands, gardens, roadsides and waysides.

Distribution : India : Uttar Pradesh, Chotanagpur, Bihar, central India and West Bengal. Native of N. America.

Specimens examined : Ghanghree, 1063; Pratappur, 2169 ; Ramgarh 2353.

3. **Gnaphalium polycaulon** Pers.; Syn. Pl. 2 : 421. 1807; Grierson in Notes Roy. Bot. Gard. Edinburgh 31 : 137. 1971.

G. strictum Roxb., Ind. 3 : 424. 1832.

G. indicum auct. non Linn. : Clarke, Comp. Ind. 114. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 289. 1881; Prain, Bengal Pl. 1 : 602. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 474. 1922.

Prostrate or decumbent-ascending, multicauline, woolly annual herbs, 5-15 cm high. Stems simple, or much branched from base, appressed-woolly. Leaves alternate, 1.2-3.5 × 0.3-1.5 cm, narrowly oblanceolate-spathulate, obtuse and apiculate at apex, with narrowed semi-amplexicaul base, glabrate or cottony above, densely appressed-woolly beneath. Heads heterogamous, disciform, 2-2.5 mm long, sessile, in small dense terminal and subterminal spiciform clusters of 1-10. Phyllaries 2 to 3-seriate, linear-oblong or lanceolate, yellowish brown; outer ones obtuse, woolly, 1-1.2 mm long; inner ones subacute, 2-2.5 mm long. Receptacle to 8 mm long. Florets pale yellow; ray-florets 1.5-1.7 mm long; disc-florets 1.5-1.8 mm long. Achenes oblong, slightly papilose, *ca* 0.5mm long. Pappus-hairs whitish, free, 1.7-1.8 mm long.

Fl. & Fr. : Dec.-Feb.

Ecology : Very common; in rice-fields, damp sandy river-beds, cultivated lands, margins of ponds and jheels, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : National Park, 50, 474; Hazaribagh, 126; Ramgarh, 1509.

Note : According to Grierson (*l.c.*), *G. indicum* L. is a South African plant which is commonly known as *Helichrysum expansum* (Thunb.) Less.

25. GRANGEA Adans.

Grangea maderaspatana (L.) Poir. in Lam., Encycl. Suppl. 2 : 825. 1811; Clarke, Comp. Ind. 37. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 247. 1881; Prain, Bengal Pl. 1 : 593. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 464. 1922. *Artemisia maderaspatana* L., Sp. Pl. ed. 2. 1190. 1763.

Local name : Mustaru.

Prostrate or sometimes ascending, aromatic, annual herbs, 10-25cm long. Stems densely white-pubescent and glandular. Leaves alternate, sessile, lyrate-pinnatifid or almost bipinnatifid, coarsely pubescent on both surfaces, 5-10 cm long, higher ones much smaller; lateral segments distantly toothed or 3 or 5-lobed or pinnatifid, subacute or obtuse at apex, 5-15 × 2-10 mm, terminal segments oblong or trilobed, 0.6-2 × 0.5-0.8 cm. Heads heterogamous, disciform, solitary or 2 together, 6-8 mm in diam., on short leaf-opposed peduncles. Phyllaries obovate or spathulate, coarsely pubescent, green, with scarious margins, 4-4.5 mm long. Corollas yellow, glandular, of female florets *ca* 2.5 mm long, of hermaphrodite ones *ca* 2 mm long. Achenes greenish, compressed, puberulent and glandular, 1.3-1.7 mm long. Pappus whitish, *ca* 0.5 mm long, connate into a fimbriate cup.

Fl. & Fr. : Dec.-May.

Ecology : Very common; in wet grounds, rice-fields, margins of tanks and pools, dried river beds, canals and temporary water courses, etc.

Distribution : Throughout India. Nepal, China, Indo-China, Sri Lanka, Malesia, Egypt, Tropical Africa.

Specimens examined : Ramgargh, 526; Hazaribagh, 1236; Hunterganj, 2191.

Uses : Infusion of leaves is considered as stomachic, antispasmodic and debostrument. The flower buds are introduced into nostrils during epileptic fit to restore consciousness.

26. GUIZOTIA Cass., *nom. cons.*

Guizotia abyssinica (L.f.) Cass. in Curvier, Dict. Sci. Nat. 59 : 248. 1829; Hook. f. in Hook. f., Fl. Brit. India 3 : 308. 1881; Prain, Bengal Pl. 1 : 614. 1903; Haines, For. Fl. Chota Nagpur 517. 1910 & Bot. Bihar & Orissa pt. 4 : 483. 1922. *Polymnia abyssinica* L. f., Suppl. Pl. 383. 1781.

Verbesina sativa Roxb. ex Sims in Curtis, Bot. Mag. t. 1017. 1807.

Local name : Ramtila, Kalatil.

Erect herb, to 30-100 cm tall. Stem hirsute upwards. Leaves opposite, linear-oblong or lanceolate, thin-chartaceous, sessile and semi-amplexicaul at base, obtuse or subacute at apex, subentire or serrate, penninerved, 8-15 × 1.5-4 cm. Heads heterogamous, radiate, 1.2-2.5 cm in diam; peduncles 2.5-5 cm long. Outer phyllaries broadly elliptic or ovate, obtuse, green, denticulate, to 1.2 cm 0.7 cm; inner ones oblong-spathulate, scarious. Ligulate corollas bright yellow, oblong, to 2×1 cm, 3-toothed; tube to 1.5 mm long. Corollas of disc florets 3.5-4 mm long; tube 1-1.2 mm long; lobes obovate, pubescent along margins, 2.3-2.6 mm long. Paleas lanceolate, scarious, ciliate, to 7×2.5 mm. Achenes 4-5 mm long, tipped with hairy base of corolla. Pappus absent.

Fl. & Fr. : Nov.-Jan.

Ecology : Very common; cultivated in the fields, also met with as an escape in field-borders, vacant plots, roadsides, waste places, etc.

Distribution : India : Throughout India particularly in West Bengal, Bihar, Orissa, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Maharastra. Native of tropical Africa, introduced early to India, Himalaya, Nepal and Ethiopia.

Specimens examied : Hazaribagh, 997; Ramgarh, 2210.

Uses : Oil, obtained from seeds, is used in cooking purposes, as an illuminant and in paint, varnish and soap industries. Seed-cake is used for feeding cattle, and as manure.

27. HELIANTHUS L.

Helianthus annus L., Sp. Pl. 904. 1753; Clarke, Comp. Ind. 139. 1876; Prain, Bengal Pl. 1 : 615. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 482. 1922.

Local name : Surajmukhi.

Erect, simple or rarely sparingly branched, robust, annual undershrub, to 1.5 m tall. Leaves usually alternate, broadly ovate to ovate-elliptic, thick-chartaceous, sparsely scabrous, subcordate to truncate at base, acute or shortly acuminate at apex, serrate, 10-15 × 7-10 cm; petiole to 8 cm long. Heads heterogamous, radiate, 8-25 cm across, solitary, nodding. Phyllaries thick, broadly lanceolate, acuminate, minutely dentate, *ca* 2 × 1 cm. Florets yellow. Lamina of ray-florets oblanceolate, *ca* 5 × 1.5 cm. Corollas of hermaphrodite florets *ca* 6 mm long, hirsute outside; lobes ovate, shortly acuminate. Anthers 4-4.5 mm long. Style-branches linear, 7-8 mm long, curled. Achenes 4-angled, 4-5 mm long. Pappus scales 1.5-3 mm long.

Fl. & Fr. : Mar.-July.

Ecology : Common; cultivated in gardens; also found to escape from cultivation or in gardens, waste places, etc.

Distribution : Almost throughout India. Native of N. America, naturalised in many countries of the World, particularly in U.S.S.R., Argentina, U.S.A, Canada, China, Turkey, Italy, France, Chile, Uruguay, England, E. & S. Africa, parts of Asia and Australia.

Specimens examined : Hazaribagh, 1511; Tondwa, 2285.

Uses : Seeds yield an oil which is used in cooking, margarine preparation, as lubricant, for burning purposes and in soap, paint and varnish industries. Oil-cake is used as cattle feed.

28. LAUNAEA Cass.

Key to the Species

1a. Leaf-segments remotely denticulate with non-cartilagenous teeth. Heads on terminal paniculately branched inflorescence ... 1. *L. asplenifolia*

1b. Leaf-segments closely denticulate with cartilagenous white teeth. Heads solitary or in clusters being arranged in a terminal sub-corymbose inflorescence ... 2. *L. procumbens*

1. **Launaea asplenifolia** (Willd.) Hook. f. in Hook. f., Fl. Brit. India 3 : 415. 1881 ('aspleniifolia'); Prain, Bengal Pl. 1 : 630. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 497. 1922. *Prenanthes asplenifolia* Willd., Sp. Pl. 3 : 1540. 1803.

Microrhynchus asplenifolius (Willd.) DC., Prodr. 7 : 81. 1838; Clarke, Comp. Ind. 276. 1876 ('Microrrhynchus').

Local name : Titlia.

Annual or biennial herbs, with milky latex. Stems simple or branched at top, ascending or trailing, 5-20 cm long. Basal radical leaves obovate-oblanceolate, sinuate-lobed to pinnatifid, narrowed at base, obtuse or rounded at apex, 5-12 cm long; lobes broadly ovate-oblong, remotely denticulate with non-cartilaginous teeth, glabrous; cauline leaves few. Heads homogamous, biguliflorus, 1-1.5 cm long, borne in terminal panicle; peduncles bracteate, 4-8 mm long. Phyllaries 3-seriate; outer ones ovate, 2.5-3 mm long; inner ones oblong-lanceolate, 6-8 mm long. Legules yellow; marginal ones purple-tinged on back. Achenes minute, columnar, ribbed with rough ribs. Pappus hairs white, 6-8 mm long.

Fl. & Fr. : Jan.-May.

Ecology : Common; in cultivated fields, grassy disturbed grounds, pasture lands, etc.

Distribution : India : Throughout the plains of India, Andaman Islands. Bangladesh, Myanmar, Tenasserim, Nepal, Bhutan.

Specimens examined : Ramgarh Cant., 1231; Telaiya Dam, 1744; National Park, 2202.

Uses : Roots form a constituent of galactagogue drugs.

2. **Launaea procumbens** (Roxb.) Ramayya & Rajagopal in Kew Bull. 23 : 465. 1969; *Prenanthes procumbens* Roxb., Fl. Ind. 3 : 404. 1832.

Brachyramphus obtuses DC., Prodr. 7 : 177. 1838.

Lactuca obtusa (DC.) Clarke, Comp. Ind. 261. 1876.

Launaea nudicaulis sensu Hook. f. in Hook. f., Fl. Brit. India 3 : 416. 1881, non *Chondrilla nudicaulis* L.; Prain, Bengal Pl. 1 : 630. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 496. 1922.

Local name : Jangli gobi.

Perennial herbs, with yellow juice. Stems simple or sparingly branched, erect or trailing. Basal radical leaves usually sessile, oblanceolate-oblong or spathulate, sinuate-dentate to runcinate-pinnatifid, narrowed at base, obtuse at apex, ± glaucous beneath, 6-15 cm long; lobes closely denticulate with cartilaginous and often white teeth. Heads homogamous, liguliflorus, 1.2-1.5 cm long, solitary or in clusters being combined into a terminal subracemose inflorescences; peduncles bracteate, 0.5-1 cm long. Phyllaries overtopping the pappus; outer phyllaries ovate, 1.5-2 mm long; inner ones oblong-lanceolate, 0.6-1 cm long. Ligules yellow; marginal ones purplish on back. Achenes rugulose, angled or slightly curved or flattened, 3-4 mm long. Pappus hairs white, 6-8 mm long.

Fl. & Fr. : May-Jan.

Ecology : Very common; in disturbed grassy grounds, roadsides, waste places, gardens, river-beds, cultivated fields, forest edges, etc.

Distribution : India : Throughout the plains of India, western Himalaya and Deccan Peninsula. Bangladesh, Pakistan, Afganistan, C. Asia, Egypt, Arabia, Iraq, Iran.

Specimens examined : Ghanghree, 1030; National Park, 1194; Joynagar, 1513.

Uses : Plant is used as fodder, also used by local people in curries.

Note : According to Ramayya and Rajagopal (*l.c.*), the species, which is identified in Indian Floras as *Launaea nudicaulis* (L.) Hook. f., *s.s.* was based on *Chondrilla nudicaulis* L. But C. *nudicaulis* possesses an easily removable homogeneous pappus and its achenes are 0.25-0.3 cm long, unlike *L. nudicaulis* (L.) Hook. f., *s.s.* which is characterised by a persistent heterogeneous pappus and achene being 0.45-0.55 cm long. Thus, the Indian plant is not *L. nudicaulis* (L.) Hook. f., *s.s.*

29. MIKANIA Willd.

Mikania micrantha Kunth in H.B.K., Nov. Gen. Sp. 4 : 134. 1820; Vaid in Ind. For. 99 : 19-22. 1973.

Mikania scandens auct. non (Linn.) Willd. : Clarke, Comp. Ind. 34. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 244. 1881; Prain, Bengal Pl. 1 : 592. 1903.

Mikania cordata auct. non (Burm.f.) Robins. : Koster in Blumea 1 : 504. 1935; Raizada in Ind. For. 84 : 648. 1958; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 146. 1980.

Annual. Stems slightly pubescent or glabrous, to 6 m long. Leaves opposite, ovate-deltoid, cordate at base, acute or acuminate at apex, ± coarsely undulate-dentate, subglabrous or sparsely pubescent on both surfaces, minutely glandular beneath, 3-10 × 1.5-6 cm; petioles 2-4 cm long. Heads homogamous, greenish-white, cylindrical, 1.2-1.5 mm in diam., numerous, in corymbs borne on short axillary branches. Phyllaries 4, 1-seriate, membranous, 2-3-veined, glabrous or sparsely puberulous, 5.5-6 mm long. Corollas greenish-white, 4-5 mm long. Achenes narrowly oblong, dark brown, glabrous, glandular. Pappus at first white, later turning reddish-brown, 2.5-3 mm long.

Fl. & Fr. : Nov.-Feb.

Ecology : Not common; in roadsides, waste places, etc.

Distribution : India : West Bengal, Bihar, Chotanagpur, Sikkim, Assam, Manipur, Tripura. Native of S.America, naturalised in C. America, W. Indies, Bhutan, Nepal.

Specimens examined : Keredari, 649 ; Bishnugarh, 1967.

Uses : Stems and leaves are eaten by cattle. Leaf-extract is applied to itches and in form of poultice to wounds.

Note : Vaid (*l.c.*) pointed out that most of the materials identified as *M. scandens* (L.) Willd. or *M. cordata* (Burm.f.) Robins. in Indian Herbaria belong to this species. According to him, *M. cordata* is a N. American species, also distributed in Philippines and *M. scandens* is distributed in N. America, Taiwan, Philippines, Celebes and Malesia.

30. PARTHENIUM L.

Parthenium hysterophorus L., Sp. Pl. 988. 1753; Woodson *et al.* in Ann. Missouri Bot. Gard. (Fl. Panama) 62 : 1094. 1975.

Annual herbs, 10-50 cm tall. Stems much-branched, strigillose. Leaves alternate, pinnately dissected, to 15 × 8 cm, strigillose on both surfaces; segments opposite to subopposite, lanceolate-oblong, decurrent at base, entire or lobed; petiole to 4 cm long. Heads small, heterogamous, radiate, 4-6 mm across, borne in dichotomous, lax, terminal panicles. Outer involucre cupulate, 4-5 mm in diam.; phyllaries 2-seriate, 5 in each series, narrowly ovate, 1.5-2 mm long; inner phyllaries each attached adaxially to base of a ray-floret, two disc paleas and two included sterile disc florets also attached to base of the ray floret on adaxial side (the whole unit termed as "achene complex"). Paleas elliptic, fimbriate at apex, *ca* 1 mm long. Ligulate corollas ovate, emarginate, 0.6-0.7 mm long.Corollas of

disc florets narrowly funneliform, 0.5-0.6 mm long. Achenes 1.8-2 mm long. Pappus of 2 broad awns of 0.5 mm long.

Fl. & Fr. : Almost throughout the year, but chiefly during July-Oct.

Ecology : Common; in waste places, roadsides, railway tracks, fallow lands, etc.

Distribution : India : Uttar Pradesh, Bihar, West Bengal, Orissa, central and south India. Native of America, now pantropical.

Specimens examined : Hazaribagh, 251; Chatra, 557; Ramgarh, 2242.

Uses : Plant is used as tonic, febrifuge and analgestic. Decoction of roots is given in dysentery.

31. PSEUDELEPHANTOPUS Rohr.

Note : Often mistaken as "PSEUDOELEPHANTOPUS". Cronquist (Compositae pp. 350-353 in I.L. Wiggins & D.M.Porter, Flora of Galapagos, 1971) gives reasons supporting the spelling "PSEUDELEPHANTOPUS".

***Pseudelephantopus spicatus** (Juss.) C.F.Baker in Trans. Acad. Sci. St. Louis 12 : 55. 1902; Koster in Blumea 1 : 467. 1935 ; Dutta & Mitra in Ind. For. 87. 308. 1961. *Elephantopus spicatus* Juss. in Aublet, Hist. Pl. Guiane 2 : 808. 1775.

Rigid herbs, 10-70 cm tall. Stems striate, sometimes hollow; branches dichotomous, ascending, strigose. Leaves alternate, chartaceous, the lower oblanceolate or obovate-oblong, attenuate at base, acute at apex, sinuate or sparsely serrate, hispid above, strigose and resin-dotted beneath, 4-20 × 2-6 cm, becoming shorter and more oblong elliptic upwards and

marging into bracts of inflorescence. Glomerules solitary in axils, to 1.5cm long and 1 cm across, few-headed, the individual heads overlapping, each with 4 similar heirmaphrodite florets. Phyllaries 8, in 4 decussate pairs, outer pairs progressively shorter, inner 2 pairs subequal, oblong-lanceolate, boat-shaped, mucronate, keeled, 0.8-1 cm long. Corolla white or lavender ; tube 5-6 mm long ; lobes 1.5-2 mm long. Style branches 1-1.2 cm long. Achenes 5-7 mm long. Pappus bristles 6-10; the two lateral ones longest, 4-6 mm long, dilated at base, doubly bent ; 2 adaxial ones longer than others, 3-5 mm long, straight; the remaining ones shorter and less conspicuous.

Fl. & Fr. : Dec.-Mar.

Ecology : Rare; in waste places near village surroundings, pastures and forest clearings.

Distribution : India ; West Bengal, Bihar,. Tropical Mexico, West Indies, Central America, South America, Chile, Africa and the Pacific.

Specimen examined : Ramgarh, 534.

Uses : Plant is used to make brushes and brooms. A syrup from the plant is used to cure coughs. The plant is also useful in warming cattle.

32. PULICARIA Gaertn.

Pulicaria foliolosa DC., Prodr. 5 : 480. 1836; Clarke, Comp. Ind. 128. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 298. 1881; Prain, Bengal Pl. 1 : 604. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 477. 1922; Mooney, Suppl. Bot. Bihar & Orissa 76. 1950.

Erect, much-branched, leafy annual herbs, 20-50 cm tall; stems and branches pubescent. Leaves alternate, sessile, linear-oblong or oblanceolate, semi-amplexicaul at base, with apiculate, recurved apex, entire, viscidly hairy, 2.5-10 × 0.6-1.8 cm. Heads small, woolly and glandular, lateral and terminal, 6.5-8 mm across. Peduncles slender, pilose

or villous. Phyllaries almost setaceous, subequal, glandular, and sparsely pilose or ciliate, 3.5-4 mm long. Ray-florets filiform, tubular, 3-toothed; ligules o. Achenes minute, oblong, terete, hairy. Outer row of pappus a minute toothed cup, inner row of few white hairs about twice as long as achenes.

Fl. & Fr. : Apr.-June.

Ecology : Very common; in river-banks, waste places, roadsides, etc.

Distribution : India : Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Chotanagpur, Central India and Deccan Peninsula. Pakistan, Afganistan.

Specimens examined : National Park, 951; Hunterganj, 998; Patratu, 1719.

Use : Plant is used as fodder for cattle and camel.

33. SOLIVA Ruiz & Pavon

Soliva anthemifolia (Juss.) R. Br. ex Less., Syn. Comp. 210. 1832; Bhattacharyya in Bull. Bot. Surv. India 5 : 375. 1963. *Gymnostyles anthemifolia* Juss. in Ann. Muss. Paris 4 : 262. 1804.

Diffuse, annual herbs, spreading radially by rigid stolons. Stems much shorter than leaves. Leaves approximate, alternate, 3-10 cm long, bipinnatifid; segments lanceolate-oblong, acute and apiculate at apex, acutely dentate, thinly white-hairy on both surfaces, 6-10×3-5 mm; petioles broadened at base. Heads heterogamous and disciform, many, approximate, greyish green, at first small, 3-4 mm in diam., enclosed within leaf-bases, becoming almost spherical and of 0.8-1 cm diam. at fruiting. Phyllaries oblong, ± 2 - seriate, thinly pilose, 3.5-4 mm long. Disc florets ± 20; corollas 2.5-3 mm long., greenish yellow, pubescent, gradually widened upwards. Achenes crowded, cuneate, truncate, with thick corky

transversely wrinkled wings in lower half, hairy on rounded upper angles, 2-2.5 mm long, tipped with hardened, 1.5-2 mm long, persistent style. Pappus absent.

Fl. & Fr. : Dec.-Feb.

Ecology : Rare; in cultivated fields, dry puddles, ditches, etc.

Distribution : India : Uttar Pradesh, Bihar and Rajasthan. native of S. America, distributed and naturalised in Nepal, tropical Australia (Queensland), New South Wales, Java.

Specimens examined : Ramgarh Cant., 1230.

34. SONCHUS L.

Key to the Species

1a. Achenes smooth, strongly compressed and narrowly winged. Auricles of cauline leaves rounded, compressed ... 1. *S. asper*

1b. Achenes transversely rugose, weakly compressed, with a slightly thickened margin, but never winged. Auricle of cauline leaves acute, spreading ...2. *S. oleraceus*

1. **Sonchus asper** (L.) Hill. Br. Herb. 1 : 47, t. f. 2. 1756; Clarke, Comp. Ind. 275. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 414. 1881; Prain, Bengal Pl. 1 : 629. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 498. 1922; *S. oleraceus* L. var. *asper* L., Sp. Pl. 794. 1753.

Local name : Didhi.

Erect, slender, shortly branched, glabrous, annual herbs, 20-100 cm tall. Basal leaves petioled, oblanceolate or spathulate, undivided or pinnatilobed to partite, spinulosely dentate; cauline ones semiamplexicaul, with rounded, compressed basal auricles, acuminate at apex, higher ones undivided, narrow-lanceolate. Heads homogamous, lighliflorus, 4-20 together borne on 1-3 cm long glandular-pubescent peduncles.

Involucre 6-8 mm in diam; phyllaries lanceolate, glabrous, 4-10 × 1.5-3 mm. Corollas yellow; basal tubes 7-8 mm long, pubescent; ligules 5-6 mm long. Achenes obovoid-oblong, brown, smooth, strongly compressed and narroly winged, 2.5-3 mm long. Pappus 7-8 mm long.

Fl. & Fr. : Dec.-Apr.

Ecology : Very common; in roadsides, waste places, railway embankments, margins of cultivated grounds, gardens, forest edges, etc.

Distribution : Throughout India. Asia, Australia, Europe, N. Africa, N. and S. America.

Specimens examined : Hazaribagh, 507; Hunterganj, 938; Churchu, 2295.

Uses : Young shoots are eaten as salad. Dried plants are pounded and applied to wounds and boils.

2. **Sonchus oleraceus** L., Sp. Pl. 794. 1753; Clarke, Comp. Ind. 275. 1876; Hook. f. in Hook. f., Fl. Brit. Ind. 3 : 414. 1881; Prain, Bengal Pl. 1 : 629. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 498. 1922.

Local name : Dudhi, Dodak.

Erect, glabrous, annual herbs, 25-125 cm tall. Basal leaves ovate, mid-cauline ones usually runcinate-pinnatifid, to 20 cm long with 1-3 pairs of lateral segments of 1-5 cm long and large deltoid or hastate terminal segments, coarsely dentate, with acute and spreading auricles; higher ones undivided, narrow-lanceolate. Heads homogamous, disciform, 6-10 together on glandular-pubescent or glabrous 2-5 cm long peduncles. Involucre campanulate, 7-9 mm across. Phyllaries lanceolate, floccose, with a few glandular hairs, 0.5-1 cm long. Corolla yellow; basal tubes 6-7 mm long; ligules 5-6 mm long. Achenes oblanceolate,

3-ribbed on each face, transversely rugose, brown, weakly compressed with a slightly thickened margin, 2.5-3 × 0.8-1 mm. Pappus 6-8 mm long.

Fl. & Fr. : Feb.-June.

Ecology : Common, in roadsides, cultivated grounds, waste places, gardens, etc.

Distribution : Throughout India. S.W.Asia, Australia, China, Sri Lanka, S. Africa, N. and S. America.

Specimens examined : National Park, 397; Chatra, 985.

Uses : Plant is used for liver-troubles. Leaf and root-extract is used in indigestion and as febrifuge. Stems are given as tonic and sedative. Poor people consumed the plant as salad and vegetable.

35. SPHAERANTHUS L.

Sphaeranthus indicus L., Sp. Pl. 927. 1753; Hook. f. in Hook. f., Fl. Brit. India 3 : 275. 1881; Prain, Bengal Pl. 1 : 601. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 473. 1922; Robyns in Kew Bull. 1924 : 197. 1924.

S. hirtus Willd., Sp. Pl. 3 : 2395. 1803; Clarke, Comp. Ind. 97. 1876.

Local name : Mundi.

Prostrate or decumbent-ascending, aromatic herbs, 10-25 cm tall. Stems divaricately much-branched, with irregularly and toothed wings, glandular-pubescent. Leaves alternate, sessile, obovate-spathulate or oblanceolate-spathulate, attenuate, semiamplexicaul and decurrent at base,

obtuse or acute and spinulose-mucronate at apex, coarsely serrate-dentate, glandular-pubescent on both surfaces and spreading whitish pilose on veins, 1-5 × 0.5-2.5 cm. Glomerules ovoid-globose, 1-1.5 cm long and 0.8-1.5 cm in diam.; individual heads heterogamous, disciform; peduncles winged, 1-3.5 cm long. Subtending bracts linear, apiculate, 2.5-3 mm long. Phyllaries 12-15, 2-seriate, 2.5-3 mm long; outer ones similar to subtending bracts; inner ones linear-oblanceolate, acuminate, ciliate at upper half. Florets purplish. Female florets 10-12; corollas tubular, 1.2-1.5 mm long, narrowed at apex, becoming swollen at maturity on lower half. Hermaphrodite florets 1-3; corollas 1.7-2 mm long, tubular at uper part, becoming swollen at maturity at lower part, with 5-toothed limb. Achenes of female florets 4-5-angled, puberulous on ribs, brown, 0.8-1 mm long; those of hermaphrodite florets narrowly obconic, sterile, 1.2-1.5 mm long. Pappus absent.

Fl. & Fr. : Nov.-Feb.

Ecology : Very common; in rice fields and along field-borders, margins of ponds and jheels, roadsides, waste places, etc.

Distribution : Almost throughout India including tropical Himalaya. Nepal, Myammar, Sri Lanka, Malay Archipelago, Australia.

Specimens examied : Ichak, 324, 356; Chouparan, 1681.

Uses : Plant-extract is used in hepatic and gastric disorders. Seeds and roots are used as anthelmintic. Decoction of leaves is used in different chest troubles. Plant is used as fish poison.

36. SPILANTHES Jacq.

Spilanthes calva DC., in Wight, Contrib. Bot. India 19. 1834; Koster & Philipson in Blumea 6 : 354. 1950; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 221. 1980.

S. acmella (L.) Murr. var. *calva* (DC.) Clarke, Comp. Ind. 138. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 307. 1881; Haines, Bot. Bihar & Orissa pt. 4 : 482. 1922.

S. acmella auct. non (L.) Murr. : Clarke, Comp. Ind. 138. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 307. 1881; Prain, Bengal Pl. 1 : 614. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 482. 1922.

Erect-ascending, annual herbs, 10-30 cm tall. Stems sparsely pubescent, much-branched, weak. Leaves opposite, ovate, cuneate to abruptly attenuate at base, acute or subobtuse at apex, entire or undulate to irregularly subcrenate, pubescent, on both surfaces, 2-5 × 1.2-3 cm; petioles 0.6-1.5 cm long, pubescent. Heads solitary or subpanicled, ovoid, 0.6-1 cm long and 5-7 mm across. Peduncles 5-10 cm long. Phyllaries 1-seriate, oblong-lanceolate, pubescent, 3.5-4.5 mm long. Ray-florets absent or when present minute, 2-fid, yellow. Corollas of disc-florets yellow, 1.5-2 mm long, with 4-5-lobed limb. Paleas 3-3.5 mm long. Achenes oblong or narrowly obovoid, truncate, compressed, dark brown, nearly glabrous. Pappus absent.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in marshy grounds, margins of tanks and pools, sandy river beds, borders of rice-fields, etc.

Distribution : Throughout India including Himalaya. Nepal, Myanmar, Sri Lanka, Malesia.

Specimens examied : Hazaribagh, 9; Raja Rappa, 865; Ghanghree, 1512.

Uses : Florets are chewed for relief in throat affections and paralysis of tongue. Plant-extraction is used in dysentery and also is used as diuretic.

37. SYNEDRELLA Gaertn.

***Synedrella nodiflora** (L.) Gaertn., Fruct. 2 : 456, t. 171. 1791; Clarke, Comp. Ind. 139. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 308. 1881; Prain, Bengal Pl. 1 : 615. 1903. *Verbesina nodiflora* L., Cent. I. Pl. 28. 1755.

Erect herbs, 20-75 cm tall. Stems much-branched, appressed pilose. Leaves opposite, ovate, ovate-lanceolate or ovate-elliptic, rounded or cuneate at base, acute or shortly acuminate at apex, shallowly serrate-dentate, strongly 3-nerved from base, appressed pilose on both surfaces, 3-8 × 1-5 cm; petioles 1-3 cm long, ciliate at base. Heads heterogamous, radiate, sessile, in upper leaf-axils, 3-4 mm across. Phyllaries 2-3 seriate, ovate-elliptic; outer 2 foliaceous, pilose, 1-1.3 cm long; inner ones smaller, 6-8 mm long. Florets yellow, ray-florets 5-8. Ligulate corollas of disc-florets 3.5-4 mm long. Paleas lanceolate, 5-6 mm long. Achenes of ray-florets oblanceolate, 4-4.5 mm long, blackish with pale narrow wings bearing lacerate appendages; of disc-florets narrowly oblanceolate, compressed, puberulous, 4-4.2 mm long. Pappus awns 2-4.5 mm long, puberulous.

Fl. & Fr. : Apr.-July.

Ecology : Common; in waste places, abundoned garden-lands, along roadsides, etc.

Distribution : India : Assam, West Bengal, Bihar, Eastern Peninsuala and Andaman Islands. Native of West Indies, introduced in Nepal, China, Malaya, Polynesia.

Specimens examined : Hazaribagh, 494; Mandu, 1354.

Uses : Leaves are used as laxative. Leaf-extract is used in rheumatism.

38. TAGETES L.

Key to the Species

1a. Involucre 1.5-2 cm long; phyllaries 8-13. Heads solitary, 6-8 cm across. Peduncles enlarged above. Glands of leaflets few, marginal near base of teeth ... 1. *T. erecta*

1b. Involucre 1-1.2 cm long; phyllaries 5-7. Heads cymose, rarely solitary, 3-4 cm across. Peduncles scarcely enlarged above. Glands of leaflets numerous, scattered. ... 2. *T. patula*

1. ***Tagetes erecta** L., Sp. Pl. 887. 1753; Clarke, Comp. Ind. 143. 1876; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 234. 1980.

Local name : Ganda, Gultera.

Erect, simple or sparingly branched, strong-scented, annual herbs, 15-60 cm tall. Stems glabrous or puberulent, ribbed. Leaves 5-20 cm long; leaflets or segments opposite or alternate, lanceolate oblong, acute to acuminate at apex, serrate to subentire, glabrous or puberulent near base, with few marginal glands near base of teeth, 1-5 × 0.2-1 cm. Heads solitary, 6-8 cm across; peduncles 5-15 cm long, clavate-inflated above, with several setiform-dissected bracts near base. Involucre campanulate, 1.5-2 cm long; phyllaries 8-13, marginally fused to short erect triangular tips, with elliptic glands in two submarginal rows and 2-7 ovate at free tips. Ray-florets 5-8(-10); basal tube 6-7 mm long; ligule yellow, obovate, entire or deeply cleft, 0.8-1.5 cm long. Disc florets 100-200; corollas yellow, 1.2-1.5 cm long, pubesent within. Achenes blackish, angled, pubescent on angles, 7-9 mm long. Pappus-scale 3-6 mm long, united with 1 or 2 longer, flattened, 0.8-1 cm long bristles.

Fl. & Fr. : Oct.-Dec.

Ecology : Common; cultivated, but also met with as an escape in waste places, roadsides, etc.

Distribution : Throughout India. Native of Mexico, naturalised in tropical and subtropical regions of Old and New World.

Specimens examined : Hazaribagh, 743 ; Telaiya Dam, 1957.

Uses : Infusion of plant is used against rheumatism, cold and bronchitis. Leaves are used by local people in renal trobules and muscular pains and applied to boils and carbuncles. Florets are used by tribals in eye troubles.

2. **Tagetes patula** L., Sp. Pl. 887. 1753; Prain, Bengal Pl. 1 : 607. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 487. 1922.

Local name : Genda, Gendu.

Erect, strongly aromatic, much-branched, annual herbs, to 50 cm tall. Leaflets or segments narrowly lanceolate-oblong, acutely serrate, with numerous scattered glands. Heads cymose, sometimes solitary, 3-4 cm across; peduncles 3-15 cm long, scarcely thickened at top. Involucres 1-1.2 cm long with 5-7 triangular, acute teeth. Ligule or ray-florets yellow with brownish red markings, 1-1.5 cm long, emarginate at apex. Pappus of 1-2 long awned scales and 2-3 shorter blunt ones.

Fl. & Fr. : Sept.-Dec.

Ecology : Very common; cultivated; but also met with as an escape in roadsides, cultivated grounds, waste places, etc.

Distribution : Throughout India. Native of Mexico, naturalised throughout the tropical and subtropical regions of both New and Old World.

Specimens examined : Barkattwa, 519; Hazaribagh, 754.

Uses : Plant yields a volatile oil which is used in perfumery. Florets are employed in production of *Attare*. Oil extracted from fresh floral heads is used as an antiseptic, fly repellent and modifier in hair lotions. Leaf-juice is applied to cuts and wounds.

39. TITHONIA Desf. ex Juss.

***Tithonia diversifolia** (Hemsl.) A. Gray, Proc. Amer. Acad. Arts 19 : 5. 1883; Blake, Contr. U.S.Natl. Herb. 20 : 434. 1921; Grierson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 218. 1980. *Mirasolia diversifolia* Hemsl., Biol. Centr. Amer. Bot. 2 : 168, t. 47. 1881.

Erect, robust undershrubs, 2-3 m tall. Stems striate, sparsely pubescent in younger parts. Leaves alternate, usually 3-5 lobed or upper ones ovate-deltoid or oblanceolate and unlobed, tapering towards the base, acuminate at apex, crenate-serrate, 3-nerved from base, hispidulous above, pubescent and glandular beneath, 5-15 × 2.5-10 cm. Petioles 2-8 cm long, with caducous basal auricles. Heads 5-6 cm in diam. heterogamous, radiate; peduncles 10-25 cm long. Phyllaries 3-4 seriate, graduated, imbricate, ovate-lanceolate to obovate-cuneate, obtuse, finely pubescent, 10-20 × 3-6 mm. Ray florets 10-12, yellow; ligules elliptic, 4-5 cm long, 2-3 dentate at apex. Corollas of disc florets yellow, 1.5-2 cm long, puberulous. Paleas oblong-spathulate, abruptly acuminate, 1-1.2 cm long. Achenes dark brown, sericeous, 5-6 mm long. Persistent longer, pappus scales 2, 4-5 mm long; intermediate scales 6, shorter, 2-2.5 mm long, connate at base.

Fl. & Fr. : Nov.-Feb.

Ecology : Common; in waste ground, ravine slopes, river banks; also cultivated in gardens.

Distribution : Throughout India. Native of Tropical South America, introduced and naturalised in China, Myanmar, Malesia and S. Africa.

Specimens examined : Hazaribagh, 701, 2291.

Uses : Well-decomposed plants form a good nitrogenous fertilizer for vegetable farming and for use in paddy fields. Mixed with excremental manure of cattle and horse, plants are used in preparation of compost.

40. TRIDAX L.

Tridax procumbens L., Sp. Pl. 900. 1753; Clarke, Comp. Ind. 142. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 311. 1881; Prain, Bengal Pl. 1 : 618. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 486. 1922.

Procumbent-ascending, hirsute, branched, annual-perennial herbs, 15-50 cm long. Leaves opposite or sometimes alternate above, ovate or ovate-lanceolate, cuneate at base, acute or subacuminate at apex, serrate to coarsely incised-dentate, scabrid-hirsute on both surfaces, 2-7 × 0.6-4 cm; petioles 0.8-2.5 cm long. Heads heterogamous, radiate, solitary, 1-1.5 cm in diam.; peduncles slender, hirsute and glandular, 10-30 cm long. Outer phyllaries ovate, acuminate, herbaceous, hirsute, 3-6 mm long; inner phyllaries oblong-lanceolate, membranous, 5-7 mm long. Ray-florets 5-6; corollas ligulate, pale yellow to creamy white, obovate-oblong, 6-8 mm long, 2-3 - lobed at apex. Corollas of disc florets bright yellow, 4.5-5 mm long, with pubescent, recurved segments. Achenes narrowly obconic, truncate at apex, blackish,sericeous, 2-2.5 mm long. Pappus-awns 15-20, unequal, 4-6 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; in roadsides, grassy waste places, lawns, cultivated grounds, gardens, river-beds, forest edges and forest clearings.

Distribution : Throughout India. Native of Central America, now widespread throughout tropical and subtropical regions of the world.

Specimens examined : Hazaribagh, 11; Jhumri Telaiyas, 166; Etkhori, 2239.

Uses : Leaves are used in bronchial catarrh, dysentery and diarrhoea. Leaf-juice is used as insecticidal and piscicidal, also to check haemorrhage of wounds.

41. VERNONIA Schreb., *nom. cons.*

Key to the Species

1a. Heads 3-5-flowered. Climbing shrubs ... 3. *V. elaeagnifolia*

1b. Heads more than 10-flowered. Erect herbs :

2a. Achenes not ribbed, 0.12-0.16 cm long ... 2. *V. cinerea*

2b. Achenes ribbed, 0.4-0.6 cm long ... 1. *V. anthelmintica*

1. **Vernonia anthelmintica** (L.) Willd. Sp. Pl. 3 : 1634. 1803; Clarke, Comp. Ind. 10. 1876; Hook. f. in Hook. f. Fl. Brit. India 3 : 236. 1881; Haines, Bot. Bihar & Orissa pt. 4 : 460. 1922. *Conyza anthelmintica* L., Sp. Pl. ed. 2, 1207. 1763.

Centratherum anthelminticum (Linn.) O. Kuntze, Rev. Gen. Pl. 1 : 320. 1891; Prain, Bengal Pl. 1 : 588. 1903.

Vern. name : Somraj.

Erect, robust, much-branched, annual herbs, 50-150 tall. Stems striate, pubescent. Leaves alternate, elliptic or oblanceolate, attenuate at base, acute to subacuminate at apex, coarsely and sharply serrate, sparsely pilose above, pubescent specially on veins beneath, 7-13 × 2-5 cm; petioles 0 to 5 mm long. Heads homogamous, discoid, in loose corymbs, sometimes few or solitary, 1.2-2 cm in diam., 30-40-flowered; peduncles hairy, 3-3.5 mm long. Phyllaries 4-5-seriate; outer ones linear, herbaceous, shorter; intermediate ones oblong, with herbaceous hairy tips, equalling or shorter than the inner; inner ones largest, linear-oblong, stiffly membranous, straw-coloured, with green apices. Corollas mauve, 0.8-1 cm long. Achenes black, 10-ribbed, pubescent on ribs, glandular on grooves between, 4-6 mm long. Pappus tawny white, later becoming red; outer rows paleaceous, persistent, 0.5-0.8 mm long; inner rows somewhat flattened, deciduous, 6-7 mm long.

Fl. & Fr. : Sept.-Jan.

Ecology : Very common; along roadsides, waste grounds, in forests, etc.

Distribution : Throughout India; Sri Lanka, Nepal, Afganistan, Laos.

Specimens examined : National Park, 196 ; Ichak, 362; Pratappur, 1887.

Uses : Plant has anthelmintic properties. It is also used as a remedy for various skin diseases. The achenes are ground to a paste with lime juice which is employed for destroying lice. They are also used in conjuction with other medicines for leucoderma.

Note : Ramamoorthy (Fl. Hassan Dist. 607. 1976), Babu (Herb. Fl. Dehra Dun 251. 1977) and others adopted *Centratherum anthelminticum* (L.) Kuntze as the correct same for this taxon.

2. **Vernonia cinerea** (L.) Less. in Linnaea 4 :291. 1829; Clarke, Comp. Ind. 20. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 233. 1881; Prain, Bengal Pl. 1 : 590. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 460. 1922. *Conyza cinerea* L., Sp. Pl. 862. 1753.

Local name : Daudotpala.

Erect or decumbent-ascending, simple or much-branched, annual-perennial herbs, 10-100 cm tall. Stems finely striate, appressed pubescent. Leaves membranous, alternate, ovate, elliptic or ovate-lanceolate, narrowed at base into a 0.5-1.5 cm long petiole, subentire or repand-dentate, glabrate or finely pubescent above, pubescent and punctate beneath, 0.5-8 × 0.3-0.35 cm. Heads homogamous and discoid, in lax terminal corymbs of usually 4-10 or more together, 4-5 mm long and 3-3.5 mm across, 20-30-flowered; Peduncles hairy, 0.3-2 cm long. Phyllaries linear - lanceolate, 3-4 seriate, 1-nerved, acuminate with awned tip, pubescent, often purple tinged at apex, 3-4 mm long. Corolla bluish mauve, pink or rarely white, 4-5 mm long; lobes hairy. Achenes dark brown or balckish, finely hairy, 1.2-1.6 mm long. Pappus whitish, 2-seriate, outer shorter ones 0.5-0.6 mm long, inner ones 3-4 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; in waste grounds, garden lands, agricultural fields, along roadsides, grassy places, etc.

Distribution : Throughout India. Tropical Asia, Africa, Australia, and New Zealand.

Specimens examined : Hazaribagh, 18, 252; Gola, 774; Simaria, 1822.

Uses : Infusion of plant with quinine makes a useful combination against malaria. Juice is given in incontinence of urine. Roots are used as an anthelmintic, their decoction is given in diarrhoea and stomach-ache, for cough and colic. Seeds are anthelmintic.

*3. **Vernonia elaeagnifolia** DC. Prodr. 5 : 22. 1836; Clarke, Comp. Ind. 24. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 237. 1881.

Climbing shrubs. Branches long, finely grooved, hoary-pubescent. Leaves alternate, elliptic-oblong, rounded at base, acute or obtuse at apex, entire, glabrous above, loosely silky beneath, 2.5-5 × 1-2 cm; Petiole slender, 4-5 mm long. Heads small, homogamous and discoid, 5-6 mm in diam., 3-5-flowered, about 3 together at end of divaricating branches of terminal loose panicles. Involucre 2.5-3 mm across. Phyllaries scarious to herbaceous; outer ones obovate, acute, pubescent outside, *ca* 1 × 0.8 mm; intermediate ones obovate ciliate, fibricate on margins, to 2.5 × 1.5 mm; inner ones oblong, thinly ciliate on margins, to 3 × 1 mm. Corolla-tube 4-5 mm long; lobes lanceolate. Anthers linear, sagittate, 2-2.5 mm long. Achenes compressed, 5-8-ribbed, glabrous, 2-2.5 mm long. Pappus 1-seriate, barbellate, white, parsistent, 4-4.5 mm long, mixed with few outer hairs.

Fl. & Fr. : Dec.-Mar.

Ecology : Common; planted extensively in garden-walls, surrounding walls of the house, etc.; also self-grown.

Distribution : India : Bihar, West Bengal, Orissa, Eastern Peninsula and elsewhere in India. Myanmar, Siam.

Specimens examined : Hazaribagh, 707; Ramgarh, 1880.

42. VICOA Cass.

Vicoa indica (L.) DC. in Wight, Contrib. Bot. India 10. 1834; Clarke, Comp. Ind. 127. 1876; Haines, Bot. Bihar & Orissa pt. 4 : 476. 1922; *Inula indica* L., Sp. Pl. ed. 2, 1237. 1763.

Vicoa auriculata Cass. in Ann. Sci. Nat. Bot. 17 : 418. 1829; Hook. f. in Hook. f., Fl. Brit. India 3 : 297. 1881; Prain, Bengal Pl. 1 : 604. 1903; Haines, For. Fl. Chota Nagpur 516. 1910.

Erect, slender, rigid, annual herbs, to 1 m tall. Stems terete, reddish, sparsely pubescent, with spreading branches. Leaves alternate, sessile, oblong-lanceolate, cordate and auriculate at base with rounded or hastate auricles, acute to acuminate at apex, entire or serrulate, pubescent on both surfaces, glandular punctate beneath, 3-7 × 0.4-2 cm. Heads 0.6-1 cm in diam., on slender spreading peduncles. Phyllaries linear-lanceolate, pubescent on midrib, 1.5-4 × 0.4-0.5 mm ; ray-florets 25-30; ligules yellow, *ca* 5 × 1 mm. Corollas of disc-florets yellow, 2-3 mm long. Achenes oblong, terete, faintly 5-ribbed, brown, appressed-pubescent, 0.7 mm long. Pappus-hairs few, free at base, white, *ca* 2 mm long.

Fl. & Fr. : Dec.-May.

Ecology : Very common; in roadsides, abandoned places, as a weed in cultivation, in forests, etc.

Distribution : Throughout drier parts of India. Sri Lanka, Nepal, Myanmar, Indo-China, W. China, Thailand, W. Tropical Africa.

Specimens examined : National Park, 79, 427; Raja Rappa, 875; Koderma Forest, 2196.

Uses : Plant is used as fodder; also used medicinally.

Note : Kitamura and Gould (in Hara *et al.*, Enum. Fl. Pl. Nepal 3 : 35. 1982) however, adopted *Pentanema indicum* (L.) Ling as the correct name for this taxon.

43. WEDELIA Jacq., *nom. cons.*

Wedelia chinensis (Osbeck) Marr., Philipp. J. Sci. 12 : 111. 1971; Grierson in Dassn. & Fosb., Rev. Handb. Fl. Ceylon 1 : 215. 1980. *Solidago chinensis* Osbeck, Dagbok Ostind. Resa. 241. 1757.

Verbesina calendulacea L., Sp. Pl. ed. 2, 1272. 1763.

Wedelia calendulacea (L.) Less., Syn. Gen. Comp. 222. 1832, non Pers. 1870; Clarke, Comp. Ind. 136. 1876; Hook. f. in Hook. f., Fl. Brit. Ind. 3 : 306. 1881; Prain, Bengal Pl. 1 : 611. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 481. 1922.

Local name : Bhanra.

Stems frequently rooting at nodes, usually reddish. Leaves opposite, oblanceolate, subsessile, attenuate at base, subacute or obtuse at apex, 3-nerved, subentire or with 1-2 shallow serrations on each side, shortly appressed hispid on both surfaces, 2.5-5.5 × 0.5-1.5 cm. Heads heterogamous, radiate, 2-3.5 cm in diam.; peduncle to 15 cm long, swollen below involucre. Outer phyllaries 5, oblong, 7-8 mm long, acute or obtuse, appressed-pubescent; inner phyllaries lanceolate, 5-7 mm long. Ray-florets 8-12; basal tube *ca* 1 mm long; ligule 6-8 mm long, yellow, 2 to 3-dentate at apex. Corolla of disc-florets yellow, 3-3.5 mm long. Paleas lanceolate, concave, 5-5.5 mm long. Achenes dark-brown, rugulose, glabrous, 4-4.5 × 2.5-2.7 mm, those of ray-florets triquetrous, those of disc-florets compressed. Pappus a minute irregularly margined withered cup at maturity.

Fl. & Fr. : Apr.-Sept.

Ecology : Common; in banks of rivers, shady grassy localities, vacant plots, forest edges, etc.; also planted in gardens.

Distribution : Almost throughout India. Sri Lanka, Malesia, China, Japan.

Specimens examined : Hazaribagh, 730; Ramgarh, 1118.

Uses : Leaves are used for dyeing hairs and for promoting their growth. Leaves are used in cough. Decoction of plant is used in menorrhagia and uterine haemorrhages.

44. XANTHIUM L.

Xanthium indicum Koen.in Roxb., Fl. Ind. 3 : 601. 1832; Majumder in Bull. Bot. Surv. India 13 : 142. 1971; Grierson in Dassan. & Fosb., Rev. Hand. Fl. Ceylon 1 : 209. 1980.

X. strumarium auct. non Linn. : Clarke, Comp. Ind. 132. 1876; Hook. f. in Hook. f., Fl. Brit. India 3 : 303. 1881, *p.p.*; Prain, Bengal Pl. 1 : 607. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 478. 1922.

Local name : Chhota-gokhru.

Erect, simple or branched, annual-biennial robust herbs, 1-2 m tall. Stems furrowed, shortly pubescent, brown blotched. Leves alternate, broadly triangular-ovate or suborbicular, palmately 3 to 5-lobed, cuneate at base, acute at apex, irregularly dentate, hispidulous on both surfaces, glandular beneath, 3-15 × 2.5-15 cm. Heads homogamous, unisexual, monoecious. Male heads : 4.5-5 mm in diam. Phyllaries 1-2 seriate, lanceolate to linear, pubescent, 2.5-3 mm long. Corolla greenish, 2-3 mm long; lobes hairy. Stamens exserted beyond the corolla mouth. Paleas oblong, pubescent near apex, 2-2.5mm long. Female heads: ovoid, 5-6 mm long at flowering time, covered with spines and glands; florets each consisting of a narrowly ovoid ovary, 2-2.5 mm long; style 2.5-4 mm long, divided almost to base. Involucres finally 2-2.5 mm

long, patent hairy, with slightly incurved and 3-5 mm long prickles. Achenes narrowed-ovoid or elliptic, 1.3-1.5 mm long, 3-4 mm broad, greyish black, smooth, tapering to a fine point at apex.

Fl. & Fr. : Nov.-May.

Ecology : Very common; in waste places, roadsides, vacant plots, agricultural fields, pasture lands, forest edges, etc.

Distribution : Throughout hotter parts of India. Sri Lanka, Malesia, Sumatra, Java.

Specimens examined : Jhumri Telaiya, 306; Simaria, 800.

Uses : Decoction of plant is used in chronic malaria, leucorrhoea and urinary disorders. Leaves are astringent, diuretic and anti-syphilitic, used in scrofula and herpes.

Note : Here, the treatment of Majumder (*l.c.*) and Grierson (*l.c.*) is followed in considering *X. indicum* Koen. as the correct name of *X. strumarium* auct. non L. However, several authors *viz.*, Rammamoorthy in Saldan & Nicols., Fl. Hassan Dist. 629. 1976; Babu, Herb. Fl. Dehra Dun 290. 1977, etc. considered them as conspecific. According to Grierson, *X. strumarium* L. does not occur in India.

45. YOUNGIA Cass.

Youngia japonica (L.) DC., Prodr. 7 : 194. 1838; Mooney, Suppl. Bot. Bihar & Orissa 81. 1950; Koster in Blumea 23 : 166. 1976. *Prenanthus japonica* L., Mant. Pl. 107. 1767.

Youngia lyrata Cass., Ann. Sci. Nat. Bot. 1, 23 : 88. 1831.

Crepis japonica (L.) Benth., Fl. Hongk. 194. 1861; Hook. f. in Hook. f., Fl. Brit. India 3 : 395. 1881. Prain, Bengal Pl. 1 : 627. 1903; Haines, Bot. Bihar & Orissa pt. 4 : 495. 1922.

C. lyrata (Cass.) Clarke, Comp. Ind. 253. 1876.

Stems to 50 cm tall. Leaves mostly radical, obovate-oblanceolate, runcinate to lyrate-pinnatifid, to 18 × 4.5 cm, shortly petiolate at base; lateral segments somewhat irregular, puberulent on both sides; terminal segment mostly rotund, rounded at apex, dentate or crenate; midvein usually reddish; cauline leaves few, smaller. Heads numerous, small, homogamous, liguliflorus, *ca* 6 mm tall, 10-20-flowered. Involucres *ca* 2 mm across at base; outer phyllaries *ca* 5, deltoid, pinkish, *ca* 1.5 mm long; inner ones *ca* 8, lanceolate, 5-6 mm long, green with purplish costa. Receptacle flat, yellow. Ligules 5-7 mm long; basal tube apically pilose. Anther dark green; appendages black, basally long-sagittate. Style-branches yellow. Achenes fusiform, narrowed at apex into an indistinct beak, many-ribbed, 1.8-2 mm long. Pappus-bristles 1-seriate, 3-3.5 mm long.

Fl. & Fr. : Apr.-Sept.

Ecology : Very common; in cultivated fields, damp places, gardens, roadsides, etc.

Distribution : Throughout India. Pakistan, Nepal, Sri Lanka, Japan, Korea to Western China, Philippines, Malay Peninsula, Malay Archipelago, Thailand and Vietnam.

Specimens examined : National Park, 437; Simaria, 791; Telaiya Dam, 1860.

115. BUTOMACEAE

BUTOMOPSIS Kunth

Butomopsis latifolia (D.Don) Kunth, Enum. Pl. 3 : 165. 1841; Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 94. 1978 ;

Butomus latifolius. D. Don, Prodr. Fl. Nepal 22. 1825.

(Fig.11)

Butomus lanceolatus Roxb., Fl. Ind. 2 : 315. 1832.

Butomopsis lanceolata (Roxb.) Kunth, Enum. Pl. 3 : 165. 1841; Hook. f. in Hook. f., Fl. Brit. India 6 : 562. 1893; Prain, Bengal Pl. 2 : 1120. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 845. 1924.

Tenagocharis latifolia (D.Don) Buchenau, Abh. Naturw. Ver. Bremen 2 : 2, 3, 6. 1868; Steenis in Steenis, Fl. Males. ser. 1, 5 : 118, f. 1. 1954; Subram., Aquat. Ang. 88, t. 4 & f. 53. 1962.

Plant 10-50 cm tall. Leaf-blades oblong to oblong-lanceolate or oblanceolate, cuneate at base, with acute or obtuse apex tipped by a hard mucro, glaucous, 4-15 × 1.5-3.5 cm, with (3-)5 main nerves, one intramarginal nerve and many obliquely ascending, thin secondary nerves; petiole 5-15 cm long. Peduncle 5-25 cm long. Umbels 4-12-flowered. Pedicels elongate in fruit, 2-14 cm long. Bracts reticulately veined, triangular-lanceolate, decreasing in size inwards, scarious, 1-1.5 cm long. Sepals 3, broadly elliptic-obovate, rounded or slightly emarginate, reticulately veined, scarious at margin, 4-6 × 2.5-3.5 mm. Petals 3, white, exceeding sepals. Stamens 8-9, sometimes less; filaments 2-3 mm long; anthers narrow. Ovaries 4-9, reticulately veined, 4-5 mm 1.7-2 mm; stigma yellow. Fruitlets 1-1.2 cm long, with membranous adaxial wall. Seeds compressed, elliptic, brown, to 0.5 mm.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; in wet and inundated rice-fields, marshes, etc.

Distribution : Throughout the plains of India. Tropical Africa to S.E.Asia through Malesia to N. Australia.

Sepcimens examined : Hazaribagh, 741; Churchu, 1286; Joynagar, 1805.

Note : According to Hara *et al.* (*l.c.*), the generic name BUTOMOPSIS Kunth (May 1841) has priority over TENAGOCHARIS Hochst. (June 1841).

116. ALISMATACEAE

SAGITTARIA L.

Key to the Species

1a. Leaves ovate, deeply cordate, with obtuse basal lobes. Mature female flowers with appressed or patent sepals. Filaments pipillose ... 1. *S.guayanensis* ssp. *lappula*

1b. Leaves sagittate, with linear or lanceolate lobes. Mature female flowers with reflexed sepals. Filamens glabrous ... 2. *S. trifolia*

1. **Sagittaria guayanensis** H.B.K. ssp. **lappula** (D. Don) Bogin, Mem. N. Y. Bot. Gard. 9 : 192, f. 5. 1955; den Hartog in Steenis, Fl. Males. ser. 1, 5 : 328. 1957; Subram., Aquat. Ang. 87. 1962; *S. lappula* D. Don, Prodr. Fl. Nepal 22. 1825.

S. cordifolia Roxb., Fl. Ind. 3 : 647. 1832.

S. guyanesis auct. non H.B.K. : Hook. f. in Hook. f., Fl. Brit. India 6 : 561. 1893, *p.p.*; Prain, Bengal Pl. 2 : 1120. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 5 : 845. 1924, *p.p.*

Laticiferous. Leaves floating, ovate, deeply cordate with obtuse basal lobes, rounded to emarginate at apex, 1.5-6.5 cm long measured along midrib and 2.5-10.5 cm width; submerged phyllodes linear-lanceolate, short-petiolate, 50-100 × 3-5cm; nerves 15-17, prominent below; petiole ribbed, 15-30 cm long; sheath with broad scarious margin. Peduncle 1-7, flaccid, ribbed, hairy towards apex, 15-40 cm long including raceme. Racemes with 2-6 whorls of 2-3 flowers; 1-4 lower whorls with bisexual flowers. Bracts in each whorl broad-elliptic, connate, green with scarious margin, 0.8-2 cm long. Pedicels

to 1 cm long. Sepals triangular-ovate, blunt, keeled, 8-10 × 7-9 mm, appressed or patent in mature female flowers. Petals obovate-orbicular, rounded, white with a small purple spot above yellowish base, 1.2-1.5 cm. Stamens in bisexual flowers 8-12, in an interrupted whorl grouped opposite to sepals, in male 6-10, in a whorl, exceeding rudimentary pistils; filaments dilated and flattened towards base, papillose. Carpels; filaments dilated and flattened towards base, papillose. Carpels elliptic-suborbicular with a dorsal and a ventral crest; style directed inward; stigma punctiform. Achenes elliptic, with broad, blunt-spiny crest, 3-4 mm long. Seed brown, 1.2-1.5 mm.

Fl. & Fr. : Aug.-Oct.

Ecology : Very common; in ponds, ditches, marshy places, wet ricefields, etc.

Distribution : Throughout the plains of India. Tropics of Africa, South-east to East Asia including Formosa and Malesia.

Specimens examined : Ramgarh, 1146; Etkhori, 1871; Hazaribagh 2175.

Uses : Plant is ploughed as green manure in rice-fields.

Note : The typical subspecies is distributed in tropical America (den Hartog, *l.c.*).

2. **Sagittaria trifolia** L., Sp. Pl. 993. 1753; Ghafoor in Nasir & Ali, Fl. W. Pakistan 68 : 8. 1974.

S. sagittifolia L. var. *leucopetala* Miq., Ill. Fl. Arch. Ind. 2 : 49. 1870.

S. sagittifolia L. ssp. *leucopetala* (Miq.) den hartog in Steenis, Fl. Males. ser. 1, 5 : 332.1957.

S. sagittifolia auct. non L. : Hook. f. in Hook. f., Fl. Brit. India 6 : 561. 1893; Prain, Bengal Pl. 2 : 1120. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 844. 1924; Subram., Aquat. Ang. 87. 1962.

Local name : Chotakut.

Glabrous, laticiferous. Emerged leaves sagittate, with linear or lanceolate lobes; terminal lobe acutely attenuate, 5-7-nerved, 4-10 cm long measured along midrib and 1-3 cm wide; basal lobes with needle-like tips, 1-2 times as long as terminal one and as wide as it. Petiole sharply triangular, ribbed, with air-channels, 20-60 cm long; sheath with broad scarious margin. Peduncles 1-5, triangular, usually hexa-or polygonal, 25-60 cm long including raceme. Raceme with 2-6 whorls of 3 flowers, lower 1-3 whorls female and with 1-2 lateral branches, other flowers male. Bracts broad-elliptic, keeled, scarious-margined, to 7 mm long. Pedicels 5-15 mm long, in female thicker than in male. Sepals elliptic-suborbicular, blunt, scarious-margined, 3-6 × 2.5-4 mm, reflexed after anthesis. Petals white, suborbicular to broad-elliptic, much longer than sepals, unguiculate. Stamens numerous; filaments glabrous, about as long as yellow anthers. Carpels ovate, to 1 mm long; stigma punctiform. Fruiting heads globular, *ca* 1 cm across. Achenes obovate, with a dorsal and ventral wing, 3-5 × 1.5-3 mm. Seed light brown, *ca* 1.5 mm.

Fl. & Fr. : Oct.-Jan.

Ecology : Very common; in ponds and pools.

Distribution : Throughout the plains of India. Europe, North Asia and North America.

Specimens examined : Patratu, 1325; Hunterganj, 1649; Hazaribagh, 2356.

Uses : Plant is given to check the flow of milk in nursing mothers. Tubers are used in cutaneous troubles. Leaves are used in sore throat and inflammation of breasts.

117. HYDROCHARITACEAE

Key to the Genera

1a. Stems leafy, branched. Leaves cauline. Spathes ± sessile :

2a. Leaves in whorls of 3-8. Male flower solitary in spathe. Stamens 3. Styles entire ... 1. HYDRILLA

2b. Leaves mosty alternate. Male flowers many in spathe. Stamens 2-3. Styles notched ... 2. NECHAMANDRA

1b. Stems none, or with stolons only, or a creeping rootstocks. Leaves radical. Spathes peduncled :

3a. Leaves linear, grass-like, sessile. Spathes neither ribbed nor winged. Flowers unisexual, male flowers breaking off and rising to the surface of water, female flowers with spirally coiled peduncle. Stamens 1-3 ... 4. VALLISNERIA

3b. Leaves broad, petiolate. Spathes ribbed or winged. Flowers bisexual; peduncle neither breaking off nor spirally coiled. Stamens 6-15 ... 3. OTTELIA

1. HYDRILLA L.C.Rich.

Hydrilla verticillata (L.f.) Royle, Illus. Bot. Himal. t. 376. 1839; Hook. f. in Hook. f., Fl. Brit. India 5 : 659. 1888; Prain, Bengal Pl. 2 : 995. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 852. 1924; den Hartog in Steenis, Fl. Males. ser. 1, 5 : 385. 1957; Subram., Aquat. Ang. 55, f. 37. 1962. *Serpicula verticillata* L.f., Suppl. 416. 1781.

Val(l)isneria verticillata (L.f.) Roxb., Fl. Ind. 3 : 751. 1832.

Hydrilla polysperma Blatter in J. Proc. Asiat. Soc. Beng. (n.s.) 26: 356. 1931.

Local name : Jhangi, Kureli.

Glabrous. Stems amply ramified; internodes 5-50 mm. Leaves linear to lanceolate, or rarely elliptic, acute, sharply serrulate-denticulate, less commonly entire, green with reddish-brown dots and dashes, finely striate, 8-40 × 1.5-5 mm. *Squamulae intravaginales* 2, in leaf-axils oblong, transparent, denticulate to ciliolate, to 5 mm long. Male spathe flattened globose, 1.2-1.5 mm cm long, provided with minute appendages, bursting open to literate flower. Pedicels 1-2 mm long; sepals 3, ovate-elliptic, reflexed, white or reddish-white, 1.5-3 mm long. Petals 3, spathulate, white or reddish white, 2-3 mm long. Stamens 3; filaments short, oblique; anthers 4-locular. Female spathe cylindrical, with bifid top, reddish-brown, striped, 5-6 mm; sepals 3, oblong-obovate, scarious, white, 1.5-3 mm long; petals 3, spathulate, white, scarious, 1.5-3 mm long; ovary 3-4 mm with reddish dashed or dotted beak; styles 3 alternipetalous, oblique, to 0.1 cm long. Fruit shortly echinate, to 7 ×1.5 mm. Seeds 2-2.5 mm.

Fl. & Fr. : July-Sept.

Ecology : Very common; in ditches, ponds, lakes, marshes,streams, wet rice fields, etc.

Distribution : Throughout India. South and East Europe, Africa, South and East Asia to Australia.

Specimens examined : Jhumri Telaiya, 309; Hazaribagh, 737; Tondwa 1420.

Uses : Plant is used in aquaria as a good oxygenator and also as a feed of fishes. It is also used as green manure.

2. NECHAMANDRA Planch.

Nechamandra alternifolia (Roxb.) Thw., Enum. 332. 1864; Subram. & Balakr. in Bull. Bot. Surv. India 3 : 23. 1961; Subram. & Balakr. in Bull. Bot. Surv. India 3 : 23. 1961; Subram., Aquat. Aug. 56. 1962.

Vallisneria alternifolia Roxb., Pl. Corom. 2 : 20, t. 165. 1802.

Nechamandra roxburghii Planch. in Ann. Sci. Nat. ser. 3, 11 : 78. 1849.

Lagarosiphon roxburghii (Planch.) Benth. in Benth. & Hook. f., Gen. Pl. 3 : 451. 1883; Hook. f. in Hook. f., Fl. Brit. India 5 : 659. 1888; Prain, Bengal Pl. 2 : 995. 1903.

L. alternifolia (Roxb.) Druce in Rep. Bot. Exch. Club Soc. Brit. Isl. 1916 : 630. 1971; Haines, Bot. Bihar & Orissa pt. 5 : 853. 1924.

Stems slender, filiform, green, 6-90 cm long, glabrous. Roots fibrous. Leaves distant, alternate and opposite, linear, acute, serrulate, 7-10 × 0.4-0.6 cm. Male flowers : spathe transparent, 4-4.2 mm long; sepals 3, broadly oblong, pink; petals nearly as long as sepals, white; anthers 2, dehiscing transversely; staminodes 3, pistillodes 0. Female flowers : spathe 3.5-4mm long, tubular, 2-fid, wrapping round the lower part of flower; perianth pinkish, floating on water; staminodes 0; ovary produced into a filiform beak of 4-6 cm long; styles 3, stouter, notched. Fruit many seeded.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; in ponds, ditches, puddles, lakes, etc

Distribution : Throughout India.Sri Lanka, tropical Asia.

Specimens examined : Hazaribagh, 1352; Ghanghree, 2361.

3. OTTELIA Pers.

Ottelia alismoides (L.) Pers., Syn. Pl. 1 : 400. 1805; Hook. f. in Hook. f., Fl. Brit. India 5 : 662. 1888; Prain, Bengal Pl. 2 : 997. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 855. 1924; den Hartog in Steenis, Fl. Males. ser. 1, 5 : 398. 1957; Subram., Aquat. Ang. 61, f. 43. 1962.

Stratiotes alismoides L., Sp. Pl. 535. 1753.

Leaves submerged, sometimes partly emerged, broadly ovate, suborbicular or cordate-reniform, shallowly cordate or truncate at base, rounded or obtuse and sometimes apiculate at apex, entire or sometimes dentate, transparent, light-green, 7-20 × 4.5-18 cm, with 7-11, curved veins; linear phyllodes of 7-10 × 0.7-1 cm, sometimes present; petiole 3-gonous, with longitudinal air channels, 8-50 cm, with broadened, sometimes denticulate pale sheath. Peduncle 4-5-angular, 10-25 cm long. Spathe elliptic-ovate, with 2 acute tips, glabrous, 2.5-5 cm long, 1-flowered; wings 5-10, of which 2 more developed than others, wavy or crisped, to 0.5-1 cm broad, sometimes obsolete and only visible as ribs. Flowers bisexual, sessile. Sepals linear-oblong, 1-nerved, 1-1.5 cm long. Petals obovate, pure white with yellow spotted base, 2-3 cm long. Stamens usually 6; filaments glandular hairy. Ovary oblong, 2-4 cm long; styles usually 6, 0.6-1 cm long, splitted near from base into 2 hairy unequal arms. Fruit oblong-elliptic, rostrate, crowned by sepals, 2-4 cm long, bursting irregularly near top. Seeds fusiform, 1-2 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; in ponds, lakes, slow streams, stagnant pools, etc.; usually grows abundantly forming a gregarious vegetation on muddy bottom.

Distribution : Throughout India. N.E.Africa and S.E.Asia, extending from India eastward to China and Japan and southward to Malesia, tropical Australia and Solomon Isl.; introduced in North Italy.

Specimens examined : Hazaribagh, 740; Jhumri Telaiya, 1727.

Uses : The leaves are used as vegetable by poor people; also used to cure hemorrhoids.

Note : The species is extremely variable in leaf characters, depending largely on depth of water in which it grows.

4. VALLISNERIA L.

Vallisneria natans (Lour.) Hara in J. Jap. Bot. 49 : 136. 1974; Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 29. 1978. *Physkium natans* Lour., Fl. Cochinch. 663. 1790.

Vallisneria asiatica Miki in Bot. Mag. Tokyo 48 : 329, f. 4 (A-F). 1934.

V. gigantea Graebner in Bot. Jahrb. 49 : 68. 1912; den Hartog in Steenis, Fl. Males. ser. 1, 5 : 388. 1957.

V. spiralis auct. non L. : Hook. f. in Hook. f., Fl. Brit. India 5 : 66. 1888, *p.p.*; Prain, Bengal Pl. 2 : 996. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 853. 1924; Subram., Aquat. Ang. 57. 1962.

Local name : Swala, Jallil.

Stolons *ca* 10 cm long, sometimes absent. Leaves ribbon-like, with faintly dentate and thickened margin, 15-100 × 1-2 cm; nerves 5-9, with black and brown stripe parallel with them. Female spathe 1.2-2 cm long, covering the ovary half-way to 3/4 times of its length, with longitudinal black stripes; peduncles 3-15, coarse, to 1 mm long. Sepals ovate,

convex, 1.7-4 × 1-2 mm, one a little larger than others, obtuse, green to brown or violet, with longitudinal black stripes, glabrous, persistent. Petals scarious, *ca* 0.4 mm long. Ovary 1.7-2.5 cm long; styles alternating with petals, *ca* 2 mm long, splitting up to near the base into 2 broad, flattened lobes; ovules numerous. Fruit greenish yellow, with black or red-brown stripes, 0.6-2 cm long, crowned by sepals. Seeds fusiform to cylindrical, 1.5-3 m long. Male spathe oblog; peduncle 2-3 cm long and 1.8-2.2 mm thick. Sepals ovate, reflexed. Stamens 1 or 2, erect or diverging.

Fl. & Fr. : Jan.-May.

Ecology : Very common; in shallow water of lakes, ponds, streams, etc., rooting in sandy or muddy bottoms and forming a dense vegetation.

Distribution : Almost throughout India. From S. and E. Asia, through Malesia to E. Australia, Tasmania and Melanesia.

Specimens examined : Hazaribagh, 44; Telaiya Dam, 633; Simaria, 1631.

Uses : Young leaves are boiled and eaten as vegetable by poor people in villages.

Note : Following the opinion of den Hartog (*l.c.*) and after carrying out critical studies on living materials from different parts of Asia, Hara (*l.c.*) separated and asiatic species as *Vallisneria natans* (Lour.) Hara from *V. spiralis* L. According to den Hartog (*l.c.*), *V. spiralis* L. differs from this species by narrower entire leaves with only 5 nerves, smaller female flowers, spathe covering only the base of ovary, acute sepals, fringed styles, absence of blackish and brown stripes on leaves, etc.

118. APONOGETONACEAE

APONOGETON L.f.

Key to the Species

1a. Leaf-margins not undulate. Spikes densely flowered. Tepals 2, shorter than the 4-8 seeded follicles ... 1. *A. natans*

1b. Leaf-margins undulate. Spikes laxly flowered. Tepals 1-3, longer than the 1-2-seeded follicles ... 2. *A. undulatus*

1. **Aponogeton natans** (L.) Engl. & Krause in Pfl.-reich IV-13, Heft 24 : 11. 1906; Mooney, Suppl. Bot. Bihar & Orissa 140. 1950; Subram., Aquat. Ang. 92, t. 5 & f. 54. 1962; Bruggen in Blumea 18 : 477, f. 2. 1970. *Saururus natans* L., Mant. 2 : 227. 1771.

Aponogeton monostachyon L. f., Suppl. Pl. 214. 1781; Edgew. in Hooker's J. Bot. Kew Gard. misc. 3 : 404, f. 17. 1844 ; Hook. f. in Hook. f., Fl. Brit. India 6 : 564. 1893; Prain, Bengal Pl. 2 : 1122. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 846. 1924.

Spathium monostachyum (L.f.) Edgew. in Calcutta J. Nat. Hist. 3 : 533, f. 16. 1843.

Local name : Ghechu.

Tubers to 2 cm in diam. Submerged leaves lanceolate, narrowly cuneate at base, acute at apex with blunt-tip, to 6.5 × 1.5 cm; mid-vein wide with 2 or 3 parallel veins on either side; petiole to 5 cm long. Floating leaves cordate or subcuneate at base, narrowly acute at apex with blunt tip, to 12 × 3 cm; parallel main veins 5-9. Peduncle to 45 cm, not thickening towards the inflorescence. Spathe to 1.5 cm long, caducous. Spike solitary, usually densely flowered, to 7 cm long. Tepals 2, spathulate, white, pink or purple, 1-nerved, 1.5-2 × 0.5-1 mm. stamens 6, 2.5-3 mm; filaments not widened towards base. Carpels 3 to 2 ×

0.8 mm; ovules *ca* 8. Infrutescence to 9 cm long, very dense. Fruits to 4×2.3 mm, with 1 mm long terminal beak; seeds 4-8, oblong, to 1.8 × 0.8 mm, with loose, winged, transparent and reticulately veined outer testa and brown inner testa.

Fl. & Fr. : Almost throughout the year, but chiefly during July-September.

Ecology : Very common; in stagnant shallow waters, rice-fields, ponds, marshes, etc.

Distribution : Throughout India. Sri Lanka, tropical Asia and Australia; also cultivated in Britain and America.

Specimens examined : Hazaribagh, 40; Jhumri Telaiya, 2222.

Use : Tubers are eaten after cooking.

2. **Aponogeton undulatus** Roxb., Fl. Ind. 2. : 211. 1832; Bruggen in Blumea 18 : 465, f. 2. t. I-II. 1970 & in Steenis, Fl. Males. ser. 1, 7 : 213. 1971.

Spathium undulatum Edgew., Calc. J. 3 : 534, f. 15. 1843.

Ouvirandra undulata (Edgew.) Edgew. in Hook., Lond. J. Bot. 3 : 404, f. 18. 1844.

Aponogeton microphyllum Roxb., Fl. Ind. 2 : 211. 1832; Hook. f. in Hook. f., Fl. Brit. India 6 : 565. 1893.

A. crispus auct. non Thunb. ; Hook. f. in Hook. f., Fl. Brit. India 6 : 564. 1893, *p.p.* ; Prain, Bengal Pl. 2 : 1122. 1903, *p.p.* ; Haines, Bot. Bihar & Orissa pt. 5 : 847. 1924; Mitra, Fl. Pl. E. India 1 : 9. 1958; Subram., Aquat. Ang. 92. 1962. ('crispum').

Tubers globular, obovoid or elongate, smooth, 0.6-2.5 cm in diam. Submerged leaves alternately transparent or opaque in an irregular pattern, narrowly cuneate or rounded at base, acute or rounded and emarginate at apex, undulate, with wide midrib and 2-4 main nerves on either side, 10-25 × 0.8-4.5 cm; petiole 10-35 cm long. Floating leaves rather rare, rounded or cordate at base, acute at apex with blunt tip, to 20 × 3.5 cm; petiole to 70 cm long. Peduncle to 55 cm long, thickening towards inflorescence. Spathe to 1.7 cm long, persistent or caducous. Spike to 10 cm long, laxly flowered. Tepals 2, caducous, spathulate or obovate, 1-3-nerved, white or pinkish, 3-8 × 1-3 mm. Filaments slightly widening towards base, white or pinkish; anthers light yellow. Ovaries 3-4, light pink, 1.2-2 × 0.5-1 mm; ovules 2. Infrutescence to 16 cm long. Fruit 5-7 × 3.5-4 mm, with a short terminal curved beak. Seeds with a simple testa.

Fl. & Fr. : July-Oct.

Ecology : Very common; in deep or shallow water of ponds, ditches, tanks, etc.

Distribution : Throughout India. Sri Lanka, Bangladesh, Myanmar, Thiland, Malesia, Australia.

Specimens examined : Hazaribagh, 42; Ichak, 326; Jhumri Telaiya, 2364.

Use : Tubers are eaten after cooking.

Note : According to Bruggen (in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 13. 1987), *A. crispus* Thunb. is distributed in South India and Sri Lanka.

119. POTAMOGETONACEAE

POTAMOGETON L.

Key to the Species

1a. Leaves, at least the upper, floating, oblong or elliptic-lanceolate, 2.5-3.5 cm broad, cuneate or rounded at base; petiole 2.5-10 cm long. Spikes 1.8-4 cm long, densely many-flowered ... 2. *P. nodosus*

1b. Leaves all submerged, linear to linear oblong, 0.3-1 cm broad, with semiamplexicaul base; petiole 0. Spikes 0.5-0.8 cm long, 6-8-flowered ... 1. *P. crispus*

1. **Potamogeton crispus** L., Sp. Pl. 126. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 374. 1893; Prain, Bengal Pl. 2 : 1123. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 848. 1924; Dandy in J. Linn. Soc. Bot. 50 : 537. 1937.

P. tuberosus Roxb., Fl. Ind. 1 : 472. 1820.

Stems slender, compressed, dichotomously branched. Leaves all submerged, distichous, closely set, linear to linear-oblong, semi-amplexicaul at base, obtuse at apex, with crisped and finely serrulate margins, 3-nerved, translucent, 2.5-7.5 × 0.3-1 cm; petiole 0. Stipules small, obtuse, caducous, *ca* 0.6 mm long. Spike very small, 5-8 mm long, only 6-8-flowered; peduncle over 2.5 cm long and exceeding the upper leaves. Flowers very small. Tepals clawed, 2-2.5mm long including the claw; limb suborbicular, 1.2-1.5 mm in diam. Druplets obliquely ovoid, 2.5-3 mm long, compressed, acuminate with straight beak.

Fl. : Aug.-Dec. *Fr.* : Mar.-May.

Ecology : Common; in ponds and ditches.

Distribution : Almost throughout the plains of India and temperate Himalaya; Widespread in temperate, tropical and subtropical regions of Asia, Europe, Africa and America.

Specimens examined : Hazaribagh, 1353; Jhumri Telaiya, 2195; Ramgarh, 2367.

Use : Plant is used as fodder.

2. **Potamogeton nodosus** Poir. in Lam., Encycl. Suppl. 4 : 535. 1816; Dandy in J. Linn. Soc. Bot. 50 : 531. 1937; Subram., Aquat. Ang. 95, 1962.

P. indicus Roxb., Fl. Ind. 1 : 452. 1820, non Roth ex Roem. & Schult. 1818; Hook. f. in Hook. f., Fl. Brit. India 6 : 565. 1893; Prain, Bengal Pl. 2 : 1123. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 847. 1924.

P. oblongus auct. non Viv. : Hook. f. in Hook. f., Fl. Brit. India 6 : 566. 1893, *p.p.*

Stem slender, terete, branched. Leaves petiolate; the upper floating, 6-10 × 2.5-3.5 cm, alternate or uppermost opposite, oblong or elliptic-lanceolate, acute, obtuse or acuminate at apex, cuneate or rounded at base, thinly coriaceous, opaque, glossy, with strong midrib and many more slender parallel nerves mostly proceeding from near base; petiole variable in length, 2.5-10 cm long; stipules free, 2.5-4 cm long; the lower submerged leaves lanceolate, membranous, undulate, usually elongate; petioles shorter. Spikes 1.8-4 cm long, on axillary or leaf-opposed, 2.5-5 cm long, stout or slender peduncle which raise the spike just above water. Flowers densely packed without spaces betwen the whorls. Tepals clawed, 2.4-2.8 mm long including the claw; limb suborbicular, convave, 1.8-2 mm in diam. Druplets obliquely truncate, shortly beacked, 2.5-3 mm long.

Fl. : Aug.-Jan. *Fr.* : Apr.-May.

Ecology : Very common; in ponds, tanks, ditches, etc.

Distribution : Throughout India. Warm temperate and tropical regions of Asia, Europe, Africa and America.

Specimens examined : Jhumri Telaiya, 2194; Hazaribagh, 2290; Ramgarh, 2366.

120. ARECACEAE

Key to the Genera

1a. Leaves palmately divided, flabelliform or orbicular :

2a. Flowers bisexual, scattered, small. Fruits small :

3a. Gynoecium of 3 trigonous carpels ... 5. LICUALA

3b. Gynoecium of 3 globose carpels ... 6. LIVISTONA

2b. Flowers dioecious; males small, sunk in cavities of thickened catkin-like branches, female very large. Fruits large ... 2. BORASSUS

1b. Leaves pinnately divided :

4a. Leaves 2-pinnate. Stamens many. Ovary 3-celled ... 3. CARYOTA

4b. Leaves 1-pinnate or pinnatisect. Stamens 3-9 :

5a. Gynoecium of 3 free carpels. Plants dioecious. Spadices interfoliar ... 7. PHOENIX

5b. Gynoecium syncarpous; stigmas 3. Plants monoecious; spadices androgynous :

6a. Spadices interfoliar. Ovary 3-celled ... 4. COCOS

6b. Spadices intrafoliar. Ovary 1-celled ... 1. ARECA

1. ARECA L.

Areca catechu L., Sp. Pl. 1189. 1753. Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 405. 1892; Prain, Bengal Pl. 2 : 1097. 1903; Haines, For. Fl. Chota Nagpur 548. 1910 & Bot. Bihar & Orissa pt. 5 : 880. 1924.

Local name : Supari.

Trunk 12-25 m in height and 10-20 cm in diam., very straight and uniform. Leaves 120-150 cm long; leaflets numerous, long-acuminate, glabrous, 30-60 cm long, upper ones confluent. Spathe glabrous, compressed. Spadix much branched; rachis stout, compressed; branches with filiform tips bearing ± distichous minute male flowers. Female flowers solitary at base and axils of branches. Sepals ovate, obtuse, 7-8 mm long. Petals ± similar to sepals. Stamens 6. Staminodes in female flowers 6, connate. Fruits ovoid or subglobular-ovoid, smooth, orange or scarlet, 3.5-5 cm in diam., with fibrous mesocarp.

Fl. : Mar.-May. *Fr.* : Jan.-Mar. (of the following year).

Ecology : Common; cultivated in gardens, open village lands, etc.

Distribution : Throughout India. Cultivated widely in hot damp regions of Asia and Malaya Islands, Africa and tropical America.

Specimens examined : Hazaribagh, 2193; Hunterganj, 2360.

Uses : Seeds ('betel-nut') are chiefly used as a masticatory, and are chewed with betel-leaf. They are also used chiefly in veterinary practice as a vermifuge for tapeworm and for the preparation of dentifrices. Powdered nut is useful in checking diarrhoea, and also in urinary disorders.

2. BORASSUS L.

Borassus flabellifer L., Sp. Pl. 1187. 1753; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 482. 1893; Prain, Bengal Pl. 2 : 1092. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 885. 1924.

B. flabelliformis Murray in Linn., Syst. Veg. ed. 13, 827. 1774; Haines, For. Fl. Chota Nagpur 546. 1910.

Local name : Tar.

Trunk 20-30(-40) m tall and to 6 m diam. near ground, often swollen near middle, when young covered with dry leaves and bases of the petioles, old naked and marked with the sheath-scars. Leaves 90-150 cm in diam., with 60-80 linear-lanceolate segments folded along the midrib; petiole 60-120 cm long, semiterete, with spinosely serrate edges. Branches of male spadix clustered, *ca.* 30 cm long and *ca* 2.5 cm diam. including closely imbricate broad truncate bracts. Flowers seated on inner upper side of the cavities. Petals spreading, *ca* 2.5 mm long. Female flowers 2.5-3 cm in diam. Fruits 12-18 cm in diam.

Fl. : Mar.-May. *Fr.* : July.-Oct.

Ecology : Common; along roadsides, bank of rivers and rivulets, margin of ponds, in scrub jungles, etc.

Distribution : Throughout India. Native of tropical Africa, naturalised in Pakistan, Bhutan, Nepal, Indo-China, Bangladesh, Burma, Sri Lanka, Malesia, Lesser Sunda Islands, New Guinea, Queensland.

Specimens examined : Pratappur, 1555; Hunterganj, 2114.

Uses : The inflorescences are tapped for the sap which, after fermentation, forms the alcoholic drink (palm wine or toddy). The sap, by boiling, is converted to 'gur'. Leaves are used for thatching, for making fans, hats, bags, mats, etc. Seeds and pulp of tender fruits are edible.

Cotyledons in germinating seeds are edible. Tender shoots are also edible. Wood is used for pillars, posts, for making crude bridges, and in construction purposes.

3. CARYOTA L.

Caryota urens L., Sp. Pl. 1189. 1753; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 422. 1892; Prain, Bengal Pl. 2 : 1903. 1903; Haines, For. Fl. Chota Nagpur 547. 1910 & Bot. Bihar & Orissa pt. 5 : 879. 1924.

Local name : Mari, Ramgoah.

Trunk stout, 9-15 m tall, and 20-30 cm in diam., annulate. Leaves 2-pinnate, 4-6 m long and 3-4 m long and 3-4 m broad. Leaflets curved and drooping, cuneiform, very obliquely truncate, acutely serrate-dentate, with the upper margin produced and caudate, 10-20 cm long; petiole very stout. Spathes 30-45 cm long; spadices 24-30 cm long; branches all nearly reaching the same level. Flowers 3-nate, a female between 2 males. Males 1.2-1.5 cm long, cylindrical in bud and about 3 times as long as broad. Stamens about 40-45. Fruit reddish, 1.6-2 cm in diameter, with apiculate base, acrid.

Fl. : Apr.-Aug.

Ecology : Common; along ravines in forests; also planted in gardens, parks, shrubberies, etc.

Distribution : Throughout the hotter parts of India. Sri Lanka, Myanmar, Nepal, Malesia.

Specimens examined : Hazaribagh, 1972; Koderma Forest, 2359.

Uses : A fibre, obtained from leaf-sheaths, is used for ropes, baskets, soft brushes and brooms. Sap, obtained from tapping of inflorescence, is used for preparing toddy or sugar.

4. Cocos L.

Cocos nucifera L., Sp. Pl. 1188. 1753; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 482. 1893; Prain, Bengal Pl. 2 : 1095. 1903; Haines, For. Fl. Chota Nagpur 547. 1910 & Bot. Bihar & Orissa pt. 5 : 880. 1924; Blatter, Palms Brit. India 499. 1926.

Local name : Nariyal, Narikel.

Trunk 15-30 m tall, annulate, thickened at base, with a mass of rootlets. Leaves 2-6 m long; leaflets numerous, close equidistant, linear or linear-lanceolate, reduplicate, coriaceous, 60-100 × 1.5-5 cm; petioles elongate, stout, 1-1.5 m long. Spadix panicled, stout, 60-100 cm long; branches many, drooping, flexuous, to 40 cm long. Spathes 3-5, lower ones 60-150 cm long, oblong, splitting lengthwise. Male flowers : sepals ovate, to 0.4 cm long; petals oblong, acute, 5-6 mm long; staminal filaments subulate, to 0.5 cm long; pistillode minute. Female flowers globose-ovoid, 2-2.5 cm long, supported by broad bracteoles; sepals broadly obovate - rounded, concave, to 2.5 cm in diam.; petals shorter than sepals, convolute, with imbricate tips. Fruit trigonously obovoid or subglobose,drupe greenish yellow, 20-35 cm long; albumen lining the endocarp, with a hollow centre filled with 'coconut milk'.

Fl. : Mar.-Aug. *Fr.* : Ripening nearly a very afterwards.

Ecology : Very common; in villages especially near houses.

Distribution : Hot damp regions of India. Throughout Indo-Pacific World and cultivated successively throughout the tropics between 20° N and 20° S.

Specimens examined : Simaria, 810; Hazaribagh, 1582.

Uses : Every part of the plant is useful. The liquid endosperm of the unripe fruit is used against stomachic and urinary disorder; it is also a delicious cold drink. The oily solid endosperm is used for the preparation of various kinds of sweets, in kitchen preparation, pastries, and

confectionery. An important non-volatile oil is extracted from this solid endosperm which is employed in food products, in making soaps, cosmetics, shampoos, shaving creams, etc. The fibrous mesocarp is a very important fibre which is used in making ropes, mats, brushes, etc. The stony endocarp is used for various kinds of drawing room decorations. Leaves are woven into mats, their midribs are used for making brooms. Wood is used for cabinets, buildings and as fuel.

5. LICUALA Thunb.

Licuala peltata Roxb., Fl. Ind. 2 : 179. 1832; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 430. 1892; Prain, Bengal Pl. 2 : 1091. 1903; Haines, For. Fl. Chota Nagpur 546. 1910 & Bot. Bihar & Orissa pt. 5 : 884. 1924.

Stems erect, 1-4 m in height, usually gregarious. Leaves very large, erect, palmately compound, orbicular in outline, 90-150 cm in diam; segments about 20, narrowly obcuneate, 10-25 cm wide at top, 3-5-lobed with lobes again 2-lobed, retuse or emarginate; petiole flat above, keeled below, with 2 rows of short recurved black prickles. Spathes to 30 cm long and 1.2-2 cm broad, with 3-5 sharp teeth. Spadix erect, with simple, drooping, woolly or tomentose racemes of 15-25 cm long. Calyx obconic, 0.8-1.2 cm long, toothed or shallowly lobed, silky-pubescent. Petals lanceolate, very coriaceous, lanceolate, spreading or reflexed, 0.8-1.2 cm long. Fruit ellipsoid, narrowed equally at both ends, orange-coloured, 1-1.2 cm long.

Fl. : Dec.-Apr. *Fr.* : Mar.-May.

Ecology : Common; along muddy streams, swamps, etc.

Distribution : Meghalaya, Assam, Sikkim Himalaya, Chotanagpur, Orissa, Andaman Islands. Pakistan, Bhutan, Nepal, Bangladesh, Myanmar.

Specimens examined : National Park, 1747; Koderma Forest, 2203.

Uses : Leaves are used for thatching, mats, roofs of boats, umbrellas and rain-hats.

6. LIVISTONA R. Br.

Livistona chinensis R. Br., Prodr. 268. 1810; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 434. 1892; Prain, Bengal Pl. 2 : 1092. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 884. 1924.

Trunk to 20 m in height. Leaves reniform 90-150 cm across; segments deeply bifid, long-acuminate, bending sharply downwards with age. Petiole plano-convex. Spadices interfoliar, long-peduncled, erect, loosely panicled. Flowers minute, bisexual. Stamens 6; filaments united in a ring. Gynoecium of 3 free carpels. Drupes ellipsoid-oblong, olive-coloured, 2-2.5 cm long.

Fl. : Feb.-Apr. *Fr.* : Nov.-Jan.

Ecology : Common; planted in gardens, parks, near school and college building, etc.

Distribution : Cultivated almost throughout India. Native to China and Japan, introduced in different countries of the World as ornamental.

Specimens examined : Hazaribagh, 1537; Koderma, 2204.

Uses : Leaves are used to make fans. Fibres from leaf-petiole is used for making ropes.

7. PHOENIX L.

Key to the Species

1a. Trunk very short, somewhat bulbous, to 30 cm long and broad. Leaves 60-180 cm long ... 1. *P. acaulis*

1b. Trunk elongated, 7-15 m high. Leaves 300-500 cm long ... 2. *P. sylvestris*

1. **Phoenix acaulis** Roxb. ex Buch.-Ham. in Trans. Linn. Soc. Lond. 15 : 87. 1826; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 426. 1892; Prain, Bengal Pl. 2 : 1096. 1903; Haines, For. Fl. Chota Nagpur 547. 1910 & Bot. Bihar & Orissa pt. 5 : 882. 1924.

Local name : Pind khajur.

Trunk very short, somewhat bulb-like, to 30 cm long and broad. Leaves 60-180 cm long; leaflets stiff, thickened and decurrent at base, acuminate and spinous at apex, 25-50 × 0.8-2 cm; marginal nerve very strong; petiole ±30 cm long, with many strong spines of 5-20 cm long. Spathes 30-40 cm long, scurfy, splitted into boat-shaped valves. Male spadix to 50 cm long; flowers 6-8 mm long. Female spadix to 50 cm long, elongating to 100 cm in fruit. Drupe bright red, finally turning blue black, terete, 1.2-1.5 cm long. Seed 7-9 mm long, with broad groove.

Fl. : Mar.-Apr. *Fr.* : May-June.

Ecology : Common; in forests.

Distribution : India : Northern and Central India, Chota Nagpur, Assam, Meghalaya, Western Peninsula, Himalaya. Nepal, Myanmar.

Specimens examined : Pratappur Forest, 613; National Forest, 2012.

Uses : Fruits and tender peduncles are edible. Terminal leaf-buds are consumed as a vegetable. Leaves are used for thatching, and making mats, brooms, etc.

2. **Phoenix sylvestris** (L.) Roxb., Fl. Ind. 3 : 787. 1832; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 425. 1892; Prain, Bengal Pl. 2 : 1096. 1903; Haines, For. Fl. Chota Nagpur 548. 1910 & Bot. Bihar & Orissa pt. 5 : 881. 1924; Blatter, Palms Brit. Ind. 3. 1926. *Elate sylvestris* L., Sp. Pl. 1189. 1753.

Local name : Khajuri.

Trunk 7-15 m tall. Leaves 3-5 m long; petiole spinous; leaflets 15-50 cm × 2-3 cm, greyish green, glaucous, rigid, narrowed at base, acuminate and spinous at apex; spines on petioles to 10 cm long, fascicled, lying in different planes. Spathe 30-40 cm long, thick, almost woolly. Male spadix white, scented, 60-90 cm long, compact, on shoot peduncle; branches filiform. Male flowers 6-8 mm long. Fruiting peduncle 20-75 cm long, terminating in large branches of spadices. Drupes orange to reddish-brown, terete, 2.5-3 cm long; pericarp very scanty, sweet. Seed rounded at both ends, pale brown, 2-2.5 cm long.

Fl. : Mar.-May; *Fr.* : May-June.

Ecology : Very common; in open lands, roadsides, forests, etc.

Distribution : Throughout India including Himalaya. Nepal, Myanmar, Sri Lanka.

Specimens examined : Raja Rappa, 473; Chatra, 1097.

Uses : Tree is tapped for its sap which is used as a refreshing drink. After fermentation, it forms the alcoholic drink (toddy). The sap, by boiling, is converted to 'gur'. The ripen fruits are edible; also used for making jams and jellies. Leaves are used for thatching, and for making mats, brooms, bags, etc. Wood is used for construction, bridges and piers.

121. PANDANACEAE

PANDANUS Parkinson

Pandanus odoratissimus L., f., Suppl. Pl. 64. 1781; St. John in Taxon 12 : 201, 204. 1963; Stone in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 311. 1981.

P. fascicularis Lam., Encycl. 1 : 372. 1783; Hook. f. in Hook. f., Fl. Brit. India 6 : 485. 1893; Prain, Bengal Pl. 2 : 1101. 1903.

P. tectorius auct. non Parkinson & ex 'Z' : Haines, For. Fl. Chota Nagpur 555. 1910 & Bot. Bihar & Orissa pt. 5 : 877. 1924, *p.p.*

Local name : Keura, Kewda.

Much branched, bushy shrub or small tree, to 5 m tall, with many stilt roots. Leaves erect, then drooping, 1-2.5 × 4-10 cm; prickles white, 3-5 mm long. Staminate inflorescence of several spikes each in axil of a white or cream-coloured bract; spikes 5-10 cm long, consisting of a central fleshy axis emerging from which numerous lateral phalanges of about 1-1.3 cm long. Each phalange bearing about 19-23 stamens on short filaments of 0.5-2 mm long; anthers narrowly sagittate, apiculate, 2-3 mm long. Cephalium (pistillate inflorescence) solitary, terminal, globose to ellipsoid, to 30 × 20 cm, composed of 50-70 carpellate phalanges each of which, in turn, composed of 4-10 fused carpels. Carpels each terminating in a single U- or V-shaped stigma. Fruiting head an aggregate of drups or phalanges. Seed enclosed in a pyrene of hard bony tissue.

Fl. : June-Sept. *Fr.* : Mar.-June of the next year.

Ecology : Common; near lakes, arable lands, etc., also cultivated in gardens.

Distribution : Throughout the hotter moisture parts of India. Malesia, Myanmar, China, Polynesia, Central Moluccas.

Specimens examined : Hazaribagh, 762; Chowpara, 1678.

Uses : Male flowers are used in perfumery. Terminal buds are eaten. Tender floral leaves are eaten raw or cooked. Seeds are edible. Leaves are employed for covering huts, mat-making, cordate, hats, etc. Juice obtained from inflorescence is used in rheumatic arthritis. Leaves are used in leprosy.

122.ARACEAE

Key to the Genera

1a. Flowers bisexual. Plants climbing by means of adventitious roots. Ovary 1-celled with 1 basal ovule ... 7. SCINDAPSUS

1b. Flowes unisexual. Plants not climbing :

2a. Aquatic or marsh herbs, rooting in soil or floating. spadix without a barren appendix :

3a. Floating aquatic. Pistil solitary. Leaves borne in a rosette-like tuft ... 5. PISTIA

3b. Aquatic or marsh herb, rooting in soil. Pistil in one whorl of connate ovaries. Leaves not as above ... 4. CRYPTOCORYNE

2b. Terrestrial tuberous herbs. Spadix with a barren appendix :

4a. Leaves entire, peltately attached to the petiole :

5a. Ovary with parietal placentae ... 3. COLOCASIA

5b. Ovary with basal placentae ... 1. ALOCASIA

4b. Leaves not entire, variously dissected, not peltate :

6a. Leaves pedately partite. Margins of basal part of spathe connate ... 6. SAUROMATUM

6b. Leaves trisect at base with (sub) dichotomously compound segments. Margins of basal part of spathe overlapping ... 2. AMORPHOPHALLUS

1. ALOCASIA (Schott) G. Don, *nom. cons.*

Alocasia macrorrhizos (L.) G. Don in Sweet, Hort. Brit. ed. 3, 631, 1839 ('macrorhizon'); Hook. f. in Hook. f., Fl. Brit. India, 6 : 526. 1893; Prain, Bengal Pl. 2 : 1111. 1903 ; Haines, Bot. Bihar & Orissa pt. 5 : 869. 1924; Nicolson in Taxon 35 : 326-328. 1986. *Arum macrorrhizon* L., Sp. Pl. 965. 1753.

A. indicum Lour., Fl. Cocchinch. 536. 1790.

Alocasia indica (Lour.) Spach, Hist. Nat. Veg. Phan. 12 : 47. 1846; Hook. f. in Hook. f., Fl. Brit. India 6 : 525. 1893; Prain, Bengal Pl. 2 : 1111. 1903; Haines, For. Fl. Chota Nagpur 553. 1910 & Bot. Bihar & Orissa pt. 5 : 870. 1924.

Local name : Mankanda.

Stem caulescent, 10-20 cm thick; petiole to 1 m long, tapering upwards, sheathing in lower one-third part. Leaf-blade triangular-sagittate, entire or subundulate, 60-90 × 50-80 cm; basal lobes triangular-acute, incurved, *ca* 30 cm long; sinus narrow; midvein strong, secondary veins 6-8 in each side of midrib, spreading at an angle of 60°-70° from the midrib and slightly ascending towards the margin. Peduncles 15-25 cm long. Spathe 20-30 cm long, with slight offensive smell; tube 3-5 cm

long; limb 15-22 × 5-6.5 cm, narrowly oblong, cuspidate. Spadix to 25cm long; pistillae part yellow, *ca* 2.5 cm long, sterile part *ca* 1 cm long, staminate part white, 3.5-5 cm long, appendix corrugated, 8-12 cm long. Ovary obovoid, *ca* 0.5 mm long; stigma 3-4-lobed. Berry red, 0.7-1 cm in diam.

Fl. : Apr.-June. *Fr.* : July-Nov.

Ecology : Common; near pools, rubbish heaps in the village surrounding, also cultivated as an ornamental and food source near houses, gardens, etc.

Distribution : Throughout India. S.E.Asia and Malesia.

Specimens examined : Ichak, 344; Satgawan, 586; Ghanghree, 2243.

Uses : Stems are used as vegetable after boiling; also used as diuretic and laxative. Leaves are used as styptic and astringent.

2. AMORPHOPHALLUS Blume ex Decne., *nom. cons.*

Amorphophallus paeoniifolius (Dennst.) Nicolson var. **campanulatus** (Decne.) Sivadason in Taxon 32 : 130. 1983; Nicolson in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 40. 1987.

Arum campanulatum auct. non Roxb., 1820, nom. illegit. : Roxb., Fl. Ind. 3 : 509. 1832, *p.p.*

Amorphophallus campanulatus Decne. in Ann. Mus. Nat. Hist. 3 : 366. 1834; Hook. f. in Hook. f., Fl. Brit. India 6 : 513. 1893; Prain, Beng. Pl. 2 : 1109. 1903; Haines, For. Fl. Chota Nagpur 554. 1910 & Bot. Bihar & Orissa pt. 5 : 861. 1924.

A. dubius Blume in Rumphia 1 : 142. 1837; Hook. f. in Hook. f., Fl. Brit. India 6 : 514. 1893.

Amorphophallus campanulatus var. *blumei* Prain, Bengal Pl. 2 : 1109. 1903.

Local name : Zamin-Kand.

Corm depressed - hemispherical, 15-25 cm in diam; petiole 40-90cm long, stout muricate, greenish with white mottles; leaf-segments obovate-oblong, glabrous, long-acuminate, 10-20 cm long. Peduncle muricate to nearly smooth, much shorter, elongating up to 10-15 cm in fruit. Spathe broadly campanulate, to 25 × 28 cm, narrow below, spreading above, light green with white patches outside, dark purple and rough at base with a yellowish area and purple to green at rest part inside. Spadix stout, to 40 cm long; pistillate part to 11 cm long, staminate part to 5 cm long, somewhat broader above than below; appendix irregularly lobed, conical, dark-purple, spongy and whitish, broader than long, 4-15 × 3-8 cm. Ovary depressed-globose, light purplish; style to 1 cm long; stigma yellow, usually 3-lobed. Stamens cream-yellow. Berries obovoid-oblong, reddish, when ripe, 0.8-1 cm long, 2-3-seeded.

Fl. : Apr.-June. *Fr.* : Sept.-Dec.

Ecology : Very common; near villages, also cultivated in gardens.

Distribution : India : Plains of Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Deccan Peninsula. Sri Lanka and Pacific Islands.

Specimens examined : Pratappur, 612; Chatra, 1085; Bishnugarh, 2227.

Uses : Corms after washing and prolonged boiling are used for edible purposes; also used in dysentery and piles. Tender petioles are edible as vegetable.

3. COLOCASIA Schott, *nom. cons.*

Colocasia esculenta (L.) Schott in Schott & Endl., Melet. Bot. 18. 1832; Nicolson in Dassan, & Fosb., Rev. Handb. Fl. Ceylon 6 : 54. 1987. *Arum esculentum* L., Sp. Pl. 965. 1753.

Colocasia antiquorum Schott in Schott & Endl., Melet. Bot. 18. 1832; Hook. f. in Hook. f., Fl. Brit. India 6 : 523. 1893; Prain, Bengal Pl. 2 : 1112. 1903; Haines, For. Fl. Chota Nagpur 551. 1910 & Bot. Bihar & Orissa pt. 866. 1924.

Local name : Kachalu, Arvi.

Stem above ground o or slightly swollen at base of leaf-sheaths, arising from a hard tapering tuberous rootstock to 15 cm thick, spreading by coppery runners; petiole to 75 cm long; leaf-blade ovate or subtriangular in outline, acute and apiculate, cordate or sagittate at base with a triangular basal sinus, subentire-repand, white-margined, glabrous, with a dull surface above, paler or coloured beneath, to 40 × 30 cm. Peduncle to 50 cm long. Spathe to 30 cm long, with a convolute, cylindrical, 5-8 cm long, green tube and a lanceolate pale yellow or orange 20-35 cm long limb flexing open near base, then deflexing and dropped. Spadix 8-20 cm long, 1-1.5 cm diam. at base; pistillate part 2.5-4 cm long, sterile part 1-1.5 cm long, staminate part 3-4 cm long and appendix 2-4 cm long. Fertile pistils green, intermixed with several whitish pistillodia. Anthers oblong, with stellately crenate or deeply lobed truncate top; anther cells 6-8, lobes as many as the cells, each lobe denticulate and much broader than cells. Berry oblong, many seeded. Seeds elongate, grooved.

Fl. : Jun.-Sept. *Fr.* : Aug.-Dec.

Ecology : Very common; in open shady, moist places, ravine slopes and forests.

Distribution : Throughout the hotter parts of India. Native of S.E. Asia, now pantropically cultivated and escaping.

Specimens examined : Gola, 773; Chowparan, 1371; Katkamasandi, 2350.

Uses : Tubers are consumed boiled or fried. Juice of petioles is used as an astringent and styptic. Tubers are also used for production of industrial alcohol.

4. CRYPTOCORYNE Fisch. ex Wydler

Cryptocoryne retrospiralis (Roxb.) Kunth, Enunm. 3 : 12. 1814; Hook. f. in Hook. f., Fl. Brit. India 6 : 493 1893 ; Prain, Bengal Pl. 2 : 1106. 1903 ; Haines, Bot. Bihar & Orissa pt. 5 : 871. 1924; Nicols. in Saldan. & Nicols., Fl. Hassan Dist. 786. 1976. *Ambrosinia retrospiralis* Roxb., Fl. Ind. 3 : 492. 1832.

A. unilocularis Roxb., Fl. Ind. 3 : 493. 1832.

Cryptocoryne unilocularis (Roxb.) Kunth, Enum. 3 : 13. 1841; Haines, Bot. Bihar & Orissa pt. 5 : 872. 1924.

Cryptocoryne roxburghii Schott, Prodr. 18. 1860; Hook. f. in Hook. f., Fl. Brit. India 6 : 494. 1893.

Rootstock to 1.5 cm in diam; roots fleshy, stout. Leaves grass-like, narrowly lanceolate to linear, narrowed at base into a slender petiole, or subsessile, sheathing, acute or acuminate at apex, usually crisped or waved, with distinct costa and 1-2 side nerves, 7-10 × 0.5-0.65 cm. Spathe ± equating the leaves in length, subsessile, grey streaked and mottled with purple; tube narrow, 2-4 times as long as the glabrous, closely twisted limb. Spadix with pistillate part *ca* 6 mm long, naked filamentous interstice *ca* 1 cm long and staminate part *ca* 3 mm long. Ovaries 5-6, 3 or more ovuled; stigmas broadly elliptic or orbicular. Fruit shortly peduncled, ovoid.

Fl. & Fr. : Nov.-Jan.

Ecology : Common; on moist soil along river-banks, marshy places, nalas, irrigation canals, streams, etc.

Distribution : India : West Bengal, Bihar, Orissa, central India and Deccan Peninsula. Myanmar.

Specimens examined : National Park, 1965 ; Koderma Forest, 2363.

5. PISTIA L.

Pistia stratiotes L., Sp. Pl. 963. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 497. 1893; Prain, Bengal Pl. 2 : 1105. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 873. 1924; Subram., Aquat. Ang. 75, f. 49. 1962.

Local name : Jalkhumbi, Takapana.

Leaves rounded or retuse at apex, variable in size, 3-12 × 1.2-1.5 cm; veins 5-9, prominent on lower surface, bright silvery green in colour. Spathe pale yellow or white, 0.8-1.2 cm long, obliquely campanulate, contracted near the middle, acute at apex. Peduncle tomentose. Staminate flowers 2-8 in a single whorl, all connate into a synandrium surrounded by a cupular structure. Female flowers : Ovary oblong, membranous, striate-walled; style stout, short, incurved; stigma papillose. Fruits irregularly rupturing. Seeds oblong.

Fl. : Mar.-July. *Fr.* : Sept.-Nov.

Ecology : Very common; in tanks, ponds, rice-fields, etc.

Distribution : Throughout India. Tropics and Subtropics but rare in Oceania.

Specimens examined : Hazaribagh, 45 ; Patratu, 1546 ; Keredari, 1703.

Uses : Plants afford excellent food for fishes. Leaves are cooked and eaten by poor people in villages in times of scarcity. They are also valued as manure and applied to ringworm of scalp.

6. SAUROMATUM Schott

Sauromatum venosum (Ait.) Kunth, Enum. 3 : 28. 1841; Hepper in Kew Bull. 21. 492. 1967. *Arum venosum* Ait., Hort. Kew. 3 : 315. 1789.

Arum guttatum Wall., Pl. As. Rar. 2 : 10, t. 115. 1830.

Sauromatum guttatum (Wall.) Schott in Schott & Endl., Meletem. Bot. 1 : 17. 1832; Hook. f. in Hook. f., Fl. Brit. India 6 : 508. 1893; Prain, Bengal Pl. 2 : 1109. 1903; Haines, For. Fl. Chota Nagpur 553. 1910 & Bot. Bihar & Orissa pt. 5 : 862. 1924.

Tuber flattened-globose or hemispheric, 5-7 cm in diam. Leaves occasionally 2, variable in size, usually 15-40 cm broad; segments 7-15, variable, elliptic-obovate or oblong, cuneate or attenuate at base, acuminate at apex, with subentire-crenulate and crispy margins, deep green, glabrous, 5-35 × 2.5-8 cm; petiole stout, 30-60 cm long, purple-blotched. Peduncle 3-8 cm long in flower, 5-15 cm in fruit, green and spotted. Spathe 20-70 cm long; tube ovoid or subglobose; limb linear-lanceolate, thick, with usually purple and waved margins, green or yellowish with dark purple spots or blotches. Spadix ± as long as spathe, with *ca* 1.5 cm long pistillate part, *ca* 8 cm long staminate part, *ca* 1.2 cm long neuter and 5-20 cm long appendix. Appendix cylindrical and obtuse, or narrowed from the base to a fine point, green or dark-purple. Stamens densely packed. Berries like ± hexagonal prisms, reddish, 0.8-1 cm long, flattened above with a round stigmatic star. Seeds 1-2, pyriform, sub-stipitate, yellow.

Fl. : Apr.-May. *Fr.* : July-Aug.

Eclogy : Common; in shady, grassy, moist places, forest edges slopes of low hills, etc.

Distribution : India : Northern Himalaya including Kashmir and Kumaon, Himachal Pradesh to Punjab, Uttar Pradesh, Bihar, Chota Nagpur, W. Peninsula including Karnataka. Nepal, S. E. Tibet.

Specimens examined : National Park, 1746; Patratu, 2285 ; Chatra, 2268.

Uses : Tubers are acrid and considered to be poisonous. They are used externally as a stimulating poultice.

7. SCINDAPSUS Schott

Scindapsus officinalis (Roxb.) Schott in Schott & Endl., Meletem. Bot. 1 : 21. 1832; Hook. f. in Hook. f., Fl. Brit. India 6 : 541. 1893; Prain, Bengal Pl. 2 : 1114. 1903; Haines, For. Fl. Chota Nagpur 551. 1910 & Bot. Bihar & Orissa pt. 5 : 859. 1924. *Pothos officinalis* Roxb., Fl. Ind. 1 : 431. 1820.

Local name : Gajapipal, Bari-pipli.

Stem climbing on trees or rocks, as thick as the little finger; branches wrinkled when dry. Leaves dark green, broadly-elliptic or ovate, undivided, fleshy, rounded or (sub) cordate at base, acuminate at apex, entire, 20-30 × 13-16 cm, with dilated or broadly winged petiole of 8-15 cm long. Peduncle solitary, terminal, much shorter than petiole. Spathe 10-15 cm long, oblong-subcylindrical, green without, yellow within, terminating in a long acumen. Spadix stout, nearly as long as the spathe, greenish-yellow, elongating to 15-25 cm in fruit. Ovaries densely packed, grooved below; anthers in the grooves, short, 4-celled; stigma elongate, hemispheric in fruit. Berries fleshy, a few only ripening. Seed ovate-cordate.

Fl. & Fr. : June-Sept.

Ecology : Common; in forests.

Distribution : India : Tropical Himalaya (from Sikkim eastwards), West Bengal, Bihar, Orissa, central India, Andhra Pradesh, Uttar Pradesh, Andaman Islands. Bangladesh, Myanmar, Indo-China, Bhutan, Nepal, Pakistan.

Specimens examined : National Park, 1969; Pratappur, 2365.

Uses : Dried fruts are used as diaphoretic, stimulant, carminative, anthelmintic, and for rheumatism. Decoction of fruit is given as an expectorant in asthma.

123. LEMNACEAE

Key to the Genera

1a. Roots present. Budding pouches 2, basal, lateral, one on either side of the axis. Inflorescence developing from one of the budding pouches, consisting of 1 female flower and 2 male flowers enclosed by a membranous spathe. Anthers bilocular, transversely dehiscing :

- 2a. Fronds with a dorsal and a ventral scale, 1 to many roots and 3-15 nerves. Stipe ventrally attached ... 2. SPIRODELA
- 2b. Fronds without dorsal and ventral scales, with usually one root and 1-3, usually indistinct, nerves. Stipe marginally attached ... 1. LEMNA

1b. Roots absent. Budding pouch 1, median, never giving rise to an inflorescence. Inflorescence 1, dorsal, consisting of a cavity containing 1 female flower and 1 male flower, without a spathe. Anther unilocular, apically dehiscing ... 3. WOLFFIA

1. LEMNA L.

Lemna perpusilla Torrey, Fl. New Yourk 2 : 245. 1843; Hartog and Plas in Blumea 18 : 370. 1970; Plas in Steenis, Fl. Males. ser. 1, 7 : 230. 1971.

L. paucicostata Engelm. in Gray, Man. Bot. ed. 5, 681. 1867; Hook. f. in Hook. f., Fl. Brit. India 6 : 556. 1893; Prain, Bengal Pl. 2 : 1117. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 874. 1924; Subram., Aquat. Ang. 78. 1962.

L.minor auct. non L.; Hook.f. in Hook.f., Fl. Brit. India 6 : 556. 1893.

Floating. Fronds solitary or cohering in groups of 2-5, asymmetric, obovate or obovate-oblong, obtuse or subcuneate at base, obtuse to subacute at apex, entire, thin, green, with slightly convex dorsal sides and flat or convex ventral side, usually with a distinct hook-shaped papilla near apex, 3-veined, 1.5-5 × 1-3 mm. Stipe hyaline, fugacious. Root sheath cylindrical with 2 lateral wings; root cap acute. Slit of budding pouch coinciding with margin of frond. Ovary with 1 orthotropous ovule; style subapical, persistent. Fruit asymmetrical, ellipsoid. Seed laterally compressed, with 12-18 ribs.

Fl. & Fr. : May-Jan.

Ecology : Very common; in ponds, ditches, small streams, inundated rice-fields, etc., forming extensive floating mats.

Distribution : Throughout India. Widespread in the tropical and subtropical regions of the World.

Specimens examined : Hazaribagh, 1579; Jhumri Telaiya, 2221.

Uses : The plant is eaten by fishes. It is introduced in carp nurseries as it destroys algae and promotes growth of zooplanktons.

2. SPIRODELA Schleid., *nom. gen. cons. prop.*

Spirodela polyrhiza (L.) Schleid. in Linnaea 13 : 392. 1839; Subram., Aquat. Ang. 77. 1962; Hartog & Plas in Blumea 18 : 360. 1970; Plas in Steenis, Fl. Males, ser. 1, 7 : 224. 1974. *Lemna polyrhiza* L., Sp. Pl. 970. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 557. 1893; Prain, Bengal Pl. 2 : 1117. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 874. 1924.

Fronds reniform to orbicular or obovate, obtuse at base, obtuse or rounded at apex, flat and smooth on dorsal side, flat to strongly inflated on ventral side, green with red-purple tinge on margin and ventral side, 3-12 × 2.5-8 mm, 7-12-nerved. Stipe hyaline, prominent. Dorsal scale membranous, orbicular to reniform, attached to base, disappearing in older plants. Ventral scale membranous, broad, centrally attached near node, covering bases of roots. Roots 7-16, one perforating the ventral scale, others passing between scale and frond; primary roots appearing earlier than secondary ones. Root-cap acute. Ovary with 1 or 2 ovules. Fruit a 1-2-seeded utricle, slightly winged. Seed smooth.

Fl. & Fr. : Sept.-Mar.

Ecology : Very common; on stagnent fresh water habitats such as ponds, ditches etc., growing together with *Lemna perpusilla* Torrey.

Distribution : Almost throughout India. Cosmopolitan, but rather rare in Africa and Australia, and absent in S. America.

Specimens examined : Hazaribagh, 1579 ; Hunterganj, 2127.

Note : The plant actively propagates vegetatively during rainy season.

3. WOLFFIA Horkel ex Schleid., *nom. cons.*

Wolffia globosa (Roxb.) Hartog & Plas in Blumea 18 : 367. 1970; Plas in Steenis, Fl. Males. ser. 1. 7 : 236. 1971. *Lemna globosa* Roxb., Fl. Ind. 3 : 565. 1832.

Wolffia arrhiza auct. non (L.) Horkel ex Wimmer : Hook. f. in Hook. f., Fl. Brit. India 6 : 557. 1893, *p.p.* ; Prain, Bengal Pl. 2 : 1117. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 5 : 875. 1924; Subram., Aquat. Ang. 79. 1962.

Fronds elliptic to oblong in outline dorsally, *ca* 1.5 times as long as wide, 0.4-0.8 × 0.2-0.35 mm and 2.5-5.5 mm high, obtuse at both apex, and base, with few papillose cells on margins, on dorsal side flat near apex and convex near base with few papillose cells, on ventral side strongly inflated, globular, with large cells, with greatest width below the dorsal plane, green. Budding pouch usually with a distinct collar of elongate cells. Fruits not found.

Fl. : June-Oct.

Ecology : Very common; in stagnant water and ditches, mixed with other floating aquatics.

Distribution : Throughout India. E & S.E. Asia, Africa and Australia.

Specimens examined : Hazaribagh, 1578; Jhumri Telaiya, 2216.

Note : According to van der Plas (*l.c.*) , *W. arrhiza* (L.) Horkel ex Wimmer is distrbuted in Temperate Zone of the Old World, in Africa and also in Tropics, and probably absent from whole of E.Asia and Australia. He added that records of *W. arrhiza* (L.) Horkel ex Wimmer from these area seem to relate to closely allied to *W. gibbosa* (Roxb.) Hartog & Plas.

124. XYRIDACEAE

XYRIS L.

Xyris pauciflora Willd. in Phytogr. 1 : 2, t. 1. f. 1. 1794; Hook. f. in Hook. f., Fl. Brit. India 6 : 365. 1893; Prain, Bengal Pl. 2 : 1080. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1073. 1924.

Leaves narrowly linear, acute to acuminate at apex, sparsely papillate at either side, 5-2.5 × 1-2 mm; sheath 1-7 mm long, with a scabrous keel. Peduncle subterete, compressed and sometimes with 2 narrow wings, twisted, 5-40 × 1-15 mm. Head ovoid to globose, 3-8 × 2-7 mm. Basal bracts elliptic, obtuse, emarginate, papillate along midrib, with 2 descending nerves, 2-4 × 2-3 mm; median bracts elliptic-orbicular to obovate, 3-6 × 4-5 mm, obtuse, with 4 descending nerves and a narrow pipillate triangle in upper third, spinulose at top. Lateral sepals curved, subacute, with narrow, coarsely serrate crest; wings unequal, tapering towards base; median sepal spathelliform, *ca* 3 mm long. Petals 6-9 mm long; limb obovate, 2-3.5 mm long; claw 4-5 mm long. Stamens 1-1.5 mm long; anthers 0.5-0.7 × 0.5 mm, inner loculi of thecae shorter than outer ones, obtuse, with membranously widened connective. Staminodes 2-forked, penicillate, 1 mm long. Ovary obovoid, 3-seded, 2-3 × 1 mm. Style3-fid, 2 mm long; branches *ca* 5 mm long, capitate.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; in damp shady places, wet fields, sandy lowlands, etc.

Distribution : India : Chotanagpur, West Bengl, Orissa, W. Peninsula, Assam. Sri Lanka, S.E.China, Hainan, Hongkong, Formosa to N. Australia and Queensland, Malesia.

Specimens examined : Raja Rappa, 375; Hazaribagh, 1574.

Uses : Root-stocks are eaten. Plant-extract is used for insomnia.

125. COMMELINACEAE

Key to the Genera

1a. Stamens 6, all perfect; staminodes 0 :

2a. Leaf-sheaths inflated. Cymes sessile, axillary, with small inconspicuous bracteoles not arranged imbricately ... 1. AMISCHOPHACELUS

2b. Leaf-sheaths not inflated. Cymes shortly peduncled, terminal, with distinctly 2-seriate, imbricately arranged bracteoles ... 3. CYANOTIS

1b. Stamens 4-6, of which 3 perfect, others 1-3 staminodial :

3a. Inflorescence a cymose panicle or a cluster of 1-6 flowers. Bracts small, not spathaceous. Sepals all free ... 4. MURDANNIA

3b. Inflorescence a cyme enclosed in large conduplicate spathaceous bract. Inner 2 sepals connate at base ... 2. COMMELINA

1. AMISCHOPHACELUS R. Rao & Kammathy

Key to the Species

1a. Leaves linear-elongate, 5-14 × 0.4-1 cm. Filaments bearded ... 1. *A. axillaris*

1b. Leaves oblong-lanceolate, 3-4 × 0.6-0.8 cm. Filaments glabrous ...2. *A. cucullata*

1. **Amischophacelus axillaris** (L.) R. Rao & Kammathy in J. Linn. Soc. Bot. 59 : 306. 1966; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 642. 1976 ; *Commelina axillaris* L., Sp. Pl. 42. 1753.

Cyanotis axillaris (L.) D. Don, Prodr. Fl. Nepal 46. 1825; Hook. f. in Hook. f., Fl. Brit. India 6 : 388. 1892; Prain, Bengal Pl. 2 : 1085. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1081. 1924.

Erect or decumbent or ascending, annual herbs, with fibrous roots. Stems simple, or branched from base, creeping and rooting below, slender, glabrous. Leaves sessile, linear-elongate, acute at apex, obtuse at base, entire, glabrous, 5-14 × 0.4-1 cm. Sheaths inflated, ciliate, 5-4 mm long. Flowers borne in short axillary clusters in inflated leaf sheaths, 1-6 in each axil, *ca* 2 cm long and *ca* 8 mm in diam. Bracteoles linear or linear-lanceolate, *ca* 2 mm long. Calyx 6-8 mm long, divided almost half-way down; segments narrowly-lanceolate, ciliate on midrib, 3.5 - 4 mm long. Corolla violet or blue; tube to 8 mm long; segments ovate, subacute, 4-4.5 mm long. Filaments bearded with long blue jointed hairs, clavate at tip; anthers oblong, with purple pollens. Style filiform, spiral, clavate above. Capsule oblong-ellipsoid, shortly stipitate, with 1.2 - 1.5 mm long, hispidulous beak, 5-6 mm long; valves 2-fid. Seeds oblong-subcylindric, truncate at one end, rounded at other, pitted, dark-brown, 2-2.5 mm long.

Fl. : July-Oct. *Fr.* : Aug.-Dec.

Ecology : Very common; in grassy localities, rice-fields, wet waste places, road-sides, gardens, etc.

Distribution : Throughout India including Himalaya. Sri Lanka; Nepal, China, Malesia, Australia.

Specimens examined : Hazaribagh, 254 ; Ghanghree, 1029 ; Jhumri Telaiya, 2226.

Uses : Plant-extract is used in ascites and tympanitis. Seeds are used as food by poor people in times of scarcity.

2. ***Amischophacelus cucullata** (Roth) R. Rao & Kammathy in J. Linn. Soc. Bot. 59 : 306. 1966; *Tradescantia cucullata* Roth, Nov. Pl. Sp. 189. 1821.

Cyanotis cucullata (Roth) Kunth, Enum. 4 : 107. 1843; Hook. f. in Hook. f., Fl. Brit. India 6 : 389. 1892.

Erect or decumbent-ascending, glabrous or sparsely hairy, annual herbs. Leaves oblong-lanceolate, obtuse, 3-4 × 0.6-0.8 cm; sheaths prominently inflated. Flowers pale lilac, clustered in sheaths. Filaments glabrous. Capsule depressed in centre with 3 horns, border than *A. axillaris*. Seeds subquadrate, obscurely pitted. Other characters almost similar to *A. axillaris*.

Fl. : Aug.-Oct. *Fr.* : Oct.-Dec.

Ecology : Not common: in moist sandy waste places, grassy localities near roadsides, etc.

Distribution : Deccan peninsula.

Specimens examined : Ghanghree, 1039; Hazaribagh, 1616.

2. COMMELINA L.

Key to the Species

1a. Ovule 1 in each of all the cells of ovary ... 4. C. PALUDOSA

1b. Ovule(s) 2 in each of anterior pair of cells and 1 in posterior cell of ovary :

2a. Spathes complicate, with free or basally connate margins :

3a. Seeds appendiculate. Leaves linear or linear-lanceolate. Spathes rounded at base ... 3. C. LONGIFOLIA

3b. Seeds muticous. Leaves lanceolate oblong or elliptic-oblong. Spathes deeply cordate at base ... 2. C. HASKARLII

2b. Spathes turbinate. Leaves ovate or ovate-elliptic. ...1.C.BENGHALENSIS

1. **Commelina benghalensis** L., Sp. Pl. 41. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 370. 1892; Prain, Bengal Pl. 2 : 1082. 1903; Haines, For. Fl. Chota Nagpur 535. 1910 & Bot. Bihar & Orissa pt. 6 : 1077. 1924.

Local name : Kanchara.

Decumbent or ascending, annual herbs. Roots fibrous, with cleistogamous flowers. Stems branched from base, usually creeping and rooting below, striate. Leaves ovate or ovate-elliptic, subsessile or narrowed at base into a 4-5 mm long petiole, rounded, subtruncate or subacute and slightly oblique at base, obtuse or rounded at apex, with ciliate margins, 2.5-8 × 1.2-4 cm. Sheaths 1-1.5 cm long, with an oblique, long-ciliate mouth. Spathes 1-3 together, subsessile, turbinate, auricled at base on one side, hairy outside, 0.8-1.5 cm long and broad. Cymes 2-nate, on 1-1.5 cm long peduncles; upper branch 2 to 3-flowered, lower one usually 1-2-flowered. Pedicels 3-4 mm long. Sepals unequal; outer one ovate-lanceolate, 3-3.2 × 1.3-1.5 mm; inner ones suborbicular, 3.2 × 3.2 mm. Petals blue; larger ones broadly ovate, *ca* 4 × 4.5 mm; smaller one shallowly notched, to 2.5 × 1.5 mm. Perfect stamens to 3.5mmlong; staminodes 3, with minute anthers. Capsule 3-gonous - oblong, 6 × 4 mm, short-stalked, membranous, 3-celled, 3-valved; 2 anticous cells larger, 2-seeded each, postical cell smaller, 1-seeded. Seeds pitted, subquadrate to oblong, 2-3 mm long. Cleistogamous flowers ovoid, 4-6 mm long.

Fl. : Jun.-Aug. *Fr.* : Aug.-Nov.

Ecology : Very common; in roadsides, waste places, gardens, grassy localities, arable lands, scrub jungles, etc.

Distribution : Throughout India including Himalaya. Sri Lanka, Nepal, China, Japan, Malesia, Africa.

Specimens examined : Gola, 781; Keredari, 1262; Chowparan, 1372.

Uses : Rhizomes are cooked and eaten. Leaves are used as a pot-herb by poor people in times of scarcity. Plant-extract is used by tribals in leprosy.

2. **Commelina hasskarlii** Clarke, Comm. & Cyrt. Beng. 13, t. 5. 1875; Hook. f. in Hook. f., Fl. Brit. India 6 : 370. 1892; Prain, Bengal Pl. 2 : 1082. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1076. 1924.

Decumbent or ascending, annual, or sometimes perennial herbs. Stems diffuse, branched from base, creeping and rooting below, striate, glabrous, or short-hairy below nodes. Leaves subsessile, lanceolate-oblong or elliptic-oblong, rounded at base, subacute or obtuse at apex, scabrid along margins, glabrous on both surfaces, 3.5-9 × 0.7-3 cm. Sheaths ovoid, inflated, conspicuously 7-10-nerved, pale, ciliate-margined, 0.8-1.5 cm long, with an oblique mouth. Spathes on 1-1.5 cm long peduncles, ovate-lanceolate, subacuminate, deeply cordate at base with 4-5 nerves on each side of midrib, hispidulous along margins, glabrous on both surfaces except ciliate midrib, 1.5-2.5 cm long. Cymes on 0.8-1.2 cm peduncles; upper branch 2-flowered, lower ones 1-flowered. Pedicels 2-2.5 mm long. Sepals unequal, ovate, obtuse, 2.5-3.5 × 2-2.5 mm. Petals blue. Capsule usually only one developing to each spathe, oblong, shortly beaked, 0.8-1 cm long, 3-celled, 3-valved; 2 anticous cells larger, 2-seeded each, third postical cell smaller, 1-seeded. Seeds brown - black, oblong, 3-3.5 mm long.

Fl. : July-Sept. *Fr.* : Aug.-Nov.

Ecology : Common ; in water sides, banks of ponds, marshy and grassy localities, etc.

Distribution : India : Upper Gangetic Plains, Bihar, West Bengal, Orissa, Deccan Peninsula, Assam. Nepal.

Specimens examined : Churchu, 1287; Chowparan, 1379.

3. **Commelina longifolia** Lam., Tab. Encycl. 1 : 129. 1791 ; Rao in Taxon 10 : 254. 1961.

Commelina salicifolia Roxb., Fl. Ind. 1 : 176. 1820; Hook. f. in Hook. f., Fl. Brit. India 6 : 370. 1892; Prain, Bengal Pl. 2 : 1082. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1076. 1924.

Local name : Jalpipari.

Decumbent or ascending, annual herbs. Stems slender, with long branches and internodes, rooting from lower nodes. Leaves linear or linear-lanceolate, glabrous, sometimes minutely hispid on upper sides and margins, obtuse at base, acute-subacuminate at apex, 3-8 × 0.5-1 cm. Sheaths cylindrical, ciliolate, to 2 cm long. Spathe axillary, solitary, ovate-lanceolate, rounded at base, acute or acuminate at apex, glabrous, to 3 cm long. Cymes on 2.5-3.5 cm long peduncles, considerably exserted; branches 1 to 2-flowered. Sepals ovate, obtuse. Petals dark blue, subequal; 2 lateral ones long-clawed, ovate, with undulate margins; dorsal one subsessile, ovate, entire. Capsule oblong, 3-celled; 2 anticous cells larger, 2-seeded each, postical cell usually smaller, 1-seeded, sometimes obsolete. Seeds ovoid-subglobose, truncate, appendiculate, black with a white bloom, to 2 mm.

Fl. : Jun.-Sept. *Fr.* : Aug.-Nov.

Ecology : Common; in damp palces, margins of ponds, canals, lakes, etc.

Distribution : Throughout the peninsular and eastern parts of India. Malesia, Java, Myanmar, Hong Kong.

Specimens examined : Mandu, 1346; Jaynagar, 1503; Koderma Forest, 1771.

4. **Commelina paludosa** Bl., Enum. Pl. Java 1 : 2. 1827; Rao & Kammathy in J. Bombay Nat. Soc. 59 : 60. 1962.

C. obliqua Buch.-Ham. ex D. Don, Prodr. 45. 1825, non Vahl 1806; Hook. f. in Hook. f., Fl. Brit. India 6 : 372. 1892, *p.p.*; Prain, Bengal Pl. 2 : 1083. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1077. 1924.

Local name : Kanjuna.

Scrambling or scandent, perennial herbs. Stems branching from base, creeping and rooting below, suberect or ascending above, stout, subterete, glabrous. Leaves subsessile, lanceolate, acute or acuminate at apex, slightly oblique at base, pubescent beneath, 5-20 × 2-5 cm. Sheaths 1.5-2 cm long, usually with bearded margins. Spathes subsessile or on 5-8 mm long peduncles, funnel-shaped, with a cordate base, acuminate, 1.5-2.5 × 2-3 cm, usually clustered together at end of branches, rarely solitary. Cymes simple, or branched once, on 1-1.5 cm long peduncles. Pedicels 0.5-1.2 cm long. Sepals unequal, outer one *ca* 3 mm long, inner ones 4.5-5.5 mm long. Petals white, 6-7 mm long. Staminodes 3, with 4-celled minute anthers. Capsule obovoid -3-gonous, 3-valved and 3-celled, *ca* 5 × 4.8 mm; cells 1-seeded each. Seeds free in the cell, ovoid-oblong, smooth, 3.5-4 × 2.5-3 mm.

Fl. : Jun.-Sept. *Fr.* : Aug.-Dec.

Ecology : Common; in moist grassy localities, along margins of canals, ponds, arable lands, etc.

Distribution : Almost throughout India. Nepal, Sri Lanka and Malesia.

Specimens examined : Churchu, 696 ; Chatra, 1095 ; Koderma Forest, 1789.

Uses : Roots are laxative and also useful in bilious affections.

3. CYANOTIS D. Don, *nom. cons.*

Cyanotis cristata (L.) D. Don, Prod. Fl. Nepal 46. 1825; Hook. f. in Hook. f., Fl. Brit. India 6 : 385. 1892; Prain, Bengal Pl. 2 : 1085. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1081. 1924 ; Rao in Ind. For. 93 : 57. 1967. *Commelina cristata* L., Sp. Pl. 42. 1753.

Erect or decumbent-ascending, annual herbs, with fibrous roots. Stems simple, or branched from base, rooting from lower nodes, usually purple-tinged, glabrous except a line of pubescence decurrent sheaths.

Leaves sessile, ovate-oblong or oblong-lanceolate, rounded or subcordate at base, subacute or obtuse at apex, glabrous on both surfaces, ciliate along margins, 3-10 × 0.6-2 cm. Sheaths loose, shortly hirsute, to 5 mm long. Cyme recurved, solitary, 2-2.5 cm long. Bracts ovate-lanceolate, acuminate, 2.5-4 cm long, greatly exceeding the cymes. Bracteoles falcate, obtuse and apiculate, glabrous or villous on margins, imbricating, 6-15 × 4-5 mm. Flowers subsessile, 6 mm across. Sepals linear-oblong, acute, hairy, 5-6 mm long. Corolla tube 4-5 mm long; petals blue or purple, oblong-spathulate, apiculate, 3-3.5 × 1.5-2 mm. Filaments bearded with blue or purple hairs. Ovary hairy at apex; stigma capitate. Capsule trigonous, 2.5-3 mm long. Seeds 2 in each cell, oblong-conic, truncate at one end, ribbed, with a pair of pits on 2 lateral faces, to 1 mm long.

Fl. : Aug.-Oct. *Fr.* : Sept.-Dec.

Ecology : Common ; in river beds, grassy moist localities, shady places of gardens, roadsides, etc.

Distribution : Almost throughout India including Himalayas. Nepal, Sri Lanka, China, Malesia and tropical Africa.

Specimens examined : National Park, 481; Chowparan, 1370.

Uses : The plant yields an oil which is used for making soaps, and as a flavouring. Infusion of the plant is taken as a beverage.

4. MURDANNIA Royle, *nom. cons.*

Key to the Species

1a. Flowers in terminal lax cymose panicles. Ovules and seeds 2-7 in each cell of ovary :

- 2a. Leaves 1-3 cm long. Ovules and seeds 3-7 in each cell of ovary ... 2. *M. spirata*
- 2b. Leaves 5-12 cm long. Ovules and seeds 2 in each cell of ovary ... 1. *M. nudiflora*

1b. Flowers 1-3 together in cluster on short axillary peduncles. Ovules and seed solitary in each cell of ovary ... 3. *M. vaginata*

1. **Murdannia nudiflora** (L.) Brenan in Kew Bull. 7 : 189. 1952; Rao in Ind. For. 93. 57. 1967. *Commelina nudiflora* L., Sp. Pl. 41. 1753, *p.p.*

Aneilema nudiflorum (L.) R. Br., Prodr. 271. 1810; Hook. f. in Hook. f., Fl. Brit. India 6 : 378. 1892; Prain, Bengal Pl. 2 : 1084. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1080. 1924.

Local name : Kanshura.

Suberect or decumbent, annual herbs, with fibrous roots. Stems branched from base, slender, usually rooting below, glabrous except a line of spreading hairs. Leaves sessile, linear-oblong or lanceolate, rounded or subcordate at base, obtuse or subacute at apex, glabrous, 5-12×0.6-1.2 cm. Sheaths hairy, with strongly ciliate margins and mouth, 0.6-1 cm long. Flowers in terminal, lax, cymose panicles. Peduncles 1.5-5 cm long, marked with scars of fallen bracts. Bracts membranous, ovate, obtuse, 2.5-3.5 mm long. Pedicels 3.5-5 mm long. Sepals ovate-oblong, obtuse, 2.5-3 × 1.8-2 mm. Petals suborbicular, purplish or pink, 3.5-4 × 2.5-2.7 mm. Filaments of fertile stamens bearded; staminodes 3, with filaments bearded or not. Style 1.5-2 mm long; ovules 2 in each cell of ovary. Capsule broadly oblong - ellipsoid, mucronate, membranous, glabrous, 3.5-4 mm long. Seeds broadly oblong, rugose and pitted, truncate at one end, rounded or obtuse at other end, dark-brown, 1.2-1.3 × 1-1.2 mm.

Fl. : June-Sept. *Fr.* : Aug.-Nov.

Ecology : Very common; in grassy localities, roadsides, moist fields, marshy places, etc.

Distribution : Throughout India including Himalaya. Nepal, Myanmar, China, Africa, S. Japan, Malesia.

Specimens examined : Raja Rappa, 382 ; Chatra, 582; Mandu, 1347.

Uses : Leaves are used as vegetable and fodder. Bruished plant is applied to boils, itches and burns.

2. **Murdannia spirata** (L.) Bruckn. in Engl. & Prantl, Pflanzenfam. ed. 2, 15a : 173. 1930; Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 83. 1978. *Commelina spirata* Linn., Mant. Pl. 176. 1767.

Aneilema spiratum (L.) R. Br., Prodr. 271. 1810; Hook. f. in Hook. f., Fl. Brit. India 6 : 377. 1892; Prain, Bengal Pl. 2 : 1084. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1079. 1924.

Procumbent or ascending, annual herbs, with fibrous roots. Stems slender, simple, or branched from base, rooting below, glabrous except a line of pubescence. Leaves sessile, oblong to ovate-lanceolate, cordate and semiamplexicaul at base, acute or subacute at apex, usually glabrous, with crispy margin, 1-3 × 0.5-1 cm. Sheaths 0.6-1 cm long, with pubescent edges in continuation of the line of pubescence of stems and branches. Flowers 8 mm across, borne in terminal lax cymose panicles; rachis usually zig-zag. Bracts ovate, persistent, minute, 1.2-1.5 mm long. Pedicels slender, 3-5 mm long. Sepals brownish, ovate-oblong, obtuse, 1.8-2 mm long. Petals blue, obovate, 3.8 × 4.2 mm long. Fertile stamens with apiculate blue anthers and bearded filaments; staminodes 3, with usually glabrous, or bearded filaments. Ovules 3-7 in single row in each cell of ovary. Capsule oblong, acutely trigonous, mucronate or shortly beaked, 3-4 × 1.5-1.8 mm. Seeds cuboid, light brown, tuberculate, 0.5-0.8 × 0.7-0.8 mm.

Fl. : July-Sept. *Fr.* : Oct.-Jan.

Ecology : Common ; in grassy moist places, shady localities, waste places, gardens, roadsides, etc.

Distribution : Throughout India including Himalaya. Nepal, Sri Lanka, China, Taiwan and Malesia.

Specimens examined : National Park, 454; Churchu, 697; Morkachho, 1463.

3. **Murdannia vaginata** (R. Br.) Bruckn. in Engl. & Prantl, Pflanzenfam. ed. 2, 15a : 173. 1930. *Aneilema vaginatum* R. Br., Prodr. 271. 1810; Hook. f. in Hook. f., Fl. Brit. India 6 : 382. 1892; Prain, Bengal Pl. 2 : 1084. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1080. 1924.

Slender, grass-like, annual herb, with suberect and prostrate, striate, usually puberulous branches of 15-40 cm long rooting at lower nodes. Leaves linear, flat, acuminate, glabrous or sparsely hairy, 7-20 × 0.6-1 cm; sheaths shortly open, ciliate. Flowers small, purple-blue, star-like, 1-3 together in axils of distant, convolute bracts along filiform slender terminations of branches. Bracts narrowly oblong, obtuse, sheathing, stongly ribbed, 8-12 mm long. Pedicels 12-18 mm long, slender, puberulous, usually twice jointed. Sepals ovate-oblong, obtuse, glabrescent, 3.5-4 mm long. Petals orbicular, ± equalling the sepals. Stamens 2 perfect and 3-4 with aborted anthers; filaments of perfect stamens bearded; those of sterile ones usually naked, shorter than fertile filaments. Ovary 3-celled; ovule 1 in each cell. Capsule globose, cuspidate, shining, 3-3.5 mm in diam.; cells of capsule usually 1-seeded, or rarely empty. Seeds trigonously conical, abruptly truncate at one end, narrowed at other end, black, rugose.

Fl. & Fr. : July-Oct.

Ecology : Common; in wet grounds, rice-field and field borders, etc.

Distribution : Throughout the tropical parts of India. Bangladesh, Sri Lanka, China.

Specimens examined : Hazaribagh, 1618; Bishnugarh, 2358.

126. ERIOCAULACEAE

ERIOCAULON L.

Key to the Species

1a. Anthers black :

2a. Involucral bracts overtopping the head. Floral bracts cuspidate-acuminate, usually glabrous ... 2. *E. edwardii*

2b. Involucral bracts not overtopping the head. Floral bracts hairy on back in upper part :

3a. Leaves usually red at base. Heads snowy white, 0.5-0.65 cm in diam. Floral bracts cuspidate-acuminate ... 3. *E. quinquangulare*

3b. Leaves not red. Heads dark grey, 0.25 - 0.45 cm in diam. Floral bracts obtuse or suddenly acute ... 4 *E. sollyanum*

1b. Anthers white. Involucral bracts not overtoping the head. Floral-bracts subacute, glabrous ... 1. *E. cinereum*

1. **Eriocaulon cinereum** R. Br., Prodr. 254. 1810; Moldenke in Phytologia 3 : 185. 1948.

E. sieboldianum Sieb. & Zucc. ex Steud., Syn. Pl. Glum. 2 : 272. 1855; Hook. f. in Hook. f., Fl. Brit. India 6 : 577. 1893; Prain, Bengal Pl. 2 : 1127. 1903 ; Fyson in J. Ind. Bot. 3 : 15, t. 50, 51. 1922; Haines, Bot. Bihar & Orissa pt. 6 : 1068. 1924.

Small, annual, marsh herbs, with fibrous roots. Stems very short. Leaves in a crowded basal rosette, subulate or setaceous, acute, glabrous, few-nerved, 25-60 mm long and 1-2.5 mm broad at base. Peduncles many, slender, glabrous, 5-ridged, 3-12 cm long; sheaths 0.5-2 cm long, obliquely split, glabrous. Heads globose or ovoid, pale or purplish, 3-5 mm across. Involucral bracts obovate-oblong, obtuse,

toothed or lacerate, inner narrower, all scarious, glabrous, much shorter than head and concealed by it. Floral bracts lanceolate or linear-oblanceolate, subacute, hyaline, closely imbricating, glabrous, shining, 1.8-2 mm long. Staminate florets pedicellate; sepals 3, connate into a glabrous, cucullate, toothed spathe; corolla tube 0.7-0.8 mm long; petals minute, narrow or absent; stamens with white anthers. Pistillate florets pedicellate; sepals usually 2, sometimes 1 or 3, linear, hyaline, glabrous, 0.5-0.6 mm long, or rarely absent; petals usually 2, sometimes 3, linear-lanceolate, 0.8-1 mm long, or rarely absent; ovary on a long-stipe; style-arms filiform, 1-1.2 mm long. Seeds ellipsoid, brown, smooth, shining, 0.1-0.2 mm long.

Fl. : Sept.-Oct. *Fr.* : Oct.-Nov.

Ecology : Common; in rice-fields, damp and marshy places, shady moist places etc.

Distribution : Throughout India including Himalaya. Nepal, Myanmar, China, Japan, Philippines and Australia.

Specimens examined : Gola, 763 ; Katkamosandi, 1410.

Note : Ghazanfar (in Nasir & Ali, Fl. W. Pakistan 142 : 2. 1982) keep *E. seaboldianum* Sieb. & Zucc. ex Steudel in the varietal status of *E. cinereum* R. Br. as *E. cinereum* R. Br. var. *seaboldianum* (Sieb. & Zucc. ex Steudel) Koyama ex Huang.

2. **Eriocaulon edwardii** Fyson in J. Ind. Bot. 2 : 213, t. 34. 1921; Haines, Bot. Bihar & Orissa pt. 6 : 1070. 1924.

Marsh or submerged, aquatic annuals. Stems very short or 0. Leaves in a basal rosette, linear-lanceolate, sharply acute at apex,glabrous, slender, 1.5-4 cm long, and 0.8-4 mm broad at base. Peduncles slender, glabrous, 3-15 cm long. Heads at first obconic, finally globose, white, turning to black on maturity, 3-4 mm across. Involucral bracts ovate - elliptic, acute, glabrous, scarious, overtopping the head, 2.5-3 mm long. Floral bracts obovate-spathulate, cuspidate-acuminate, pale black, usually

glabrous, shorter than involucral bracts. Receptacle columnar, villous. Staminate florets : Sepals 2, spathaceous, lanceolate or linear-oblanceolate, usually connate, 1.2-1.5 mm long; petals 2-3, filiform, or absent; stamens with black anthers. Pistillate florets : Sepals usually 2, filiform, connate, 1.2-1.5 mm long; petals usually absent, when present, 2-3, filiform. Seeds yellow, ovoid, finely trasversely rugose, 0.2-0.3 mm long.

Fl. : Sept.-Nov. *Fr.* : Oct.-Dec.

Ecology : Not common; in moist, grassy places, marshy low lands, paddy fields, etc.

Distribution : Endemic to Uttar Pradesh, Bihar and Orissa.

Specimens examined : Keredari, 653 ; Joynagar, 1505.

3. **Eriocaulon quinquangulare** L., Sp. Pl. 87. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 582. 1893; Prain, Bengal Pl. 2 : 1127. 1903; Fyson in J. Ind. Bot. 2 : 204. 1921; Haines, Bot. Bihar & Orissa pt. 6 : 1068. 1924.

Annual herbs of marshy lands, or wet places. Stems very short. Leaves in a basal crowded rosette, linear-ensiform, flat, tapering from base to apex, without distinct sheath, reddish-tinged at base, 8-12 nerved, obscurely fenestrate between nerves, 2-8 cm long and 2.5-7 mm broad at base. Peduncles many, 5-8-ridged, 7-25 cm long. Heads globose-ovoid, snowy white, 5-6.5 mm across. Involucral bracts oblong-oblanceolate or obovate-cuneate, obtuse, glabrous, scarious, 1.5-2 mm long, not overtopping the head. Floral bracts broadly obovate-cuneate, cuspidate-acuminate, hairy on dorsal side, 1.5-2 mm long. Staminate florets subsessile; sepals 3, all or 2 only connate into a spathe, linear-oblanceolate, obtuse, shortly hairy at tip, 1-1.2 mm long; corolla-tube *ca* 1.2 mm long; petals pilose, one much larger than others, shorter or nearly as long as floral bracts; stamens with black anthers. Pistillate florets shortly pedicellate or subsessile; sepals 3, narrowly linear-spathulate, obtuse, pilose at apex, 1.2-1.5 mm long; petals 3, linear-

spathulate, villous, 1-1.2 mm long. Capsule 3.5-4 mm in diam. Seeds yellow, ellipsoid, smooth, 0.5-0.6 mm long.

Fl. : Oct.-Dec. *Fr.* : Nov.-Feb.

Ecology : Very common; in wet places, rice-fields, moist grassy localities, swampy and marshy lands, etc.

Distribution : Throughout India. Sri Lanka, Nepal and Myanmar.

Specimens examined : Hazaribagh, 120; Ramgarh Cant., 1141; Chowparan, 1373.

4. **Eriocaulon sollyanum** Royle, Illustr. 409, t. 97. f. 1. 1839.

E. trilobum Buch.-Ham. ex Koern. in Linnaea 27 : 645. 1856; Hook. f. in Hook. f., Fl. Brit. India 6 : 583. 1893; Prain, Bengal Pl. 2 : 1127. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1068. 1924.

Stemless, small herb. Leaves ensiform, mostly erect, narrowed at apex, fenestrately 9-11-nerved, 1.8-6 cm long, not drying red. Peduncles slender, numerous, glabrous, 5-6-ribbed, twisted, 7-20 cm tall ; sheaths slightly lax, obliquely split, striatulate, 2-5 cm long. Heads subglobose, dark grey, 2.5-4.5 mm in diam. Involucral bracts oblong, obtuse, glabrescent, pale, shining *ca* 3 × 1.2 mm, not overtopping the head, spreading or reflexed. Floral bracts obcuneate, with triangular-obtuse tip, or suddenly acute, concave, hairy on back in upper part, *ca* 2 mm long. Staminate florets : shortly pedicellate; sepals 3, oblong, connate into a spathe, glabrous, *ca* 1.5 mm long; corolla-tube *ca* 1 mm long; lobes minute; stamens 6, with black anthers. Pistillate florets : subsessile; sepals 3, oblanceolate, boatshaped, hairy outside, *ca* 1.5 mm long; petals 3, free, narrowly spathulate, hairy above; ovary subsessile, 3-lobed; style-branches 3, filiform. Seeds ellipsoid, transversely ridged, pale 0.5 mm long.

Fl. & Fr. : Oct.-Apr.

Ecology : Very common; in wet waste places, rice-fields, etc.

Distribution : Throughout India.Pakistan, Bangladesh.

Specimens examined : Hazaribagh, 1825 ; Ramgarh, 2349.

127. JUNCACEAE

JUNCUS L.

Key to the Species

1a. Annual. Stems copiously dichotomously branched. Leaves not divide by cross partitions. Lateral flowers in cymes 6-androus, terminal 3-androus ... 1. *J. bufonius*

1b. Perennial, strict, caespitose. Leaves divided by cross partitions. All flowers in cymes 3-androus ... 2. *J. wallichianus*

1. **Juncus bufonius** L. Sp. Pl. 328. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 392. 1892; Prain, Bengal Pl. 2 : 1088. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1084. 1924.

Tufted, pale-coloured, annual. 10-35 cm long. Stems erect, erecto-patent or decumbent, terete, usually branched. Branches rather straight. Leaf-sheaths not auricled. Leaves linear, channelled down the face, lower ones to 15 cm long; higher ones shorter. Flowers almost sessile, solitary or in ± remote clusters of 2-6, subtended at base with one bract and 2 bracteoles; bracts and bracteoles ovate, acute, 3-5 mm long. Tepals narrowly ovate-lanceolate, pale, acute, inner 3 usually much smaller. Stamens 6, usually 3 in upper flowers. Stigmas straight. Capsule oblong, trigonous, usually shorter than perianth, 0.3-0.5 mm long; placentas either free or cohering into a central column. Seeds ellipsoid, brown, 0.4-0.5 mm long.

Fl. & Fr. : Nov.-Feb.

Ecology : Very common; in wet places, river banks, rice-fields, etc.

Distribution : India : Northern India, Uttar Pradesh, Bihar, West Bengal. Almost cosmopolitan in northern temperate zone, in Tropics restricted to mountainous regions.

Specimens examined : Raja Rappa. 861; Barkaganwa. 892.

2. **Juncus wallichianus** Laharpe, Monogr. Junc. 139. 1827; Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 85. 1978.

J. prismatocarpus auct. non R. Br. : Hook. f. in Hook. f., Fl. Brit. India 6 : 395. 1892, *p.p.*; Prain, Bengal Pl. 2 : 1088. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1084. 1924.

Glabrous perennial, 30-70 cm long. Stems tufted, erect, erecto-patent, ascending or floating, terete or compressed. Leaves few, partly basal, partly cauline, linear, acute, compresed, hollow but divided by remote cross-partitions, 5-20 cm long; sheaths long, with 2 short, obtuse auricles at top. Inflorescence a terminal lax corymb of few to many-flowered heads sometimes bearing in their centre a small tuft of short leaves; heads partly sessile at remification of inflorescence, partly on 0.7-5 cm long stalks. Bracts ovate-lanceolate, much shorter than perianth. Tepals equal, ovate-lanceolate, longitudinally nerved, 3.5-4.5 mm long. Stamens 3, before the outer tepals and shorter than these, sometimes 1-3 before the inner tepals. Style very short; stigmas much longer, usually recurved or sinuous. Capsule usually pale brown, narrowly prismatic, acutely angled, slightly shorter to much longer than perianth. Seeds many, oblong, yellow, 0.5-0.8 mm long.

Fl. & Fr. : May-July.

Ecology : Common; in marshy plains, pools, on swampy river-banks, etc.

Distribution : India : Punjab, Uttar Pradesh, Bihar, West Bengal, Deccan Peninsula. Sri Lanka, S.E. to E. Asia, Australia, Malesia, Tasmania and New Zealand.

Specimens examined : Raja Rappa, 862; Ghanghree, 1312.

128. CYPERACEAE

Key to the Genera

1a. Flowers unisexual :

2a. Pistillate flowers enclosed in a sac-like organ (utricle) ... 2. CAREX

2b. Pistillate flowers not enclosed in a utricle ... 12. SCLERIA

1b. Flowers bisexual [sometimes also staminate in distal glume (s) of KYLLINGA] :

3a. Style continuing down to ovary without demarcated border, hence nut neither crowned by, nor jointed with style-base :

4a. Spikelets bearing few to many glumes, as a rule few-to many-flowered :

5a. Glumes spirally imbricated. Hypogynous scales and/or bristles present (exceptions : some SCHOENOPLECTUS) :

6a. Hypogynous scales 3, alternating with 3 bristles. Glumes pilose outside ... 6. FUIRENA

6b. Hypogynous scales absent, bristles 0-6. Glumes glabrous ... 11. SCHOENOPLECTUS

5b. Glumes distichously arranged. Hypogynous scales and bristles absent :

7a. Rachilla articulated, hence spikelets falling in entirety :

8a. Style 2-fid. Nuts bilaterally flattened with one angle facing rachilla ... 7. KYLLINGA

8b. Style 3-fid. Nuts trigonous, with one side facing rachilla ...8. MARISCUS

7 b. Rachilla not articulated, persistent, hence glumes falling apart from rachilla

9a. Nuts trigonous or dorsiventrally flattened with one side facing the rachilla ... 3. CYPERUS

9b. Nuts bilaterally flattened with one angle facing the rachilla ... 9. PYCREUS

4b. Spikelets reduced to a single glume subtending a single flower ... 10. RIKLIELLA

3b. Style jointed with the ovary; style-base dilated or spongy-thickened, clearly demarcated :

10a. Hypogynous bristles present ... 4. ELEOCHARIS

10b. Hypogynous bristles absent :

11a. Nut crowned by persistent style-base ... 1. BULBOSTYLIS

11b. Nut not crowned by persistent style-base ... 5. FIMBRISTYLIS

Note : Here, the treatment of J.H.Kern (in Steenis, Fl. Males. ser. 1, 7 : 435-753. 1974) is followed for generic delimitation except for CYPERUS L. and SCIRPUS L. The 3 genera like KYLLINGA Rottb., MARISCUS Vahl and PYCREUS Beauv., and the 2 genera like RIKLIELLA Raynal and SCHOENOPLECTUS (Reichb.) Palla, *nom. cons.* which are included by him under CYPERUS L. (*s.l.*) and SCIRPUS L. (*s.l.*) respectively, are here kept separately following T. Koyama (in Gard. Bull. Singapore 30 : 123-164. 1977 and in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 125-407. 1987).

1. BULBOSTYLIS Kunth, *nom. cons.*

Bulbostylis barbata (Rottb.) Kunth ex Clarke in Hook. f., Fl. Brit. India 6 : 651. 1893; Prain, Bengal Pl. 2 : 1156. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 923. 1924; Kern in Steenis, Fl. Males. ser. 1, 7 : 539. 1974; *Scirpus barbata* Rottb., Progr. 27. 1772 & Descr. & Ic. Rar. Pl. 52, t. 17. f. 4. 1773.

Local name : Masa.

Stems setaceous, glabrous, smooth, 5-30 cm tall and 6-8 mm thick. Leaves capillary, glabrous or slightly scaberulous below towards apex, much shorter than stem, 4-10 cm long and 4-6 mm wide. Inflorescence capitate, hemispheric, 0.5-1.5 cm across. Involucral bracts 1-3, filiform, with dilated scarious base, 0.5-2 cm long. Spikelets 3-20, sessile, ovoid-oblong, acute, pale-brownish, 3-8 mm long and 1-1.7 mm wide, 7-15-flowered. Glumes ovate, membranous, with recurved short awn, 1.5-2.2 mm long and and 1.2-1.5 mm wide. Stamen 1. Stigmas 3, shorter than style. Nut smooth, finely reticulate, white-stramineous, 5-7 mm long and 4-6 mm wide.

Fl. & Fr. : July-Dec.

Ecology : Very common; in open dry or wet sandy places, river banks, wet rice-fields, swamps, etc.

Distribution : Throughout India. Widespread in tropical warmer parts of the Old World; also in southeastern U.S.A.

Specimens examined : National Park, 410 ; Raja Rappa, 854.

Uses : Plant is boiled in water and brew is given for dysentery.

2. CAREX L.

Carex cruciata Wahlenb., Vet. Akad. Handl. Stockh. 24 : 149. 1803; Clarke in Hook. f., Fl. Brit. India 6 : 715. 1894; Prain, Bengal Pl. 2 : 1130. 1903; Kukenth. in Engl., Pfl.-reich IV-20, Heft 38 : 265. 1909; Haines, Bot. Bihar & Orissa pt. 5 : 934. 1924, *p.p.*; Kern & Nooteb. in Steenis, Fl. Males. ser. 1, 9 : 121. 1979.

C. condensata Nees in Wight, Contr. Bot. 123. 1834; Clarke in Hook. f., Fl. Brit. India 6 : 716. 1894.

Plant loosely tufted. Rhizomes woody, curved or obliquely creeping, 3-6 mm thick. Stems erect, stiff, 50-130 cm tall and 2.5-4.5 mm thick, surrounded by few dark-reddish cataphylls and brownish withered remains of old leaf sheaths. Leaves mostly basal, coriaceous, stiff, flattish to plicate, with slightly revolute margins, long-sheathing, long-attenuate at apex, much exceeding the stem, 0.6-1.4 cm wide; radical leaves few on stems at intervals; sheaths of lower leaves brown or dull reddish, with dark brown concave mouth. Inflorescence a panicle, continuous above, usually interrupted below, 15-50 cm long; secondary panicles 3-11, usually all single, or binate, oblong-lanceolate or subpyramidal, 4-10 × 2.5-5 cm, lower on long, exserted peduncles. Rachis hispiduous on angles. Lower bracts foliaceous, equalling to much exceeding the panicle, upper ones reduced. Spines numerous, androgynaeceous, 0.5-1.5 cm long, patulous to patent, sessile, male part equalling to longer than female

part. Male part 3-9 × 1 mm; glumes ovate, 3-3.5 mm long, stramineous, purplish-brown streaked, acute or mucronulate; female part 3-7 × 2.2-2.5 mm; glumes 2-3.2 mm long, lower mucronate or mucronulate, upper mucronulate or acute, stramineous, brownish streaked. Stamens 3; anthers *ca* 2.5 mm long. Style 1.5 mm long, slightly swollen at base; stigmas 3. Utricle subsessile, inflated, ellipsoid or ovoid-oblong, abruptly beaked, whitish stramineus, 3-4.5 × 1.2-1.5 mm; beak bidentate, smooth or scaberulous margined. Nuts subsessile, ellipsoid, trigonous, olive-brown to blackish, 1.5-2 × 0.8-1 mm.

Fl. & Fr. : June-Aug.

Ecology : Very common; along margins of forests, wastelands, hanging from hill-slopes, etc.

Distribution : Himalaya, E. India and E. Peninsula. Bhutan, Nepal, Lower Myanmar, Indo-China, Japan, Malesia.

Specimens examined : National Park, 350 ; Pratappur, 814 ; Bishnugarh, 1949.

Note : Clarke (*l.c.*) described *C. cruciata* var. *nagporensis* and var. *argocarpus* and treated *C. condensate* Nees as distinct. Kukenthal (*l.c.*) considered the former as distinct and latter two as synonymous with *C. cruciata*. Haines (*l.c.*) also expressed a similar opinion.

3. Cyperus L.

Key to the Species

1a. Stigmas 2. Nuts plano-convex, dorsoventrally compressed with the plane side facing the rachilla. Spikelets borne in loose spikes being arranged in a compound umbel ... 14. C. *serotinus* var. *inundatus*

1b. Stigmas 3. Nuts trigonous or triquetrous :

2a. Spikelets spicately arranged at some distance from one another upon a more or less elongated rachis :

3a. Rachilla of spikelets conspicuously winged with base of glumes being decurrent along rachilla internodes. Perennials :

4a. Stems with concave sides, almost 3-winged above, spongious, robust ... 9. *C. malaccensis*

4b. Stems with flat or convex sides :

5a. Rhizomes horizontally long-creeping and emitting slender stolons. Glumes approximate, closely imbricate, tip of each glume distinctly overlapping the next higher glume on same side of spikelet :

6a. Stems thick, 0.6-1 cm wide and 90-200 cm tall, clothed at base with bladeless sheaths ... 3. *C. corymbosus*

6b. Stems slender, mostly 0.1-0.2 cm wide and 10-40 cm tall. Leaves with elongated blades ... 13 *C. rotundus*

5b. Rhizomes short, neither creeping, nor emitting stolons. Glumes very distant, those on one side of spikelet not overlapping ... 6. *C. distans*

3b. Rachilla of spikelets not or hardly winged with base of glumes not decurrent along rachilla-internode :

7a. Perennial with creeping stolons. Nuts about half as long as the subtending glumes ... 12. *C. procerus*

7b. Annuals with fibrous roots :

8a. Nuts slightly shorter than or nearly as long as the subtending glumes. Glumes muticous or mucronulate :

9a. Rachis of spikes glabrous. Keels 3-5-nerved, entire, not winged ... 8. *C. iria*

9b. Rachis of spikes hispid on angles. Keels 7-nerved, winged, with serrulate margins in upper part ... 1. *C. alulatus*

8b. Nuts about one-third the length of subtending glumes. Glumes with straight, strong mucro ... 2. *C. compressus*

2b. Spikelets digitately or stellately arranged at more or less same level upon a much shortened rachis, forming several to numerous clusters, sometimes part of them solitary, or inflorescence capitate :

10a. Angles of nut much thickened by a corky tissue. Stout perennial with thick, filiform roots and broad, septate-nodulose leaves. Style flattened, fimbriate ... 11. *C. platystylis*

10b. Angles of nut not corky-thickened :

11a. Annuals with fibrous roots :

12a. Glumes with strong mucro :

13a. Glumes emarginate. Mucro recurved ... 4. *C. cuspidatus*

13b. Glumes acute. Mucrostraight ... 2. *C. compressus*

12b. Glumes muticous or mucronulate :

14a.Spikelets many, congested in globose heads. Glumes densely imbricate and close together, therefore nuts not shown between glumes ... 5. *C. difformis*

14b.Spikelets digitately arranged in whorls of 3-9. Glumes sublaxly imbricate and slightly spaced, thus nuts exposed between glumes ...15.*C.tenuispica*

11b.Perennials with short or long rhizomes :

15a.Anther-connective with bristly appendages. Inflorescence umbellate ... 7. *C.halpan*

15b.Anther-connective not with bristly appendages. Inflorescence capitate ... 10. *C. niveus*

1. ***Cyperus alulatus** Kern in Reinwardtia 1 : 463. 1952; Verma *et al.* Fl. India Ser.3 (Fl. Raipur, Durg and Rajanandgaon), 411. 1985. **(Fig12).**

Cyperus iria L. var. *rectangularis* Kukenth. in Pfl.-reich iv-20, Heft 101 : 152. 1935.

C. rectangularis (Kukenth.) Bennet in Ind. For. 95 : 692. 1969, *nom. illeg.*

Annual. Stems erect, slender, triquetrous, smooth, 10-70 cm tall and 1-2 mm thick, few-leave below. Leaves shorter or equal to the stem, flaccid, long-acuminate, scabrous in upper part, 1-5 mm wide. Inflorescence simple or subcomposite, lax. Involucral bracts obliquely patent, 2-4 longest, similar to leaves, much exceeding the inflorescence. Rays 3-9, unequal, obliquely patent, smooth, or hispidulous at apex, to 16 cm long; radioles very short, subtended by caudate ochreoles. Spikes ovate or oblong-ovate, lax or subdense, 1-3 cm long and 0.8-2.5 cm broad; rachis flexuous, with hispid angles. Spikelets compressed, divaricate or subreflexed, ovate to oblong, 3-8 mm long and 2-2.5 mm broad, 4-18-flowered; rachilla brownish, straight, with 0.6-1 mm long internodes.

Glumes ± orbicular, 1/3-1/2 part imbricate, concave, 1.7-2 mm in diam, emarginate, mucronulate, with 7-nerved green back, yellowish-brown, purple-marked, 1-nerved sides and acute, arched, narrowly winged and finely spined-ciliate keel. Stamens 2; anthers short-oblong; connective produced into a short appendage. Style nearly absent; stigmas 3. Nut obovate, trigonous, broadly stipitate at base, mucronate, dark-brown, 1.4-1.5 mm long and 0.8-0.9 mm broad.

Fl. & Fr. : Aug.-Dec.

Ecology : Not common; in rice-fields, ditches, margins of ponds, etc.

Distribution : India : N.W.Himalaya, Kashmir, Uttar Pradesh, Bihar, Orissa. Pakistan, Nepal, W. Germany.

Specimen examined : Ghanghree, 1067.

2. **Cyperus compressus** L., Sp. Pl. 46. 1753; Clarke in Hook. f., Fl. Brit. India 6 : 605. 1893; Prain, Bengal Pl. 2 : 1143. 1903; Haines, Bot. Bihar & Orissa Pt. 5 : 896. 1924.

Annual with fibrous roots. Stems tufted, triquetrous, 10-50 cm tall and 0.1-0.2 cm thick. Leaves flat or channelled, acuminate, scabrous at top, shorter to somewhat longer than stems, 0.2-0.4 cm wide; lower sheaths reddish-brown. Inflorescence simple, open, sometimes reduced to a single sessile cluster. Involucral bracts 3-5, the lower ones overtopping the inflorescence, to 30 cm long. Rays 0-8, slender, subdigitately arranged on very short rachis, oblong, to linear, rhomboidal in cross-section, compressed, 1-3 cm long and 3-5 mm wide, 15-40-flowered ; rachilla flexuous, persistent, with caducous wings. Glumes ovate, acute, mucronate, many-nerved, 3-4 mm long and 2-2.5 mm wide, with strong, green keel, pale green to yellowish brown sides and silvery-hyaline margins; mucro strong, to 1 mm long. Stamens 3. Stigmas 3. Nut trigonous with incrassate angles, obovoid, stipitate, shortly apiculate, shining, dark-brown to blackish, 1.3-1.6 mm long and 0.8-1 mm wide.

Fl. & Fr. : July-Dec.

Ecology : Common; in open grasslands, waste places, fallow rice fields, roadsides, etc.

Distribution : Throughout India. Cosmopolitan.

Specimens examined : Ramgarh Cant., 1126; Bishnugarh, 1941.

Use : Plant is used as fodder for cattle.

3. **Cyperus corymbosus** Rottb., Descr. & Ic. Rar. Nov. Pl. 42, t. 7. f. 4. 1773; Clarke in Hook. f., Fl. Brit. India 6 : 612. 1893; Prain, Bengal Pl. 2 : 1144. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 899. 1924.

Perennial with long-creeping rhizome. Stems spaced or 2 or 3 close together, subterete or weekly trigonous, 90-200 cm tall and 0.6-1 cm thick, clothed at base with 3-4 sheaths. Sheaths reddish-brown, obliquely truncate, the uppermost one 15-30 cm long, bladeless or bearing a short blade of to 3 cm long. Inflorescence compound or subdecompound, 10-16 cm long. Involucral bracts 2-4, lanceolate, longer ones 2-3.5 cm long. Primary rays 6-15, unequal, flattened, to 10 cm long; secondary rays 7-10, to 2 cm long. Spikes ovoid, densely bearing 10-15 spikelets. Spikelets linear, 0.6-1.5 cm long and 1-1.5 mm wide; rachilla straight, with white-hyaline wings. Glumes ovate-oblong, brownish on back, whitish-scarious on weakly incurved margins,with obtuse back bearing 2-3 parallel veins on both sides of costa. Stamens 3. Style deeply 3-cleft. Nut oblong, trigonous, brown when mature, 1-1.2 mm long and 0.2 - 0.3 mm.

Fl. & Fr. : Oct.-Dec.

Ecology : Common; in marshes, margins of ponds and ditches.

Distribution . Almost throughout India; Tropical West Africa, Madagascar, Nepal, Myammar, northern Australia, West Indies and tropical South America.

Specimens examined : Hazaribagh, 105 ; Ghanghree, 1303 ; Telaiya Dam, 1843.

Use : Stems are woven into mats.

4. **Cyperus cuspidatus** Kunth in H.B.K., Nov. Gen. & Sp. 1 : 204. 1815; Clarke in Hook. f., Fl. Brit. India 6 : 598. 1893; Prain, Bengal Pl. 2 : 1141. 1903; Haines, Bot. Bihar & Orissa pt. 5. 895. 1924.

C. angustifolius Nees in Wight, Contrib. Bot. India 79. 1834.

Small annual, with fibrous yellowish roots. Stems tufted, trigonous, smooth, 2-15 cm long and 0.8-1 mm thick. Leaves very narrow, setaceous, rigid, scaberulous in upper part, 0.5-1 mm wide; sheaths membranaceous, striate, reddish-brown. Inflorescence simple, usually reduced to a single head. Involucral bracts 3-4, patent, longer one overlapping the inflorescence. Rays 0-4, filiform, erect to spreading, to 3 cm long. Spikelets digitately arranged, in clusters of up to 20, linear, strongly compressed, 0.5-1.5 cm long and 2.5-3 mm wide, to 40-flowered; rachilla wingless, persistent. Glumes oblong-spathulate, strongly 3-nerved, emarginate at apex, with green, usually lineolate keel and nerveless ferrugineous sides, 1.2-1.5 mm long (including mucro) and 0.5-1 mm wide; mucro strong, ± recurved, 0.7-1 mm long. Stamens (2-)3. Stigmas 3. Nut triquetrous, obovoid-oblong, shortly apiculate, brown to castaneous, 0.7-0.8 mm long and 0.35-0.4 mm wide.

Fl. & Fr. : Sept.-Nov.

Ecology : Common; in open, moist localities, arable lands, rice-fields, etc.

Distribution : Throughout India. Pantropical : tropical Africa, extending northwards to S. China and S. Formosa, southwards to Malesia and Queensland; from southern N. America through Mexico and West Indies to Brazil.

Specimens examined : Hazaribagh, 22 ; Pratappur, 623.

Use : Plant is grazed well by cattle.

5. **Cyperus difformis** L., Cent. Pl. 2 : 6. 1756; Roxb., Fl. Ind. 1 : 195. 1832; Clarke in Hook. f., Fl. Brit. India 6 : 599. 1893; Prain, Bengal Pl. 2 : 1142. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 893. 1924.

Annual with fibrous reddish roots. Stems rather weak, tufted, triquetrous, 10-40 cm tall and 2-3 mm thick. Leaves flaccid, slightly canaliculate, abruptly acuminate, smooth or somewhat scaberulous on margins at top, slightly shorter than stems, 2-5 mm wide; lower sheaths stramineous to brown. Inflorescence simple or compound, lax, 1.5-6 cm. Involucral bracts 2-3, larger 2 far overtopping the inflorescence, to 25 cm long. Primary rays 5-9, to 3 cm long; secondary ones when present to 1 cm long. Spikes globose, dense, 0.8-1.5 cm across, with numerous spikelets. Spikelets linear-oblong, compressed, 2.5-5 mm long and 1-1.5 mm wide, 10-30-flowered; rachilla wingless, persistent. Glumes broadly obovate-orbicular, patulous, obtuse or somewhat emarginate at apex, muticous, 0.6-0.8 mm long and 0.6-1 mm wide, with arcuate, green, faintly 3-nerved keel, purplish nerveless sides and broad whitish hyaline margins. Stamens usually 2. Style very short; stigmas 3, longer than style. Nut ellipsoid-obovoid, triquetrous, broadly stipitate, apiculate, stramineous or pale brown, about as long as subtending glume, 0.5-0.7 mm long and 0.4-0.5 mm wide.

Fl. & Fr. : Aug.-Jan.

Ecology : Very common; in open grasslands, river banks, wet rice-fields, etc.

Distribution : Throughout India. Widely distributed in Eurasia from southern Europe through India and China to Japan and Malesia; also in Pacific Islands and Australia; introduced to central America and South Africa.

Specimens examined : Raja Rappa, 388 ; National Park, 451; Hunterganj, 1648.

6. **Cyperus distans** L. f., Suppl. 103. 1781; Clarke in Hook. f., Fl. Brit. India 6 : 607. 1893; Prain, Bengal Pl. 2 : 1143. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 898. 1924.

Perennial with shortly creeping rhizome. Stems subcaespitose, slender or slightly stout, triquetrous, 10-60 cm tall and 2-3.5 mm thick. Leaves flat, rigid to flaccid, gradually acuminate, scabrous in upper part,

shorter than or as long as stems, 5-8 mm wide; lower sheaths purplish. inflorescence compound or decompound, open. Involucral bracts 4-6, lower ones overtopping the inflorescence, 20-45 cm long. Primary rays 6-12, unequal, to 20 cm long; secondary ones to 8 cm long. Spikes broadly ovoid-pyramidal, loose, bearing 8-20 spikelets. Spike lets narrowly linear, subterete, 1-2 cm long and 8-1 mm wide, 6-20-flowered; rachilla flexuous, persistent, with whitish hyaline caducous wings. Glumes ovate-oblong or elliptic, remote, 1.8-2.5 mm long and 1-1.2 mm wide, with green 3-5 nerved keel, reddish brown nerveless sides and broad whitish hyline margins. Stamens 3. Style short; stigmas 3. Nut oblong-cylindrical, trigonous, broadly stipitate, apiculate, dark-brown. 1.5-1.6 mm long and 0.4-0.5 mm wide.

Fl. & Fr. : July-Oct.

Ecology : Common; in swamps, river banks, grassy road sides, wet rice-fields and meadows, open forests, etc.

Distribution : Almost throughout India. Pantropical.

Specimens examined : National Park, 98 ; Chowparan, 1364.

7. **Cyperus halpan** L., Sp. Pl. 45. 1753 ('haspan') ; Clarke in Hook. f., Fl. Brit. India 6 : 600. 1893; Prain, Bengal Pl. 2 : 1142. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 894. 1924; Kern in Steenis, Fl. Males. ser. 1, 7 : 624. 1974 ; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 203. 1985.

Perennial, with short rhizome and fibrous reddish roots. Stems slender, weak, solitary or tufted, triquetrous to almost 3-winged, usually with a longitudinal median rib on each side, smooth, 10-40 cm long. Leaves flat, smooth, or scaberulous at top, 2.5 mm wide; lower sheaths scarious, inflated; sometimes all leaves reduced to ovate-lanceolate appendages of sheaths. Inflorescence compound or decompound, loose or rather dense, to 15 cm across. Involucral bracts 2-3, spreading,all shorter than inflorescence or one rather longer, to 10 cm long. Primary rays to 20, obliquely spreading, to 15 cm long, secondary ones to 2.5 cm long and

tertiary ones, when present, very short. Spikelets digitately arranged, in clusters of 3-6, linear-lanceolate, strongly compressed, 0.5-1 cm long and 1-2 mm wide, 10-30-flowered; rachilla straight, persistent, hidden by glumes. Glumes oblong-ovate, muticous, 1-1.5 mm long, with 3-nerved green keel and fuscous to sanguineous nerveless sides. Stamens 2-3; anther with bristly appendage of connective. Stigmas 3. Nut obovoid, trigonous, stipitate, apiculate, densely granulate to verrucose, whitish, 0.4-0.5 mm long.

Fl. & Fr. : May-Sept.

Ecology : Common; in open, wet places, rice-fields, grasslands, etc.

Distribution : Throughout India. Tropical and subtropical regions of whole world.

Specimens examined : Churchu, 699; Hazaribagh, 1222; Gola, 1526.

Use : Plant is used as fodder.

Note : According to Kern (*l.c.*), Linnaeus misread the vernacular name halpan as haspan. According to Art. 73 of ICBN, this orthographic error must be corrected. However, Koyama (*l.c.*) adopted the Linnaeus's term 'Haspan'.

8. **Cyperus iria** L., Sp. Pl. 45. 1753; Clarke in Hook. f., Fl. Brit. India 6 : 606. 1893; Prain, Bengal Pl. 2 : 1143. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 895. 1924.

Annual. Stems tufted, slender or slightly stout, triquetrous, 15-50 cm tall and 2-3 mm thick. Leaves basal, flat or channelled, acuminate, scabrous on margins in upper parts, shorter than to slightly surpassing the stems, 3-6 mm wide. Inflorescence simple or compound, loose, 5-20 cm long. Involucral bracts 3-5, the larger 1-3 overtopping the inflorescence, to 40 cm long. Primary rays 3-5, unequal, to 10 cm long, the larger ones usually branched; secondary rays very short. Spikes oblong-

ovoid, usually elongate, 1-5 cm long, bearing 5-25 spikelets. Spikelets oblong-linear, compressed, 3-10 mm long and 1.5-2 mm wide, 6-25-flowered; rachilla persistent, wingless. Glumes orbicular or broadly ovate, usually broader than long, rounded to emarginate at apex, shortly mucronulate, 1.2-1.5 mm long and 1-1.2 mm wide, with green, arched, 3-5 - nerved sharp keel, golden-fulvous nerveless sides and whitish hyaline margins towards top. Stamens 2-3. Style short; stigmas 3. Nut obovoid-ellipsoid, triquetrous with concave sides, broadly stipitate, shining, dark-brown to black, 1-1.5 mm long and 0.5-0.7 mm wide.

Fl. & Fr. : Aug.-Jan.

Ecology : Very common; in open wet places, along roadsides, river - banks, wet rice-fields, etc.

Distribution : Throughout India. Widespread in tropical Asia, extending northwards to Iran, Afganistan, China and Japan, southwards to Malesia and Australia and westwards to tropical E. Africa; introduced in S.E.United States and West Indies.

Specimens examined : Ichak, 343 ; Barkagawan, 882 ; Chatra, 1079.

Uses : Plant is used as fodder. Stems are woven into mats; also used as astringent, stomachic and tonic.

9. **Cyperus malaccensis** Lam., Illus. 1 : 146. 1791; Clarke in Hook. f., Fl. Brit. India 6 : 608. 1893; Prain, Bengal Pl. 2 : 1144. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 899. 1924.

Perennial. Stolons stout, clothed with ovate, scarious scales, hardening into woody creeping rhizome. Stems approximate, robust, spongious, triquetrous with concave sides, 3-winged above, smooth, 60-175 cm long and 1-1.2 cm thick. Lower leaves on flowering stems reduced to spongious, bladeless greyish black sheaths, upper ones with to 20 cm long sheaths, shortly laminate; uppermost reaching to half way

the stem; blades of sterile shoots acuminate, scabrid at top, 0.5-1 cm wide. Inflorescence compound or subcompound, broader than long, to 10 cm long and 15 cm broad. Involucral bracts 3-4, flat, much overtopping the inflorescence, to 30 cm long and 1.5 cm broad. Primary rays 3-6, unequal, 3-10 cm long; secondary ones setaceous, to 2 cm long. Spikes ovoid, with glabrous rachis. Spikelets 6-12 per spike, linear, subterete, 1-3 cm long and 1.2-1.7 cm broad, 16-20-flowered; rachilla straight, very narrowly winged, persistent. Glumes ovate-elliptic, not keeled, 5-7-nerved, pale fuscous with yellowish margins, 2-2.2 mm long and 1-1.5 mm broad. Stamens 3. Stigmas 3. Nut triquetrous, narrowly oblong, dark brown to black, 1.7-2 mm long and 0.5 mm broad.

Fl. & Fr. : Sept.-Dec.

Ecology : Rare; in moist places, sandy river-banks, etc.

Distribution : India:West Bengal, Bihar, Orissa, Western Peninsula. Eastern hemisphere, from Mesopotamia through India to S. China, northern Australia and Polynesia.

Specimens examined : Ichak, 1315 ; Jhumri Telaiya, 1793.

Uses : Stems are used for tying purposes and for making mats, baskets and hats.

10. **Cyperus niveus** Retz., Obs. Bot. 5 : 12. 1789; Clarke in Hook. f., Fl. Brit. India 6 : 601. 1893; Prain, Bengal Pl. 2 : 1142. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 896. 1924.

Perennial, glabrous, tufted herbs, 15-75 cm tall. Rhizomes woody, creeping, 2-3 cm long and 2-3 mm thick. Stems trigonous, rigid, 1.5-2 mm thick, nodose at base. Leaves usually 3-4, usually shorter than to sometimes equalling the stem, 2-3 mm thick. Inflorencence capitate, 1.5-4 cm broad. Bracts 2-3, spreading to deflexed, lowest 5-8 cm long. Spikelets oblong-lanceolate, 1-2.5 × 0.4-0.6 cm, 14-40 flowered; rachilla broad, wingless; glumes tightly imbricating, ovate-oblong, acutely keeled, mucronate, whitish-stramincus, striolate, 4-5 mm long. Stamens 3. Styles

long; stigmas 3. Nut sessile, obovoid-oblong, trigonous, black, puncticulate 1.2-1.5 mm long.

Fl. & Fr. : Feb.-June.

Ecology : Common; in grassy places, roadsides, forest-edges, railway tracks, etc.

Distribution : India : Almost throughout India including Himalaya but excepting E. Peninsula.Central Asia, N. Myanmer, Indo-China and S.W.China.

Specimens examined : Ichak, 349 ; National Park, 882 ; Hazaribagh 1633.

11. **Cyperus platystylis** R. Br., Fl. Nov. Holl. 214. 1810; Clarke in Hook. f., Fl. Brit. India 6 : 598. 1893; Prain, Bengal Pl. 2 : 1141. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 893. 1924.

Perennial with short rhizome and thick roots. Stems solitary or 2-3 together, stout, triquetrous, scabrid on angles above, 30-80 cm tall and 4-8 mm thick. Leaves basal, channelled or flat, acuminate, septate, nodulose, scabrous on margins and midrib, as long as or longer than stems, 0.6-1.2 cm wide; lower sheaths bladeless, keeled, cinnamomeous to purplish. Inflorescence compound or decompound, depressed-corymbose to semiglobose, loose or very dense, to 25 cm across. Involucral bracts 5-8, slightly distant, larger ones to 75 cm long. Primary rays 8-12, to 10 cm long; secondary rays to 4 cm long. Spikelets digitately arranged, in clusters of 3-8, ovate to linear-lanceolate, flattened, 5-20 cm long and 2.5-3 mm wide, 15-60-flowered; rachilla straight, wingless, persistent. Glumes ovate, appressed, mucronulate, 2-2.5 mm long and 1.5-2 mm wide, with 3-nerved green back, nerveless yellowish or brownish sides and whitish hyaline margins. Stames 3. Style flattened, ciliate; stigmas 3, short. Nut unequally trigonous, compressed, ellipsoid, apiculate, brownish, 1.7-2 mm long and 0.8-1 mm wide.

Fl. & Fr. : May-Jan.

Ecology : Common; in swampy places, on swinging bogs, wet rice-fields, etc.

Distribution : India : Bihar, Chotanagpur, West Bengal. Bangladesh, Sri Lanka to Taiwan and through Malesia eastwards to northern and eastern Australia.

Specimens examined : Jhumri Telaiya, 308 ; Hazaribagh, 1607.

12. **Cyperus procerus** Rottb., Descr. & Ic. Rar. Nov. Pl. 29. t. 5. f. 3. 1773; Clarke in Hook. f., Fl. Brit. Ind. 6 : 610. 1893; Prain, Bengal Pl. 2 : 1143. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 902. 1924..

Perennial with stoloniferous rhizome. Stems stout, triquetrous, 70-125 cm tall and 4-7 mm thick, clothed at base with greyish brown to purplish sheaths. Leaves canaliculate, spongious or coriaceous, acuminate, scabrid at top, shorter than to surpassing the stem, 0.7-1 cm wide. Inflorescence simple or subcompound, loose, 10-15 cm long. Involucral bracts 3-4, the larger one(s) far overtopping the inflorescence, to 50 cm long. Primary rays 3-7, unequal, the longest 6-12 cm, secondary rays when present very short. Spikes broadly ovoid, loose, 2-4 cm long and wide, spikelets to 10 to terminal spike, only 3-4 to lateral ones, oblong to linear, slightly curved compressed, 1-3.5 cm long and 2.5-3.5 mm wide, to 40-flowered; rachilla not or hardly winged, persistent. Glumes ovate-elliptic, hardly keeled, *ca* 7-nerved, redddish brown, with broad hyaline margins in upper part, 2.5-3 mm long and 1.5-2 mm wide. Stamens 3. Stigmas 3. Nut obovoid or ellipsoid, triquetrous, apiculate, blackish brown, 1.3-1.5 mm long and 0.6-0.7 mm wide.

Fl. & Fr. : Sept.-Nov.

Ecology : Common; in swamps, marshy pools, wet rice-fields, etc.

Distribution : Almost throughout India. Sri Lanka, Cochinchina, E. China and Formosa, southwards to Queensland and Malesia.

Specimens examined : Barkattwa, 506; Patratu, 1731; Pratappur, 2073.

13. **Cyperus rotundus** L., Sp. Pl. 45. 1753; Clarke in Hook. f., Fl. Brit. India 6 : 614. 1893; Prain, Bengal Pl. 2 : 1145. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 903. 1924.

Local name : Mutha, Motha.

Perennial with long slender stolons terminated by a subglobose or ellipsoid tuber. Stems triquetrous, solitary or few together, tuberous at base, 10-40 cm tall and 1-2 mm thick. Leaves several, flat, acuminate, scabrid on margins in upper part, dark green above, 2-6 mm wide; lower sheath reddish brown. Inflorescence simple or compound, 3-10 cm long. Involucral bracts 2-4, as long as or overtopping the inflorescence, to 30 cm long. Primary rays 3-9, unequal, to 10 cm long. Spike ovoid, loose to rather dense. Spikelets linear, strongly compressed, 1-3.5 cm long and 1.5-2.5 mm wide, usually 10-40-flowered; rachilla flexuous, with persistent, broad wings. Glumes obliquely erect, ovate, rubiginous to deep brown, with green keel ± curved and slightly recurved at top and narrow hyaline margins, 5-7 - nerved in either side. Stamens 3. Stigmas 3. Nut triquetrous, oblong-obovoid, apiculate, brownish to black, 1.3-1.5 mm long and 0.6-0.7 mm wide.

Fl. & Fr. : July-Dec.

Ecology : Very common; in lawns, along roadsides, in waste places, forest edges, cultivated fields, etc.

Distribution : Throughout India. Cosmopolitan, distributed in tropical, subtropical and temperate regions of the World.

Specimens examined : Hazaribagh, 236; Etkhori,1452; Jhumri Telaiya, 2217.

Uses : Dried roots are used in perfumes; also used in stomach and bowel complaints.

14. **Cyperus serotinus** Rottb. var. **inundatus** (Roxb.) Kukenth. in Engl., Pfl.-reich IV-20, Heft 101 : 318. 1936. *Cyperus inundatus* Roxb., Fl. Ind. 1 : 201. 1832.

Cyperus amoyensis Hance in Ann. Sc. Nat. ser. 5, V : 249. 1866.

Juncellus innundatus (Roxb.) Clarke in Hook. f., Fl. Brit. India 6 :

595. 1893; Prain, Bengal Pl. 2 : 1138. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1257. 1924.

Cyperus procerus sensu Clarke in Hook. f., Fl. Brit. India 6 : 610. 1893; *p. min. p. quoad syn. C. amoyensis* Hance *cit.* non Rottb.

Stoloniferous. Stem stout, erect, simple, triquetrous at top, 30- 90 cm high, leafy only near base. Leaves usually as long as stem, 6-8 mm broad. Involucral bracts 3-5, 20-50 cm long, leaf-like. Inflorescence a compound umbel. Rays 3-6, very unequal. Rachis of spikes glabrous, 2.5-5 cm long. Spikelets linear, compressed, 8-12 × 2.5-3 mm, usually 10-30-flowered, loosely arranged (0.3-0.4 cm apart) on rachis of spikes. Rachilla robust, tetragonous, excavate, scarcely winged, persistent. Glumes broadly ovate, obtuse, distichous, 5-7-nerved, scareious-margined, muticous, lowest 2 empty, succeeding 4 to many bisexual, uppermost 1-3 sterile or empty. Stames 3; anthers not apiculate. Style short; branches 2, linear, about as long as nut. Nut obovoid, obtuse, plano-convex, smooth, dark-brown, over half as long as the glume.

Fl. & Fr. : Aug.-Oct.

Ecology : Not common; in swamps.

Distribution : West Bengal, Bihar and Orissa. China.

Specimens examined : National Park, 89; Ichak, 348; Ramgarh, 1144.

Uses : Tubers are used as tonic and stimulant.

15. **Cyperus tenuispica** Steud., Synops. Pl. Glumac. 2 : 11. 1855; Fischer, Fl. Madras 3 : 1640(1139). 1931; 1936; Kern in Reinwardtia 6 : 59. 1961 & in Steenis, Fl. Males. ser. 1, 7 : 625. 1974.

C. flavidus auct. non Retz. : Clarke in Hook. f., Fl. Brit. India 6 : 600. 1893; Prain, Bengal Pl. 2 : 1142. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 893. 1924.

Annual, with fibrous reddish roots. Stems slender, weak, solitary or tufted, triquetrous, smooth, 5-40 cm tall and 1-2 mm thick. Leaves flat, gradually acuminate, smooth or scaberulous at top, flaccid, much shorter than to nearly equalling the stems,0.2-0.4 cm wide; lower sheaths bladeless to shortly laminate, scarious, stramineous or cinnamomeous. Inflorescence compound or decompound, loose, 3-10 cm across. Involucral bracts 2-3, the longest somewhat to conspicuously overtopping the inflorescence, to 20 cm long. Primary rays 5-10, slender, smooth, to 10 cm long; secondary ones 2-2.5 mm long; tertiary ones rare. Spikelets digitately arranged in whorls of 3-9, linear-oblong, compressed, 3-12 cm long and 1-1.5 mm wide, 10-40-flowered; rachilla slightly flexuous, visible between glumes, wingless. Glumes ovate, obtuse, excurved, 0.7-1 mm long and 0.5-0.7 mm wide, with 3-nerved green keel towards top, nerveless hyaline purplish-lineolate sides and excurrent midrib ending in a minute mucro below apex. Stamen(s) 1-2. Stigmas 3. Nut obtusely trigonous with convex sides, subglobose-obovoid, densely tuberculate, marbly white, 0.3-0.4 mm long and 0.25-0.3 mm wide.

Fl. & Fr. : Apr.-Dec.

Ecology : Common; in wer waste places, inundated rice fields, etc.

Distribution : Throughout India. Sri Lanka, Nepal, from India throughout Indo-China to Malesia and S. Japan, tropical Australia and tropical Africa.

Specimens examined : Ichak, 334 ; Jhumri Telaiya, 676; Gola, 1523.

4. ELEOCHARIS R. Br.

Eleocharis geniculata (L.) Roem. & Schult., Syst. Veg. 2 : 150. 1817; Kern in Steenis, Fl. Males. ser. 1, 7 ; 536. 1974. *Scirpus geniculatus* L., Sp. Pl. 1 : 48. 1753.

Eleocharis capitata R. Br., Prodr. Fl. Nov. Holl. 1 : 225. 1810, non *Scirpus capitatus* L.; Clarke in Hook. f., Fl. Brit. India 6 : 627. 1893;

Prain, Bengal Pl. 2 : 1149. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 913. 1924.

Annual. Stems tufted, slender but rigid, erect or oblique, angular-striate, 5-40 cm tall and 0.5-1 mm thick. Sheaths appressed, purplish at base, the uppermost with an oblique and attenuate mouth. Spikelets globose or oblong-ovoid, obtuse, terete, 4-8 cm long and 3-3.5 mm wide, reddish-ferrugineous, densely many-flowered. Glumes patent, membranous, broadly elliptic to ovate-suborbicular, obtuse, 1-nerved, ferrugineous with greenish indistinct keel, 1.7-2 mm long and 1.2-1.5 wide. Hypogynous bristles 6-8, coarse, somewhat longer than nut, ferrugineous. Stamens 2-3; anthers minutely apiculate. Style 2-fid; style-base depressed-conical, 0.2 mm long, 1/3 the width of nut. Nut biconvex, obovate, shining black, 0.7-0.9 mm long and 6-8 mm wide.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in wet rice-fields, swamps, swampy grasslands, etc.

Distribution : West Bengal, Bihar, Uttar Pradesh, Orissa, central, western and southern India. Pantropical.

Specimens examined : Ichak, 342; Hunterganj, 939; Satgawan, 1979.

5. FIMBRISTYLIS Vahl, *nom. cons.*

Key to the Species

1a. Lower glumes distichous, upper ones irregularly subspiral ... 5. *F. eragrostis*

1b. Glumes all regularly spiral :

2a. Nuts oblong-cylindrical with almost parallel edges ... 8. *F. tetragona*

2b.Nuts suborbicular, obovoid or obovoid elliptic :

3a.Stigmas 3. Nuts trigonous or triquetrous :

4a.Cauline leaves at least the upper ones reduced to bladeless tubular sheaths. Glumes mucronate. Nuts verruculose ... 7. *F. miliacea*

4b.Cauline leaves with well developed blades :

5a.Glumes aristate or mucronate. Nuts smooth ... 9. *F. uliginosa*

5b.Glumes muticous. Nuts verruculose ... 3. *F. cymosa ssp. spathacea*

3b.Stigmas 2. Nuts strongly dorsiventrally compressed, biconvex or plano-convex :

6a.Ligules present, represented by dense fringe or short hairs :

7a.Glumes puberulous at apical part. Nuts not trabeculate ... 6. *F. ferruginea*

7b.Glumes glabrous. Nuts trabeculate ... 4. *F. dichotoma*

6b.Ligules absent :

8a.Spikelets 0.1-0.15 cm wide. Stamen 1. Nuts 0.04-0.06 cm long :

9a.Inflorescence capitate, nearly globose ... 2. *F. argentea*

9b.Inflorescence anthelate ... 1. *F. aestivalis*

8b.Spikelets *ca* 0.2 cm wide. Stames mostly 2. Nuts 0.07-0.08 cm long ... 3. *F. cymosa ssp. spathacea*

1. **Fimbristylis aestivalis** (Retz.) Vahl, Enum. Pl. 2 : 288. 1806; Clarke in Hook. f., Fl. Brit. India 6 : 637. 1893, *p.p.*; Prain, Bengal Pl. 2: 1154. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 920. 1924. *Scirpus aestivalis* Retz., Obs. 4 : 12. 1768.

Annual. Stems slender, densely tufted, setaceous, angular, 3-20 cm long and 0.3-0.5 mm thick. Leaves shorter than stems, filiform, flat or canaliculate; sheaths stramineous or ferrugineous, soft-hairy, 0.3-0.5 mm wide; ligule absent. Inflorescence compound, loose, 1-7 cm long. Involucral bracts to 6, similar to leaves, lower 1-2 usually shorter than inflorescence. Primary rays filiform, obliquely patent, to 5 cm long. Spikelets solitary, ovoid-oblong or lanceolate, angular, densely many-flowered, 3-7 mm long and 1-1.5 mm broad; rachilla narrowly winged. Glumes spiral, ovate, mucronulate, with green, obscurely 3-nerved keel, prominent midnerve and prominent sides, ferrugineous, lineolate, 1.2-1.5 mm long and 0.7-1 mm broad. Stamen 1. Style flat, dilated at base; stigmas 2, shorter than style. Nut biconvex, elliptic or obovate, umbonulate, smooth, shining stramineous, 0.5-0.6 mm long and 0.4-0.5 mm broad.

Fl. & Fr. : May-July.

Ecology : Common; in open damp places, swamps, wet rice-fields, etc.

Distribution : Throughout India. Indo-China, China, Sri Lanka, Thailand, Formosa, Japan, Amurland, southward to tropical Australia and Malesia.

Specimens examined : Hazaribagh, 338; Mandu, 837; Chouparan, 1680.

2. **Fimbristylis argentea** (Rottb.) Vahl, Enum. Pl. 2 : 294. 1806; Clarke in Hook. f., Fl. Brit. India 6 : 640. 1893; Prain, Bengal Pl. 2 : 1154. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 922. 1924. *Scirpus argentea* Rottb., Progr. 27. 1772.

Glabrous annual. Stems densely tufted, setaceous, trigonous, slightly compressed, 3-10 cm long and 0.5-0.7 mm thick. Leaves flat or

canaliculate, acuminate, smooth or scabrid at top, shorter than stem, 0.5-0.7 mm wide, with stramineous sheaths; ligule absent. Inflorescence capitate, nearly globose, 0.5-1 cm across, with 4-10 spikelets. Involucral bracts 2-4, dilated at base, the lowest much longer than inflorescence. Spikelets sessile, oblong ovoid or cylindrical, slightly angular, densely many-flowered, 4-10 mm long and 1.2-1.5 mm wide; rachilla narrowly winged. Glumes spiral, broadly ovate-deltoid, with 3-nerved keel, strong midnerve and nerveless, silvery grey or ferrugineous sides, *ca* 1 mm long and broad. Stamen 1. Style flat, dilated at base, minutely ciliolate above; stigmas 2, shorter than style. Nut broadly obovate or suborbicular, biconvex, shortly stipitate, minutely umbonulate, obscurely reticulate, 0.4-0.5 mm long and broad.

Fl. & Fr. : Nov.-Jan.

Ecology : Common; in swampy places, wet sandy ground of grasslands, rice-fields, etc.

Distribution : India : West Bengal, Bihar, Uttar Pradesh, central and western India and throughout Deccan Peninsula. Indo-China, Sri Lanka, Thailand and Malesia.

Specimens examined : Koderma, 149; Mandu, 844; Simaria, 1632.

3. **Fimbristylis cymosa** R. Br. ssp. **spathacea** (Roth) Koyama in Micronesica 1 : 83. 1964 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 301. 1985. *F. spathacea* Roth, Nov. Pl. Sp. 24. 1821; Clarke in Hook. f., Fl. Brit. India 6 : 640. 1893; Prain, Bengal Pl. 2 : 1154. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 922. 1924.

F. cymosa sensu Kern in Steenis, Fl. Males. ser. 1, 7 : 557. 1924, *p.p. quoad* syn. *F. spathacea* Roth *cit.*, non L.

Glabrous perennial with short rhizome. Stems densely tufted, compressed-trigonous to subterete, many-leaved at base, 10-50 cm tall and 1-2 mm thick. Leaves flat or canaliculate, abruptly acuminate, scabrid on margins, much shorter than stems, 1-3 mm wide; ligule

0. Inflorescence compound, loose to very dense, sometimes subcapitate. Involucral bracts 2-3, dilated at base, 0.5-1 cm long. Primary rays 3-8, unequal, compressed, to 4 cm long. Spikelets solitary or clusters, ovate-oblong to oblong-elliptic, ± angular, 3-6 mm long and *ca* 2 mm wide, densely many-flowered; rachilla broadly winged. Glumes spiral, muticous, ovate-oblong, notched, slightly keeled, 3-5-nerved in centre with long and 1.2-1.7 mm wide. Stamens 1-3, mostly 2. Style flat or triquetrous, dilated at base; stigmas 2 or 3, as long as style. Nut obovoid, biconvex or trigonous, shortly stipitate, umbonulate, verruculose, 0.7-0.8 mm long and 0.5-0.6 mm wide.

Fl. & Fr. : May-Aug.

Ecology : Not very common; in open sandy and rocky places.

Distribution : India : Bihar, Orissa, Deccan Peninsula. Pantropical.

Specimens examined : Ramgarh, 1125; Hazaribagh, 1614.

Use : Stems are used for making mats.

Note : It differs from the ssp. *cymosa* in having obtusely trigonous nuts and distigmatic style.

4. **Fimbristylis dichotoma** (L.) Vahl, Enum. Pl. 2 : 287. 1806, *excl.* var.; Clarke in Hook. f., Fl. Brit. India 6 : 635. 1893; Haines, Bot. Bihar & Orissa pt. 5 : 920. 1924. *Scirpus dichotomus* L., Sp. Pl. 1 : 50. 1753.

Scirpus diphyllus Retz., Obs. Bot. 5 : 15. 1789.

Fimbristylis diphylla (Retz.) Vahl, Enum. Pl. 2 : 289. 1806; Clarke in Hook. f., Fl. Brit. India 6 : 636. 1893; Prain, Bengal Pl. 2 : 1153. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 920. 1924.

Annual, or perennial with very short rhizome. Stems slender to rather stout, angular, compressed especially below inflorescence, striate, glabrous or pilose, 10-75 cm long and 1-2 mm in diam. Leaves basal, much shorter than to about as long as stems, abruptly acuminate,

glabrous or ± pubescent, scabrid on margins in upper part, green or glaucous, 1.5-5 mm wide; ligule a dense fringe of short hairs. Inflorescence simple to decompound, to 20 cm long. Involucral bracts 2-5, much shorter to somewhat longer than inflorescence. Primary rays obliquely patent, to 10 cm long. Spikelets ovoid or oblong-ovoid, densely many-flowered, 5-10 × 2.5-3 mm. Glumes spiral, braoadly ovate to oblong-ovate, obtuse, glabrous, with 3-nerved green keel, 2-3 mm long. Style flat, hyaline-margined, ciliate in upper half, 2-2.5 mm long; stigmas 2, shorter than style. Nut biconvex, obovate, shortly stipitate, umbonulate, conspicuously trabeculate by 5-10 longitudinal ribs on either face, glistening white to stramineous, 1-1.2 × 0.7-1 mm.

Fl. & Fr. : July-Sept.

Ecology : Very common; in rice-fields, open waste places, grassy roadsides, forests, etc.

Distribution : Throughout India. All warmer parts of whole World.

Specimens examined : Ramgarh, 1135; Joynagar, 1499; Telaiya Dam, 1858.

Uses : Stems are used for making mats. Plant furnishes a large quantity of forage.

5. ***Fimbristlyis eragrostis** (Nees & Meyen ex Nees) Hance in J. Linn. Soc. Bot. 13 : 132. 1873; Kern in Steenis, Fl. Maes. ser. 1, 7 : 567. 1974. *Abildgaardia eragrostis* Nees & Meyen ex Nees in Wight, Contrib. Bot. India 95. 1834.

Fimbristylis nigrobrunnea Thw., Enum. Pl. Zeyl. 434. 1864; Clarke in Hook. f., Fl. Brit. India 6 : 648. 1893.

Glabrous perennial with short rhizome clothed with decayed leaf-sheaths. Stems solitary or somewhat tufted,acutely 4-5-anlged, ridged, sulcate, 30-70 cm long and 1-2.5 mm thick, clothed at base with 2-3 tubular, 4-5 cm long sheaths with short blades. Basal leaves numerous, subflacate, flat, spinulose-scabrid on margins in upper part, much shorter than stems, 3-5 mm wide; ligule absent. Inflorescence

compound, or decompound, 3-6 cm long. Involucral bracts 2-4, dilated at base, 5-15 mm long. Primary rays 3-6, compressed, to 4 cm. Spikelets solitary lanceolate, compressed or subterete, stramineous to dark brown, 0.6-1 cm long and 2-4 mm wide, 8-16- flowered; rachilla winged. Lower glumes distichous, upper ones irregularly subspiral, all broadly ovate, mucronulate, keeled, 3-5 mm long and 2.5-3 mm wide. Stamens 3. Style triquetrous, pyramidally thickened at base; stigmas 3, as long as style. Nut trigonous, obovoid, shortly stipitate, umbonulate, verruculose, 0.8-1 mm long and 0.6-0.8 mm wide.

Fl. & Fr. : Aug.-Nov.

Ecology : Common; in grassy sandy grounds, forest clearings, forest edges, etc.

Distribution : North-eastern India, Deccan Peninsula, Andaman and Nicobar Islands. S. Asia, from Sri Lanka and India eastwards to S. China, Hainan and Formosa, southwards to Malesia and tropical Australia.

Specimens examined : Satgawan, 585; Churchu, 1284.

Note : This probably will be new record for Bihar State.

6. **Fimbristylis ferruginea** (L.) Vahl, Enum. Pl.2 : 291. 1806; Clarke in Hook. f., Fl. Brit. India 6 : 638. 1893; Prain, Bengal Pl. 1 : 1154. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 921. 1924. *Scirpus ferrugineus* L., Sp. 1 : 50. 1753.

Perennial with shortly creeping rhizome. Stems tufted, rigid, striate, compressed, greyish green, 20-80 cm tall and 1.5-3 mm thick. Cauline leaves conduplicate or triquetrous, scabrid at top, much shorter than stem, 2-10 cm long and 0.5-1.5 mm wide; lower sheaths bladeless, shining brown to castaneous; upper ones ferugineous-membranous in front, ciliolate at month; ligule a dense frigne of short hairs. Involucral bracts 2-3, scarious margined at dilated base, shorter to slightly longer than inflorescence. Primary rasy compressed, to 2.5 cm. Spikelets solitary, ovoid or oblong, dull brown, 0.5-2 cm long and 3-4 mm wide, densely many-flowered; rachilla narrowly winged. Glumes spiral, ovate-oblong, apiculate, with green 1-nerved keel and nerveless sides, puberulous at

apical part, 3-4.5 cm long and 2.5-3 mm wide. Stamens 3. Style flat, slightly dilated at base, ciliate; stigmas 2, shorter than style. Nut obovoid-oblong, biconvex, compressed, shortly stipitate, umbonulate, stramineous to fuscous 1-1.2 mm long and 0.8-1 mm wide.

Fl. & Fr. : May-Oct.

Ecology : Not common; in open swamps, near margins of pools and mud-wells, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Raja Rappa, 860 ; Katkamosandi, 1409.

7. **Fimbristylis miliacea** (L.) Vahl, Enum. Pl. 2 : 287. 1806; Clarke in Hook. f., Fl. Brit. India 6 : 644. 1893; Prain, Bengal Pl. 2 : 1155. 1903; Haines, Bot. Bihar & Orissa pt. 5. 915. 1924. *Scirpus miliaceus* L., Syst. Veg. ed. 10, 868. 1759.

Glabrous annual. Stems erect, densely tufted acutely 4-5-angled, striate, 10-50 cm tall and 1-2 mm thick; the base clothed with obliquely truncate bladeless sheaths. Leaves dorsiventrally flattened, acuminate, scabrid on rib-like angles in upper part, shorter than to as long as stems, 2-3 mm wide; ligule absent. Inflorescence compound or decompound, loose, 4-10 cm long. Involucral bracts 3-5, setaceous, to 3 cm; primary rays several, compressed, scabrid, to 6 cm. Spikelets solitary, ovoid-globular, rusty brown, 2-4 mm, densely many-flowered; rachilla narrowly winged. Glumes spiral, broadly ovate, mucronate, with 3-nerved keel and hyaline margins, 1-1.3 mm long and 0.8-1 mm wide. Stamen usually 1. Style triquetrous, pyramidally thickened at base; stigmas 3, as long as style. Nut broadly obovoid, trigonous, verruculose, transversely lineolate, stramineous, 0.5-0.7 mm long and 0.4-0.5 mm wide.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; in open wet places, rice - fields, swampy grassland, etc.

Distribution : Throughout India. Tropical and subtropical regions of whole World; in eastern Asia the range extends into temperate regions as far as to central Japan and China.

Specimens examined : Hazaribagh, 727; Gola, 1533.

8. **Fimbristylis tetragona** R. Br., Prodr. Fl. Nov. Holl. 226. 1810; Clarke in Hook. f., Fl. Brit. India 6 : 631; 1893; Prain, Bengal Pl. 2 : 1152. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 918. 1924.

Glabrous perennial with short rhizome. Stems erect, densely tufted, quadrangular, rigid, 10-60 cm tall and 0.6-1 mm thick. Leaves reduced to 2-3 obliquely truncate, ferrugineous or fuscous, 3-10 cm long sheaths, bladeless or uppermost with a short lanceolate blade. Inflorescence consisting of a single terminal spikelet. Spikelet ebracteate, broadly ellipsoid to ovoid-ellipsoidal, dull brown, 0.5-1.2 cm long and 4-6 mm across, densely many-flowered; rachilla narrowly winged. Glumes closely imbricate, oblong ovate, concave, faintly many-nerved, 3-5 mm long and 0.2-0.3 cm wide. Stamens 1-3, Style flat, slightly dilated at base, ciliate, dark-brown; stigmas 2 or 3. Nut oblong-cylindrical, with almost parallel edges, slightly curved, stipitate, trabeculate, strameneous, 1.5-2 mm long and 0.4-0.5 mm wide. Stipe to 1 mm long.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in swamps, swampy grasslands, wet rice-fields, etc.

Distribution : Throughout India except north-west regions. Tropical southern Asia from India and Sri Lanka through Indo-China north-eastwards to southern China, eastwards to Malesia and northern Australia.

Specimens examined : Jhumri Telaiya, 679; Chowparan, 1357; Pratappur, 1553.

9. ***Fimbristylis uliginosa** Hochst. ex Steud., Syn. Pl. Glum. 109. 1855; Clarke in Hook. f., Fl. Brit. India 6 : 648. 1893.

Glabrous, annual; stems 10-20 cm long and 1-1.5 mm in diam., slender, angular. Leaves very slender, scaberulous, 3-8 cm long and 1.2-1.5 mm broad; sheaths striate below. Umbel simple or reduced to a single cluster or sometimes to a single spikelet. Spikelets black-chestnut-like, 5-7 mm long; rachilla winged. Glumes spiral, ovate, aristate or mucronate, keeled; keel 3-nerved. Stamens 3. Style 3-fid, basally pyramidal, ciliate; stigmas 3. Nut obovoid, trigonous, obscurely striolate, umbonulate, stipitate, pale, smooth, slightly narrowed at top.

Fl. & Fr. : July-Oct.

Ecology : Rare, along railway tracks, rice-fields, open wet places, etc.

Distribution : Deccan Peninsula.

Specimen examined : Ramgarh, 2299.

6. FUIRENA Rottb.

Fuirena ciliaris (L.) Roxb., Fl. Ind. 1 : 184. 1820; Kern in van Steenis, Fl. Males. ser. 1, 7 : 519, f. 32. 1974.*Scirpus ciliaris* L., Mant. 2 : 182. 1771. **(Fig.13)**

Fuirena glomerata Lam., Tabl. Enc. Meth. Bot. 1 : 150. 1791; Clarke in Hook. f., Fl. Brit. India 6 : 666. 1893; Prain, Bengal Pl. 2 : 1158. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 928. 1924.

F. rottboelli Nees in Wight, Contrib. Bot. India 94. 1834.

Annual. Stems slender, obtusangular, striate-sulcate, 10-40 cm long. Leaves linear or lanceolate, ± pubescent or at least ciliate on margins, with 3-5 prominent veins, light green, sheaths pubescent. Inflorescence sometimes a single terminal cluster, but usually also with 1-2 clusters on

short peduncles in upper axils. Glumes obovate or oblong-obovate, short-hairy on back, pilose in centre, 1.5-2 × 1-1.2 mm (excluding 0.8-0.1 cm long awn). Perianth-bristles scaberulous or smooth, much shorter or as long as nut; scales clawed, subquadrate, cordate or hastate at base, with 3 minute teeth at top. Nut elliptic to obovate, triquetrous, narrowed into a stipe and beak, smooth, 0.8-1 × 0.5-0.6 mm.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; in rice-fields, open wet grassy lands, swamps, river-banks, margins of ponds, ditches, jheels, etc.

Distribution : Throughout the warmer parts of India. Tropical Africa, throughout S.E.Asia extending to S.China, Japan, Malesia and Australia.

Specimens examined : Hazaribagh, 130; Ghanghree, 1043; Telaiya Dam, 1849.

7. KYLLINGA Rottb., *nom. cons.*

Key to the Species

1a. Keel of the glumes broadly winged ... 3. *K. nemoralis*

1b. Keel of the glumes not winged :

2a. Rhizome short stolons wanting ... 2. *K. bulbosa*

2b. Rhizome long, horizontally creeping ... 1. *K. brevifolia*

1. **Kyllinga brevifolia** Rottb., Descr. & Ic. Rar. Nov. Pl. 13, t. 4. f. 3. 1773; Clarke in Hook. f., Fl. Brit. India 6 : 588. 1893; Prain, Bengal Pl. 2 : 1135; Haines, Bot. Bihar & Orissa pt. 5 : 897. 1924.

Cyperus brevifolius (Rottb.) Hassk., Cat. Hort. Bog. 24. 1844; Rao & Verma, Cyper. N.E.India 6. 1982.

Perennial; rhizome long, horizontally creeping, covered by reddish-brown scales. Stems approximate to distant, triquetrous, 3-40 cm tall and 0.5-1.5 mm thick. Leaves canaliculate, scabrid on margins in upper part, grass-green, shorter than to nearly equalling stems, 1-3 mm wide, lower ones almost bladeless. Inflorescence capitate, usually consisting of a terminal head. Involucral bracts 3-4, lowest 3-10 cm long. Head globose to ovoid, 0.5-1 cm long and wide, at first pale green, becoming straw-coloured at maturity. Spikelets elliptic-oblong, compressed, 2.5-3.5 cm long and 0.8-1 mm wide, 1(-2)-flowered. First glume elliptic-lanceolate, 0.5-1 mm, 2nd ovate, 1 mm, 3rd and 4th boat-shaped, compressed, mucronulate, 2.5-3 mm, with spinulose keel and 2-3-nerved sides. Stamens 1-2, or rarely 3. Stigmas 2. Nut biconvex, obovate-elliptic, laterally compressed, yellowish-brown, 1-1.2 mm long and 0.5-0.7 mm wide.

Fl. & Fr. : May-Oct.

Ecology : Common ; in shady places, along roadsides, in grassy fields, moist forest clearings, etc.

Distribution : Throughout India; Tropical and warm-temperate regions of whole World.

Specimens examined : Churchu, 690; Joynagar, 1497; Etkhori, 1867.

Uses : Plant is eaten by cattle. Roots and rhizomes are used as aromatic. Leaves are used in diarrhoea.

2. **Kyllinga bulbosa** Beauv., Fl. d'Oware & Benin 1 : 11, t. 8. f. 1. 1804; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 245. 1985.

Schaenoides triceps Rottb., Descr. Pl. Rar. Progr. 15. 1772, *nom. inval.*

Kyllinga triceps Rottb., Descr. & Ic. Rar. Nov. Pl. 14, t. 4. f. 6. 1773, *nom. illegit.*; Clarke in Hook. f., Fl. Brit. India 6 : 587. 1893;

Prain, Bengal Pl. 2 : 1135. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 907. 1924.

Cyperus triceps (Rottb.) Endl., Cat. Hort. Acad. Vindb. 1 : 94. 1842.

Local name : Nirbisi.

Rhizome short; stolons absent. Stems densely tufted, slender, sometimes setaceous, obtusely trigonous, smooth, 5-20 cm tall and 0.6-1 cm wide, with increassate base covered by brownish sheath. Leaves flat or slightly conduplicate, gradually acuminate, nearly as long as stem, 1.5-2.5 mm wide. Inflorescence capitate, consisting of usually 3 (rarely 1, 4 or 5) sessile, dense spikes; central spike subglobose, 5-8 cm long and 4-6 cm wide; lateral ones globose, smaller. Involucral bracts 3 or 4, spreading or reflexed, to 10 cm long. Spikelets oblong, compressed, pale-green, 1.6-2 mm long and 0.6-0.7 mm wide. Glumes ovate-oblong, hyaline, with sharp, almost smooth keel; 1st and 2nd glume small, 3rd 7-nerved, 1.5-1.7 mm long, 4th 5-nerved, 1.7-2 mm long. Stamens 2. Nut biconvex, laterally compressed, oblong, brownish, 1-1.2 mm long and 0.5 mm wide.

Fl. & Fr. : Aug.-Feb.

Ecology : Very common; in waste places, road-sides, open grasslands, cultivated fields and field borders, forests, etc.

Distribution : Throughout India. From tropical Africa through Pakistan, India and Indo-China northeastwards to southern China, and eastward to Malesia and northern Australia.

Specimens examined : Hazaribagh, 234; Ramgarh , 542 ; Chowparan, 1677.

Uses : An oil extracted from roots is used for stimulating liver and to relieve pruritus.

3. **Kyllinga nemoralis** (J. R. & G. Forst.) Dandy ex Hutch. & Dalziel, Fl. W. Trop. Africa 2 : 486. & 487. 1936; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 249. 1985. *Thryocephalon nemoralis* J.R.& G. Forst., Char. Gen. Pl. 130. 1776.

Kyllinga monocephala Rottb., Descr. & Ic. Rar. Nov. Pl. 13, t, 4. f. 4. 1773, *nom. illegit.*; Clarke in Hook. f., Fl. Brit. India 6 : 588. 1893; Prain, Bengal Pl. 2 : 1135. 1903 ('microcephala'); Haines, Bot. Bihar & Orissa pt. 5 : 907. 1924.

Cyperus kyllingia Endl., Cat. Hort. Acad. Vindb. 1 : 94. 1842; Rao & Verma, Cyper. N.E.India 7. 1982.

Local name : Swetgothubi, Nirbishi.

Rhizome horizontally creeping, covered by ovate-lanceolate scales, with internodes variable in length. Stems approximate to distant on rhizome, triquetrous, smooth, 5-40 cm tall and 1-1.5 mm thick. Leaves flaccid or rigidulous, canaliculate, scabrid on margin in upper part, grass-green, 2-4 mm wide. Inflorescence a terminal, ovoid-globose head, 0.8-1.2 cm long and 0.6-1 cm wide, with usually 1-3 much smaller sessile heads at base, snowy white at first, turning fulvous later. Involucral bracts 3-4, spreading or relfexed, the lowest to 30 cm long. Spikelets obliquely ovate-elliptic, compressed, 3-3.5 mm long and 1.2-1.5 mm wide. 1st and 2nd glume narrow, 1-1.5 mm long; other glumes boat-shaped, compressed, acutely keeled, broadly winged on keel, green in upper part of keel, otherwise, white; 3rd glume enclosing a bisexual flower, 2.5-3 mm long, 4th glume enclosing a male and bisexual flower, 3-3.5 mm long; 5th glume when present sterile. Stamens 3. Nut biconvx, laterally compressed, oblong-obovate, brownish, 1.2-1.5 mm long and 0.5-0.7 mm wide.

Fl. & Fr. : July-Feb.

Ecology : Very common; in waste places, road-sides, open grass - lands, etc.

Distribution : Throughout India.Pantropical, but relatively scarce in tropical America.

Specimens examined : National Park, 201; Keredari, 644; Satgawan 1978.

Uses : Plant is eaten by cattle. Decoction of rhizome is used as diuretic, demulcent and tonic; also given in fevers and diabetes.

8. MARISCUS Vahl

Key to the Species

1a. Spikelets compressed, with acute edges, bearing 6-25 nuts. Glumes each with a recurved awn. Stamen 1 ... 1. *M. sqarrosus*

1b. Spikelets subterete, without edges, bearing only 1 to 2 nuts with maturity. Glumes without awn. Stamens 3 ... 2. *M. sumatrensis*

1. **Mariscus squarrosus** (L.) Clarke in Hook. f., Fl. Brit. India 6 : 623. 1893, *quoad. basyonym*; Prain, Bengal Pl. 2 : 1146. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 908. 1924; Koyama in Gard. Bull. Singapore 30 : 153. 1977 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 229. 1985. *Cyperus squarrosus* L., Cent. Pl. 2 : 6. 1756.

Cyperus aristatus Rottb., Descr. Pl. Rar. Progr. 22. 1772; Clarke in Hook. f., Fl. Brit. India 6 : 606. 1893; Prain, Bengal Pl. 2 : 1143. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 895. 1924.

Mariscus aristatus (Rottb.) Cherm. in Bull. Soc. Bot. France 85 : 366. 1938.

Small annual. Stems densely tufted, triquetrous to 3-winged, 3-10 cm tall and 0.5-1.5 mm tall. Leaves few, canaliculate, acuminate, shorter than to as long as stems, 1-2 mm wide; lower sheaths purplish. Inflorescence simple, usually reduced to a single hemispherical head.

Involucral bracts 2-4, at least 1 overtopping the inflorescence, to 7 cm long. Rays 1-3, to 4 cm long. Spikes dense, oblong avoid to subglobose, appearing echinate, light yellow-green, 0.5-2 cm long and 0.4-1.5 cm wide. Spikelets oblong to oblong-linear, compressed, with acute edges, 0.5-1 cm long and 3-4 mm wide, 6-25-flowered; rachilla wingless. Glumes ovate to elliptic-oblong, ferrugineous, 1-2 mm long and 0.5-1 mm wide, 5-9-nerved over whole breadth, with a recurved 0.5-1.2 mm wide, 5-9-nerved over whole breadth, with a recurved 0.5-1.2 mm long awn. Stamen 1. Stigmas 3. Nut oblong-obovoid or linear-oblong, broadly stipitate, minutely apiculate, grey-brown, 0.7-1 mm long and 0.2-0.5 mm wide.

Fl. & Fr. : Oct.-Nov.

Ecology : Common; in wet sandy soil in open grassy fields, etc.

Distribution : Almost throughout India. Tropical Africa, extending to S. Africa, tropical Asia to S. Chaina, Australia, in Western hemisphere from S. Canada through United States and tropical America to Argentina and Chili.

Specimens examined : Raja Rappa, 457; National Park, 1199.

2. **Mariscus sumatrensis** (Retz.) Raynal in Adansonia 15 : 110. 1975; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 232. 1985. *Kyllinga sumatrensis* Retz., Obs. Bot. 4 : 13. 1786.

Scirpus cyperoides L., Mant. 2 : 181. 1771, non *Mariscus cyperoides* (Roxb.) Dietr. 1833.

Kyllinga umbellata Rottb., Descr. Ic. Rar. Nov. Pl. 15. 1773, excl. t. 4. f. 2. *nom.. illegit.*

Mariscus sieberianus Nees ex Clarke in Hook. f., Fl. Brit. India 6 ; 622. 1893; Prain, Bengal Pl. 2 : 1147. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 909. 1924.

Cyperus cyperoides (L.) Kuntze, Rev. Gen. Pl. 3(2) : 333. 1898; Rao & Verma, Cyper. N.E.India 21. 1982.

Perennial with short rhizome, not stoloniferous. Stems solitary or several together, triquetrous, smooth, with increassate base clothed with remains of old leaf-sheaths, 25-75 cm tall and 1-3 mm thick. Leaves flat, long-attenuate, scabrid in upper part, shorter than to equalling the stem, 3-6 mm wide; lower sheaths reddish brown. Inflorescence simple, rarely subcompound. Involucral bracts 5-10, lower ones much overtopping the inflorescence, to 30 cm long. Rays 5-17, straight, smooth, to 8 cm long. Spikes cylindrical, obtuse, dense, 2-4 cm long and 0.6-1 cm wide, greenish. Spikelets many, at first obliquely erect, finally at right angles to rachis and lower ones usually reflexed, linear, subterete, without edges, 3-4 mm long and 0.6-1 mm wide, maturing 1-or 2-fruited; rachilla straight, with broad hyaline wings tightly clasping the nut. Glumes oblong-ovate, appressed, fugaceous - lineolate, many-nerved, 3-3.5 mm long and 1 mm wide, with 3-nerved green keel and stramineous sides. Stamens 3. Stigmas 3, longer than style. Nut linear-oblong, apiculate, rufous to castaneous, 1.7-2.2 mm long and *ca.* 0.5 mm wide.

Fl. & Fr. : Aug.-Oct.

Ecology : Common; in open an shaded grasslands, roadsides, thickets, gardens, forests, etc.

Distribution : India : From North-West Himalaya through Uttar Pradesh, Bihar, West Bengal to Assam and through Orissa to Deccan Peninsula. Tropical Africa, tropical and subtropical Asia, Malesia, northern Australia; also introduced in West Indies.

Specimens examined : National Park, 202; Chatra, 984.

Use : Plant is used as vermifuge.

Note : T. Koyama (*l.c.*) pointed out clearly why the specific epithets of Linnaeus (1771) and of Rottboell (1773) have not been available while transferring the taxon to MARISCUS. The earliest valid name *Scirpus cyperoides* cannot be transferred because of Dietrich's homonym. The next name *Kyllinga umbellata* is illegitimate as Rottboell cited *Scirpus cyperoides* as synonym. As such, the specific epithet of *Kyllinga sumatrensis* is needed to be transferred to MARISCUS to make the correct name of this taxon.

9. PYCREUS Beauv.

Key to the Species

1a. Midvein of the glumes excurrent beyond glume apex into a distinct mucro ... 2. *P. pumilus*

1b. Glumes muticous :

2a. Stems decumbent, rooting at lower nodes, leafy in lower one-third to one-half. Glumes with arcuate keel and with a depression on either side of it ... 3. *P. sanguinolentus*

2b. Stems erect, not rooting at nodes, leafy only at very base. Glumes with straight keel and without depressions ... 1. *P. flavidus*

1. **Pycreus flavidus** (Retz.) Koyama in J. Jap. Bot. 51 : 313. 1976 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 222. 1985. *Cyperus flavidus* Retz., Obs. Bot. 5 : 13. 1788; Rao & Verma, Cyper. N.E.India 10. 1982.

Cyperus globossus All., Fl. Pedem. Auct. 49. 1789, non Forsk. 1775.

C. capillaris Koen. ex Roxb., Fl. Ind. 1 : 198. 1820.

Pycreus globossus (All.) Reichb., Fl. Germ. Excurs. 2 : 130. 1830; Haines, Bot. Bihar & Orissa pt. 5 : 905. 1924.

P. capillaris (Koen. ex Roxb.) Nees ex Clarke in Hook. f., Fl. Brit. India 6 : 519. 1893, incl. vars.; Prain, Bengal Pl. 2 : 1137. 1903.

Annual, or perennial with short rhizome. Stems erect, slender, tufted, trigonous, leafy only at very base, 5-60 cm tall and 1-1.5 mm thick. Leaves narrow, canaliculate, setaceous, smooth or minutely scabrid at top, shorter than stems, 1-2.5 mm wide; lower sheaths ferrugineous to reddish-brown.

Inflorescence simple or subcompound, open to contracted into a single cluster. Involucral bracts 2-4, lowest 1-2 much overtopping the inflorescence, to 25 cm long. Primary rays 3-6, to 5 cm long. Spikes ovoid, with 5-20 spikelets. Spikelets linear, parallel-sided, compressed, 1-2 cm long and 2.5-3 mm wide, 20-40-flowered; rachilla straight, wingless, persistent. Glumes oblong-ovate, 1.5-2.5 mm long and 1-1.5 mm wide, with green, straight, 3-nerved keel, nerveless stramineous-brown sides and whitish hyaline margins. Stamens 2. Style short; stigmas 2, longer than style. Nut obovate to oblong-elliptic, biconvex, laterally compressed, apiculate, dark brown when mature, 0.8-1.2 mm long and 0.4-0.6 mm wide.

Fl. & Fr. : Feb.-May.

Ecology : Very common; in open, wet places, swampy fields, grasslands, rice-fields, etc.

Distribution : Throughout India. Widely distributed from the Mediterranean region and tropical Africa eastwards to Central and South Asia to Malesia and Australia and northwards to Japan.

Specimens examined : Hazaribagh, 721; Ramgarh, 1124; Hunterganj, 1647.

2. **Pycreus pumilus** (L.) Nees ex Clarke in Hook. f., Fl. Brit. India 6 : 591. 1893, *quoad nom. cit. excl. basion.*; Haines, Bot. Bihar & Orissa pt. 5 : 905. 1924; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 224. 1985. *Cyperus pumilus* L., Cent. Pl. 2 : 6. 1756; Kren in Steenis, Fl. Males.ser. 1, 7 : 650. 1974.

Cyperus nitens Retz., Obs. Bot. 6 : 13. 1789.

Pycreus nitens (Retz.) Nees in Nova Act. Acad. Caes. Leop.-Carol. Nat. Cur. 19, suppl. 1 : 53, 1843; Clarke in Hook. f., Fl. Brit. India 6 : 591. 1893; Prain, Bengal Pl. 2 : 1137. 1903.

Annual, with yellowish roots. Stems tufted, triquetrous, smooth, 5-20 cm long and 0.5-1 m thick. Leaves canaliculate, gradually

acuminate, scabrid in upper part, 1-2 mm wide; sheaths stramineous to reddish brown. Inflorescence simple or subcompound. Involucral bracts 3-5, overtopping the inflorescence, longest 2.5-15 cm long. Primary rays 3-6, divergent. Spikes ovoid or subglobose, 1-2 cm across, with 5-30 spikelets. Spikelets oblong to linear, compressed, 0.5-1 cm long and 1.5-2.5 mm wide, 8-30 flowered. Rachilla straight, almost wingless, persistent. Glumes ovate, 1/2 imbricate, sharply keeled, 1.2-1.7 mm long; keel 3-5-nerved, green or reddish brown; sides nerveless; mucro erect or slightly recurved. Stamens usually 1, sometimes 2. Nut bicovex, laterally compressed, oblong-obovate, shining brown to castaneous, 0.5-0.8 mm long and 0.3-0.5 mm wide.

Fl. & Fr. : Sept.-Nov.

Ecology : Very common; in open damp localities, rice-fields, moist meadows, etc.

Distribution : Throughout India. Sri Lanka, Indo-China, S. China eastwards to Malesia and Australia.

Specimens examined : Raja Rappa, 876; Bishnugarh, 1117; Chatra, 1667.

Note : Often credited to Nees (in Linnaea 9 : 283. 1835); but according to Kern *(l.c.)*, Nees made an invalid combination without citing the basionym.

3. **Pycreus sanguinolentus** (Vahl) Nees ex Clarke in Hook. f., Fl. Brit. India 6 : 590. 1893; Prain, Bengal Pl. 2 : 1137. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 504. 1924. *Cyperus sanguinolentus* Vahl, Enum. Pl. 2 : 351. 1806; Kern in van Steenis, Fl. Males. ser. 1, 7 : 646. 1974; Rao & Verma, Cyper. N.E.India 9. 1982.

Annual, or perennial with short rhizome without stolons. Stems tufted, decumbent at base, trigonous, smooth, 1-4-noodded at base, rooting at lower nodes, 10-60 cm tall and 0.7-2 mm thick, leafy in lower one-third to one-half. Leaves flat or canaliculate, gradually acuminate, scabrid on

margins in upper part, 1.5-3 mm wide. Inflorescence simple, either reduced to a cluster of few spikelets or contracted into a dense head or with 1-5 up to 5 cm long rays. Involucral bracts 2-5. obliquely erect to patent, longer ones overtopping inflorescence, lowest sometimes erect, to 15 cm long. Spikes ovoid, with 3-18 spikelets. Spikelets ovate to oblong lanceolate, compressed. sanguiceous-brown, 0.6-1 cm long and 2-3 mm wide, 8-25-flowered. Rachilla straight, not winged, persistent. Glumes ovate, keeled, 1/2 imbricate, 1.5-2.5 mm long and 1.5-2 mm wide; keel green, arcuate, 3-5-nerved; sides nerveless, usually with a longitudinal depression in centre. Stamens 2 or 3. Nut biconvex, laterally compressed, obovate-orbicular, brown to blackish, 1-1.5 mm long and 0.8-1.2 mm wide.

Fl. & Fr. : Aug.-Feb.

Ecology : In grassy fields, swampy places, rice-fields, etc.

Distribution : Throughout India. Widely distributed in Old World from north-eastern Africa through Afganistan and Indo-China north-eastward to China and Japan, and eastward to Malesia.

Speicmens examined : Ichak, 346; Jhumri Telaiya, 632; Pratappur 1547.

Note : Often credited to Nees (in Linnaea 9 : 283. 1835), but according to Kern (*l.c.*), Nees made an invalid combination without citing the basionym.

10. Rikliella Raynal

Rikliella squarrosa (L.) Raynal in Adansonia 13 : 154. 1973; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 254. 1985. *Scirpus squarrosus* L., Mant. 2 : 181. 1771; Clarke in Hook. f., Fl. Brit. India 6 : 663. 1893; Prain, Bengal Pl. 2 : 1160. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 925. 1924.

Isolepis squarrosa (L.) Roem. & Schult., Syst. Veg. 2 : 111. 1817.

Stems erect, tufted, setaceous, obtusangular, 5-20 cm tall and 0.2-0.5 mm thick, leafy only at base. Leaves filiform, smooth or slightly scaberulous towards apex eligulate, shorter than stems, 0.6-1 mm wide; lower sheaths bladeless, ferrugineus, purplish striate. Head Pseudolateral, consisting of 2-4 spikelets. Involucral bracts 1-3, similar to leaves, dilated at base, 1-6 cm long, lowest usually erect, continuous with stem. Spikelets sessile, ovoid, subterete, squarrose, brownish with pale green awns, 3-6 cm long and 2-4 mm wide, densely many-flowered. Glumes membranous, obovoid-rhomboid, 3-5-nerved, 1.2-1.5 mm long including 0.4-0.5 mm long recurved mucro. Hypogynous bristles 0. Style very short; stigma 3, recurved. Nut trigonous, obovoid, castaneous to black, 0.5-0.6 mm long and 0.3-0.4 mm wide.

Fl. & Fr. : Sept.-Jan.

Ecology : Common; in open sandy places, cultivated land, grassy fields, etc.

Distribution : Throughout India. Sri Lanka through Malesia and Thailand and to Indo-China.

Specimens examined : National Park, 472; Pratappur, 603; Ichak, 1322.

11. SCHOENOPLECTUS (Reichb.) Palla, *nom. cons.*

Key to the Species

1a. Stems and bracts transversely septate;the bract longer than or about as longas stem proper, hence inflorescence seemingly inserted in lower part or about middle of stem :

2a. Glumes inflated in fruit, straw-brown, shining. Bract about as long stem proper, hence inflorescence seemingly inserted about middle of stem ... 2. *S. roylei*

2b. Glumes not inflated in fruit, rusty or purple, not shining. Bract longer than stem proper, hence inflorescence seemingly inserted at base of stem ... 1. *S. articulatus*

1b. Stems and bracts not septate; the bract shorter than stem proper, hence inflorescence inserted in upper part of stem ... 3. *S. supinus* *ssp. lateriflorus*

1. **Schoenoplectus articulatus** (L.) Palla in Bot. Jahrb. Syst. 10 : 229. 1889; Koyama in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 163. 1985. *Scirpus articulatus* L., Sp. Pl. 47. 1753; Clarke in Hook. f., Fl. Brit. India 6 : 656. 1893; Prain, Bengal Pl. 2 : 1160. 1903; Haines, Bot. Biahr & Orissa pt. 5 : 926. 1924; Rao & Verma, Cyper. N.E.India 43. 1982.

Local name : Chichora.

Stems erect, tufted, terete, fistulose, transversely septate, smooth, 10-50 cm tall and 3-8 cm wide, clothed at base with 2 or 3 bladeless sheaths only. Upper 2 sheaths cylindrical, stramineous-brown, scarious-margined, obliquely truncate, 4-15 cm long; lower 1 or 2 reduced and scale-like, 1-1.2 cm long, brown. Inflorescence pseudolateral, capitate, globose, 1-3 cm across, consisting of numerous (up to 60 cm) spikelets. Involucral bract 1, similar to and continuous with stem, terete, transversely septate, somewhat to much longer than stem proper, to 60 cm. Spikelets sessile, ovoid to oblong-ovoid, terete, acutish, 0.7-1.5 cm long and 3-5 mm wide, densely many-flowered. Glumes appressed, concave, rusty or purple, ovate-suborbicular, apiculate, hardly keeled, many-nerved, 3-5 mm long and wide. Hypogynous bristles 0. Stamens 3. Stigmas 3, shorter than style. Nut triquetrous, obovoid, apiculate, transversely wavy-ridged, black, 1.2-1.5 mm long and 0.8-1 mm wide.

Fl. & Fr. : Nov.-Jan.

Ecology : Very common; in open swampy or inundated places, shallow pools, rice-fields, margins of ponds, etc.

Distribution : Throughout India. Indo-China, Malesia and tropical Australia.

Specimens examined : Ramgarh Cant., 1250; Hazaribagh, 1591; Jhumri Telaiya, 2224.

Uses : Dried plants are used for thatching. Rhizomes are given in diarrhoea and to stop vomitting.

2. ***Schoenoplectus roylei** (Nees) Ovczinn. & Czukav. in Fl. Tadjikist. 2 : 40. 1963. *Isolepis roylei* Nees in Wight, Contr. Bot. Ind. 107. 1834.

Scirpus quinquefarius Buch.-Ham. ex Boeck. in Linnaea 36 : 701. 1870; Clarke in Hook. f., Fl. Brit. India 6 : 657. 1893; Prain, Bengal Pl. 2 : 1160. 1903.

S. roylei (Nees) Parker in Duthie, Fl. Upp. Gang. Pl. 3 : 361. 1929.

Annual. Stems rather slender, terete, smooth, usually transversely septate, 5-30 cm long and 2-2.5 mm thick. Leaves almost absent; sheaths 2-3, loosely enveloping the stem. Inflorescence pseudolateral, capitate, 0.8-1.2 cm across. Bract stem-like, erect, about as long as stem proper. Spikelets oblong-lanceolate, terete, acutish, 6-12 × 2.5-3 mm. Glumes laxly imbricating particularly in fruit, membranaceous, broadly ovate, acute, shining straw-brown, many-ribbed, keeled, inflated in fruit 3-3.5 mm long. Hypogynous bristles 0. Stamens 3, *ca* 3 mm long. Style *ca* 1 mm long; stigmas 3, nearly as long as style. Nut obovoid, triquetrous, faintly transversely wavy, black, 1.2-1.3 mm long.

Fl. & Fr. : May-Sept.

Ecology : Rare, in wastelands, swamps, rice-fields, etc.

Distribution : India : North-West India, Uttar Pradesh, West Bengal, Assam, central India, Gujarat and western Peninsula. Pakistan, Afganistan, Tadjikistan, Beluchistan and Africa.

Specimens examined : Hazaribagh, 684; Patratu, 1737.

3. **Schoenoplectus supinus** (L.) Palla ssp. *lateriflorus* (Gmel.) Koyama in Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 119, 1978 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 158. 1985. *Scirpus lateriflorus* Gmel., Syst. Veg. 127. 1791.

Scirpus lateralis Retz., Obs. Bot. 4 : 12. 1786, non Forsk. 1775.

S. supinus auct. non L. : Clarke in Hook. f., Fl. Brit. India 6 : 655. 1893; Prain, Bengal Pl. 2 : 1160. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 925. 1924.

S. supinus L. var. *uninodes* sensu Clarke in Hook. f., Fl. Brit. India 6 : 656. 1893, *quaod nom. cit.* non *Isolepis uninoides* Delile; Prain, Bengal Pl.2 : 1160. 1903.

Annual. Stems slender, densely tufted, obtusangular to subterete, smooth, with a node a short distance above base, 10-35 cm tall and 0.5-1.5 mm thick. Leaves reduced to 2-3 sheaths, obliquely truncate at apex, usually with a small rudimentary blade. Inflorescence pseudolateral, headlike or corymbose, usually with to 4 short rays. Involucral bracts 1-2, lower erect, similar to and continuous with stem and shorter than latter, to 15 cm long, second one when present much shorter, to 5 cm long. Spikelets oblong-ovoid, angular, acutish, 0.4-1 cm long and 2-3 mm wide, densely many-flowered. Glumes ovate-elliptic, boat-shaped, 2-2.5 mm long and 1.7-2 mm wide, stramineous to ferrugineous, sometimes reddish variegated, keeled throughout, with prominent midvein, nerveless sides and hyaline margins. Hypogynous bristles 0. Stamens 3; connective papillose at apex. Stigmas 3, as long as style. Nut obovate, compressed-trigonous, trasversely wavy-ridged, black, 1-1.2 mm long and 0.8-1 mm wide.

Fl. & Fr. : Oct.-Dec.

Ecology : Very common; in wet grassy low lands, edges of swamps, rice-fields, etc.

Distribution : Throughout India. From Indo-China eastwards to Malesia and tropical Australia; also in southern continental China and Formosa.

Specimens examined : Tandwa, 1417; Hazaribagh, 1615.

12. SCLERIA Berg.

Scleria lithosperma (L.) Sw., Prodr. Fl. Ind. Occid. 18. 1788; Clarke in Hook. f., Fl. Brit. India 6 : 685. 1894; Prain, Bengal Pl. 2 : 1132. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 931. 1924. *Scirpus lithospermus* L., Sp. Pl. 51. 1753.

Scirpus tenuis Retz., Obs. Bot. 4 : 13. 1786.

Perennial. Stems slender, smooth, 40-60 cm tall and 1-2 mm thick. Leaves usually aggregated towards middle of stem, narrowed gradually to obtuse tip, glabrous to sparsely pubescent, 1.5-4 mm wide; sheaths narrow, not winged; pubescent in middle of side, glabrous on angles; contraligule short, ovate-triangular, obtuse, hirsute. Inflorescence narrow, loose, to 30 cm long, with a terminal panicle and 2-3 distant axillary ones; panicles spiciform, wth few spikelets; primary bracts much exceeding the panicles. Spikelets bisexual, solitrary or in clusters of 2-3 with 1 female and 1 or 2 male. Glumes ovate-lanceolate, ferrugineous. Stamens 1 or 2. Disc much reduced, annular, glabdular. Nut ovoid or oblong-ovoid, trigonous, 2.5-3 mm long and 1.5-2 mm wide with 3 basal depressions having glandular ridges.

Fl. & Fr. : Sept.-Nov.

Ecology : Common; in rocky and sandy places, forest edges, open grassy places, etc.

Distribution : Almost throughout India except west arid areas. Pantropical.

Specimens examined : National Park, 443; Ghanghree, 2159.

Uses : Terminal younger parts of plants are given to children with enlarged stomach. Decoction of roots is given after parturition. Plant is used as antinephritic.

129. POACEAE

Key to the Genera

1a. Spikelets 2-flowered, falling entire at maturity, usually with hermaphrodite upper floret and male or barren lower floret, frequently dorsally compressed :

2a. Spikelets all hermaphrodite, or with male or barren and hermaphrodite spikelets mixed in same inflorescence, or if unisexual, then lemmas of fertile florets indurated :

3a. Spikelets usually paired, with one sessile and the other pedicelled, those of each pair similar or dissimilar, sometimes in threes, very rarely solitary and all alike. Glumes as long as the spikelets and enclosing the florets, rigid. Lemmas hyaline or membranous, upper usually awned :

4a. Spikelets in pairs, rarely in threes (e.g. *Ischaemum, Chrysopogon, Apluda*, etc.) similar or dissimilar :

5a. Spikelets of each pair similar, both the sessile and the pedicelled hermaphrodite. Joints of panicle thin, linear or somewhat expanded at top :

6 a. Spikelets arranged in panicles or compound racemes along a central axis :

7a. Rachis of racemes continuous and tough ... 31. IMPERATA

7b. Rachis of racemes fragile, breaking up ... 50. SACCHARUM

6b. Spikelets arranged in a solitary or several racemes, the latter being digitate or arranged along a short main axis :

8a. Racemes solitary ... 46. POGONATHERUM

8b. Racemes 2 or more, digitate ... 48. PSEUDOPOGONATHERUM

5b. Spikelets in each pair dissimilar, the sessile hermaphrodite, the pedicelled male or sterile, or absent, if similar then the joints of racemes, and pedicels thick and swollen :

9a. Joints of rachis, and pedicels swollen, 3-angled, rounded or flattened :

10a. Sessile spikelet with a male and a hermaphrodite floret. Upper lemma awned :

11a. Racemes 1-noded, reduced to 3 heteromorphous spikelets, enclosed in a boat-shaped spathe ...2. APLUDA

11b. Racemes many-noded, not enclosed in a spathe ... 33. ISCHAEMUM

10b. Sessile spikelet with a hermaphrodite floret only or occasionally with a male floret below. Upper lemma awnless :

12a. Sessile spikelet spherical. Lower glume pitted all over. Pedicelled spikelet reduced ... 28. HACKELOCHLOA

12b.Sessile spikelet not spherical. Lower glumenot pitted; pedicelled spikelet distinct ... 49. ROTTBOELLIA

9b. Joints of rachis and pedicels narrow, not thickened, occasionally with a translucent longitudinal furrow :

13a.Spikelets in racemes which are neither interrupted by spathes nor solitary at ends of branches, but collected into whorled panicles ... 12. CHRYSOPOGON

13b.Panicles of racemes interrupted by spathes, or if not, then racemes digitate or in pairs or solitary and terminal :

14a.Upper lemma of sessile spikelet with a basal awn. Sessile spikelet compressed from side; pedicelled spikelet reduced ... 4. ARTHRAXON

14b.Upper lemma of sessile spikelet awned from tip or from cleft, or upper lemma reduced to hyaline base of awn, rarely awnless :

15a.Margins of lower glume of sessile spikelets sharply infolded, 2-keeled; awn glabrous :

16a.Upper lemma of sessile spikelet not cleft, usually stipitate, and passing into the awn. Non-aromatic grasses :

17a.Joints and pedicels with a translucent longitudinal furrow. All pairs of spikelets heterogamous, rarely one pair homogamous ... 8.BOTHRICHLOA

17b.Joints and pedicels without a translucent furrow. Lowest 1-3 pairs of spikelets homogamous ... 19. DICHANTHIUM

16b. Upper lemma of sessile spikelet 2-lobed or 2-cleft, awned in the sinus. Racemes in pairs supported by spathes, collected into panicles. One pair of spikelets in each raceme homogamous, male or neuter, all other pairs heterogamous. Aromatic grasses ... 15. CYMBOPOGON

15b. Margins of lower glumes inturned and rounded at sides, mostly keeled up wards; awn, when present, hairy :

18a. Racemes surrounded at base by an involucre of homogamous spikelets :

19a. Involucral spikelets pedicelled, deciduous; callus of fertile spikelets very short, truncate or obtuse ... 34. ISEILEMA

19b. Involucral spikelets sessile, persistent; callus of fertile spikelets pointed ... 53. THEMEDA

18b. Racemes without an involucre ... 29. HETEROPOGON

4b. Spikelets solitary, shortly pedicelled or almost sessile. Inflorescence of a single raceme or of 2 to several racemes. Rachis of racemes not jointed, tough ... 21. DIMERIA

3b. Spikelets solitary or paired, more or less similar. Glumes usually membranous, lower usually smaller or sometimes suppressed. Lower lemma mostly resembling the upper glume in texture, upper lemma papery to very tough and rigid, awnless :

20a. Spikelets falling singly, not subtended by bristles :

21a.Spikelets arranged in open or contracted panicles ... 39. PANICUM

21b.Spikelets arranged in one-sided spikes or spike-like racemes; spikes or racemes digitate or scattered, rarely solitary :

22a.Lemmas of upper floret thinly cartilaginous, usually with flat, hyaline margins :

23a.Spikelets awned ... 1. ALLOTEROPSIS

23b.Spikelets awnless ... 20. DIGITARIA

22b .Lemmas of upper floret crustaceous or coriaceous, usually with narrow inrolled margins exposing much of palea :

24a.Lower glume and lowest internode of rachilla forming a swollen callus at base of spikelet. Upper lemma mucronate or short-awned ... 27. ERIOCHLOA

24b.Lower glume and lowest internode of rachilla not forming a swollen callus at base of spikelet :

25a.Lower glume, when present, turned away from rachis of racemes orspikes, the back of upper lemma facing it, i.e. spikelets abaxial :

26a.Lower glume absent. Spikelets planoconvex ... 41. PASPALUM

26 b.Lower glume present, although sometimes small :

27a.Glumes cuspidate-acuminate or awned :

28a. Leaf-blades linear. Clums erect or suberect. Glumes cuspidate-acuminate, or awned from entire tip ... 22. ECHINOCHLOA

28b. Leaf-blades ovate-lanceolate. Clums creeping and ascending. Glumes awned from notched tip ... 37. OPLISMENUS

27b. Glumes neither cuspidate-acuminate nor awned ... 40. PASPALIDIUM

25b. Lower glume turned towards rachis, the back of upper lemma turned away from it, i.e. spikelets adaxial. Lower glume present ... 9. BRACHIARIA

20b. Spikelets with an involucre of bristles or subtended by a solitary bristle and falling with or without bristles at maturity :

29a. Upper lemma smooth; bristles caducous :

30a. Involucre of free, naked or plumose bristles ... 42. PENNISETUM

30b. Involucre of spines or rigid bristles united at base into a hard cup ... 10. CENCHRUS

29b. Upper lemma transversely pitted or rugose; bristles persistent ... 51. SETARIA

2b. Spikelets unisexual, male and female in separate inflorescence or in different parts of same inflorescence and of different appearance. Lemmas hyaline or membranous and thinner than glumes :

31a. Female spikelets completely enclosed in a metamorphosed leaf-sheath which takes the form of a spherical or cylindrical, osseous or ivory beadlike structure ... 14. COIX

31b. Female spikelets not enclosed in a false involucre as above ... 57. ZEA

1b. Spikelets 1-to many-flowered, breaking up at maturity above persistent glumes, or if falling entire, then not 2-flowered, usually more or less laterally compressed or terete :

32a. Tall, stout, arborescent. Leaf-blades with a petiole like base which is articulated with sheaths. Stamens 6. Lodicules 3 or 0 :

33a. Pericarp of fruit crustaceous, free from the seed ... 18. DENDROCALAMUS

33b. Pericarp of fruit thin, adnate to the seed ...7. BAMBUSA

32b. Herbaceous, rarely suffruticose. Leaf-blades sessile and not articulated with sheaths. Stamens 1-3 or 6. Lodicules 2 or 0 :

34a. Spikelets borne in open or contracted or spike-like panicles, less often in racemes or spikes :

35a. Spikelets with one fertile floret, with or without one or two male or barren florets below it :

36a. Glumes minute or suppressed. Fertile lemma an dpalea similar in shape and texture. Spikelets firmly compressed :

37a. Leaf-blades linear, acute or acuminate. Aquatic or terrestrial, but never floating :

38a. Fertile lemma solitary Tip of pedicel without lips ...35. LEERSIA

38b. Fertile lemmasupported by 2 empty scales. Tip of pedicel with 2 lips ... 38. ORYZA

37b. Leaf-blades ovate-oblong or ovate-lanceolate with inflated sheaths. Floating grass. Glumes absent. Floret 1; lemma awned ... 30. HYGRORYZA

36b. Glumes well-developed. Fertile lemma and palea not similar :

39a. Spikelets with 3 florets, lower 2 represented by empty lemmas which are usually minute and occasionally one of them absent ... 44. PHALARIS

39b. Spikelets with 1 or 2 florets :

40a. Spikelets with 2 florets, lower male or barren, upper hermaphrodite :

41a. Lower floret empty and epaleate. Glumes up to half the length of spikelet. Rachilla produced beyond upper floret. Glumes deciduous with spikelets and part of pedicel ... 54. THYSANOLAENA

41b. Lower floret male or barren, usually paleate. Upper glume as long as spikelet. Rachilla disarticulating below upper floret and not produced beyond it. Glumes persistent :

42a. Glumes equal, obtuse or mucronate. Upper lemma awnless :

43a.Upper lemma becoming indurated. Glumes finally deciduous ... 32. ISACHNE

43b.Upper lemma remaining membranous. Glumes persistent ... 13. COELACHNE

42b.Glumes unequal, lower acute, upper acuminate. Upper lemma awned with a perfect awn or at least a bristle ...5.ARUNDINELLA

40b.Spikelets with one fertile floret :

44a.Spikelets very rarely falling entire and then with firmly membranous to coriaceous, awned or 5-nerved lemmas :

45a.Lemmas hyaline or membranous at maturity, rarely indurated and then laterally compressed :

46a.Lemmas usually 5-nerved, awned. Glumes longer and firmer than hyaline lemmas. Caryopsis with an adhering pericarp ...47POLYPOGON

46b.Lemmas 1-3-nerved, awnless. Glumes and lemmas similar in texture, thinly membranous, shining. Caryopsis with a free pericarp ...52 SPOROBOLUS

45b.Lemmas indurated or rigid at maturity, terete or dorsally compressed. Spikelets with trifid awns ... 3. ARISTIDA

44b.Spikelets falling entire at maturity, either singly or in clusters. Lemmas delicate, 1-3-nerved :

47a.Spikelets in pairs. Glumes awnless ... 55. TRAGUS

47b.Spikelets solitary. Glumes awned ... 43. PEROTIS

35b.Spikelets with 2 or more fertile florets, if with 1, then with sterile reduced florets above it :

48a.Lemmas or rachilla-joints bearing long silky hairs which envelop lemmas; lemmas awnless or with a straight awn :

49a.Lemmas glabrous. Rachilla longvillous ... 45. PHRAGMITES

49b.Lemmas hairy all over the back. Rachilla glabrous ... 6. ARUNDO

48b.Lemmas and rachilla glabrous or hairy, but with hairs not enveloping lemmas, or if so, then lemmas with a geniculate awn :

50a.Inflorescence of digitate spikes; spikelets secund :

51a.Spikelets with 1 fertile floret and no imperfect florets, awnless ... 16. CYNODON

51b.Spikelets with 1 or more fertile florets and 1 or more imperfect florets above them, awned ... 11. CHLORIS

50b.Inflorescence of panicles; if racemes or spikes, then ikelets not secund :

52a.Spikelets awned, borne in dense globose clusters densely or interruptedly densely or interruptedly packed on rachis of cylindrical, continuous, lobod or interrupted spiciform panicles ... 24.ELYROPHORUS

52b.Spikelets awnless, if awned, then inflorescence not as above :

53a.Inflorescence of open or contracted panicles :

54a.Spikelets secund, (sub) sessile ... 36. LEPTOCHLOA

54b.Spikelets not secund, distinctly pedicelled ... 26. ERAGROSTIS

53b.Inflorescence of spikes or spiciform racemes :

55a.Inflorescence of terminal, secund, spiciform racemes ... 25. ERAGROSTIELLA

55b.Inflorescence of usually digitate or subdigitate spikes :

56a.Axis and branches of inflorescence ending in a spikelet ... 23. ELEUSINE

56b.Axis of spikes terminating in a sharp point ... 17. DACTYLOCTENIUM

34b.Spikelets borne on opposite sides of a rachis of solitary spikes or spike-like racemes ... 56. TRITICUM

1. ALLOTEROPSIS J. S. Presl ex C.B. Presl, emend. Hitchc.

Alloterposis cimicina (L.) Stapf in Prain, Fl. Trop. Africa 9 : 487. 1919; Haines, Bot. Bihar & Orissa pt. 5 : 1009. 1924; Bor, Grass.Burma Ceylon India & Pakistan 276. 1960. *Milium cimicinum* L., Mant. Alt. 184. 1771.

Axonopus cimicinus (L.) Beauv., Ess. Agrost. 12. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 64. 1896; Prain, Bengal Pl. 2 . 1174. 1903.

Annual. Culms erect or decumbent and geniculate at base, hirsute, 30-60 cm high. Leaf blades flat, ovate or ovate-lanceolate, with broad and cordate base, hairy on both surfaces, ciliate on margins, 2.5-7.5 cm long and 1-2.5 cm wide; sheaths hirsute; ligule of long hairs. Racemes 3-8, false, sub -verticillate, 5-15 cm long; rachis flexuous, scabrous; pedicels swollen at top. Spikelets ovoid, pale, 1 to 2-nate, laxly imbricate or distant.Lower glume ovate-lanceolate, with green nerves, 1.5-2.5 mm long; upper glume ovate-lanceolate, mucronate or aristate, velvety on margins. Lower floret : Lemma 2.5-4 mm long, ovate; palea much reduced. Upper floret : lemma ovate-oblong, smooth, aristate, with narrowly incurved margins, 3-nerved, awned; palea ovate-elliptic. Caryopsis ovate, 2.5-4 mm long.

Fl. & Fr. : July - Oct.

Ecology : Common; in waste places, abandoned cultivated fields, roadsides, etc.

Distribution : Throughout India. Old World Tropics.

Specimens examined : Churchu ,697; Koderma Forest : 1772.

2. APLUDA L.

Apluda mutica L., Sp. Pl. 82. 1753; Bor, Grass. Burma Ceylon India & Pakistan 93. 1960.

Apluda aristata L., Amoen. Acad. 4 : 303. 1756.

A. varia Hack., Monogr. Andropog. in A. & C. DC., Monogr. Phan. 6 : 196. 1889, *nom. superfl.*; Hook. f. in Hook. f., Fl. Brit. India 7 : 150. 1896; Haines, Bot. Bihar & Orissa pt. 5 : 1056. 1924.

A. varia Hack. ssp. *aristata* (L.) Hack., Monogr. Andropog. in A. & C. DC, Monogr. Phan. 6 : 196. 1889; Hook. f. in Hook.f., Fl. Brit. India 7 : 150. 1896; Prain, Bengal Pl. 2 : 1194. 1903; Haines, For. Fl. Chota Nagpur 581. 1910 & Bot. Bihar & Orissa pt. 5 : 1056. 1924.

A. varia Hack. ssp. *mutica* (L.) Hack,Monogr. Andropog. in A. & C. DC, Monogr. Phan. 6 : 196. 1889; Hook. f. in Hook. f., Fl. Brit. India 7 : 150. 1896; Prain, Bengal Pl. 2 : 1194. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1056. 1924.

Local name : Ponai.

Perennial. Culms to 2.5 m tall, solid, cylindrical, geniculately ascending from a decumbent base, or erect, smooth and glabrous; branches flexuous. Leaf-blades 10-30 cm long, sub-bifarious, linear-lanceolate,cuspidately acuminate, narrowed at base, or shortly petioled, scaberulous above and on margins, glaucous beneath; sheaths mostly glabrous, upper-shorter and dilated into spathes with subulate, imperfect blades; ligule short, rounded, membranous. Panicle made up of many solitary, simple racemes or false spikes, each enclosed in membranous spathe. Spikelets in threes, one sessile,two pedicelled. Sessile spikelets hermaphrodite; lower glume convolute, 4-4.5 mm long; upper boat-shaped, 2-mucronate, as long as lower, with dorsally gibbous, 5-7-nerved keel. Lower floret male; lemma ovate-lanceolate, hyaline,

3.5-4 mm long; palea oblong-lanceolate; stamens 3. Upper floret hermaphrodite; lemma ovate, 3-3.5 mm long, cleft half-way down, awned in cleft or awnless; palea ovate. Terminal pedicelled spikelet male; lower glume lanceolate, 4.5-4.8 mm long; upper similar to lower. Lower floret male; lemma ovate-lanceolate, scaberulous above, ciliate on margins, 3.5-4 mm. long; palea lanceolate, with inflexed margins. Upper floret male; lemma ovate, *ca* 0.4 cm long; palea oblong, 2 mm long; stamens 3. Caryopsis oblong, 1.5-1.8 mm long.

Fl. & Fr. : Sept.- Nov.

Ecology : Common; in damp places, under shade, slopes of rocky hills, hedges and bushes.

Distribution : Throughout India. Myanmar, Sri Lanka, S.E.Asia, Malesia, Australia.

Specimens examined : National Park, 81; Ichak, 347; Ghanghree, 1292.

Uses : Plant is used as fodder for buffaloes. Culms are used for making mats.

Note : The species is much variable in respect of the presence or absence of awn. Linnaeus in 1753 described the unawned form under the name *A. mutica* L. Later in 1756, he felt that the awned form was distinct and he named it *A. aristata* L. Hackel (1889) taking these two forms created two subspecies under *A. varia* Hack. *viz.*, ssp. *aristata* and ssp. *mutica,* both of which were again subdivided into several varieties and subvarieties. Hooker f. (*l.c.*), Prain (*l.c.*), Haines (*l.c.*), etc. followed Hackel's treatment. Bor (*l.c.*) merged all the subspecies, varieties and subvarieties under one name *A. mutica* L. He has given opinion that as the characters used by Hackel are distributed freely in intermediate forms without showing any correlation, therefore, there is no justification of maintaining all these subspecies, varieties and subvarieties and as such these should be merged in one taxon.

3. ARISTIDA L.

Aristida setacea Retz., Obs. Bot. 4 : 22. 1786; Hook. f. in Hook. f., Fl. Brit. India 7 : 225. 1896; Prain, Bengal Pl. 2 : 1211. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 977. 1924; Bor, Grass. Burma Ceylon India & Pakistan 412. 1960.

Perennial. Culms erect, simple or subfastigiately branched, 30-120 cm long. Leaf-blades filiform, convolute, scaberulous, with finely projected tip, 12-30 cm long and 1.5-2 mm broad; sheaths open, lax, glabrous; ligule a ridge of stiff hairs.Panicle 18-36 cm long, inclined, contracted; branches scaberulous, usually fascicled. Spikelets linear, smooth, secund, usually purplish, 0.7-1.2 cm long. Lower glume 7-8 mm long, shortly awned, 1-nerved, serrulate on back; upper minutely 2-toothed, 1-nerved, inarticulate at base, 0.8-1.5 mm long. Lemma laterally compressed; awn scaberulous, inarticulate at base, 3-partite, middle branch to 2.5 cm long, lateral ones slightly smaller; rachilla above upper glume with a tuft of white hairs. Palea 2-nerved, keeled, 1-1.2 mm long.

Fl. & Fr. : Sept. - Feb.

Ecology : Very common; on sandy gravelly soil, heavily grazed open lands, thin forests, etc.

Distribution : West Bengal, Bihar, Orissa, Uttar Pradesh, Madhya Pradesh, western India, Deccan Peninsula. Myanmar, Sri Lanka to Mascarene Islands.

Specimens examined : Chatra, 1086; National Park, 1200.

Uses : Young plant is grazed by cattle. Culms are used for making brooms, brushes, screens, and frames for paper manufacture.

4. ARTHRAXON Beauv.

Arthraxon lancifolius (Trin.) Hochst. in Flora 39 : 188. 1856; Raizada *et al.* in Ind. For. Rec. (n.s.) Bot. 4 : 224. 1957; Bor, Grass. Burma Ceylon India & Pakistan 100. 1960. *Andropogon lancifolius* Trin. in Mem. Acad. Sci. Petersb. ser. 6, 2 : 271. 1832.

Andropogon microphyllus Trin. in Mem. Acad. Sci. Petersb. ser. 6, 2 : 275. 1832.

Arthraxon microphyllus (Trin.) Hochst. in Flora 39 : 188. 1856; Hook. f. in Hook. f., Fl. Brit. India 7 : 147. 1896; Prain, Bengal Pl. 2 : 1199. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1026. 1924.

Annual. Culms slender, decumbent at base, then ascending, multi-noded, puberulous below inflorescence, 10-40 cm tall. Leaf-blades lanceolate, cordate-amplexicaul at base, subacuminate at apex, 1.5-3 cm long and 6-9 mm wide; the older flat, softly hairy, ciliate on margins; sheaths striate, terete, shorter than internodes; ligules 1-2 mm long, rounded, membranous, ciliate. Racemes 2-10, unequal, 0.7-1.4 cm long, flat, densely hairy; joints 1-1.7 mm long, filiform, ciliate; cilia usually longer than joints; articulation straight. Sessile spikelets linear-lanceolate, compressed laterally, 2.5-3.5 mm long, lower glume 3-3.2 mm long, 2-toothed or 2-aristate, 5 to 7-nerved, scabrid at top. Upper glume lanceolate, silky hairy at end, 1-nerved, 0.5-0.8 mm long. Lower floret : lemma lanceolate, glabrous, 1-1.7 mm long. Upper floret : lemma linear-oblong, 2-nerved, grooved between nerves, 2-toothed; awn 0.5-1 cm long. Stamens 2. Stigmas small, equalling styles. Caryopsis linear, *ca* 0.6 mm long. Pedicellate spikelets ovate-lanceolate, empty, 1.5-2 mm long.

Fl. & Fr. : Aug. - Dec.

Ecology : Common; in old walls, damp rocks of streams, in ravines and waste places.

Distribution : Almost throughout India, particularly in the hilly regions. Bangladesh, Myanmar, Sri Lanka, Malesia, China, tropical Africa.

Specimens examined : Tondwa, 1436; Ghanghree, 2154.

Uses : Plant is used as fodder for cattle; also used as hay.

5. ARUNDINELLA Raddi

Arundinella nepalensis Trin., Gram. Panic. 62. 1826; Raizada *et al.* in Ind. For. Rec. (n.s.) Bot. 4 : 639. 1957; Bor, Grass. Burma Ceylon India & Pakistan 423. 1960.

A. brasiliensis auct. non Raddi : Hook. f. in Hook. f., Fl. Brit. India 7 : 73. 1896, *p.p;* Prain, Bengal Pl. 2 : 1215. 1903; Haines, For. Fl. Chota Nagpur 563. 1910 & Bot., Bihar & Orissa pt. 5 : 982. 1924.

Perennial, much variable. Rootstock woody, creeping. Culms stout and reed-like or slender, glabrous, or scabridly hairy, striate, with usually glabrous nodes, 30-200 cm tall. Leaves flat, sometimes involute, usually villous, 15-30 cm long and 0.4-1.8 cm broad; sheaths loose, villous to almost glabrous, with a tuft of hairs of collar; ligule a ring of soft hairs. Panicle 10-45 cm long; branches few to many, loosely spreading or contracted. Spikelets distant or crowded, ovate-elliptic ,3-4 mm long; rachis and pedicels ± scabrid.Lower glume ovate-lanceolate, 2.2-2.5 mm long, 3 to 4-nerved, scabrid on nerves; upper ovate-lanceolate, 5-nerved, strongly compressed in upper half, glabrous. Lower floret male; lemma lanceolate, 5-nerved, ciliate on margins at near apex; palea *ca* 2.5 mm long, with involute, fringed margins. Upper floret : lemma ovate, *ca* 2 mm long, 2-lobed at apex; callus hairy; awn 2-3 mm long; lemma scabrid on dorsal surface; palea narrow-lanceolate, as long as lemma, ciliate.

Fl. & Fr. : Sept.-Nov.

Ecology : Common; in forests.

Distribution : Throughout the hilly parts of India. South-East Asia, China and Japan.

Specimens examined : Telaiya Dam, 634; Ramgarh, 1147; National Park, 2015.

Uses : Plant is eaten by cattle. Culms are used for thatching. A lotion prepared from the plant is used as a vulnerary.

6. ARUNDO L.

Arundo donax L., Sp. Pl. 81. 1753; Hook. f. in Hook.f., Fl. Brit. India 7 : 302. 1896; Prain, Bengal Pl. 2 : 1218. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 953. 1924; Bor, Grass. Burma Cylon India & Pakistan 413. 1960.

Local name : Bara nal.

Culms 2-6 m tall, many noded, simple or branched, glabrous and smooth. Leaf-blades linear-lanceolate, tapering to a fine point, ± drooping, 30-60 cm long and 2-7 cm wide. Panicle erect, 30-60 cm long; branches scaberulous, erect or drooping. Spikelets light-brown, 0.8-1 cm long. Glumes broadly lanceolate, acuminate, keeled on back, *ca* 1 cm long. Lemma ovate to ovate-lanceolate, acuminate, 0.9-1 cm long; hairs 4-5 mm long. Palea 2-nerved. Lodicules obovate. Anthers 2.5-3 mm long. Ovary glabrous. Caryopsis broadly obovoid-oblong, 2.3-2.5 mm long.

Fl. & Fr. : Sept.- Nov.

Ecology : Common, along ditches and streams, river-banks, irrigation canals, hill-slopes, etc.; also cultivated as an ornamental in gardens.

Distribution : Throughout India. Tropical Asia and Mediterranean region, introduced into the New World.

Specimens examined : Pratappur, 828; Ramgarh, 1223; Patratu, 1739.

Uses : Culms are used for making mats, baskets, trays, fishing rods, and musical pipes.Culms and stems are used for making paper-pulp.

7. BAMBUSA Schreber., *nom. cons.*

Bambusa arundinacea (Retz.) Willd., Sp. Pl. 2 : 245. 1799; Hook. f. in Hook. f., Fl. Brit. India 7: 395. 1896; Prain, Bengal Pl. 2 : 1233. 1903; Haines, For. Fl. Chota Nagpur 585. 1910 & Bot. Bihar & Orissa pt. 5 : 950. 1924. *Bambos arundinacea* Retz., Obs. Bot. 5 : 24. 1788.

Arundo bambos L., Sp. Pl. 81. 1753, *nom. conf.*

Bambusa bambos (L.) Voss in P.L.Vilm. Blumengartnerei 1 : 1189. 1896; McClure in Blumea (suppl.) 3 : 95. 1946.

Local name : Kanta bans, Ketua.

Densely tufted bamboo. Culms bright green, shining, branched, 15-35 m tall and 10-15 cm in diam, with to 50 cm long internodes; basal branches horizontal, armed at nodes with 2-3 recurved spines; nodes prominent, lower rooting. Culm-sheaths orange-yellow, with dense golden hairs, usually stripped with green or red; limb triangular, to 10 cm long; margins decurent on sheath, wavy, plaited, ciliate, with very narrow auricle. Leaves linear-lanceolate, short-petioled, subcordate at base, acuminate at apex, smooth or scaberulous on margins, glabrous above, hairy beneath, 7-20 cm long and 0.2-1 cm broad; sheaths at first hirsute, then glabrescent. Panicle-branches spicate with a few loose clusters of spikelets. Spikelets about 5 in each cluster, lanceolate, sessile, 1.75-2.5 cm long, 4 to 6-flowered. Glumes 2, ovate-lanceolate,

mucronate, or absent. Lemmas sometimes shortly fimbriate at top, glabrous. Paleas narrower than lemmas but longer; keels ciliate. Anthers sometimes with an apiculate bristle. Stigmas 2-3, plumose. Caryopsis oblong, 5-8 mm long.

Fl. & Fr. : Once in life.

Ecology : Common; on low hills.

Distribution : Throughout India except the Himalayas; Myanmar, Sri Lanka and West Indies.

Specimens examined : National Park, 2046; Pratappur, 2102.

Uses : Culms are used in construction purposes. These also yield a good quality paper. Young shoots are pickled or made into curries. Leaves and tender part of twigs are used as fodder.

8. BOTHRIOCHLOA O. Kuntze

Bothriochloa bladhii (Retz.) S.T.Blake in Proc. Roy. Soc. Queensland 80 : 62. 1969; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 284. 1982. *Andropogon bladhii* Retz., Obs. Bot. 2 : 27. 1781.

Andropogon intermedius R. Br., Prodr. 202. 1810; Hook. f. in Hook. f., Fl. Brit. India 7 : 175. 1896; Prain, Bengal Pl. 2 : 1204. 1903.

Amphilophis glabra (Roxb.) Stapf in Prain, Fl. Trop. Africa 9 : 172. 1917; Haines, Bot. Bihar & Orissa pt. 5 : 1028. 1924.

Bothriochloa intermedia (R. Br.) A. Camus in Ann. Soc. Linn. Lyon 1930, n.s. 76 : 164. 1931; Bor, Grass. Burma Ceylon India & Pakistan 108. 1960.

B. glabra (Roxb.) A. Camus in Ann. Soc. Linn. Lyon 1930, n.s. 76 : 164. 1931; Bor, Grass. Burma Ceylon India & Pakistan 107. 1960.

B. caucasica (Trin.) Hubb. in Kew Bull. 1939 : 101. 1939; Bor, Grass. Burma Ceylon India & Pakistan 106. 1960.

Local name : Sandhor.

Culms tufted, erect or ascending, terete, rather stout below, 5-7-noded, bearded at upper nodes, over 1 m in height. Leaf-blades linear, pale-green, hairy on margins, to 30 cm long and 5 mm wide; sheaths terete, glabrous; ligules very short. Panicle oblong, 10-23 cm long and 2.5-4 cm broad, erect; primary axis shortly bearded at branch-axils; branches usually whorled or opposite, straight. Racemes 1.2-3.7 cm long, straight or flexuous, white-villous; joints and pedicels ciliate. Sessile spikelet pale green, 3-3.5 mm long including small bearded callus. Lower glumes hairy below middle, with keels ciliolate upwards, 4 to 5-nerved; upper 3-nerved, lanceolate, with ciliate margins and scabrid keel. Lemma of lower floret oblong, 2.2 × 2.5 mm long; awn of upper floret 0.6-1.2 cm long. Anthers yellow, 1.2-1.3 mm long. Caryopsis 1.3-1.4 mm long. Pedicellate spikelet neuter, reduced to glumes, linear, 2.5-2.7 mm long; lower glume ciliolate, 5 to 9-nerved, usually rolled; upper minute, nerveless.

Fl. & Fr. : Oct. - Jan.

Ecology : Very common; in forest glades, along roadsides, railway tracks, etc.

Distribution : Throughout India. Sri Lanka, westward to the Caucasus, China, Malesia, Australia, tropical Africa, southern Russia and America.

Specimens examined : Markachho, 1461; Katkamasandi, 1714.

Uses : Young plant is relished well by cattle; culms yields a good paper-pulp.

9. BRACHIARIA (Trin.) Griseb.

Brachiaria ramosa (L.) Stapf in Prain, Fl. Trop. Africa 9 : 542. 1919; Haines, Bot. Bihar & Orissa pt. 5 : 1005. 1924; Bor, Grass. Burma Ceylon India & Pakistan 284. 1860. *Panicum ramosum* L., Mant. Pl. 1 : 29. 1767; Hook. f. in Hook. f., Fl. Brit. India 7 : 36. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1177. 1903.

Annual. Culms fascicled, suberect or ascending, rooting at base, terete, branched below, to 60 cm long. Leaf-blades linear-lanceolate, rounded at base, flaccid, sharply scabrid on margins, 5-12.5 cm long and 0.6-1.5 cm broad; sheaths thin, loose below, striate, ciliate near mouth; ligule a line of short white hairs. Panicles 5-15 cm long; common axis angular, channelled, scabrid on edges; racemes 5-many, 3-5 cm long, upper gradually shorter; rachis triquetrous, scabrid. Spikelets ovoid, somewhat turgid, usually paired or fascicled, 2.5-3 mm long. Lower glume broadly ovate, clasping at base, 1.2-1.5 mm long; upper distinctly 7-nerved. Lower floret neuter; lemma similar to upper glume, 5-nerved; palea oblong, ± reduced. Upper floret slightly shorter than lower, ovate; lemma and palea transversely rugose. Caryopsis broadly elliptic, depressed on both sides, to 2 mm long.

Fl. & Fr : June- Dec.

Ecology : Very common; in cultivated fields, gardens, roadsides, etc.

Distribution : Throughout India.Bangladesh, Pakistan, Afganistan, tropical Asia, Senegal to Yemen and southwards to Malawi and South Africa.

Specimens examined : Chowparan, 1375; Patratu,1733.

Use : Plant is grazed by cattle.

10. CENCHRUS L.

***Cenchrus ciliaris** L., Mant. Alt. 302. 1771; C. Fischer, Fl. Madras 3 : 1794 (1242). 1934; Bor, Grass. Burma Ceylon India & Pakistan 287. 1960.

Pennisetum cenchroides Rich in Pers. Syn. 1 : 72. 1805; *nom. superfl.*; Hook. f. in Hook. f., Fl. Brit. India 7 : 88. 1896.

Culms tufted, much branched from base, 15-45 cm tall. Leaf-blade linear, glabrous or villous, 15-25 cm long and 3-4 mm broad; sheaths usually woolly. Spikes 3.5-10 cm long, pale or purplish; rachis flexuous, scaberulous. Involucels subsessile; outer bristles slender, squarrosely spreading; inner twice as long as spikelets, thickened and ciliate below, filiform-flexuous and scbrid above. Spikelets 1-3 in each involucel, 4-5 mm long. Glumes ovate, 1-nerved; lower to 2 mm long; upper to 3 mm long. Lower lemma ovate-lanceolate, cuspidately acuminate, 3-5-nerved, 3.5-4 mm long; upper lemma as lower, 5-7-nerved. Palea lanceolate, to 3.5mm long. Styles nearly free at base. Caryopsis truncate, to 2 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Common; in open grassy places, lawns, river beds, forests, etc.

Distribution : India : Plains and low hills, throughout western India, from Kashmir to Gangetic Plains and southern India. Tropical and South Africa and Mediterranean region.

Specimens examined : Ghanghree, 1040; Gola, 1534.

Uses : Plant yields a valuable fodder, especially for hay. It is also a useful lawn grass.

11. CHLORIS SW.

Chloris barbata Sw., Fl. Ind. Occ. 1 : 200. 1797; Hook. f., in Hook. f., Fl. Brit. India 7 : 292. 1896; Prain, Bengal Pl. 2 : 1228. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 969. 1924; Bor, Grass. Burma Ceylon India & Pakistan 465. 1960.

Andropogon barbatus L, Mant. Pl. 302. 1771, non L. 1759.

Chloris inflata Link, Enum. Pl. Hort. 1 : 105. 1821; Fosb. in Taxon 25 : 178. 1976.

Culms 30-100 cm tall, simple or branched, rooting at lower nodes; nodes usually bearing large tufts of leaves. Leaf-blades flat, linear, acute, with few long hairs near base, 5-50 cm long and to 5 mm wide; sheaths compressed, loose, glabrous with tuft of hairs at mouth; ligule a narrow membranous ridge. Spikes 5-15, digitately arranged, 2-10 cm long. Spikelets purplish, to 2.5 mm long. Lower glume strongly keeled, scabrid on keel, *ca* 1.7 mm long, lanceolate, 1-nerved; upper glume keeled, scabrid on keel, 1-nerved, *ca* 2.2 mm long, short-awned. Lemma ovate, 3-nerved, densely bearded above middle, with scabrid awn. Palea oblanceolate, *ca* 2 mm long. Stamens 3. Lodicules 2. Caryopsis 1.5 -1.7 mm long.

Fl. & Fr. : Sept. - Nov.

Ecology : Common; in shady localities, gardens, roadsides, etc.

Distribution : Throughout India. Widespread throughout the Tropics.

Specimens examined : Raja Rappa, 365; National Park, 471.

Use : Plant is used as good fodder grass for cattle and horses.

12. CHRYSOPOGON Trin.

Key to the Species

1a. Pedicels half as long as sessile spikelet or longer. Callus of sessile spikelet acicular, as long as spikelet ... 1. *C. aciculatus*

1b. Pedicels less than half as long as sessile spikelet. Callus of sessile spikelet adnate, smaller than spikelet ... 2. *C. fulvus*

1. **Chrysopogon aciculatus** (Retz.) Trin., Fund. Agrost. 188. 1820; Haines, For. Fl. Chota Nagpur 574. 1910 & Bot. Bihar & Orissa pt. 5 : 1035. 1924; Bor, Grass. Burma Ceylon India & Pakistan 115. 1960. *Andropogon aciculatus* Retz., Obs. Bot. 5 : 22. 1789; Roxb., Fl. Ind. 1 : 262. 1820; Hook. f. in Hook. f., Fl. Brit. India 7 : 188. 1896; Prain, Bengal Pl. 2 : 1205. 1903.

Local name : Chora-kanta, Chui-kanta.

Rhizome creeping, woody. Culms 20-60 long; base creeping, branching and rooting at lower nodes, glabrous. Leaf-blades close below, linear, rounded at base, obtuse or acute, flat, with usually undulate and spinulose margin, 2-15 cm long and 3-5 mm wide; sheaths rounded, not auricled, lower much longer, upper shorter than internodes; ligules narrow. Panicles erect, oblong, spreading, 3-10 cm long; branches 4-5-nate, fragile, convex on back, hairy, articulating very obliquely, with hermaphrodite spikelets on one joint, the same node carrying hermaphrodite sessile and 2 male or neuter pedicellate spikelets. Pedicels half as long as sessile spikelet or longer. Sessile spikelets hermaphrodite, linear, compressed, aristate, 2-4 mm long; callus needle-shaped, incurved, equalling the spikelet. Lower glume linear-subulate, involute at base, broadly implicate towards top, obscurely 2-3-nerved, 2-keeled. Upper glume lanceolate-acuminate, aristate, 2-4 mm long, keeled. Lower floret : lemma 1.5-3 mm long, linear-oblong, 2-nerved, retrorsely ciliate. Upper floret : hermaphrodite; lemma linear-acuminate, entire, awned, 4-8 mm long; palea linear, short. Pedicellate spikelets male, narrower

than sessile, 5-6 mm long; lower glume dorsally convex, keeled, 3-nerved, 5-6 mm long, awned; upper glume 4.5-5.5 mm long, 3-nerved, retrorsely ciliate. Lower floret : lemma shorter, oblong-acuminate, retrorsely ciliate; palea small. upper floret; lemma short;palea linear, glabrous. Pedicel compressed, glabrous.

Fl. & Fr. : Aug. - Nov.

Ecology : Very common; in well grazed pasture lands, open grounds, gardens, roadsides, etc.

Distribution : Almost throughout India. Sri Lanka, tropical Asia, Australia and Polynesia.

Specimens examined : Hazaribagh, 8; Patratu, 1288; Jaynagar, 1806.

Use : Culms are used in brush industry.

2. **Chrysopogon fulvus** (Spreng.) Chiov., Fl. Somala 327. 1929; Bor, Grass. Burma Ceylon India & Pakistan 116. 1960. *Pollinia fulva* Spreng., Pugill. 2 : 10. 1815.

Chrysopogon montanus Trin. ex Spreng., Neue Entdeck. 2 : 93. 1821; Haines, Bot. Bihar. & Orissa pt. 5 : 1037. 1924.

Andropogon monticola Roem. & Schult. in Linn., Syst. Veg. 2 : 665. 1827; Hook. f. in Hook. f., Fl. Brit. India 7 : 192. 1896.

A. monticola Roem. & Schult. var. *trinii* (Steud.) Hook. f. in Hook. f., Fl. Brit. India 7 : 193. 1896; Prain, Bengal Pl. 2 : 1205. 1903.

Chrysopogon monticola (Roem. & Schult.) Haines in Ind. For. 40 : 495. 1914.

Local name : Goria, Dholu.

Stems erect or ascending, glabrous, usually slender, 30-120 cm tall. Leaf-blades very narrow, flat, mostly glabrous, scaberulous on margin;

lower sheaths compressed; ligule a belt of short hairs. Panicle 5-13 cm long; rachis usually puberulous; branches in whorls of 3-12, capillary, flexuous, very unequal, bearing solitary spikes. Pedicels less than half as long as sessile spikelets. Sessile spikelets pale, 4-5 mm long; tip of peduncle brown-bearded, clavate; callus adnate, to 0.7 mm long, with oval scar and dense beard. Lower glume laterally compressed, linear, usually scabrid or ciliate above middle; upper ± ciliate with rigid bristles, conduplicate, with rounded back and membranous broad side, embracing the lemma and palea, with 2 short lobes and a slender awn; lemma shorter, conduplicate, ciliate; palea with a slender 1.2-3.5 cm long awn. Pedicellate spikelet 3.5-5 mm long; lower glume 7-nerved, scabrous, awned or not, upper 3-nerved, with incurved villous margins; palea linear, sparsely ciliate; pedicel shortly adnate to callus, bearded on edges.

Fl. & Fr. : Sept.-Dec.

Ecology : Not common; in open grounds, pasture lands, etc.

Distribution : Western Himalaya from Kashmir through Punjab to Bihar, Madhya Pradesh and South India. Tropics of Asia and East Africa.

Specimens examined : Ghanghree, 1057; Tondwa, 1886.

Use : Plant is used as a cattle feed.

13. Coelachne R. Br.

Coelachne simpliciuscula (Wight & Arn. ex Steud.) Munro ex Benth. in J. Linn. Soc. Bot. 19 : 93. 1881;Bor, Grass. Burma Ceylon India & Pakistan 576. 1960; Prakash & Jain in Jain *et al.*, Fl. India Fasc. 14 : 6. 1984. *Panicum simpliciusculum* Wight & Arn. ex Steud., Syn. Pl. Glum. 1 : 96. 1854.

Coelachne pulchella R. Br. var. *simpliciuscula* (Wight & Arn.ex Steud.) Hook. f. in Hook. f., Fl. Brit. India 7 : 271. 1896.

C. pulchella R. Br. var. *spicata* Hook. f., *l.c.* 271; Prain, Bengal Pl. 2: 1214. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 954. 1924.

C. pulchella R. Br. var. *brachiata* (Munro ex Benth.) Hook. f. in Hook. f., Fl. Brit. India 7 : 271. 1896.

C. pulchella auct. non R. Br. : Hook. f. in Hook. f., Fl. Brit. India 7 : 270. 1896, *p.p.*

Annual. Culms 15-45 cm tall, weak, ascending from a somewhat decumbent base, with bearded nodes. leaves almost up to the panicle; blades lanceolate, flat, minutely scaberulous above, with many equal nerves, 1.2-2.5 cm long; sheaths usually loose, striate; ligule a rim of hairs. Panicle 6-10 cm long. Spikelets subsessile, globose to ovoid, to 2 mm across. Lower glume subrotund, *ca* 1 mm long; upper glume subrotund, *ca* 1.5 mm long, obscurely nerved. Lower floret : lemma rounded on back, *ca* 2 mm long; palea 2mm glabrous. Upper floret imperfect, neuter or female, stipitate; lemma narrow-lanceolate or ovate, 0.5-1.2 mm long; palea similar to that of lower floret.

Fl. & Fr. : Nov. - Jan.

Ecology : Not common; in damp and marshy places, rice-fields, etc.

Distribution : India : Sikkim, Assam, Nagaland, Meghalaya, West Bengal, Bihar, Orissa, Andhra Pradesh, Madhya Pradesh, Maharastra, Karnataka, Tamil Nadu and Kerala.South- East Asia, China, Madagascar.

Specimens examined : Churchu, 691; Barhi, 1387.

14. Coix L.

Coix lachryma-jobi L., Sp. Pl. 972. 1753; Hook. f. in Hook. f., Fl. Brit. India 7 : 100. 1896; Prain, Bengal Pl. 2 : 1210.1903; Haines, For. Fl. Chota Nagpur 564. 1910 & Bot. Bihar & Orissa pt. 6 : 1063. 1924; Bor, Grass. Burma Ceylon India & Pakistan 264. 1960.

Local name : Sankru.

Annual. Culms rooting at lower nodes, robust, spongy, glabrous, to 2 m tall. Leaf-blades 10-50 cm long and 2-5 cm broad, firm, cordate at base, acuminate at apex, with cartilaginous-scabrid margins; median nerve robust; sheaths smooth, very broad; ligules membranous, frilled, to 4 mm long. Spikes suberect, false. Peduncles 4-8 cm long. Male spikelets 2-3-nate, loosely imbricate, 0.8-1.2 cm long and to 2 mm broad; lower glume papyraceous, ovate, shortly winged along inturned margins, ciliolate; upper glume oblong-lanceolate, acuminate, 9-nerved. Lower floret male, triandrous; lemma oblong-lanceolate, 5-nerved; palea 2-keeled. Upper floret male or empty; lemma oblong-lanceolate, acute, 5-nerved. Female spikelet ovoid, surrounded by bony involucre, yellowish-white or bluish-grey, 0.6-1 cm long; lower glume ovate-oblong, acute; upper thinner, ovate, acuminate. Lower floret female or empty. Upper floret female; lemma ovate-oblong, as long as spikelet; palea a little shorter than lemma. Caryopsis ovoid or globose, 0.7-1 cm long, polished.

Fl. & Fr. : Sept. - Feb.

Ecology : Common; in roadsides, marshy places, along water-courses, nalas, river banks, etc.

Distribution : Throughout the hotter and damper parts of India. Native of tropical Asia, now widely distributed throughout the Tropics.

Speciemens examined : Ramgarh, 655; Chatra, 1101; Hazaribagh, 2263.

Uses : Leves are used as fodder for cattle. Grains are widely used in bed-curtains, rosaries, etc.; also used by local people for affections of urinary tract.

15. CYMBOPOGON Spreng.

Key to the Species

1a. Lower glume of sessile spikelet with a median longitudinal cleft in lower half appearing as a rib on inner surface ... 2. *C. martinii*

1b. Lower glume of sessile spikelet flat, without any cleft as above ... 1. *C. flexuosus* *var. microstachys*

1. **Cymbopogon flexuosus** (Nees ex Steud.) Wats. var. **microstachys** (Hook.f.) Bor in J. Bomb. Nat. Hist. Soc. 52 : 162. 1954 & Grass. Burma Ceylon India & Pakistan 127. 1960. *Andropogon nardus* L. var. *microstachys* Hook. f. in Hook. f., Fl. Brit. India 7 : 207. 1896.

Cymbopogon nardus L. var. *microstachys* (Hook. f.) Haines, Bot. Bihar & Orissa pt. 5 : 1046. 1924.

Culms erect, very slender, pale with dark nodes. Leaf-blades narrow, rounded or cordate at base, purple-tinged, 0.8-1 cm broad, glaucous beneath, with filiform tips;sheaths pale yellow, terete, striate; ligule 3-4 mm long. Panicles lax, slender; branches filiform, erect;spikes 1-1.2 cm long; spatheole 1-2 cm long; joints 2-3; pedicels shortly ciliate. Sessile spikelets 4.5-5 mm long; lower glume oblong-lanceolate, 2-keeled, with 2 distinct green nerves between keels, dorsally flat; keels narrowly winged and margined above middle, scabrous; upper glume with scaberulous keel and softly ciliate inflexed margins; lower lemma empty, ciliate above, 2-keeled, epaleate; upper lemma hermaphrodite, divided halfway down, with 7-9 mm long awn in sinus, epaleate. Pedicellate spikelets 3.8-4 mm long, barren or male, awnless. Glumes glabrous except ciliate keels at top.

Fl. & Fr. : Sept. - Nov.

Ecology : Not common; in forest edges and forest clearings.

Distribution : Endemic to Uttar Pradesh and Bihar.

Specimen examined : National Park, 477.

Uses : Plant is the source of Lemon-grass oil which is used in perfumery, soaps and cosmetics.

2. **Cymbopogon martinii** (Roxb.) Wats. in Atkins., Gaz. N.W.Prov. India 392. 1882; Haines, For. Fl. Chota Nagpur 580. 1910 & Bot. Bihar & Orissa pt. 5 : 1046. 1924, *p.p.* excl. syn. *Andropogon schoenanthus* L.; Bor, Grass. Burma Ceylon India & Pakistan 129. 1960. *Andropogon martinii* Roxb., Fl. Ind. 1 : 280. 1820.

Andropogon schoenanthus L. var. *martinii* (Roxb.) Hook. f. in Hook. f., Fl. Brit. India 7 : 204. 1896.

A. schoenanthus auct. non L. : Prain, Bengal Pl. 2 : 1203. 1903, p.p.

Cymbopogon motia Gupta in Proc. Ind. Acad. Sci. Sec. B, 71 : 92. 1970; Nayar & Ramamoor. in Bull. Bot. Surv. India 15 : 213. 1976.

Local name : Gandh bel.

Culms erect, smooth, simple or sparingly branched, knotty at base when old, 1-2 m tall. Leaf-blades lanceolate or linear-lanceolate, cordate or rounded and semi-amplexicaul at base, ± glaucous beneath, glabrous, scabrid on margins, 25-40 cm long and 1-3 cm broad; sheaths glabrous, faintly striate; ligule oblong, scarious, 2-3 mm long. Panicle decompound, linear-oblong. Geminate spikes 1.2-2 cm long, oblique or divaricate. Peduncle half the length of 2-2.5 cm long spatheole. Joints and pedicels linear-subclaviform, convex on back, long-villose on margins. Sessile spikelets ovate-oblong, 4-5 mm long. Lower glume lanceolate or oblong, having winged keels, and a vertical median longitudinal cleft in lower half appearing as a rib on inner surface. Upper glume cymbiform

with dorsal keel winged above and minutely ciliate below. Lower floret with ciliate, oblong, 3-3.5 mm long lemma. Upper floret : lemma small, divided into filiform fimbriae, awned.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; along slopes of hills,in forests, etc.

Distribution : Hotter parts of India. Sri Lanka, Pakistan, westward to tropical Africa.

Specimens examined : Ghanghree, 1289; Ramgarh, 1898.

Uses : Plant is the source of Palmarosa Oil which is used in soaps and cosmetics, also used for lumbago and stiff- joints.

16. CYNODON Rich. ex Pers., *nom. cons.*

Key to the Species

1a. Plants rhizomatous. Ligule a ring of white hairs. Hairs on lemma simple, not clavellate. Anthers 1mm or longer ... 3. *C. dactylon*

1b. Plants not rhizometous. Ligule membranous, its margins laciniate or not. Hairs on lemma always clavellate. Anthers to 0.5 mm long :

2a. Leaf-sheaths short, strongly compressed, keeled. Ligule with laciniate margins. Spikes 3-5, 2-5 cm long. Upper glume slightly longer than or equal to lemma. Clavellate hairs on lemma not pointed above globular tips; palea also hairy ... 2. *C. barberi*

2b. Leaf-sheaths slightly compressed, not keeled. Ligule not laciniate on margins. Spikes 4-8, 5-10 cm long. Upper glume shorter than lemma. Clavellate hairs on lemma pointed above flattened tips; palea devoid of hairs ... 1. *C. arcuatus*

1. **Cynodon arcuatus** J.S. Presl ex C.B.Presl, Rel.Haenk. 1 : 290. 1830; Bor, Grass. Burma Ceylon India & Pakistan 469. 1960.

C. intermedius Rang. & Tad. in J. Bombay Nat. Hist. Soc. 26 : 304. 1918.

C. dactylon (L.) Pers. var. *suberectus* Haines, Bot. Bihar & Orissa pt. 5 : 967. 1924.

C. dactylon (L.) Pers. var. *intermedius* (Rang. & Tad.) Fischer in Fl. Madras 3 : 1835 (1270). 1934.

Local name : Siuri.

Culms glabrous, usually stolonifereous, not rhizomatous, with geniculately ascending flowering branches, 30-40 cm high; nodes slightly swollen. Leaf-blade linear, flat, acuminate, scaberulous on margins, 2-10 cm long and 4-6 mm broad; sheaths slightly compressed, scarcely bearded on mouth; ligule membranous. Inflorescence of 4-8, slender, 5-10 cm long, slightly drooping and flexuous digitate spikes; rachis tumid and pubescent at base. Spikelets awnless, sessile, 1.5-2 mm long; rachilla produced to about half the length of spikelet as slender bristle behind palea. Glumes unequal, shorter than lemma; lower glume lanceolate, *ca* 1 mm long, with scabrid keel;upper longer than lower. Lemma obliquely ovate-oblong, longer than glumes; margins and keels with close-set hairs being faintly clavellate and swollen below pointed tips. Palea linear-oblong, 2-nerved, with scaberulous keels. Anthers *ca* 0.5 mm long. Stigmas purple. Carypsis reddish-brown, faintly grooved on dorsal face.

Fl. & Fr. : July - Oct.

Ecology : Rare; river beds, roadsides, etc.

Distribution : India : Uttar Pradesh, Bihar, Orissa, West Bengal, Assam, Madhya Pradesh, Maharastra, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka and Nicobar Islands.Nepal, Myanmar and parts of S.E.Asia.

Specimen examined : Ramgarh, 1142.

Use : Cattle is very fond of this grass; it is readily eaten by them.

2. ***Cynodon barberi** Rangachari Tadulingram in J. Bomb.Nat. Hist. Soc. 24 : 846. 1916; Bor, Grass. Burma Ceylon India & Pakistan 469. 1960; Jain in Bull. Bot. Surv. India 9 : 144. 1967.

Local name : Khati Dobb.

Culms radiately creeping, close to ground, not rhizomatous, 30-60 cm long, rooting at nodes; flowering branches erect or ascending, 2.5-15 cm long; internodes slightly flattened, pale green or purplish. Leaf-blades narrowly oblong to lanceolate, flat, scaberulous above and more so on margins, 1-3.5 cm long and 3-4 mm broad; leaf sheaths short, strongly compressed, keeled, hairy at mouth; ligule a narrow membrane with laciniate margins. Inflorescence of 3-5, slender, digitate, 2-5 cm long, erect or spreading spikes; rachis slightly angular. Spikelets awnless, 1.5-2 mm long, sessile or sub sessile; rachilla produced into a bristle behind palea, about 1/2-2/3 the size of spikelet. Glumes unequal, lanceolate; keel shortly scabrid; lower glume 1.2-1.5 mm long, acute; upper slightly longer than or equal to lemma, acuminate. Lemma obliquely oblong-ovate, truncate, or 2-toothed with a minute mucro in between; keel and margins densely pilose with distinctly and characteristically clavellate hairs not pointed above globular tips. Palea linear-oblong, equal to slightly smaller than lemma, densely hairy with clavellate hairs along keel, with glabrous margins. Anthers 0.5 mm long. Caryopsis pale, smooth.

Fl. & Fr. : July - Nov.

Ecology : Not common; waste places, river-beds, etc.

Distribution : India : Rajasthan, Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka and Laccadive group of Islands. Myanmar.

Specimen examined : Pratappur, 1550.

Use : It is a good pasture grass.

Note : Haines did not report this.

3. **Cynodon dactylon** (L.) Pers., Syn. Pl. 1 : 85. 1805; Hook. f. in Hook. f., Fl. Brit. India 7 : 288. 1896, *p.p.*, excl. Syn. *C. filiformis* Voigt; Prain, Bengal Pl. 2 : 1227. 1903; Haines, For. Fl. Chota Nagpur 582. 1910 & Bot. Bihar & Orissa pt. 5 : 966. 1924; Bor, Grass. Burma Ceylon India & Pakistan 469. 1960; Jain in Bull. Bot. Surv. India 9 : 139. 1967. *Panicum dactylon* L., Sp. Pl. 58. 1753.

Local name : Dub, Ramghas, Kalighas.

Creeping by scaly rhizomes or by strong flat stolons. Culms to 30 cm long, slender, glabrous and smooth. Leaves distichous on barren shoots and at lower part of culms; blades linear, acute, ± glaucous, smooth on lower surface, scaberulous above, 2-15 cm long and to 3 cm wide; sheaths smooth; ligule a ring of white hairs. Spikes 2-5, 1.5-5 cm long; rachis pubescent at base. Spikelets light green or purplish, 2 2.8 mm long. Glumes lanceolate, lower 1.2-1.8 mm long, upper longer; keel scabrid or smooth. Lemma obliquely oblong or semi-ovate, *ca* 2.5 mm long; hairs on lemma simple. Keels of palea scaberulous; rachilla usually prolonged beyond palea as a slender naked bristle. Stigmas purple. Anthers 1 mm or longer. Caryopsis 1.2-1.3 mm long.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; on roadsides, lawns, waste places, etc. forming a dense mat.

Distribution : Throughout India. Tropical and Warm temperate regions throughout the World.

Specimens examined : Koderma, 156; National Park, 401; Chatra, 1083.

Uses : Plant is used as a pasture and lawn grass. Rhizomes are used in genito-urinary troubles.

17. DACTYLOCTENIUM Willd.

Dactyloctenium aegyptium (L.) Beauv., Ess. Agrost. Expl. Pl. 15. 1812; Fischer, Fl. Madras 3 : 1840 (1273). 1934; Bor, Grass. Burma Ceylon India & Pakistan 489. 1960. *Cynosurus aegyptius* L., Sp. Pl. 72. 1753.

Eleusine aegyptia (L.) Desf., Fl. Atlant. 1 : 85. 1798; Hook. f. in Hook. f., Fl. Brit. India 7 : 295. 1896; Prain, Bengal Pl. 2 : 1230. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 970. 1924.

Annuals. Culms erect or ascending, rooting at lower nodes, 2-3-noded, glabrous and smooth, 25-80 cm high. Leaf blades linear, acute, flat, ciliate on margins, 2.5-20 cm long and to 2.5 mm wide; sheaths shorter than internodes, whitish and keeled on lower surface; ligule very short, ciliolate. Spikes 2-6, olive-grey, 1-5 cm long; rachis keeled, pubescent at base. Spikelets 3-5-flowered, 3-4 mm long. Lower glume 1.5-2.5 mm long; upper glume mucronate or awned, *ca* 0.2 cm long. Lemmas mucronate or short-awned, 2.5-3 mm long. Palea 2-keeled; keels winged, ciliate. Caryopsis obovoid-globose, rugose, 1-1.5 mm long.

Fl. & Fr. : Aug. - Dec.

Ecology : Very common; in cultivated fields, pasture lands, grassy waste places, roadsides, gardens, etc.

Distribution : Throughout India. Tropical and Warm temperate regions of Old World, introduced into America.

Specimens examined : Hazaribagh, 124; Raja Rappa, 452; Simaria, 1640.

Use : Grains are used as food in times of scarcity.

18. DENDROCALAMUS Nees

Dendrocalamus strictus (Roxb.) Nees in Linnaea 9 : 476. 1835; Hook. f. in Hook. f., Fl. Brit. India 7 : 404. 1896; Prain, Bengal Pl. 2 : 1234. 1903; Haines, For. Fl. Chota Nagpur 585. 1910 & Bot. Bihar & Orissa pt. 5 : 947. 1924. *Bambos stricta* Roxb., Pl. Corom. 1 : 58, t. 80. 1798.

Local name : Narbans.

Deciduous, densely tufted bamboo. Culms glaucous-green when young, dull-green or yellowish when old, 6-20 m tall and 2.5-7.5 cm in diam., with 30-45 cm long internodes; nodes somewhat swollen. Culm-sheaths usually covered on back with golden-brown, stiff hairs, striate, slightly auricled, ciliate on margins; imperfect blade triangular, hairy on both sides; ligule narrow. Leaves linear-lanceolate, rounded at base, shortly petioled, sharply acuminate, twisted at apex, rough, hairy above, softly hairy below, scabrous on margins, 5-25 cm long and 0.5-3 cm broad; leaf-sheaths striate, hairy, ending in a prominent callus and short auricle; ligule narrow. Panicle consisting of dense, glabrous, spaced heads. Spikelets spinescent, hairy, 0.8-1.2 cm long, fertile mixed with many smaller sterile ones. Glumes usually 2, ovate, spinescent, many-nerved; lemmas ovate, sharply spinescent with tufts of cilia on spine; palea ovate, emarginate, 6-8-nerved. Stamens long-exserted; anthers shortly apiculate. Stigma 1. Caryopsis ovoid to sub-globose, brown, shining, beaked, 7-8 mm long.

Fl. & Fr. : Oct. - Nov.

Ecology : Very common; on hill slopes, hilly forests, etc.

Distribution : India : From North India through Punjab to Bihar, Orissa, West Bengal, Central and South India. Pakistan, Myanmar, Singapore and Java.

Specimens examined : National Park, 1171; Chatra, 1660.

Use : Culms are employed for rafters, battens, baskets, sticks, furniture, fishing rods, etc.; also used for paper-pulp. Leaves are used as fodder.

19. DICHANTHIUM Willem.

Key to the Species

1a. Racemes solitary at ends of branches supported by spathes; sessile spikelets not overlapping; lower glume of sessile spikelet usually with a deep dorsal pit ... 2. *D. foveolatum*

1b. Racemes several to many, if solitary then sessile spikelets imbricate. Lower glume of sessile spikelet not pitted :

2a. Ligules short, fringed. Racemes unequal. Upper glume of sessile spikelets mucronulate ... 3. *D. ischaemum*

2b. Ligules not fringed. Racemes almost equal. Upper glume of sessile spikelets muticous ... 1. *D. annulatum*

1. **Dichanthium annulatum** (Forsk.) Stapf in Prain, Fl. Trop. Africa 9 : 178. 1917; Haines, Bot. Bihar & Orissa pt. 5 : 1039. 1924; Bor, Grass. Burma, Ceylon, India & Pakistan 133. 1960; Dashpande in Jain *et al.*, Fl. India Fasc. 15 : 5. 1984. *Andropogon annulatus* Forsk., Fl. Aegypt.-Arab. 173. 1775; Hook. f. in Hook. f., Fl. Brit. India 7 : 196. 1896; Prain, Bengal Pl. 2 : 1205. 1903.

Culms 0.5-1 m tall, erect or ascending, usually woody at base, smooth, with nodes usually bearded with soft hairs. Leaves narrow-linear,

setaceous-acuminate, flat, papillose, scabrid above and on margins, 5-30 cm long and 3-6 mm wide; sheaths rounded, sub-carinate at top, striate; ligules obtuse, 2-4 mm long, decurrent into sheaths. Spiciform racemes solitary or 2-4-nate. subdigitate and panicled, almost equal, 3-6 cm long; nodes of common axis bearded, 0.4-1 cm long. Joints of rachis and pedicels linear-filiform, flat on back; articulations oblique, without appendage. Sessile spikelet hermaphrodite, ovate-oblong, dorsally awned, 3-5 mm long. Lower glume ovate-oblong, 5-9-nerved, clasping the upper glume; upper glume lanceolate, muticous, depressed towards central keel, 3-5 mm long. Lower floret : barren; lemma linear-oblong, 2.8 - 3.3 mm long. Upper floret : hermaphrodite; lemma narrow, with 1.5-2.4 mm long awn. Caryopsis flat on ventral surface, convex dorsally. Pedicellate spikelet male or neuter, equalling or exceeding the sessile but more flattened;lower glume 7-11-nerved, with ciliate margin; upper glume 3-nerved, equalling the lower, ciliate. Lower floret : lemma ciliate, 2.5-2.7 mm long. Upper floret : lemma small or absent.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; in grassy localities, thickets, gardens, etc.

Distribution : Throughout India. Myanmar, tropical and North America, Australia and Western North Africa.

Specimens examined : National Park, 459; Chouparan, 1374.

Use : Plant is used as a fodder grass.

2. **Dichanthium foveolatum** (Del.) Roberty in Boissiera 9 : 170. 1960; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 279. 1982.

Andropogon foveolatus Del., Fl. d'Egypte 16, t. 8.f. s. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 168. 1896; Prain, Bengal Pl. 2 : 1203. 1903.

Eremopogon foveolatus (Del.) Stapf in Prain, Fl. Trop. Africa 9 : 183. 1917; Bor, Grass. Burma Ceylon India & Pakistan 148. 1960.

Hypogynium foveolatum (Del.) Haines, Bot. Bihar & Orissa pt. 5 : 1041. 1924.

Culms usually decumbent, simple or subfastigiately branched above, bearded on nodes, 30-70 cm tall. Leaves very narrow, almost filiform, rigid, scaberulous beneath; sheaths shorter than internodes,scabrous or glabrous, basal ones silky villous; ligule short, truncate, ciliolate. Racemes 2-4 cm long; peduncles capillary, far exserted beyond slender spathe; joints and pedicels villous. Sessile spikelets linear-oblong, purplish, 3 4 mm long; lower glume 4-5 mm long, 4-nerved, usually with a deep dorsal pit; keels scabrid; upper glume equal to lower, 3-nerved; lower lemma much shorter, nerveless, glabrous; upper reduced to an 5-8 mm long awn. Anthers 3. Caryopsis not seen. Pedicellate spikelets nearly equal to sessile ones, lanceolate-oblong, reddish; lower glume unpitted, 5-nerved, glabrous, with scabrid keels; upper 3-nerved.

Fl. & Fr. : Aug. - Sept.

Ecology : Common; in abandoned fields, pasture lands, waste places, etc.

Distribution : Drier parts of north-western, central, eastern and southern India. Kenya, Mali and N. Africa, east through the Middle East and Somalia to India, Pakistan and Sri Lanka.

Specimens examined : Ghanghree, 1048; Churchu, 1291.

Use : Plant is relished by cattle.

* 3. **Dichanthium ischaemum** (L.) Roberty in Boissiera 9 : 160. 1960; Deshpande in Jain *et al.*, Fl. India Fasc. 15 : 16. 1984. *Andropogon ischaemum* L., Sp. Pl. 1047. 1753; Hook. f. in Hook. f., Fl. Brit. India 7 : 171. 1897.

Bothriochloa ischaemum (L.) Keng in Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 10 : 201. 1936; Bor, Grass. Burma Ceylon India & Pakistan 108. 1960.

Culms 40-100 cm long, erect or aciculately ascending; nodes glabrous or shortly bearded. Leaf-sheaths compressed, with long hairs at mouth; blades 6-20 cm long, narrowly linear, glabrous or hairy towards base, glabrous, rounded at base; ligule short, fringed. Racemes 3-20, slender, unequal, 6-7 cm long, (sub)digitate; joints and pedicels silky-hairy, *ca* 2 mm long. Spikelets 3-5 mm long; callus shortly bearded. Sessile spikelets *ca* 4 mm long, elliptic-lanceolate; lower glume 5-7-nerved, dorsally flat, hairy below middle; upper lanceolate, mucronulate; keels scabrid above; lemma oblong-lanceolate, acute, ciliate; palea similar to lemma, with 1.2-2 cm long awn. Pedicelled spikelets darker than sessile ones, male; lower glume lanceolate, 9-nerved, glabrous; keels ciliate above; upper lemma linear-lanceolate, 5-7-nerved; lemma linear-oblong, obtuse, ciliate, 2.8-3 mm long; palea similar to lemma, but very narrow. Caryopsis 2-2.5 mm long.

Fl. & Fr. : Aug. - Dec.

Ecology : Common; in waste places, along railway tracks, pasture lands, etc.

Distribution : India : Jammu and Kashmir, Punjab, Uttar Pradesh, Rajasthan, Madhya Pradesh, Tamilnadu and Manipur. Pakistan, Afganistan, Africa.

Specimens examined : Hazaribagh, 988; Chouparan, 1679.

20. DIGITARIA Rich.

Key to the Species

1a.Hairs present on spikelets always verrucose ... 3. *D. longiflora*

1b.Hairs present on spikelets, if any, never verrucose :

2a.Hairs on spikelets clavate ... 2. *D. granularis*

2b.Hairs on spikelets not clavate :

3a.Upper glume less than half of the length of spikelet ... 4. *D. setigera*

3b.Upper glume as long as to exceeding the spikelet ... 1. *D. ciliaris*

1. **Digitaria ciliaris** (Retz.) Koeler, Descr. Gram. Gallia & Germania 27. 1802; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 228. 1982. *Panicum ciliare* Retz., Obs. Bot. 4 : 16. 1786.

Panicum adscendens Kunth in H.B.K., Nova Gen. Sp. 1 : 97. 1816.

Paspalum sanguinale (L.) Lam. var. *ciliare* (Ratz.) Hook. f. in Hook. f., Fl. Brit. India 7 : 15. 1896.

Digitaria sanguinalis (L.) Scop. var. *ciliaris* (Retz.) Prain, Bengal Pl. 2 : 1182. 1903.

D. sanguinalis (L.) Scop. fa. *ciliaris* (Retz.) Haines, Bot. Bihar & Orissa pt. 5 : 1008. 1924.

D. adscendens (Kunth) Henr. in Blumea 1 : 92. 1934; Bor, Grass. Burma Ceylon India & Pakistan 298. 1960.

D. adscendens ssp. *adscendens* var. *criniformis* Henr., Monog. *Digitaria* 999. 1950; Bor, Grass. Burma Ceylon India & Pakistan 299. 1960.

D. ciliaris ssp. *marginata* var. *fimbriata* (Link) Jain & Das in Ind. For. 99 : 572. 1973.

D. ciliaris var. *criniformis* (Henr.) Majumdar in Bull. Bot. Soc. Bengal 25 : 75. 1971.

Local name : Takri, Takria.

Annual. Culms 30-60 cm tall, tufted, ascending from a geniculate or prostrate rooting base, simple or branched from lower nodes, glabrous. Leaf-blades linear-lanceolate, from a contracted and rounded base, tapering to a sharp point, flat, glabrous or sparsely hairy towards mouth, with finely cartilaginous margins, to 14 cm long and 4-8 mm wide; sheaths thin, glabrous or bearded at base; ligules membranous, to 1 mm long. Spikes 4-9, sessile, subdigitate, 6-12 cm long; rachis triquetrous or winged. Pedicels 2-nate, one very short, other to 1.5 mm long, scabrid. Spikelets appressed, lanceolate, usually pale-green, 2-3 mm long, usually hairy. Lower glume scaly, ovate, 3-4 mm long, sometimes obsolete or absent; upper ovate-lanceolate, as long as to exceeding the spikelet, 3-nerved, usually with lines of hairs between nerves and on margins. Lower floret sterile; lemma as long as spikelet, 7-nerved; palea and lodicules minute. Upper floret hermaphrodite; lemma oblong-lanceolate, as long as spikelet, chartaceous, pale or purplish; palea same as lemma. Anthers 1.8-2 mm long. Caryopsis oblong, plano-convex, white, 1.3-1.5 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Very common; in waste places, roadsides, open grounds, bunds between rice fields, railway tracks, etc.

Distribution : Throughout India. Tropics of the Old World.

Specimens examined : Hazaribagh, 587; Tondwa, 1429; Koderma Forest, 1791.

Use : Plant is used as a fodder grass.

2. **Digitaria granularis** (Trin.ex Spreng.) Henr., Monogr. Gen. *Digitaria* 302. 1950; Bor, Grass. Burma Ceylon India & Pakistan 301. 1960. *Paspalum granulare* Trin. ex Spreng., Neue Entdeck. 2 : 47. 1821.

Paspalum pedicellare Trin. ex Steud., Nom. ed. 2, 2 : 272. 1841;

Hook. f. in Hook. f., Fl. Brit. India 7 : 19. 1896.

Digitaria pedicellaris (Trin. ex Steud.) Prain, Bengal Pl. 2 : 1182. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1009. 1924.

Annual or perennial. Culms tufted, erect, slender, branched and kneed at base, 15-70 cm tall. Leaf-blades narrowly linear-lanceolate, acuminate, flat or rolled, 5-15 cm long and 2-4 mm broad, minutely scabrid; sheaths narrow, sparsely hairy in lower part; ligule short, scarious. False spikes 5-10, alternate, subterminal, contracted, erect or spreading, 2.5-10 cm long; rachis hardly winged, minutely scabrid; pedicels 2-5-nate, unequal, scaberulous. Spikelets ovate-elliptic, mucronate, spaced, 1.2-1.5 mm long; upper of each fascicle with a pedicel exceeding the lower spikelet in length. Lower glume absent; upper elliptic or ovate-oblong, 5-nerved, *ca* 1 mm long, hairy. Lower floret : lemma ovate-oblong, 5-nerved, pubescent. Upper floret : lemma elliptic-oblong, mucronulate, punctate, with incurved margins; palea elliptic-oblong, with strongly incurved margin. Caryopsis *ca* 1-1.2 mm long.

Fl. & Fr. : Aug.-Nov.

Ecology : Common; in open grassy places, cultivated fields, etc.

Distribution : Throughout India. Tropical Asia.

Specimens examined : Chatra, 987; Jaynagar, 1808.

Use : Plant is grazed by cattle.

3. **Digitaria longiflora** (Retz.) Pers., Syn. Plan. 1 : 85. 1805; Haines, Bot. Bihar & Orissa pt. 5 : 1008. 1924; Henr., Monogr. Gen. *Digitaria* 408. 1950; Bor, Grass. Burma Ceylon India & Pakistan 302. 1960. *Paspalum longiflorum* Retz., Obs. Bot. 4 : 15. 1786; Hook. f. in Hook. f., Fl. Brit. India 7 : 302. 1896,*p.p.*; Prain, Bengal Pl. 2 : 1181. 1903.

Digitaria preslii (Kunth) Henr., Monogr. *Digitaria* 589, f. 880. 1950; Bor, Grass. Burma Ceylon India & Pakistan 304. 1960.

Annual. Culms usually creeping and sending up erect shoots from nodes; flowering branches erect, slender. Leaf-blades linear-lanceolate, spreading, flat, soft, sparsely hairy, 1-6 cm long and 2-4 mm broad; sheaths rather tight, usually glabrous; ligule short, truncate. Spikes usually 2-3, sometimes more, sessile, digitate, slender, erect or spreading, pale-green, 2.5-7.5 cm long; rachis flat, with scabrid margins;pedicels 2-3-nate, with discoid tips, to 2 mm long.Spikelets appressed, subimbricate, elliptic oblong, 1.3-1.5 mm long. Lower glume absent; upper oblong, delicate, 3-5-nerved, densely appressed hairy between nerves and along margin. Lowe floret:lemma 7- nerved,as long as spikelet, appressed - pubscent between nerves; palea and lodicules microscopic upper floret:lemma as long as spikelet, with overlapping margin; palea similar to lemma. Caryopsis ellipsoid, 0.7-0.8 mm long.

Fl. & Fr. : July-Dec.

Ecology : Common; in open places, roadsides, along border of rice fields, etc.

Distribution : Throughout India. Tropics of the Old World, introduced to the New World.

Specimens examined : Raja Rappa, 383; National Park, 1593.

4. **Digitaria setigera** Roth in Roem. & Schult., Syst. Veg. 2 : 474. 1817; Henr., Monogr. Gen. *Digitaria* 684. 1950; Bor, Grass. Burma Ceylon India & Pakistan 305. 1960; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 226. 1982.

Paspalum sanguinale (L.) Lam. var. *extensum* Nees & Arn. ex Hook. f. in Hook. f., Fl. Brit. India 7 : 15. 1896.

P. sanguinale (L.) Lam. var. *pruriens* (Trin.) Hook. f. in Hook. f., Fl. Brit. India 7 : 15. 1896.

D. sanguinalis (L.) Scop. var. *extensa* (Nees & Arn. ex Hook. f.) Prain, Bengal Pl. 2 : 1181. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1007. 1924.

Digitaria sanguinalis (L.) Scop. var. *pruriens* (Hook.f.) Prain, Bengal Pl. 2 : 1181. 1903.

D. microbachne (Presl.) Henr. in Meded. Rijks Herb. no. 16, 13. 1930; Bor, Grass. Burma Ceylon India & Pakistan 302. 1960.

D. microstachya Henr., Monogr. *Digitaria* 454. 1950; Bor, Grass. Burma Ceylon India & Pakistan 303. 1960.

Paspalum sanguinale (L.) Lam. var. *commutatum* sensu Hook. f. in Hook. f., Fl. Brit. India 7 : 15. 1896, *p.p.*, non *Panicum commutatum* Nees.

Digitaria sanguinalis (L.) Lam. var. *commutata* (Hook.f.) Haines, Bot. Bihar & Orissa pt. 5 : 1007. 1924.

Annual. Culms tufted, creeping below and rooting at nodes, smooth, glabrous, to 1.5 m tall. Leaves linear or linear-lanceolate, flat, flaccid, rough, thickened and scabrid on margins, to 20 cm long and 1.2 cm broad; sheath loose, striate; ligule membranous, truncate, to 2 mm long. Spikes to 20, 10-15 cm long, subdigitately arranged on a common axis; rachis narrowly winged, with scabrid margins. Pedicels angled, scabrid on angles, 2-nate. Spikelets elliptic, to 3 mm long. Lower glume a small hyaline scale; upper glume less than half the length of upper lemma and much narrower, lanceolate, ciliate on margin, 3-nerved, sparsely hairy on dorsal surface. Lower floret : lemma hyaline, 5-7 nerved, equalling the spikelet in shape and size, pubescent. Upper floret : lemma elliptic, apiculate, pale, minutely punctate, with inturned margins clasping the palea.

Fl. & Fr. : Sept. - Nov.

Ecology : Common; in roadsides,open grassy grounds, fields, forest edges, etc.

Distribution : Throughout India. Pakistan, Tanzania, Mauritius and Seychelles, through Asia to Pacific Islands.

Specimens examined : Jaynagar, 1506; National Park, 2025.

Use : Plant is used as a fodder grass.

21. DIMERIA R. Br.

Key to the Species

1a.Upper glume narrowly winged all along keel. Spikelets 0.35-0.4 cm long ... 1. *D. connivens*

1b.Upper glume not winged. Spikelets 0.15-0.3 cm long ... 2. *D. ornithopoda*

1. **Dimeria connivens** Hack. in DC., Monogr. Phan. 6 : 689. 1889; Hook. f. in Hook. f., Fl. Brit. India 7 : 104. 1896; Prain, Bengal Pl. 2 : 1187. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1016. 1924; Bor, Grass. Burma Ceylon India & Pakistan 140. 1960.

Annual, much-tufted. Culms very slender, ascending, 10-25 cm long, with minutely bearded nodes. Leaves chiefly near base of culms, linear, acuminate, with long tubercle-based hairs particularly on margins, 1-7 cm long and to 4 mm broad. Spikes 2, erect, parallel, 2.5-4 cm long; rachis nearly straight, costate, ciliate, 0.7-0.8 mm wide. Spikelets subsessile, 3.5-4 mm long excluding 6-8 mm long awn, with minute hairs at their base. Lower glume slightly shorter than spikelet, slender, finely pointed, dorsally ciliate; upper glume as long as spikelet, oblong-lanceolate, acuminate, prominently keeled, ciliate; cilia longer towards top. Palea hyaline, 2-fid. Caryopsis linear, slightly curved, 2-2.5 mm long.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; in grassy glades of forests, pasture lands, etc.

Distribution : Endemic to Bihar and Orissa.

Specimens examined : Barkagwan, 1270; Barhi, 1813.

2. **Dimeria ornithopoda** Trin., Fund. Agrost. 167, t. 14. 1820; Hook. f. in Hook. f., Fl. Fl. Brit. India 7 : 104. 1896; Prain, Bengal Pl. 2 : 1187. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1016. 1924; Bor in Kew Bull. 7 : 576. 1952 & Grass. Burma Ceylon India & Pakistan 142. 1960.

Annual. Culms many, subcompressed, bearded at nodes, 7-40 cm high. Leaves soft, narrowly linear, acuminate, hairy or ciliate, 2-7 cm long and 1-2 mm broad; sheaths keeled, shorter than internodes, glabrous or hairy at summit. Spikes usually 2, rarely 3, sessile, reddish-brown, 2-4 cm long; rachis subundulate, glabrous, to 0.5 mm wide; back flat, smooth, with a strong nerve, scabrid on margins, with smooth keel; internodes 1.2-1.5 mm long, shorter than spikelets. Pedicels *ca* 0.4 mm long. Spikelets linear, 1.5-3 mm long; callus reddish, 0.4-0.5 mm long. Lower glume shorter than spikelet, narrowly linear, with scabrid keel and usually ciliate margins; upper twice as broad as lower, with puberulous keel and ciliate margin. Lower floret : lemma linear, short or very reduced. Upper floret : lemma oblong, shortly 2-toothed, ± 1.5 mm long; awn 0.9-1 cm long. Styles twice as long as stigmas. Caryopsis 1.8-2 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Not common; on abandoned dry fields, waste places,etc.

Distribution : Throughout India. Nepal, Myanmar, Malesia, Australia and Japan.

Specimens examined : Raja Rappa, 384; Bishnugarh, 1946.

Use : Plant is used as a cattle feed.

Note : Bor (*l.c.*) recognised 4 varieties, *viz.* var.*ornithopoda*, var. *gracillima* Bor, var. *khasiana* Bor and var. *megalantha* Bor on the

basis of length of spikelets and anthers. The specimens of this area are referable to the type variety, *i.e.* var. *ornithopoda.*

22. ECHINOCHLOA Beauv.

Key to the Species

1a. Ligule a fringe of stiff hairs ... 3. *E. stagnina*

1b. Ligule entirely absent :

2a. Lower lemma and upper glume equally acute or cuspidate, not awned ...1. *E. colona*

2b. Lower lemma and upper glume acuminate-cuspidate, the former produced into a long awn ... 2. *E. crusgalli*

1. **Echinochloa colona** (L.) Link, Hort. Berol. 2 : 209. 1833; Haines, Bot. Bihar & Orissa pt. 5 : 997. 1924; Bor, Grass. Burma Ceylon India & Pakistan 308, f. 34. 1960. *Panicum colonum* L., Syst. Nat. ed. 10, 2 : 870. 1759; Hook. f. in Hook. f., Fl. Brit. India 7 : 32. 1896; Prain, Bengal Pl. 2 : 1177. 1903.

Local name : Jhari, Sawank.

Annual, to 60 cm tall. Culms erect or ascending, branched in lower part, glabrous and smooth. Leaf-blades narrow, linear, tapering to an acute point, delicately pruinose, with slightly rough margins, 3-6 mm wide; sheaths loose, ± compressed, smooth. Ligule absent. Panicle erect, 5-13 cm long; branches 6-many, solitary or 2-nate, obliquely spreading, lower 2.5-3 cm long, upper decreasing gradually in length. Spikelets crowded, approximately 4-ranked, ovate or ovate-elliptic, 3-3.5 mm long. Lower glume broadly ovate, clasping at base, acute - cuspidate, 1.2-1.4 mm long. Upper glume elliptic-ovate, concave, acute or cuspidate,5-7-nerved. Lower floret : male; lemma similar to upper glume, depressed on back; palea oblong, nearly as long as lemma, keeled, scaberulous. Upper floret:

hermaphrodite, elliptic-ovate, cuspidate, 2.2-2.6 mm long, polished; lemma boat-shaped, white, 1.8-2 mm long; palea 1.5-1.8 mm long. Caryopsis broadly elliptic, plano-convex, 1.5-1.8 mm long.

Fl. & Fr. : July - Nov.

Ecology : Very common; in rice fields, gardens, waste places, etc.

Distribution : Throughout India. Widespread in the Tropics and Subtropics.

Specimens examined : Hazaribagh, 475; Barkaganwa, 1269; Chatra, 1669.

Uses : Plant is used as fodder grass. Grains are eaten in times of scarcity.

2. **Echinochloa crusgalli** (L.) Beauv., Ess. Agrost. 53, 161. 1812; Haines, Bot. Bihar & Orissa pt. 5 : 998. 1924, *p.p*; Bor, Grass. Burma Ceylon India & Pakistan 310. 1960; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 193, t. 22. 1982. *Panicum crusgalli* L., Sp. Pl. 56. 1753; Hook. f. in Hook. f., Fl. Brit. India 7 : 30. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1777. 1903.

Echinochloa crusgalli (L.) Beauv. var. *breviseta* (Doell) Neilr., Fl. Nied. Ost. 31. 1859; Bor, Grass. Burma Ceylon India & Pakistan 310. 1960.

E. glabrescens Munro ex Eggel., Ann. List. Grass. Uganda 16. 1847 (Hook. f. in Hook.f., Fl. Brit. Ind. 7 : 31. 1896, *nom. prov.*); Bor, Grass. Burma Ceylon India & Pakistan 311. 1960.

Local name : Soma grass, Samak.

Annual. Culms geniculately ascending, branched below, 30-100 cm high. Leaf-blandes linear, flat, subflaccid, with finely cartilaginous margins, 7.5-25 cm long and 0.75-2 cm wide; sheaths somewhat loose, smooth, usually compressed at lower part, striate, glabrous except

pubescent lower part; ligule absent; junction of blade and sheath glabrous inside,marked by a brown zone. Panicles erect,lobed,7.5-20cm long; axis triquetrous,scabrid,coarsely bristly; branches few to 15, solitary or 2-nate, 1-3.5 cm long; pedicels fascicled or 2-nate, short, bristly. Spikelets crowded, ovate-elliptic, cuspidate or awned, 3-3.7 mm long. Lower glume ovate, clasping, 5-nerved, scaberulous, 1-1.2 mm long; upper glume broadly ovate-oblong, concave, cuspidate, as long as spikelet, 5-7-nerved, rigidly pubescent. Lower floret barren; lemma similar to upper glume, flat, produced into a scabrid long flexuous awn, 7-nerved; palea elliptic, 2.5-2.8 mm long, with scaberulous keels. Upper floret elliptic-ovate, cuspidate, polished; lemma and palea 2.8-3.2 mm long. Caryopsis 1.6-1.8 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Common; in rice fields, margins of marshes, ponds, ditches and other watercourses.

Distribution : Throughout India. Sri Lanka, Myanmar, Malesia and South-East Asia, extending to subtropics of Africa.

Specimens examined : Hazaribagh, 323; Simaria , 803.

Use : Plant is used as a good fodder for cattle.

3. **Echinochloa stagnina** (Retz.) Beauv., Ess. Agrost. 53, 161 & 171. 1812; Bor, Grass. Burma Ceylon India & Pakistan 311. 1960; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 198. 1982. *Panicum stagninum* Retz., Obs. Bot. 5 : 17. 1789.

Panicum crusgalli sensu Hook. f. in Hook. f., Fl. Brit. India 7 : 30. 1896, *p.p., quoad syn. cit.*, non L.

P. crusgalli L. var. *stagninum* (Retz.) Trim. ex Hook. f. in Trim., Fl. Ceylon 5:136. 1900; Prain, Bengal Pl. 2 : 1177. 1903.

Echinochloa crusgalli L. var. *stagninum* (Retz.) Haines, Bot. Bihar & Orissa pt. 4 : 998. 1924.

Perennial. Culms to 2 m long, with creeping rhizomes, geniculate at base, rooting at lower nodes, simple, smooth and glabrous. Leaf-blades linear, long tapering to a fine point, flat, glabrous, with spinulose margins, 15-45 cm long and 0.6-2.5 cm wide; sheaths terete or keeled upwards, smooth and glabrous, usually ciliate near mouth. Ligule a fringe of stiff hairs. Panicle ± nodding and secund, 10-25 cm long; rachis and branches hispidulous or scabrid; pedicels 2-nate. Spikelets ovate-oblong to lanceolate-ovate, 5-7 mm long; glumes thin, pubescent between hispidulous nerves, cilia on nerves tubercled based; lower ones ovate-lanceolate, mucronate, 3-5-nerved, 2-2.5 mm long; upper ones concave, caudate-acuminate, 5-7-nerved at tip, with spinulose sides. Lower floret : male or barren; lemma similar to upper glume, depressed on back, 3-3.5 mm long excluding 3-5 mm long awn; palea oblong, with scaberulous nerves. Upper floret : hermaphrodite, oblong-lanceolate, mucronate, straw-coloured, 3.5 - 6.5 mm long. Lemma and palea sub-coriaceous, crustaceous. Caryopsis obovate-oblong, white, 2.6-3 mm long and 1.5-1.6 mm wide.

Fl. & Fr. : Aug. - Nov.

Ecology : Not common; in paddy fields, margins of ponds, ditches and marshes.

Distribution : Throughout India. All warm countries.

Specimens examined : Hazaribagh, 320; Jhumri Telaiya, 673.

Uses : Plant is used as fodder for cattle. Grains are eaten in times of scarcity. Culms are used for thatching. Juice of culms is used as diuretic.

23. ELEUSINE Gaertn.

Key to the Species

1a. Spikes slender, narrow, 1 to 0.5 cm wide, straight, nearly glabrous at base. Seeds oblong, obtusely trigonous. ... 2. *E. indica*

1b. Spikes stout, broad, to 1 cm wide, incurved, hairy at base.
Seeds globose ...1. *E. coracana*

1. **Eleusine coracana** (L.) Gaertn., Fruct. 1 : 8, t. 1. f. 11. 1789; Prain, Bengal Pl. 2 : 1299. 1903; Haines, For. Fl. Chota Nagpur 582. 1910 & Bot. Bihar & Orissa pt. 5 : 970. 1924; Bor, Grass. Burma Ceylon India & Pakistan 492. 1960; Phillips in Kew Bull. 27 : 254. 1972. *Cynosurus coracanus* L., Syst. Nat. ed. 10, 2 : 875. 1759.

Eleusine indica (L.) Gaertn. fa. *coracana* (L.) Hook. f. in Hook. f., Fl. Brit. India 7 : 294. 1896.

Local name : Marua.

Annual. Culms stouter, to 1 m high. Leaves usually far overtopping the stem, 30-60 cm long and 5-6 mm broad; sheaths loose, compressed; ligule of hairs. Spikes 4-7, sometimes a solitary below the whorl, stout, broad, to 1 cm wide, wholly or slightly incurved, hairy at base; rachis of spikes usually pubescent at base, trigonous or flattened on back. Spikelets much congested, awnless, 3-5-flowered. Lemmas broadly ovate, usually with 1 to 2 nerves in margins, to 5 mm long. Caryopsis globose, dark-brown, slightly flattened on one side.

Fl. & Fr. : Sept. - Dec.

Ecology : Cultivated; sometimes also met with as an escape in paddy fields, waste places, etc.

Distribution : Throughout India. In Tropics of the Old World, introduced in the New World.

Specimens examined : Etkhori ,1454; Hazaribagh, 2260.

Uses : Grains are used in cakes, puddlings and in preparation of alcoholic beverage; also useful in biliousness.

2. **Eleusine indica** (L.) Gaertn., Fruct. 1 : 8. 1789; Hook. f. in Hook. f., Fl. Brit. India 7 : 293. 1896; Prain, Bengal Pl. 2 : 1229. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 970. 1924; Bor, Grass. Burma Ceylon India

& Pakistan 493. 1960; Phillips in Kew Bull. 27 : 256. 1972. *Cynosurus indicus* L., Sp. Pl. 72. 1753.

Local name : Mandla.

Annual. Culms tufted or solitary, erect or slightly geniculate, compressed, 2-3-noded, glabrous, smooth, 10-75 cm high. Leaves usually crowded at base; blades linear, flat or folded, glabrous, smooth or sparingly hairy; ligule very small or absent. Spikes digitate, slender, narrow, straight, 2-15 cm long and to 5 mm wide, 2-4 in a terminal umbel, with one or more below it, glabrous at base. Spikelets glabrous, ovate-oblong, green, 3-7 mm, 3-8 flowered. Glumes lanceolate, lower 2-3 mm long, upper 3-4 mm long. Lemmas lanceolate, 3-4 mm long; paleas about two-third the length of lemmas. Caryopsis oblong, obtusely trigonous, transversely rugose, 1.5-2 mm long.

Fl. & Fr. : July-Nov.

Ecology : Very common; in roadsides, waste places, open grassy lands, gardens and lawns.

Distribution : Throughout India. Tropical and subtropical regions of the World.

Specimens examined : Gola, 768; Barhi, 1388; Pratappur, 2100.

Uses : Culms are used for making hats. Grains are eaten in times of scarcity.

24. ELYTROPHORUS Beauv.

Elytrophorus spicatus (Willd.) A. Camus in Lecompte, Fl. Gen. del' Indo-Chine 7 : 547. 1923; Bor, Grass. Burma Ceylon India & Pakistan 493. 1960. *Dectylis spicata* Willd., Ges. Naturf. Freunde Berlin, Neue Schrift 3 : 416. 1801.

Echinalysium articulatum Trin., Fund. Agrost. 142. 1820.

Elytrophorus articulatus (Trin.) P. Beauv., Ess. Agrost. 67, t. 14. f. 2. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 306. 1896; Prain, Bengal Pl. 2 : 1218. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 963. 1924.

Culms tufted, erect or geniculately ascending, simple or branched from base, 12-60 cm long, flowering culm usually longer than rest. Leaf-blades linear, flat, slightly rough, 2-24 cm long and 1.5-5 mm broad; sheaths loose, glabrous, smooth, longer than next node; ligule truncate, glabrous, to 1 mm long. Panicles 5-34 cm long and to 1 cm wide, bristly, pale green or white; branches erect, densely spiculate to base, forming dense, globular, ovoid-oblong clusters of spikelets, lower 0.5-2.5 cm long and distant,upper shorter and closer. Spikelets 2-4 mm long. Glumes lanceolate, ciliolate on margins, 3-8 mm long. Lemmas lanceolate, 2-2.5 mm long, ciliolate, tapering into a bristle. Paleas 0.8-2 mm long; wings toothed or ciliate. Caryopsis 0.6-0.8 mm long.

Fl. & Fr. : Nov. - Jan.

Ecology : Common; in rice-fields, dried beds of ditches, ponds,etc.

Distribution : Almost throughout India. Tropical regions of Old World.

Specimens examined : Hazaribagh, 129; Raja Rappa, 863; National Park, 2068.

25. Eragrostiella Bor

Key to the Species

1a. Keel of palea broadly winged. Leaf-blades usually flat, or sometimes complicate, to 0.4 cm broad ...1. *E. bifaria*

1b. Keel of palea very narrow. Leaf-blades mostly complicate, rarely flat, to 0.25 cm broad ... 2. *E. brachyphylla*

1. **Eragrostiella bifaria** (Vahl) Bor in Ind. For. 66 : 270. 1940 & Grass. Burma Ceylon India & Pakistan 494. 1960. *Poa bifaria* Vahl, Symb.Bot. 2 : 19. 1791.

Poa coromandeliana Koen. ex Rottl. in Ges. natur. Freunde Berlin, Neue Schrift 4 : 191. 1803.

Eragrostis coromandeliana (Koen. ex Rottl.) Trin. in Mem. Acad. Sci. Petersb. ser. 6, 1 : 415. 1830, per errorem *coromandelina*; Hook. f. in Hook. f., Fl. Brit. India 7 : 326. 1896; Prain, Bengal Pl. 2 : 1223. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 961. 1924.

E. bifaria (Vahl) Wight ex Steud., Nom. Bot. ed. 2, 1 : 562. 1840, *nomen* & Syn. Pl. Glum. 1 : 264. 1854; Hook. f. in Hook. f., Fl. Brit. India 7 : 325. 1896.

Culms densely tufted, erect, simple, subcompressed, glabrous, 30-90 cm high. Leaf-blades linear, usually flat, or sometimes complicate, rigid, smooth, 5-7 cm long and to 4 mm broad; sheaths scaberulous, keeled; ligule a ciliate line. Racemes 25-30 cm long, erect; rachis smooth, subcompressed; spikelets ovate-oblong, or sometimes linear, spreading, much compressed, olive-grey or green, 0.6-1.5 cm long, 6-40-flowered. Lower glume very acute or acuminate, 3-3.2 mm long, with scaberulous keel; upper 2-2.5 mm long, with stout rounded keel. Lemma broadly ovate, 3-3.5 mm long; palea slightly shorter than glume, with broadly winged scaberulous keel above, faintly nerved. Caryopsis brown, obovoid-ellipsoid, 0.4-0.5 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Common; in dry pasture lands, paddy-fields, rocky places, etc.

Distribution : From Rajasthan to Bihar, Chotanagpur, Orissa, Madhya Pradesh, Deccan Peninsula; Myanmar, Sri Lanka.

Specimens examied : Koderma Forest, 1263; National Park, 2063.

Use : Plant is used as fodder grass for cattle.

2. **Eragrostiella brachyphylla** (Stapf) Bor in Ind. For. 66 : 270. 1940 & Grass. Burma Ceylon India Pakistan 494. 1960. *Eragrostis brachyphylla* Stapf *apud* Hook. f. in Hook.f., Fl. Brit. India 7 : 327. 1896; Prain, Bengal Pl. 2 : 1223. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 961. 1924.

Culms densely tufted, slender, 25-45 cm long. Leaf-blades coriaceou, linear, usually complicate, rarely flat, glabrous above, 6-10 cm long and to 2.5 mm broad; spikes 7-20 cm long, slender. Spikelets close-set, oblong to linear, slightly compressed, olive green, 0.6-1.5 cm long, to 20-flowered. Glumes subequal, 2.2-2.5 mm long; lower acute, acutely keeled; upper obtuse, dorsally rounded. Lemma broadly ovate, obtuse, to 2.6 mm long, with scaberulous keel below tip. Palea with very narrow scabrid keel. Caryopsis shortly ellipsoid, brown, obscurely triquetrous, 0.4-0.5 mm long.

Fl. & Fr. : July - Sept.

Ecology : Common; within grass in waysides, waste places, paddy fields, etc.

Distribution : India : West Bengal, Bihar, Maharashtra and Deccan Peninsula.

Specimen examined : Ichak, 1315; National Park, 2067.

Use : Plant is consumed by grazing animals.

26. Eragrostis Beauv.

Key to the Species

1a. Spikelets breaking up from above downwards; rachis fragile :

2a. Panicles effuse. Lemmas not ciliate on margins ... 8. *E. tenella*

2b. Panicles spiciform. Lemmas ciliate on margins :

3a. Spiciform panicles terete. Lemmas mucronate or cuspidately acuminate ... 2. *E. ciliata*

3b. Spiciform panicles usually lobed, dense. Lemmas obtuse ... 3. *E. coarctata*

1b. Spikelets breaking up from below upwards; rachis tough :

4a. Perennials :

5a. Panicles ± contracted. Lemmas 1-1.8 mm long. Spikelets grey or pale-yellow :

6a. Spikelets 2-2.5 mm wide. Lemmas 1.5-1.8 mm long. Paleas deciduous with lemmas ...1. *E. atrovirens*

6b. Spikelets 1-1.2 mm wide. Lemmas 1-1.2 mm long. Paleas persistent ... 6. *E. nutans*

5b. Panicles effuse. Lemmas 2 mm or more long. Spikelets to 2 mm wide, slate-grey to black ... 5. *E. nigra*

4b. Annuals :

7a. Spikelets ovate or ovate-oblong, 2.5-4 mm wide, tinged with pale or purple. Rachilla straight, closely nodose ... 10. *E. unioloides*

7b. Spikelets linear or linear-oblong, less than 0.2 cm wide, blue-grey or brown. Rachilla zig-zag, with distinct internodes :

8a. Spikelets more orless fascicled on primary or secondary branches, all pointing forwards, or shortly pedicelled in narrow racemes ... 4. *E. gangetica*

8b. Spikelets not fascicled, long-pedicelled, more or less divaricate when ripe :

9a. Spikelets 6-25 mm long, linear, versatile. Branches of panicle solitary. ... 9. *E. tremula*

9b. Spikelets 5 mm long or less, ovate-elliptic. Branches of panicles fascicled or subwhorled at base ... 7. *E. pilosa*

*1. **Eragrostis atrovirens** (Desf.) Trin. ex Steud., Nom. Bot. ed.2, 1 : 562. 1840; Bor, Grass. Burma Ceylon India & Pakistan 503. 1960. *Poa atrovirens* Desf., Fl. Atlant. 1 : 73, t. 14. 1798.

Perennial. Culms erect 50-80 cm long; nodes glabrous, purple-tinged. Leaf-blades linear, acute, with scabrid inrolled margins, 10-20 cm long and 3-4 mm broad; sheath striate; ligule membranous, truncate. Panicles contracted, 5-20 cm long. Spikelets oblong, glaucous grey or purplish, 0.5-1.0 cm long, 6-10-flowered. Pedicels 2-3 mm long. Lower glume lanceolate, acute, 1-nerved, 1.2-1.4 mm long; upper glume lanceolate, boat-shaped, 1.2-1.6 mm long. Lemma 3-nerved, scabrid along midnerve, 1.4-2 mm long. Palea equalling lemma, scabrid on keels. Stamens 3; anthers yellowish. Caryopsis brownish, oblong 0.5-1 mm long.

Fl. & Fr. : Aug. - Nov.

Ecology : Not common; in watercourses, swamps, banks of streams, etc.

Distribution : India : Deccan Peninsula, Madhya Pradesh, Uttar Pradesh. North Africa to Zambia and Angola, Pakistan, Mauritania to Phillippines.

Specimens examined : Ichak : 345; Chatra : 834.

Use : Plant is eaten by fodder animals.

Note : Haines did not report this plant.

2. **Eragrostis ciliata** (Roxb.) Nees, Agrost. Bras. 512. 1829; Stapf in Hook. f., Fl. Brit. India 7 : 313. 1896; Prain, Bengal Pl. 2 : 1221. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 956. 1924; Bor, Grass. Burma Ceylon India & Pakistan 506. 1960. *Poa ciliata* Roxb., Fl. Ind. 1 : 336. 1820.

Perennial. Culms erect or geniculately ascending, terete, 40-250 cm high. Leaf-blades linear-lanceolate, flat or convolute, spreading, acuminate, smooth, glabrous, 5-15 cm long and 2.5-4 mm broad; sheaths bearded below mouth; ligule of a few hairs. Panicle spiciform, cylindric, dense, 5-8 cm long and 4-6 mm in diam.; rachis finely bearded at nodes. Spikelets much-compressed, 2.5-4 mm long, 6 to 12-flowered. Glumes ovate, acute, ciliate. Lemma broadly ovate, mucronate or cuspidately acuminate, with minutely scaberulous keel and ciliate margins, 2-3 mm long. Palea shorter than lemma, with strongly reduplicate ciliate keels. Caryopsis ovoid-ellipsoid, terete, 0.5 mm long.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; on sandy river-beds.

Distribution : India : From Maharashtra through southern and central India to Chotanagpur and West Bengal. Myanmar and Indo-China.

Specimens examined : Raja Rappa, 851;Katkamasandi,1413; Hazaribagh,1622.

Use : Plant is grazed well by cattle.

3. **Eragrostis coarctata** Stapf in Hook. f., Fl. Brit. India 7 : 313. 1896; Prain, Bengal Pl. 2 : 1221. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 956. 1924; Bor, Grass. Burma Ceylon India & Pakistan 507. 1960.

Perennial, with thick fibrous roots. Culms tufted, geniculately ascending from a nodose branched stock, clothed with short hard sheaths at base. Leaves linear, flat or convolute, smooth, glabrous, somewhat glaucous, to 9 cm long and 6 mm broad; sheaths tight, close-fitting, striate, with bearded corolla; ligule a ring of short hairs. Panicle spiciform, much contracted, elongate, usually lobed; rachis stout, scaberulous, angled. Spikelets crowded on short pedicels, 2-3 mm long and 1-1.5 mm broad. Glumes almost equal, 1.2-1.5 mm long. Lemma 1.5-2 mm long, 3-nerved, ciliate on margins, with prominent green lateral nerves. Palea as long as lemma, ciliate on keels. Stamens 3. Caryopsis ovoid-ellipsoid, 0.4-0.5 mm long, brown.

Fl. & Fr. : Sept. - Jan.

Ecology : Common; in open pasture lands, gardens, sandy river beds, etc.

Distribution : India : From Uttar Pradesh through Bihar and West Bengal to Sikkim, Chotanagpur, Central India, Orissa, Tamil Nadu, Bangladesh. Myanmar.

Specimens examined : Raja Rappa, 368; Koderma Forest, 1762; Hunterganj, 2146.

Use : Plant is eaten by cattle.

4. **Eragrostis gangetica** (Roxb.) Steud., Syn. Pl. Glum. 1 : 266. 1854; Prain, Bengal Pl. 2 : 1222. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 5 : 958. 1924, *p.p.*; Bor, Grass. Burma Ceylon India & Pakistan 508. 1960. *Poa gangetica* Roxb., Fl. Ind. 1 : 341. 1820.

Eragrostis stenophylla Hochst. ex Miq, Verh. Konink. Nederl. Inst. 3 : 4. 39. 1851, *p.p.*; Stapf in Hook. f., Fl. Brit. India 7 : 318. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1222. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 959. 1924.

Annual. Culms tufted, erect or geniculately ascending, simple or branched, 30-75 cm high; upper internodes long. Leaf-blades narrowly linear, usually convolute, sometimes flat, glabrous, smooth, 7-20 cm long and 1-3 mm broad; sheaths glabrous; ligule a membranous ring. Panicle suberect or nodding, 7.5-12 cm long; branches alternate, rather distant, spreading when ripe, much divided upwards; rachis smooth; pedicels of spikelets filiform. Spikelets linear-oblong, 4-6 mm long and 1-1.2 mm wide, 20-30-flowered, crowded on branches, grey; rachilla flexuous. Lower glume 0.7-0.8 mm long, upper 0.8-1 mm long. Lemmas ovate-oblong, 1-1.2 mm long, with smooth keel. Paleas linear-oblong, with scabrid keels, caducous with glumes. Stamens 2; anthers minute. Caryopsis glabose-ellipsoid, reddish-brown, *ca* 4-5 mm long.

Fl. & Fr. : Sept. - Jan.

Ecology : Very common; on sandy river beds, along banks of nalas and streams, moist pasture lands, etc.

Distribution : Througout India. Nepal, Myanmar and Sri Lanka.

Specimens examined : Gola, 783; Koderma Forest, 1787; Hazaribagh, 2261.

Use : Plant is eaten by grazing animals.

5. **Eragrostis nigra** Nees ex Steud., Syn. Pl. Glum. 1 : 267. 1854; Stapf in Hook. f., Fl. Brit. India 7 : 324. 1896; Haines, Bot. Bihar & Orissa pt. 6 : 1258. 1924; Bor, Grass. Burma Ceylon India & Pakistan 511. 1960.

Perennial, much variable. Culms erect, simple or branched, slender to stout, leafy at base, 15-100 cm high. Leaf-blades lanceolate, tapering to a short point, smooth or scarcely scabrid on margins; sheaths narrowly terete or obscurely compressed, bearded on mouth, with smooth or ciliate margins; ligule a ciliate rim. Panicle large, spreading, ovate or oblong, lax, much branched, to 60 cm long; branches usually in whorls or fascicles, sometimes solitary or geminate. Spikelets linear to oblong, olive grey, 4-4.5 mm long; pedicels longer than spikelets. Glumes subequal, strongly 1-nerved, keeled, 1.5-1.7 mm long; lemma ovate, to 2 mm long or over; palea denticulate, persistant. Stamens 3. Caryopsis very short, truncate at both ends, 0.6-0.7 mm long, grooved dorsally.

Fl. & Fr. : July - Sept.

Ecology : Not common; on open pasture lands, grassy waste places, etc.

Distribution : India : Temperate and tropical Himalaya from Himachal Pradesh through Uttar Pradesh, Sikkim and Khasia Hills, Bihar, Orissa and southward throughout Deccan Peninsula. Sri Lanka and extending to China.

Specimens examined : Ghanghree, 1072; Barakagawan, 1274.

Use : Plant is grazed well by cattle, horses, etc.

6. **Eragrostis nutans** (Retz.) Nees ex Steud., Nom Bot. ed. 2, 563. 1840; Bor, Grass. Burma Ceylon India & Pakistan 511. 1960. *Poa nutans* Retz., Obs. Bot. 4 : 19. 1786.

Eragrostis stenophylla auct. non. Hochst. ex Miq. : stapf.in Hook. f., Fl. Brit. India 7 : 318. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1222. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 959. 1924.

Perennial. Stems densely tufted, erect or geniculately ascending, simple or branched, 30-45 cm high. Leaf-blades very narrow, stiff, usually convolute, glabrous, 7.5-12 cm long and 2-3 mm wide; sheaths smooth, silky hairy at mouth; ligule fringed, to 0.3 mm long. Panicles suberect or nodding, contracted, 7-12 cm long; branches rather distant, alternate, oblique, spreading, much divided upwards; rachis slender, smooth. Spikelets linear-oblong, 6-10-flowered, 1-1.2 mm wide, grey; rachilla tough. Lower glume 0.7-0.8 mm long; upper 0.8-1 mm long. Lemma ovate-oblong, 1-1.2 mm long, with smooth keels. Palea linear-oblong, persistent, shorter than lemma; keels scabrid. Stamens 3. Caryopsis sub-globose or ellipsoid, reddish-brown, smooth, 0.4-0.5 mm long.

Fl. & Fr. : Oct. - Dec.

Ecology : Very common; on sandy river-beds, in nalas, moist pasture lands, etc.

Distribution : Throughout India. Myanmar, Sri Lanka, tropical Asia and Africa.

Specimens examined : Patratu , 2301; Ramgarh , 2394.

7. **Eragrostis pilosa** (L.) P. Beauv., Ess. Agrost. 71, 162 & 175. 1812; Stapf in Hook. f., Fl. Brit. India 7 : 323. 1896; Prain, Bengal

Pl. 2 : 1223. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 960. 1924; Bor, Grass. Burma Ceylon India & Pakistan 512. 1960.*Poa pilosa* L., Sp. Pl. 68. 1753.

Annual. Culms erect or geniculate at base, slender, densely tufted, to 30 cm tall. Leaves narrowly linear, acuminate, usually convolute, or flat, rough on margins and upper surface, glabrous; sheaths tight, smooth, hairy at throat; ligules a ring of short hairs. Panicles erect, spreading at anthesis, 5-10 cm long, purplish; rachis filiform, hairy at nodes; branches capillary, flexuous; pedicels almost as long as spikelets. Spikelets erect, ovate or elliptic, 2.5-4 mm long, 4 to 10-flowered; rachilla flexuous. Gulmes unequal, lanceolate, acute; lower 0.3-0.5 mm long, nerveless; upper 0.8-1 mm long, strongly 1-nerved, with smooth keel. Lemmas ovate, 3-nerved, 1.2-1.3 mm long. Paleas persistent, sub denticulate at apex, with smooth keel. Stamens 3. Caryopsis narrowly obovoid-ellipsoid.

Fl. & Fr. : Sept. - Jan.

Ecology : Very common; in sandy fields, gardens, river-banks, etc.

Distribution : Throughout India. Widely distributed in tropical and warm temperate regions of the Old World.

Specimens examiend : Gola, 784; Bishnugarh, 1947; Hazaribagh, 2262.

Use : Plant is used as fodder grass for cattle, horses, etc.

8. **Eragrostis tenella** (L.) P. Beauv. ex Roem. & Schult., Syst. Veg. 2 : 576. 1817; Stapf in Hook. f., Fl. Brit. India 7 : 315. 1896; Haines, Bot. Bihar & Orissa pt. 5 : 956. 1924; Bor, Grass. Burma Ceylon India & Pakistan 513. 1960. *Poa tenella* L., Sp. Pl. 69. 1753.

Poa amabilis L., Sp. Pl. 68. 1753.

P. plumosa Retz., Obs. Bot. 4 : 20. 1786.

Eragrostis amabilis (L.) Wight & Arn. ex Hook. & Arn., Bot. Beech. Voy. 251. 1838.

E. tenella var. *plumosa* (Retz.) Stapf in Hook. f., Fl. Brit. India 7 : 315. 1896; Prain, Bengal Pl. 2 : 1221. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 957. 1924.

Key to the Varieties

1a. Panicle loose with spreading branches; axis hairy at nodes ... 1. var. *tenella*

1b. Panicle rather contracted with ascending branches; axis glabrous ... 2. var. *insularis*

1. var. **tenella;** Bor, Grass. Burma Ceylon India & Pakistan 514. 1960.

Local name : Bharbhusi.

Annual, loosely tufted. Culmes erect or geniculately ascending, slender, wiry, 3-5-noded, simple or branched, glabrous, smooth, 10-40 cm high. Leaf-blades narrowly linear, flat or rolled when dry, soft, glabrous, smooth, 2-12 cm long and 1-3 mm wide. Leaf-sheaths shorter than internodes, bearded at mouth; ligule represented by a fringe of short hairs. Panicle usually loose and open, 5-12 cm long and 1.5-3.5 cm wide, straw-coloured, green or purplish; rachis usually hairy at nodes; pedicels 1-5 mm long. Spikelets ovate-oblong, 1-nerved; lower 0.5-1 mm long; upper 0.7-1.3 mm long. Lemmas oblong, 0.8-1.2 mm long; paleas as long as lemmas, ciliate on keels. Anthers very minute, 0.3-0.4 mm long. Caryopsis pale to light brown, ovoid, polished, 0.5-0.7 mm long.

Fl. & Fr. : Oct. - Feb.

Ecology : Very common; in open fields, grassy localities, sandy river-beds, fields, etc.

Distribution : Throughout Inida. Widespread in Tropics of Old World, introduced into America.

Specimens examined : National Park, 462; Satgaon, 595; Pratappur, 2084.

Use : Plant is eaten by cattle both green and as hay.

2. var. **insularis** C.E.Hubbard in Kew Bull. 1939 : 564. 1939; Bor, Grass. Burma Ceylon India & Pakistan 514. 1960.

Panicle very contracted; branches erect; rachis glabrous.

Fl. & Fr. : Sept. - Jan.

Ecology : Common; on sandy, grassy localities, on river beds, etc.

Distribution : India : South India, Bihar, West Bengal. Sri Lanka, Madagascar and Mascarenes.

Specimens examined : Chatra, 1087; Satgaon, 589; Pratappur, 2084.

Use : Same as type variety.

9. **Eragrostis tremula** (Lam.) Hochst. ex Steud., Syn. Pl. Glum. 1 : 269. 1854; Stapf in Hook. f., Fl. Brit. India 7 : 320. 1896; Prain, Bengal Pl. 2 : 1223. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 960. 1924; Bor, Grass. Burma Ceylon India & Pakistan 514. 1960. *Poa tremula* Lam., Tab. Encycl. Meth. Bot. 1 : 185. 1791.

Annual. Culms densely tufted, suberect or geniculately ascending, 15-75 cm high. Leaf-blades linear-lanceolate, glabrous or sparsely hairy, rounded at base, eglandular and finely serrate on margin, 2.5-20 cm long; sheaths smooth, glabrous, changing to a mauve colour when dry; ligule a rim of short stiff hairs. Panicle effuse, nodding, lax, to 50 cm long and 30 cm broad; rachis stout, angled, scaberulous; branches solitary, ascending, scaberulous; branchlets capillary, hairy in axils; pedicels shorter or longer than spikelets. Spikelets linear, compressed, glabrous, green or tinged with violet, to 2.5 cm long, to 60-flowered. Glumes subequal, 1.2-

1.5 mm long, ovate, 1-nerved, with scaberulous keels. Lemmas broadly ovate, 1.5-2 mm long; paleas obovate-oblong, persistent, with scabrid keels. Stamens 3. Lodicules 2. Caryopsis globose, 0.3-0.4 mm across.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; in dry sandy places, river-beds, etc.

Distribution : Almost throughout India. Myanmar, tropical Africa.

Specimens examined : Ghanghree, 1060; Patratu, 1737; Hazaribagh, 2257.

Uses : Plant is eaten as fodder. It forms a good sand binder. Grains are eaten in times of scarcity.

10. **Eragrostis unioloides** (Retz.) Nees ex Steud., Syn. Pl. Glum. 1 : 264. 1854; Fischer, Fl. Madras 3 : 1826 (1264). 1934; Bor, Grass. Burma Ceylon India & Pakistan 515. 1960. *Poa unioloides* Retz., Obs. Bot. 5 : 19. 1789.

Eragrostis amabilis auct. non (L.) Wight & Arn. ex Hook. & Arn. : Stapf in Hook. f., Fl. Brit. India 7 : 317. 1896; Prain, Bengal Pl. 2 : 1222: 1903; Haines, Bot. Bihar & Orissa pt. 5 : 958. 1924.

Annual. Culms loosely tufted or solitary, erect or geniculately ascending, slender, with 2 to 3 nodes, glabrous, smooth, 14-45 cm long. Leaves mostly basal; blades tapering from an abruptly contracted base, flat, glabrous or hairy above, with rough margins, 3-10 cm long and 2-5 mm wide; sheaths longer or slightly shorter than internodes, hairy at mouth; ligule a narrow rim of hairs. Panicle 5-15 cm long and 3-3.5 cm wide, green or reddish-purple. Spikelets strongly compressed, 20 to 50-flowered; rachilla straight, persistent. Glumes lanceolate to ovate, subequal, 1-nerved, to 2 mm long. Lemmas ovate-elliptic, imbricate, to 2 mm long, with straight and prominent side nerves. Paleas as long as lemmas, with narrowly winged and ciliolate keels. Anthers minute. Caryopsis oblong, compressed, 0.6-0.8 mm long.

Fl. & Fr. : Oct.-Dec.

Ecology : Very common; in open grassy fields, sandy banks of rivers, gardens, etc.

Distribution : Throughout India. South-East Asia.

Specimens examined : Hazaribagh, 122; Koderma Forest, 315; Hunterganj, 2140.

Uses : Plant is grazed well by cattle and horses; also used as green manure.

27. ERIOCHLOA H.B.K.

Eriochloa procera (Retz.) C.E.Hubbard in Kew. Bull. 1930 : 256. 1930; Bor, Grass. Burma Ceylon India & Pakistan 312. 1960. *Agrostis procera* Retz., Obs. Bot. 4 : 19. 1786.

Milium ramosum Retz., Obs. Bot. 6 : 22. 1791.

Eriochloa polystachya auct. non H.B.K. : Hook. f. in Hook. f., Fl. Brit. India 7 : 20. 1896; Prain, Bengal Pl. 2 : 1183. 1903.

E. ramosa (Retz.) O. Kuntze, Rev. Gen. Pl. 2 : 775. 1891; Haines, Bot. Bihar & Orissa pt. 5 : 1006. 1924.

Perennial. Culms densely tufted, erect or decumbent at base, usually geniculate, simple or branched, striate, swollen and pubescent at nodes, 0.3-1.5 cm tall. Leaf-blades linear, flat, acuminate, 9.5-25 cm long; sheaths open, compressed, subcarinate, striate; ligule short, hairy. Racemes 5-13 cm long, loosely arranged; rachis angular, smooth; pedicels triquetrous, swollen at apex, silky-hairy. Spikelets laxly imbricate, ovate-lanceolate, velvety, 2.5-3.5 mm long. Lower glume absent; upper ovate-lanceolate, convex, with inrolled margins, silky, 2.5-3.5 mm long. Lower floret sterile; lemma 2.3-3.2 mm long, epaleate. Upper floret :

lemma subcoriaceous, oblong, pale, compressed dorsally, with narrowly inflexed margins, hairy at top; palea oblong. Caryopsis lenticular, smooth, *ca* 2 mm.

Fl. & Fr. : Aug. - Dec.

Ecology : Common; in damp places, ditches, edges of paddy fields, etc.

Distribution : India : From Punjab through central part to West Bengal, Orissa and southwards. Tropical Africa, throughout S.E.Asia; introduced in tropical America.

Specimens examined : Chatra, 1088; Katkamasandi, 1723.

Use : Plant yields a good fodder, relished by the cattle.

28. HACKELOCHLOA O. Kuntze, *nom. cons. prop.*

Hackelochloa granularis (L.) O. Kuntze, Rev. Gen. Pl. 776. 1891; Raizada *et al.* in Ind. For. Rec. (N.S.) Bot. 4 : 205. 1957; Bor, Grass. Burma Ceylon India & Pakistan 159. 1960. *Cenchrus granularis* L., Mant. 2, App. 575. 1771.

Manisuris granularis (L.) L. f., Nov. Gram. Gen. 40. 1779; Hook. f. in Hook. f., Fl. Brit. India 7 : 159. 1896; Prain, Bengal Pl. 2 : 1191. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 1105. 1924.

Local name : Trinpali, Kangni.

Culms erect, ± terete below, compressed above, glabrous or hirsute, to 1 m high. Leaf-blades linear-lanceolate, cordate or amplexicaul at base, hirsute, ciliate on margins, 5-10 cm long and 1-1.5 cm wide; midrib white and flat above; sheaths compressed, striate, hirsute, bearded at nodes; ligules short, ciliate, membranous. Racemes 1.5-2.5 cm long; joints 1.2-1.7 mm long. Sessile spikelets including obconical callus 2.5-3 mm

long, glabrous; lower glume pitted and tubercled, faintly ribbed; upper glume ovate-oblong, hyaline towards base, 3-nerved, 1-1.2 mm long; lower floret shorter than glumes, lemma ovate; upper floret 1 mm long, lemma nerveless; anthers orange yellow; caryopsis to 1.2 mm long. Pedicellate spikielets as long as or slightly longer than sessile, ovate; lower glume slightly asymmetrical, one keel widened, scaberulous; upper glume boat-shaped, with prominent scaberulous keels; lower floret barren, with ovate-lanceolate, 2-nerved lemma. Upper floret with lemma similar to that of lower, but shorter and 1-nerved or sometimes florets reduced or suppressed.

Fl. & Fr. : Oct. - Dec.

Ecology : Very common; in open grassy localities, agricultural fields, etc.

Distribution : Throughout the hotter parts of India. Widespread in the Tropics.

Specimens examined : National Park, 469; Ghanghree, 1036.

Uses : Plant yields a good fodder, relished by cattle. It is used in cases of enlarged spleen and liver.

29. HETEROPOGON Pers.

Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult., Syst. Veg. 2 : 836. 1817; Haines, For. Fl. Chotanagpur 579. 1910 & Bot. Bihar & Orissa pt. 5 : 1040. 1924; Bor, Grass. Burma Ceylon India & Pakistan 159. 1960. *Andropogon contortus* L., Sp. Pl. 1045. 1753; Roxb., Fl. Ind. 1 : 253. 1820; Hook. f. in Hook. f., Fl. Brit. India 7 : 199. 1896; Prain, Bengal Pl. 2 : 1205. 1903.

Local name : Kher, Kumeria.

Perennial, caespitose, to 1 m tall; innovations extra-and intra-vaginal. Culms erect or geniculate-ascending, ± compressed below, simple or fastigiately branched. Leaves glaucous - pruinose, linear, tapering to a

fine point, flat, thinly hairy above and on margins, 7.5-20 cm long and 3-7 mm wide; sheaths compressed, keeled; ligule short, truncate, ciliolate. Spikes 2.5-7.5 cm long; lower 2-6 pairs of spikelets male; joints rufous-ciliate on sides; pedicels disarticulating at base with an oblique scar. Lower glume minutely pubescent, 9-nerved; upper linear-oblong. Lower floret reduced to a linear-oblong, ciliolate lemma of *ca* 3 mm long. Upper floret female; lemma hirsute, with 5-10 cm long awn; column dark-brown, pubescent; palea absent. Lodicules minute. Stamens absent or reduced. Stigmas exserted. Caryopsis grooved on face, whitish, 3-3.5 mm long. Pedicellate spikelets 0.8-1 cm long, green; lower glume lanceolate; wings with narrow inflexed flaps; upper glume acute, ciliate; lemma linear-lanceolate, ciliolate.

Fl. & Fr. : Sept. - Dec.; fruits persist till March.

Ecology : Common; in forests, hills and open grounds in valleys, railway tracks, etc.

Distribution : Throughout India. Widespread in other tropical countries.

Specimens examined : Raja Rappa, 376; Keredari, 650; Markachho, 1477.

Uses : Plant is used for silage and hay, also used in manufacture of paper. Roots are used as stimulant and diuretic.

30. Hygroryza Nees

Hygroryza aristata (Retz.) Nees ex Wight & Arn. in Edinburgh New Phil. J. 15 : 380. 1833; Hook. f. in Hook. f., Fl. Brit. India 7 : 95. 1896; Prain, Bengal Pl. 2 : 1185. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 981. 1924; Bor, Grass. Burma Ceylon India & Pakistan 597. 1960. Subram., Aquat. Ang. 112, f. 63. 1962. *Pharus aristatus* Retz., Obs. Bot. 5 : 23. 1789. **(Fig.14)**

Local name : Janglidal.

Floating grass, forming mat on suface of water. Culms 30-60 cm long, spongy, glabrous, flexuous, diffusely branched, rooting at nodes by numerous capillary rootlets. Leaf-blades ovate-oblong or ovate-lanceolate, obtuse at apex, rounded or cordate at base, 2.5-8 cm long and 0.8-1.8 cm wide; sheaths broad, compressed, smooth; ligule absent or membranous. Panicle 5-8 cm long; branches few, spreading, smooth. Spikelets solitary, 1-flowered, narrowly lanceolate, 7-8 mm long; pedicels articulate, with a red annulus below middle. Lemma 5-nerved, usually hairy between nerves; nerves awned. Palea similar to lemma but narrower, 3-nerved, with scabrid or ciliate keels. Caryopsis 1-1.3 mm long.

Fl. & Fr. : Sept.-Nov.

Ecology : Not common; floating in paddy fields, ponds, lakes and other similar habitats.

Distribution : Throughout India except north-western parts. Tropics of Old and New World.

Specimen examined : Hazaribagh, 1214.

Uses : Grains are used in biliousness. Plant yields a good fodder, relished by cattle.

31. Imperata Cyrill.

Imperata cylindrica (L.) Beauv. var. **major** (Nees) C.E.Hubb. ex C. E. Hubb & Vaugham, Grass. Maur. 96. 1940; Bor, Grass. Burma Ceylon India & Pakistan 170. 1960. *Imperata koenigii* (Retz.) Beauv. var. *major* Nees, Fl. Afr. Austr. 90. 1841.

I. arundinacea Cyrill., Pl. Rar. Neapol. 2 : 27. 1792; Hook. f. in Hook. f., Fl. Brit. India 7 : 106. 1896; *p.p.*; Prain, Bengal Pl. 2 : 1188. 1903, *p.p.*; Haines, For. Fl. Chotanagpur 569. 1910 & Bihar & Orissa pt. 5 : 1015. 1924, *p.p.*

Local name : Siru, Ulu.

Culms solid, glabrous, fistular at base, with usually densely bearded nodes. Leaves to 1.5 m long, narrowed towards base, tapering to an acuminate apex, scabrid on margins, white-villous at base; sheaths rather loose, glabrous or slightly pubescent, longer than internodes; ligules ciliate, dorsally silky, erose or cleft. Panicle 5-25 cm long, cylindric, dense. Spikelets lanceolate, 3-4 mm long; callus hairs white, soft, 2-3 times as long as spikelets; pedicels slender, swollen at tips, hairy. Lower glume lanceolate, firmer towards base, hyaline at apex, 3-9-nerved, dorsally villous; villae 2-3 times as long as glume; upper glume keeled, as long as lower. Lower floret empty; lemma nerveless, ciliate,epaleate, 1.5-2 cm long. Upper floret hermaphrodite; lemma ovate-lanceolate, nerveless, glabrous or minutely ciliate. Anthers orange. Stigmas 2, purple.

Fl. & Fr. : Apr. - June and Oct. - Dec.

Ecology : Very common; on open grounds, sandy river-beds, forest-edges, roadsides, etc.

Distribution : Hotter parts of India. Pakistan, throughout Old World Tropics, extending to Mediterranean and Middle East; also in Chili.

Specimens examined : National Park , 1170; Tandwa , 1442.

Uses : Plant is used in manufacture of paper. Culms are used for making ropes, brushes, mats, etc.; also employed as packing materials.

32. ISACHNE R. Br.

Key to the Species

1a.Florets equal in size and of same texture ... 1. *I. albens*

1b.Florets unequal in size and of different texture ... 2.*I. globosa*

1. ***Isachne albens** Trin., Sp. Gram. 1, t. 85. 1826; Hook. f. in Hook. f., Fl. Brit. India 7 : 22. 1896; Bor, Grass. Burma Ceylon India & Pakistan 579. 1960; Prakash & Jain in Jain *et al.*, Fl. India Fasc. 14 : 13. 1984.

Perennial. Culms erect, or sometimes spreading, branched, 30 - 130 cm tall. Leaf-blades flat, linear-lanceolate, rough, distinctly veined, with cartilaginous and toothed margins, 5-20 cm long and 0.7-2.5 cm width; sheaths loose, smooth, striate; ligule a ridge of stiff hairs. Panicle decompound, 8-40 cm long and to 20 cm broad; branches and pedicels capillary, at first erect,finallly spreading. Spikelets minute, globose, 1-2.5 mm long. Florets equal in size and of same texture. Lower glumes orbicular, glabrous, many-nerved, *ca* 1 mm long; upper similar to lower. Lemmas orbicular, pubescent on dorsal surface, with infolded margins. Lower floret male, or sometimes hermaphrodite; upper always hermaphrodite; paleas somewhat shorter than lemmas. Anthers minute.

Fl. & Fr. : Oct. - Jan.

Ecology : Rare; in rice-fields.

Distribution : India : Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh, Manipur, Nagaland, Meghalaya. Widely distributed in tropical and subtropical Himalayas and South- East Asia.

Specimens examined : Jhumri Telaiya, 861; Barkagaon, 883.

Use : Plant is eaten by cattle.

Note : Haines did not report this plant.

2. **Isachne globosa** (Thunb.) O. Kuntze, Rev. Gen. Pl. 2 : 778. 1891; Bor, Grass. Burma Ceylon India & Pakistan 580. 1960; Prakash & Jain in Jain *et al.*, Fl. Ind. Fasc. 14 : 22. 1984. *Milium globosum* Thunb., Fl. Japan 49. 1784.

Isachne australis R. Br., Prodr. 196. 1810; Hook. f. in Hook. f., Fl. Brit. India 7 : 24. 1896; Prain, Bengal Pl. 2 : 1172. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 284. 1924.

I. australis var. *effusa* Trin. ex Hook. f. in Hook.f, Fl. Brit. India 7 : 25. 1896.

I. globosa var. *effusa* (Trin. ex Hook. f.) Senaratna, Grass. Ceylon 109. 1956; Bor, Grass. Burma Ceylon India & Pakistan 580. 1960.

I. dispar auct. non Trin. : Hook. f. in Hook. f., Fl. Brit. India 7 : 26. 1896, *p.p.*; Bor, Grass. Burma Ceylon India & Pakistan 580. 1960.

Perennial. Culms ascending from a creeping branched base, 20-60 cm high. Leaf-blades lanceolate or linear-lanceolate, subscaberulous above or on both surfaces, ciliolate on margins, 3-8 cm long; sheaths smooth, ciliate on mouth and margins. Panicle lax, pyramidal, 5-10 cm long. Spikelets 2-flowered, subglobose, green or purplish, 1.5-2 mm across. Florets unequal in size and of different texture. Glumes subequal, 6-nerved or more, glabrous or setulose, 1.5-1.6 mm long. Lower floret male; lemma 1.5-1.7 mm long, flat with inflexed edge; palea similar to lemma, orbicular or broadly ellipsoid. Stamens 3, brown. Upper floret hermaphrodite or female; lemma 1-1.2 mm long. Caryopsis deep-pink, *ca* 0.8 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Very common; in rice-fields, marshy grounds, etc.

Distribution : India : Assam, Manipur, West Bengal, Bihar, Orissa, Madhya Pradesh, Uttar Pradesh, Rajasthan, Gujarat, Maharashtra, Goa, Daman, Nagar Haveli, Kerala, Karnataka, Tamil Nadu, Andhra Pradesh. South-East Asia, extending to Japan and Australia.

Specimens examined : Raja Rappa, 358; Chouparan, 1384; Pratappur, 2101.

Use : Plant is used as a fodder grass.

33. ISCHAEMUM L.

Key to the Species

1a. Lower glume of sessile spikelets with expanded winged margins, not rugose on back. Ligule 1-1.5 mm long ... 1. *I. indicum*

1b. Lower glume of sessile spikelets with inturned margins from base, rugose on back. Ligule 4-5 mm long ... 2. *I. rugosum*

1. **Isachaemum indicum** (Hoult.) Merr. in J. Arnold Arb. 19 : 320. 1938; Bor, Grass. Burma Ceylon India & Pakistan 180. 1960. *Phleum indicum* Houtt., Nat. Hist. II, 13 : 198, t. 90. f. 2. 1782.

Ischaemum ciliare Retz., Obs. Bot. 6 : 36. 1791; Hook. f. in Hook. f., Fl. Brit. India 7 : 133. 1896; Prain, Bengal Pl. 2 : 1196. 1903; Haines, For. Fl. Chota Nagpur 567. 1910 & Bot. Bihar & Orissa pt. 5 : 1022. 1924.

Ischaemum aristatum auct. non L.; Hook. f. in Hook. f., Fl. Brit. India 7 : 126. 1896, *p.p.*, excl. *I. imberbe* Retz.

Local name : Kander.

Perennial. Culms erect or decumbent, 30-60 cm tall, with usually bearded internodes. Leaf-blades linear, pubescent to villous on both surfaces, 5-15 cm long; sheaths glabrous or hirsute; ligule short, ciliate, membranous, truncate, 1-1.5 mm long. Racemes 2-3 together, rather stout, 2-5 cm long. Joints of rachis and pedicels strongly compressed, firm, straw-coloured, ciliate on one edge, straight or incurved, nearly as long as spikelets. Sessile spikelets oblong-lanceolate, 5-6 mm long; tips of lower node of callus bearded; lower glume obovate, glabrous, 4.5-5 mm long, with winged margins expanded below middle; wings ciliolate on upper surface; upper glume boat-shaped, 4.5-5 mm long; keels scabrid; awn *ca* 2 mm long; lower lemma hyaline, boat-shaped, glabrous, 3.7-4.2 mm long; palea linear-lanceolate, 2-nerved,

scabrid, 4-4.2 mm long. Anthers yellow, 2 mm long. Caryopsis 1.3-1.5 mm long, with persistent style. Pedicellate spikelet : upper lemma deeply notched, 3-nerved, with twisted 1.5-1.8 cm long awns; upper glume 5-nerved, 5-8 mm long; lower lemma 2-nerved, with ciliate margin.

Fl. & Fr. : Aug. - Nov.

Ecology : Very common; in rice-fields.

Distribution : Almost throughout India. South-East Asia.

Specimens examined : National Park, 95; Satgaon, 588.

Use : Plant is eaten by cattle.

2. **Ischaemum rugosum** Salisb., Icon. Stirp. Rar. 1, t. I. 1791; Hook. f. in Hook. f., Fl. Brit. India 7 : 127. 1896; Prain, Bengal Pl. 2 : 1196. 1903; Haines, For. Fl. Chota Nagpur 567. 1910 & Bot. Bihar & Orissa pt. 5 : 1021. 1924; Bor, Grass. Burma Ceylon India & Pakistan 184. 1960.

Annual. Culms branching at base, 15-100 cm tall; branches usually 2-nate, compressed, swollen at base. Leaf-blades flat, linear-lanceolate, with scabrid margins, 5-25 cm long; sheaths lax, auricles at throat passing into ligule, compressed, keeled, with ciliolate margins; ligules oblong, 4-5 mm long. Racemes usually 2 together, 3-8 cm long, erect; joints of rachis sub-claviform, trigonous. Sessile spikelet ovate-oblong, 3.5-6 mm long;callus thick, silky; glumes glabrous; lower glume herbaceous, flattened, thin at top, cartilaginous and shining at base, rolled, with convex rugose back having 5-6 transverse folds, scabrid-ciliate on margins, 5-5.5 × 2-2.5 mm; upper glume ovate, compressed laterally, keel acute, 3-nerved, scabrid. Lower floret neuter; lemma lanceolate, with inflexed margins, 2.5-5 mm long; palea a little shorter than lemma, 2-nerved. Upper floret : lemma ovate-oblong, bifid, 3-nerved; awn variable; palea ovate-lanceolate, nerveless, 2-2.5 mm long. Caryopsis broadly elliptic-oblong, brown, 2.2-2.5 mm long. Pedicellate spikelet 2.5-4.5 mm long; lower glume broadly winged, with 2-4 rugosities; upper floret : lemma entire, oblong, awned; palea as in sessile floret.

Fl. & Fr. : Sept. - Jan.

Ecology : Very common; in wet grassy places, borders of rice-fields, etc.

Distribution : Throughout India. Myanmar, Malesia, Siam to China.

Specimens examined : National Park, 466; Simaria, 1625; Ichak, 1838.

Uses : Plant is used as good fodder for cattle and horses. Grains are consumed by poor people in times of scarcity.

34. ISEILEMA Anders.

Iseilema prostratum (L.) Anders. in Nov. Act. Soc. Sci. Upsal. ser. 3, 2 : 251. 1856; Bor, Grass. Burma Ceylon India & Pakistan 188. 1960. *Andropogon prostratum* L., Mant. Alt. 304. 1771.

Andropogon wightii Nees ex Steud., Syn. Pl. Glum. 1 : 400. 1855.

Iseilema wightii (Nees ex Steud.) Anders. in Nov. Act. Soc. Sci. Upsal. ser. 3, 2 : 251. 1856; Hook. f. in Hook. f., Fl. Brit. India 7 : 218. 1896; Prain, Bengal Pl. 2 : 1208.1903; Haines, Bot. Bihar & Orissa pt.5: 1055. 1924.

Culms usually prostrate and rooting at base, finally ascending, branched below, 20-80 cm long. Leaf-blades linear, rounded at base, 6-12 cm long and 2-3 mm broad, scabrid above; sheaths loose, bearded at nodes, compressed, keeled, shorter than internodes; ligule short, ciliate. Panicle oblong, dense, spreading, decompound; rachis with bearded nodes; proper sheaths 0.8-1.3 cm long, linear-lanceolate. Involucral spikelets 3-3.5 mm long, compressed, lanceolate; pedicel short, bearded at base; lower glume 5-nerved, usually verrucose; upper glumes glabrous, 1-nerved, with inflexed ciliate margins. Lower floret absent. Upper floret male; lemma 2-3-toothed, nerveless. Pedicellate spikelets male or neuter. Sessile spikelets hermaphrodite, lanceolate, 1.5-3 mm long; lower glume with inflexed margins and scaberulous keels; upper glume

oblong-lanceolate, obliquely carinate, with scabrid keels; lower floret neuter; lemma linear; upper floret hermaphrodite; lemma epaleate.

Fl. & Fr. : Aug. - Nov.

Ecology : Common; on damp places, fields and field-borders.

Distribution : Throughout India. Myanmar.

Specimens examined : Mandu, 847; Hazaribagh, 1219; Koderma Forest, 1778.

Use : Plant is used as fodder, preferably as hay.

35. LEERSIA SW.

Leersia hexandra Sw., Prod. Veg. Ind. Occ. 21. 1788; Hook. f. in Hook. f., Fl. Brit. India 7 : 94. 1896; Prain, Bengal Pl. 2 : 1185. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 981. 1924; Bor, Grass. Burma Ceylon India & Pakistan 599. 1960.

Pharus ciliatus Retz., Obs. Bot. 5 : 23. 1789.

Leersia ciliata (Retz.) Roxb., Fl. Ind. 2 : 207. 1832.

Local name : Jangli dhan.

Culms 60-120 cm long, slender, smooth, striate, somewhat compressed, simple or branched, with hairy nodes. Leaf-blades flat, rigid, linear, acuminate, glaucous, scabrid on margins, 7-20 cm long and 4-10 mm broad; sheaths somewhat loose, scaberulous or smooth. Inflorescence an erect terminal panicle, slender, contracted, 5-10 cm long; axis and branches flexuous; branches few, erect or spreading; pedicels very short. Spikelets closely imbricate, oblong, 3-4 mm long. glumes reduced to a rim at apex of pedicel. Lemma dimidiate-oblong, 5-nerved, with ciliate keel and scabrid lateral nerves. Palea dimidiate, linear-oblong, 3-nerved, grasped by margins of lemma, ciliate on keels. Stamens 6. Caryopsis glabrous, narrow-oblong.

Fl. & Fr. : Oct. - Jan.

Ecology : Very common; in paddy fields,marshes, ponds, jheels, pools, etc.

Distribution : Throughout India. Tropics of the Old and New World.

Specimens examined : Hazaribagh, 1617; Ghanghree, 2176; Jhumri Telaiya, 2230.

Uses : Plant affords good forage when cut early. It is also used both as green feed and hay.

36. LEPTOCHLOA Beauv.

Leptochloa panicea (Retz.) Ohwi in Bot. Mag. Tokyo 55 : 311. 1941; Bor, Grass. Burma Ceylon India & Pakistan 517. 1960. *Poa panicea* Retz., Obs. Bot. 3 : 11. 1783.

Aira filiformis Koen. ex Roxb., Fl. Ind. 1 : 328. 1820.

Leptochloa filiformis auct. non Roem. & Schult. : Hook. f. in Hook. f., Fl. Brit. India 7 : 298. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1225. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 972. 1924.

Local name : Chanhel.

Culms slender, erect from a ± geniculate base, to 60 cm long. Leaf-blades narrow, flat, flaccid, thin, 10-25 cm long and to 1 cm broad; sheaths sparsely hairy; ligule very short, lacerate, ± 0.5 mm long. Panicle diffuse, 5-24 cm long; spikes 3-10 cm long, capillary. Spikelets subsessile, 1.2-1.5 mm long, distant nearly their own length on rachis. Lower glume 0.7-0.8 mm long, linear-lanceolate; upper glume 1-1.2 mm long; lemma a little shorter than upper glume, hairy on marginal nerves; palea 0.8-1 mm long, reduplicate. Caryopsis fusiform-oblong, 4-5 mm long.

Fl. & Fr. : Aug. - Nov.

Ecology : Common; in waste places, gardens, open fields, etc.

Distribution : Throughout India. Sudan to Transvaal and Natal, W. Africa, Pakistan, tropical Asia.

Specimens examined : Barkagaon, 1271; Chouparan, 1683; Pratappur Forest, 2110.

Use : Young plant is eaten by cattle.

37. OPLISMENUS Beauv.

Key to the Species

1a. Spikelets to 5 mm long. Awns smooth, viscid, filiform ... 2. *O. compositus*

1b. Spikelets to 2.5 mm long. Awns barbellate, capillary ... 1. *O. burmannii*

1. **Oplismenus burmannii** (Retz.) P. Beauv., Ess. Agrost. 54, 168 & 169. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 68. 1896; Prain, Bengal Pl. 2 : 1173. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 999. 1924; Bor, Grass. Burma Ceylon India & Pakistan 317. 1960; *Panicum burmannii* Retz., Obs. Bot. 3 : 10. 1783.

Panicum hirtellum Burm., Fl. Ind. 24, t. 12. f. 1. 1768, *non* L. 1753.

Local name : Nini.

Annual. Culms to 0.5 m long, ascending from a decumbent and rambling rooting base, simple or branched upwards. Leaf-blades lanceolate, slightly rounded at base, acutely acuminate at apex, flat, sparingly hairy, 2-5 cm long and 0.5-1.2 cm wide; sheaths prominently striate, ciliate along margins; ligules very short, truncate. Racemes 3-8, forming a panicle, ± secund, dense, to 1.6 cm long, on a slender, triquetrous

axis; rachis dorsally flat, silky hairy; pedicels 2-nate or solitary. Spikelets contiguous, oblong, to 2.5 mm long, one of a pair usually imperfect. Glumes subequal, 1.8-2 mm long, oblong, with pale, capillary, barbellate awns; lower glume 3-nerved, upper 5-7-nerved. Lower floret : barren; lemma lanceolate-oblong, awned, 7-nerved, ciliate upwards, epaleate. Upper floret : hermaphrodite, oblong-acute, brownish polished; lemma and palea papery, the former faintly 7-nerved. Stigmas red. Caryopsis *ca* 2.5 mm long, convex on back, flat on face.

Fl. & Fr. : Sept. - Nov.

Ecology : Very common; in shady banks, grazing grounds, in shade of trees near roadsides, etc.

Distribution : Throughout the plains of India. Tropics of both hemispheres.

Specimens examined : Hazaribagh, 389; Koderma Forest, 1792; Hunterganj, 2145.

Uses : Young plant is relished well by cattle; plant also yields a good hay.

2. **Oplismenus compositus** (L.) P. Beauv., Ess. Agrost. 54, 168 & 169. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 66. 1896; Prain, Bengal Pl. 2 : 1173. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 999. 1924; Bor, Grass. Burma Ceylon India & Pakistan 317. 1960. *Panicum compositum* L., Sp. Pl. 57. 1753.

Local name : Basahwa.

Perennial. Culms to 1 m long, ascending from a decumbent rooting base, terete, branched from base. Leaf-blades lanceolate to linear-lanceolate from a constricted and distinctly rounded base, acuminate, flat, dull green, hairy to velvety below, 4-12 cm long and 0.5-2 cm wide; sheaths striate, ciliate along margin; ligules short, truncate, ciliate. Racemes forming a panicle of to 18 cm long, secund or subsecund, decreasing in length; rachis flexuous, triquetrous, bearded at

base; pedicels 2-nate or solitary, short, stout, with few bristles. Spikelets lanceolate-oblong, acuminate, greenish, often with purple tips, 4-5 mm long; glumes *ca* 3 mm long, lanceolate-oblong, with smooth, filiform, viscid, purple awns, sparingly hairy; lower glume 5-nerved, with to 1.2 cm long awn; upper 7-9-nerved, with 2.5-3 mm long awn. Lower floret barren, equalling spikelet; lemma similar to upper glume, apiculate, 9-nerved; palea reduced or 0. Upper floret hermaphrodite, *ca* 3 mm long, whitish to brownish; Palea and lemma sub-coriaceous. Caryopsis dorsally compressed.

Fl. & Fr. : Oct. - Dec.

Ecology : Very common; in shady, grassy localities, roadsides, gardens, etc.

Distribution : Throughout India. Tropical regions of Old and New World.

Specimens examined : National Park , 387; Barkatta , 1693.

Use : Plant is grazed by cattle.

38. ORYZA L.

Key to the Species

1a. Spikelets persistent, awned or not ... 2. *O. sativa*

1b. Spikelets deciduous with age, always long-awned ... 1. *O. rufipogon*

1. ***Oryza rufipogon** Griff., Notul. 3 : 5. 1851; Bor, Grass. Burma Ceylon India & Pakistan 605. 1960.

Oryza fatua Koen. ex Trin. in Mem. Acad. Sci. Petersb. ser. 6, 2 : 177. 1839, *nom. nud.*

O. sativa L. var. *fatua* Prain, Bengal Pl. 2 : 1184. 1903.

O. nivara Sharma & Shastry in Ind. J. Gen. Pl. Breed 25 : 161. 1965.

Local name : Deodhan.

Annual. Culms to 2 m tall, spongy below, rooting at nodes below water surface. Leaf-blades flat, prominently nerved, scabrid on margins and main nerves, 18-40 cm long and 0.6-1 cm broad; sheaths striate, markedly inflated, smooth; ligule to 1 cm long, finally splitting. Panicle effuse; joints shortly bearded; branches and branchlets smooth or scabrid. Spikelets 0.8-1 cm long, falling with age. First and second lemmas similar, empty, 1-nerved, keeled, scabrid on margins, 2.2-2.5 mm long. Fertile lemma with a conical callus, coriaceous, punctate, striate, coarsely scabrid on keel and ridges, terminating in an coarsely scabrid, to 7 cm long awn. Palea similar to lemma, as long as or slightly longer. Caryopsis 4-5 mm long.

Fl. & Fr. : Sept. - Nov.

Ecology : Very common; in ditches, swamps, paddy fields, etc.

Distribution : India : Eastern and Central India and Tamil Nadu. Pantropic.

Specimens examined : Etkhori, 1461; Hazaribagh, 1579.

Uses : The grain is edible and is eaten in times of scarcity. Young plant is eaten by buffaloes.

2. **Oryza sativa** L., Sp. Pl. 333. 1753; Hook. f. in Hook. f., Fl. Brit. India 7 : 92. 1896, p.p.; Prain, Bengal Pl. 2 : 1184. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 980. 1924, *p.p.*; Bor, Grass. Burma Ceylon India & Pakistan 605. 1960.

Local name : Dhan, Chaval.

Annual. Culms 40-100 cm tall, rooting at lower nodes, smooth; nodes glabrous. Leaf-blades flat, scabrid below and on margins, 30-60 cm long and 6-8 mm broad; sheaths smooth, with ciliate auricles; ligule 0.8-1 cm

long, scarious, finally splitting. Panicle 15-30 cm long; rachis angled and channelled, scaberulous; pedicels angular, swollen at top. Spikelets persistent, ovate-oblong, 0.8-1.2 cm long, awned or not. Lower lemmas oblong-lanceolate, entire or toothed at top, epaleate. Fertile lemma as long as spikelet, hispid-ciliate, with short awn. Palea similar to lemma, acuminate. Caryopsis oblong, angular, 4-6 mm long, tightly enclosed in lemma and palea.

Fl. & Fr. : Sept. - Nov.

Ecology : Cultivated; also met with as an escape.

Distribution : Throughout the plains and hills of India. Pantropical.

Specimens examined : Hazaribagh, 1580; Jhumri Telaiya, 2004.

Uses : Grains are used as an important food for human beings. Broken grains, obtained during milling , are used as human and cattle food. Rice straw is used for making papers, cardboards, mats, etc.; also used as thatching. Rice-bran oil used for soaps, cosmetics and as an anticorrosion oil. Rice-husk is used as fuel, bedding material for animals and poultry, packing material, animal feed, etc., also used for preparing activated carbon, sodium silicate and silicon.

39. PANICUM L.

Key to the Species

1a.Spikelets to 1.5 mm long. Lower glume actuely acuminate ... 5. *P. walens*

1b.Spikelets over 1.5 mm long :

2a.Lower glume cuspidate-acuminate. Spikelets gaping widely at anthesis ... 4. *P. trypheron*

2b.Lower glume not cuspidate - acuminate. Spikelets not gaping :

3a. Annual, not stoloniferous. Spikelets ovate-oblong or elliptic ... 2. *P. psilopodium*

3b. Perennial. Stems below creeping or stoloniferous. Spikelets lanceolate :

4a. Leaf-blades broad, flat. Culms spongy, creeping and floating at base. Pedicels angular, scaberulous, with clavellate-truncate tips ... 1. *P. paludosum*

4b. Leaf-blades narrow, usually involute. Culms tough, stoloniferous at base. Pedicels glabrous, with small cupular tips ... 3. *P. repens*

1. **Panicum paludosum** Roxb., Fl. Ind. 1 : 310. 1820; Bor, Grass. Burma Ceylon India & Pakistan 329. 1960.

P. proliferum auct. non Lam. : Hook. f. in Hook. f., Fl. Brit. India 7 : 50. 1896, *p.p.*; Prain, Bengal Pl. 2 : 1179. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 5 : 995. 1924.

Perennial. Culms erect or ascending, creeping and floating at base, rooting at lower nodes, spongy, 60-90 cm long. Leaf-blades linear or ensiform, flat, rounded or subcordate at base, scaberulous on margins, many-nerved, 15-30 cm long and 0.6-1.5 cm broad; sheaths lax, striate, glabrous; ligule reduced to a ring of hairs. Panicle at first contracted, then spreading, 10-25 cm long; branches fasciculate below, trigonous, scabrous. Pedicels angular, scaberulous, clavellate-truncate at tips. Spikelets singly or in pairs, lanceolate, 3-4 mm long. Lower glume clasping, orbicular or kidney-shaped, white, 0.6-0.8 mm long; upper ovate, strongly 7-9-nerved, 3-4 mm long. Lower floret : lemma ovate-lanceolate, 9-nerved, 3-4 mm long; palea small, or absent. Upper floret sessile; lemma narrowly oblong, dorsally convex, ivory or pale-yellow, with involute margins, 2.5-3.5 mm long. Palea narrowly oblong, with inturned margins and auricled base, 2.5-3.5 mm long. Anthers to 1.5 mm long. Caryopsis narrowly ellipsoid, *ca* 1 mm long.

Fl. & Fr. : Aug. - Dec.

Ecology : Common; in marshy lowlands, rice fields, margins of tanks and other watercourses.

Distribution : Throughout India. Pakistan, Nepal, Sri Lanka, through Myanmar to S.E.Asia and Australia.

Specimens examined : Gola, 782; Chatra, 1098.

Uses : Plant provides a favourite fodder for elephants and buffaloes. Grains are used by hill tribes for making a cake-like preparation.

2. **Panicum psilopodium** Trin., Gram. Panic. 217. 1826; Hook. f. in Hook. f., Fl. Brit. India 7 : 46. 1896; Prain, Bengal Pl. 2 : 1179. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 993. 1924; Bor, Grass. Burma Ceylon India & Pakistan 329. 1960.

P. psilopodium Trin. var. *coloratum* Hook. f. in Hook. f., Fl. Brit. India 7 : 47. 1896; Haines, Bot. Bihar & Orissa pt. 5 : 993. 1924.

Local name : Chire kutke.

Annual. Culms usually tufted, simple or branched, glabrous, 30-60 cm long. Leaf-blades linear, flat, rounded at base, with cartilaginous margins, glabrous, smooth, 7.5-30 cm long and 4-8 mm broad; sheaths rather loose, compressed; ligule a lacerate membranous ring. Panicle 5-20 cm long; branches capillary, angled, scaberulous; pedicels cupular at tip. Spikelets in pairs or solitary, ovate-oblong or elliptic, flattened, 2 - 3.5 mm long, purplish. Lower glume orbicular, rotund, clasping, apiculate, 3-5-nerved, *ca* 1 mm long; upper 2-3.5 mm long, ovate-oblong, 11-nerved. Lower floret barren; lemma as long as spikelet, 9-nerved; palea oblong, 2-keeled, with inflexed margins. Upper floret : lemma oblong, pale-yellow, apiculate, with inflexed margins; palea slightly shorter. Anthers 1 mm long. Caryopsis ellipsoid, brown, *ca* 1.2 mm long.

Fl. & Fr. : July - Nov.

Ecology : Common; in wet waste lands, rice-fields, etc.

Distribution : Hotter parts of India. Himalayas, Pakistan, Myanmar, Sri Lanka and Malesia.

Specimens examined : Hazaribagh, 237; Pratappur, 943; Keredari, 1706.

Uses : Plant is used as cattle feed. Grains are used in preparation of alcoholic beverage.

3. **Panicum repens** L., Sp. Pl. ed. 2, 87. 1762; Hook. f. in Hook. f., Fl. Brit. India 7 : 49. 1869; Prain, Bengal Pl. 2 : 1179. 1903; Haines, For. Fl. Chota Nagpur 562. 1910 & Bot. Bihar & Orissa pt. 5 : 994. 1924; Bor, Grass. Burma Ceylon India & Pakistan 330. 1960.

Perennial. Culms tough, stoloniferous at base, erect or ascending, rooting at lower nodes, striate, simple or branched at base, glabrous, 0.5-1.2 m long. Leaf-blades distichous, linear-lanceolate, rounded or cordate at base, acuminate, usually involute, glaucous, stiff, rigid, 5 - 15 cm long, many-nerved, with cartilaginous margins; sheaths with ciliate margins; ligule a narrow hairy ring. Panicle ± contracted, irregularly branched, 7.5-20 cm long; branches numerous, erect, angular, solitary or 2-3-nate; pedicels glabrous, cupular at tip. Spikelets erect, solitary or in pairs, lanceolate, 2.5-3.5 mm long. Lower glume clasping, suborbicular, 0.5-0.7 mm long; upper ovate, convex, usually 5-7-nerved. Lower floret : lemma ovate, concave, 7-9-nerved; palea ovate, white, 2-2.3 mm long, with inflexed margins. Upper floret with a short stipe; lemma ovate-oblong, dorsally convex, 2-3 mm long; palea similar to lemma. Anthers purple, 1-1.2 mm long. Caryopsis oblong white, 2-4 mm long.

Fl. & Fr. : Aug. - Dec.

Ecology : Very common; in aquatic and semi-aquatic habitat, cultivated fields, etc.

Distribution : Throughout India. Tropical and subtropical areas of both hemispheres.

Specimens examined : Jhumri Telaiya,157; Raja Rappa,855; Simaria,1634.

Uses : Plant is fed to cattle both as green feed and as hay. It is a good grass for turfs and lawns.

4. **Panicum trypheron** Schult., Syst. Veg. 2, Mant. 244. 1824; Hook. f. in Hook. f., Fl. Brit. India 7 : 47. 1896; Prain, Bengal Pl. 2 : 1179. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 995. 1924; Bor, Grass. Burma Ceylon India & Pakistan 331. 1960.

Annual. Culms tufted, erect or geniculate at base, 15-90 cm tall. Leaf-blades linear, usually flat, acuminate, softly hairy, with smooth margins, 7-25 cm long and 4-6 mm broad; sheaths glabrous or hairy; ligule short, fimbriate. Panicle erect or nodding, effuse, lax, 10-25 cm long; rachis scaberulous; branches filiform, scaberulous, flexuous, bearing few spikelets, the lower fasciculate. Pedicels scaberulous, swollen at tip. Spikelets gaping widely, ovoid, glabrous, 2.5-3.5 mm long. Lower glume broadly ovate, cuspidate-acuminate, 5-nerved, 1.6-2.5 mm long; upper broadly ovate, recurved, 7-9-nerved, 2.5-3.5 mm long. Lower floret barren; lemma ovate, concave, 7-nerved, 2.3-3.3 mm long; palea linear-oblong, white.Upper floret sessile; lemma oblong, dorsally convex, 3-5-nerved, with narrowly inflexed margins, 2-3 mm long; palea same as lemma. Anthers to 1.5 mm long. Caryopsis ovoid, to 1 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Very common; in grassy covering of waste places, grazing fields, dry paddy fields, etc.

Distribution : Throughout the plains and hills of India. Pakistan, China, extending into South-East Asia.

Specimens examined : Chouparan, 1376; Jaynagar, 1507; Etkhori, 1876.

Uses : Plant is grazed by cattle. Grains are used for making breads in time of scarcity.

5. **Panicum walens** Mez. in Engl., Bot. Jahrb. 34 : 146. 1904; Clayton in Kew Bull. 20 : 264. 1966; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 166. 1982.

Panicum humile Nees ex Steud., Syn. Pl. Gram. 1 : 84. 1854, *non* Thunb. ex Trin. 1826; Hook. f., in Hook. f., Fl. Brit. India 7 : 48. 1896; Prain, Bengal Pl. 2 : 1179. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 996. 1924.

P. austroasiaticum Ohwi in Acta Phytotax. & Geobot. 11 : 45. 1942; Bor, Grass. Burma Ceylon India & Pakistan 324. 1960.

Dwarf annual. Culms tufted, erect or geniculate, slender, usually purplish, glabrous, 15-40 cm tall, branched usually from all nodes; branches usually fascicled, unequal. Leaf-blades linear, rounded at base, flat, flaccid, slightly scaberulous on margins, glabrous, 2-15 cm long and 3-5 mm broad; sheaths somewhat loose, hirsute, striate, ciliate on upper margins; ligule a minute, ciliolate rim. Panicle open and very loose, glabrous, to 10 cm long and 5 cm broad; branches and branchlets slender, scaberulous upwards; pedicels thickened at tips. Spikelets usually tinged with purple, 1.2-1.5 mm long. Lower glume obliquely lanceolate, acutely acuminate, 3-nerved, to 1 mm long; upper longer and broader, 3-5-nerved. Lower floret barren; lemma slightly shorter than upper glume, paler, 5-nerved; palea shorter than lemma. Upper floret oblong, to 1.5 mm long; lemma and palea crustaceous. Anthers purplish, to 1 mm long. Caryopsis elliptic, 0.8 mm long.

Fl. & Fr. : Aug. - Nov.

Ecology : Very common; in rice fields, moist grazing fields, etc.

Distribution : Punjab, Assam, Sikkim, Arracan, West Bengal, Bihar, Orissa, central and southern India. Tropics of South- East Asia and North tropical Africa.

Specimens examined : National Park, 146; Telaiya Dam, 639; Ichak, 1840.

Use : Plant is used as a good fodder for cattle and horses.

40. PASPALIDIUM Stapf

Paspalidium flavidum (Retz.) A. Camus in Lecomte, Fl. Gen. del' Indo-Chine 7 : 419. 1922; Haines, Bot. Bihar & Orissa pt. 5 : 1001. 1924; Bor, Grass. Burma Ceylon India & Pakistan 333. 1960.

Panicum flavidum Retz., Obs. Bot. 4 : 15. 1786; Hook. f. in Hook. f., Fl. Brit. India 7 : 28. 1896; Prain, Bengal Pl. 2 : 1176. 1903.

Local name : Chapri.

Culms 0.3-1.2 m long, decumbent-ascending, compressed. Leaf-blades linear-lanceolate, flat or rolled, acute-acuminate at apex, 7.5 - 12 cm long and 3-7 mm wide; sheaths longer than internodes, compressed, striate, inflated in lower leaves; ligules absent or represented by a rim of hairs. Racems 6-9, longer than internodes, distant, alternate, recurved. Common axis triquetrous, scaberulous on angles; rachis flattened, flexuous, with 2 rows of spikelets. Spikelets 2-20, ovate-oblong, pale-greenish, gibbous, 1.8-3.5 mm long; lower glume 1.5-1.8 mm across, ovate-suborbicular, clasping, 3-nerved; upper glume 1.5-2.5 mm across, suborbicular, clasping. Lower floret male or neuter; lemma convex, ovate-oblong, 3-nerved; palea ovate-oblong. Upper flaret hermaphrodite; lemma convex, ovate-suborbicular, mucronate, embracing palea; palea ovate-oblong, coriaceous. Lodicules quadrangular, very short.

Fl. & Fr. : June - Oct.

Ecology : Very common; in roadsides, fields, wet grassy places, ditches, etc.

Distribution : Throughout the moisture parts of plains and hills of India. Tropical Asia.

Specimens examined : Jhumri Telaiya, 158; Mandu, 698; Hunterganj, 2129.

Uses : Plant forms an excellent fodder. Grains are eaten in times of scarcity.

41. PASPALUM L.

Key to the Species

1a. Rachis narrower than distichous spikelets ... 1. *P distichum*

1b. Rachis as wide as the spikelets ... 2. *P. scrobiculatum*

1. ***Paspalum distichum** L., Syst. Nat. ed. 10, 2 : 855. 1759; Hook. f. in Hook. f., Fl. Brit. India 7 : 12. 1896; Prain, Bengal Pl. 2 : 1183. 1903; Bor, Grass. Burma Ceylon India & Pakistan 338. 1960.

Perennial, with subcompressed culms and slender rhizome, stoloniferous;stolons slender, subcompressed, to 1 m long; nodes dark, hairy. Leaf-blades flat, with rounded ciliate base, acuminate at apex, 3-12 cm long and 2-6 mm wide; sheaths loose, keeled, pilose on margins; ligule membranous, *ca* 3 mm long. Racemes 2, rarely 4, erect or reflexed, incurved, 1.5-7 cm long; rachis usually pedunculate in one, sometimes in both racemes, with long hairs in axils, triquetrous, scaberulous on margin. Spikelets solitary, rarely in pairs, 2.5-3.5 mm long, elliptic; lower glume occasionally developed. Upper glume and sterile lemma equal, 3-5-nerved, the former appressed-pubescent. Caryopsis elliptic, 2.5-2.8 mm long.

Fl. & Fr. : Sept. - Nov.

Ecology : Not common; in pasture lands, rice-fields, roadsides, etc.

Distribution : Throughout India; Tropics and Subtropics of the Old World.

Specimens examined : Hazaribagh, 233; Pratappur, 612; Chouparan, 1358.

Uses : Plant forms a valuable pasture grass and soil binder.

2. **Paspalum scrobiculatum** L., Mant. Pl. 1 : 29. 1767; Hook. f. in Hook. f., Fl. Brit. India 7 : 10. 1896; Prain, Bengal Pl. 2 : 1182. 1903; Haines, For. Fl. Chota Nagpur 560. 1910 & Bot. Bihar & Orissa pt. 5 : 1000. 1924; Bor, Grass. Burma Ceylon India & Pakistan 340. 1960; Cope in Nasir & Ali, Fl. W. Pakistan 143 : 213. 1982.

P. orbiculare Forst., Fl. Insul. Austr. Prodr. 7. 1786; Bor, Grass. Burma Ceylon India & Pakistan 340 : 1960.

P. commersonii Lam., Tab. Ency. Meth. Bot. 1 : 175. 1791, Bor, Grass.Burma ceylon India & Pakistan 335.1960

P. cartilageneum Presl, Rel. Haenk. 1 : 216. 1830; Bor, Grass. Burma Ceylon India & Pakistan 335. 1960.

Annual. Culms tufted, erect or decumbent, rooting at lower nodes, glabrous, 0.15-1.5 m long. Leaves linear-lanceolate, flat, acuminate, with keeled compressed base and scaberulous margins, 15-40 cm long and 2-8 mm wide; ligule very short. Spikes 2 to several, distant, erect or spreading, 1.5-15 cm long; rachis flattened, with scaberulous striate margins. Spikelets secund, in 2 rows, orbicular or subovoid, plano-convex, 2-3.5 mm long; lower glume absent; upper 2-3.5 mm long, concave, orbicular-subovate, 5 to 6-nerved. Lower floret neuter; lemma similar to upper glume, flat, 5-7- nerved. Upper floret hermaphrodite; lemma orbicular or subovate, shining, 2-3.5 mm long, with involute margins; palea similar to lemma, convex on back, with 2 large flaps on ventral surface. Lodicules quadrangular, emarginate. Anthers cream-coloured, 0.8-1 mm long. Caryopsis biconvex, pale, 2-2.2 mm long.

Fl. & Fr. : Oct. - Nov.

Ecology : Very common; in paddy fields.

Distribution : Throughout the hotter parts of India. All the warm countries.

Specimens examined : Jhumri Telaiya, 159; Raja Rappa,386; Tandwa, 1421.

Use : Plant is used as fodder for cattle.

42. PENNISETUM Rich.

Pennisetum pedicellatum Trin. in Mem. Acad. Sci. Petersb. ser. 6, 3 : 184. 1834; Hook. f. in Hook. f., Fl. Brit. India 7 : 86. 1896; Prain, Bengal Pl. 2 : 1169. 1903; Haines, For. Fl. Chota Nagpur 559. 1910 & Bot. Bihar & Orissa pt. 5 : 986. 1924; Bor, Grass. Burma Ceylon India & Pakistan 346. 1960.

Culms branched from base and above, 50-150 m long. Leaf-blades sparsely hairy, 18-30 cm long and 0.6-2 cm broad. Sheaths almost smooth below. Spikes 5-15 cm long, conspicuous by involucral tufts of densely plumose bristles. Spikelets solitary or geminate, shortly pedicellate, 4-5 mm long. Bristles in sessile groups of 15-20, very unequal, longest, *ca* 1.2 cm long, inner densely cottony-villous in lower half or three-fourth. Lower glume oblong, woolly, nerveless, *ca* 0.5 mm long; upper glume oblong, apiculate, 5-7-nerved, with tripartite apex. Lower floret male; lemma 5-nerved, with toothed tip, 4-4.5 mm long; palea 3-5-nerved, 3-3.5 mm long. Upper floret hermaphrodite; lemma lanceolate, 5-nerved, 3-3.5 mm long; palea may or may not be present. Caryopsis 2-2.5 mm long.

Fl. & Fr. : Sept. - Nov.

Ecology : Very common; in forests, roadsides, etc.

Distribution : West Bengal, Bihar, Madhya Pradesh and Tamil Nadu. West Africa.

Specimens examined : Jhumri Telaiya, 674;Chatra,1089; Patratu, 1735.

Uses : Plants forms a good fodder grass for horses and cattle. It is also used as a hay.

43. PEROTIS Ait.

Perotis indica (L.) O. Kuntze, Rev. Gen. Pl. 2 : 787. 1891; Bor, Grass. Burma Ceylon India & Pakistan 611. 1960. *Anthoxanthum indicum* L., Sp. Pl. 28. 1753. **(Fig.15)**

Perotis latifolia Ait., Hort. Kew. 1 : 85. 1789; Roxb., Fl. Ind. 1 : 239. 1820; Hook. f. in Hook. f., Fl. Brit. India 7 : 98. 1896; Prain, Bengal Pl. 2 : 1186. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 978. 1924.

Annual or sub-perennial, tufted, wiry. Culms erect from a geniculate base, to 45 cm high. Leaf-blades ovate-lanceolate, flat, cordate at base, acute at apex, spinulose on margins, 1-2.5 cm long and 0.4-1 cm broad; sheaths short, loose, striate, smooth, glabrous, with scarious margins; ligule a minute, membranous ridge, with erose or ciliate margin. Raceme terminal, 7-15 cm long, slender; rachis simple, scabrid. Spikelets 2.5-4 mm long; callus conical. Glumes subequal, 2.5-4 mm long, linear, scabrid; awn scabrid, purple, to 1.5 cm long. Lemmas narrow-lanceolate, to 1 mm long. Paleas narrow, about as long as lemmas. Stamens 3. Styles 2. Lodicules 2. Caryopsis linear, terete, nearly as long as glumes and free within them.

Fl. & Fr. : Oct. - Dec.

Ecology : Not common; in overgrazed sandy pasture lands.

Distribution : Lower Himalayas, Plains of India. Nepal, Sri Lanka, Myanmar, Malesia to South-East Asia.

Specimens examined : Mandu, 1348; Hazaribagh, 1595.

Use : Plant forms a good fodder grass relished by stock at all stages.

44. PHALARIS L.

***Phalaris minor** Retz., Obs. Bot. 3 : 8. 1783; Hook. f. in Hook. f., Fl. Brit. India 7 : 221. 1896; Bor, Grass. Burma Ceylon India & Pakistan 616. 1960.

Annual. Culms erect or ascending, 30-90 cm long, stout or slender, leafy. Leaf-blades linear, acuminate, glabrous, 15-25 cm long and 1 - 1.5 cm broad; sheath smooth; ligule oblong, scarious. Panicle dense, ovoid or cylindric, green, 6-9 cm long and 1.5-2 cm in diam. Spikelets ellipsoid, shortly pedicellate, shining, 5-6 mm long and 3-3.5 mm broad. Glumes acuminate; wings irregularly crenate or serrulate. Fertile lemma ovate, silky, with one bristle-like imperfect glume at base. Palea lanceolate, ciliate at top. Anthers pale yellow. Caryopsis ovoid, apiculate, 1.8-2 mm long.

Fl. & Fr. : Feb. - Apr.

Ecology : Not commmon; in fallow fields.

Distribution : Kashmir, plains of western, central and eastern India. Mediterranean region to Baluchistan.

Specimen examined : Ghanghree, 2162.

Uses : Plant is consumed by dairy cattle. Grains are used as a bird feed.

45. PHRAGMITES Trin.

Phragmites karka (Retz.) Trin. ex Steud., Nom. Bot. ed. 2, 2 : 324. 1841; Hook. f. in Hook. f., Fl. Brit. India 7 : 304. 1896; Prain, Bengal Pl. 2 : 1218. 1903; Haines, For. Fl. Chota Nagpur 583. 1910 & Bot. Bihar & Orissa pt. 5 : 952. 1924; Bor, Grass. Burma Ceylon India & Pakistan 416. 1960. *Arundo karka* Retz., Obs. Bot. 4 : 21. 1786.

Local name : Narkul.

Very large grass, to 7 m tall. Culms close-jointed, hollow, usually widely spreading by means of long stolons. Leaves distichous, linear to broadly lanceolate, with subulate tip; ligule a ridge of short stiff hairs. Panicle 15-60 cm long and 10-40 cm broad,silky-hairy at base; branches filiform, scaberulous. Spikelets grey or brown, 1-1.7 cm long, several-flowered. Lower glume oblong-lanceolate, 1-nerved, 2-2.5 mm long; upper glume oblong-lanceolate, 3-nerved, 5-6 mm long. Lower lemma narrowly oblong-lanceolate, convolute, 1-1.25 cm long; upper lemmas subulate-lanceolate, subaristate, successively a little shorter than lower; paleas to 3 mm long, usually ending in two short horns. Rachilla above lowest lemma penicillate. Stamens 3; anthers yellow. 2-2.5 mm long. Caryopsis narrowly ellipsoid, purplish,1.2-1.5 mm long.

Fl. & Fr. : Sept. - Dec.

Ecology : Very common; along banks of rivers and canals, marshy places, valleys of hills, etc.

Distribution : Throughout India. Myanmar, Sri Lanka, extending to Southeast Asia and North Australia.

Specimens examined : Katkamasandi,1412; Hazaribagh, 1620; Jhumri Telaiya, 1726.

Uses : Plant yields a paper-pulp for manufacturing writing and printing papers. Culms are employed for thatching and for making mats, baskets, chair, fences and fish-traps. Panicles are used for making brooms. Young plant is eaten by cattle. Rhizomes and roots are used as diuretic, diaphoretic and in diabetes.

46. POGONATHERUM P. Beauv.

Pogonatherum paniceum (Lam.) Hack. in Allg. Bot. Z. 12 : 178. 1906; Bor, Grass. Burma Ceylon India & Pakistan 202. 1960. *Saccharum paniceum* Lam., Encycl. Meth. Bot. 1 : 595. 1785.

P. saccharoideum P. Beauv., Ess. Agrost. 176. & 177. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 141. 1896; Prain, Bengal Pl. 2 : 1197. 1903; Haines, For. Fl. Chota Nagpur 569. 1910 & Bot. Bihar & Orissa pt. 5 : 1017, 1924.

Culms tufted, 10-50 cm tall; nodes shining. Leaf-blades soft, pale-green, linear or linear-lanceolate, rounded at base, acuminate at apex, older ones flat, 2-7 cm long and 1-4 mm wide, scabrid or scaberulous; sheaths lax, sub-compressed, smooth; throat fimbriate; ligules reduced. Raceme 1.5-3 cm long; joints and pedicels 1-1.5 mm long, depressed-trigonous, white-hairy on margins. Sessile spikelets linear-oblong, 2.5 - 3 mm long; callus small, with few white hairs; lower glume linear-oblong, truncate at top, convex on back, 2-3 mm long, 2-3-nerved, ciliate below apex; upper glume lanceolate, obtuse, 2.5-3 mm long; keel scabrid or hispid, hairy at apex; awn 1-1.4 mm long. Lower floret : lemma oblong-ovate, nerveless, ciliate at top, 1.5-2.5 mm long; palea linear-oblong, 2-toothed. Upper floret : lemma linear, toothed, nerveless. Stamens mostly 2. Caryopsis linear, 1.2-1.5 mm long. Pedicellate spikelets usually smaller than sessile; lower floret absent; upper female, rarely male or neuter.

Fl. & Fr. : Sept. - Dec.

Ecology : Common; along rocky banks of streams and watercourses.

Distribution : Throughout India.Myanmar, Sri Lanka, Bhutan, China and Malesia.

Specimens examined : National Park, 482; Keredari : 654; Koderma Forest, 1780.

47. POLYPOGON Desf.

Polypogon monspeliensis (L.) Desf., Fl. Atlant. 1 : 67. 1798; Hook. f. in Hook. f., Fl. Brit. India 7 : 245. 1897, *p.p.*; Prain, Bengal Pl. 2 : 913. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 976. 1922; Bor, Grass.Burma Ceylon India & Pakistan 403. 1960. *Alopecurus monspeliensis* L., Sp. Pl. 61. 1753.

Culms tufted, stout or slender, from a geniculate base, 15-60 cm long. Leaves linear, flat, scabrid; sheaths striate, inflated, scaberulous; ligule lanceolate, ciliolate, to 6 mm long. Panicle cylindric, 3.5-12 cm long, light green or straw-coloured; branches scaberulous; pedicels disarticulating near base. Spikelets 2-2.5 mm long. Glumes subequal, linearly oblanceolate-oblong, shortly 2-lobed or emarginate, scaberulous or ciliolate, with to 8 mm long awn. Lemma ovate, 1.2-1.3 mm long, minutely 2-4-mucronulate, obscurely nerved; awn as long as lemma or shorter or absent. Palea 2-toothed or 2-mucronulate. Caryopsis subterete, grooved, 1.3-1.5 mm long.

Fl. & Fr. : Mar. - May.

Ecology : Common; on sandy dried river-beds, waste sandy grounds, etc.

Distribution : India : Jammu and Kashmir, Himachal Pradesh, Punjab, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, West Bengal,

Meghalaya, Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu. Europe and temperate parts of Asia and Africa.

Specimens examined : Chatra, 830; Ramgarh, 1148.

Uses : Plant affords rich feeding for grazing animals. Sometimes it is cultivated in gardens for its beautiful panicle.

48. PSEUDOPOGONATHERUM Camus

Pseudopogonatherum contortum (Brongn.) Camus in Lecomte, Gen. del'Indo-Chine 7 : 255. 1922; Bor, Grass. Burma Ceylon India & Pakistan 204. 1960. *Pogonatherum contortum* Brongn. in Duperr., Voy. Coq. Bot. 90, t. 17. 1831.

Pollinia articulata Trin. in Mem. Acad. Sci. Petersb. ser. 6, 2 : 273. 1832; Hook. f. in Hook. f., Fl. Brit. India 7 : 109. 1896; Prain, Bengal Pl. 2 : 1190. 1903.

Puliculum articulatum (Trin.) Stapf ex Haines, Bot. Bihar & Orissa pt. 5 : 1018. 1924.

Culms 20-50 cm tall, densely tufted, erect; internodes shortly exserted at top. Leaves flexuous, acuminate, scabrous, subdilated at base, 10 - 30 cm long and 2-5 mm broad, with prominent median nerve below; sheaths rounded, glabrous; ligules shortly ciliate. Racemes 3-20, close, alternate or opposite, silky white, suberect, 4-6 cm long; rachis glabrous on back; joints equal to pedicel in length. Spikelets all pedicellate, lanceolate, 1.5-2.5 mm long; callus 0.4-0.5 mm long, with 0.5-0.8 mm long white hairs. Lower glume papyraceous, shining, with 2 sharp teeth, with narrowly inflexed margins, slightly defelxed between keels. Upper glume ovate-lanceolate, keeled, 1-nerved, with margins close to keels, awned. Lower floret : lemma 0.8-1.2 cm long, nerveless. Upper floret : lemma 1-nerved, almost entire or bifid; palea absent. Lodicules 2. Stamens 3. Stigmas short.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; in forests, open hills, etc.

Distribution : Plains of lower Gangetic valley, Bihar, Chota Nagpur, Sikkim, Khasia hills and Nilghiri hills. Widespread in Southeast Asia extending to Australia and China.

Specimens examined : Hazaribagh, 1220; Jhumri Telaiya, 1724.

49. ROTTBOELLIA L. f., *nom. cons.*

Rottboellia cochinchinensis (Lour.) Clayton in Kew Bull. 35 : 817. 1981. *Stegosia cochinchinensis* Lour., Fl. Cochinch. 1 : 51. 1790.

R. exaltata L. f., Suppl. 114.1781, non (L.) L.f. 1779; Hook. f. in Hook. f., Fl. Brit. India 7 : 156. 1896; Prain, Bengal Pl. 2 : 1192. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1059. 1924; Bor, Grass. Burma Ceylon India & Pakistan 206. 1960.

Local name : Bhursali, Barsali.

Culms to 3 m tall, branched, terete with a channel facing the branches. Leaf-blades linear-lanceolate, tapering to a long fine point, somewhat flaccid, smooth below, scabrid above and along margins, 30-45 cm long and 1.2-2.5 cm wide; sheaths terete, tight or widened upwards, hirsute, striate; ligules brown, stout, rounded, ciliolate. Racemes 7.5-15 cm long, stiff, pale yellowish-green; joints 5-8 mm long, rounded on back, concave on inner face, smooth, disarticulating with an orbicular scar; pedicels shorter than joints, rounded on back, concave on inear face. Sessile spikelet ovate-lanceolate, glabrous, 6-8 mm long; callus broad, smooth. Lower glume entire or minutely 2-toothed, usually narrowly winged near emarginate apex, with about 9 faintly visible intracarinal nerves on inear surface; upper glume very broad in profile, about 11-nerved. Lower floret: lemma oblong-lanceolate, glabrous, acute, 5-6 mm long; palea similar to lemma, rigid, 2-nerved. Upper floret : lemma slightly shorter than that of

lower floret, boat-shaped, obliquely ovate in profile; palea narrowly oblong, nerveless, nearly as long as lemma. Caryopsis 2.5-3 × 1.5-2 mm.

Fl. & Fr. : Aug. - Nov.

Ecology : Common; in wet cultivated fields, grassy open places of forests, etc.

Distribution : Plains and lower hills of India and Andaman Islands. Throughout Old World Tropics and introduced to the Caribbean.

Specimens examined : Keredari, 651; Bishnugarh, 1117; Ghanghree, 2160.

Uses : Plant is relished by cattle, also used as hay and silage. Culms are used for making mats.

50. SACCHARUM L.

Key to the Species

1a. Culms with silky appressed hairs below the panicle. Lower and upper glumes of sessile spikelets not dorsally villous ... 2. *S. spontaneum*

1b. Culms glabrous below the panicle. Lower and upper glumes of sessile spikelets dorsally villous ... 1. *S. benghalense*

1. Saccharum benghalense Retz., Obs. Bot.: 16. 1789; Bor, Grass. Burma Ceylon India & Pakistan 211. 1960.

S. munja Roxb., Fl. Ind. 1 : 250. 1820; Haines, Bot. Bihar & Orissa pt. 5 : 1012. 1924.

S. arundinaceum Retz. var. *ciliaris* (Anderss.) Prain Bengal Pl. 2 : 1189. 1903; Haines, For. Fl. Chota Nagpur 571. 1910.

S. arundinaceum auct. non Retz. : Hook.f, in Hook.f. Fl. Brit. India 7 : 119. 1896, *p.p.*

Local name : Munj.

Culms strong, erect from a stout rootstock, branching after second year, 3-5 m tall and 1-1.5 cm in diam. glabrous below the panicle; internode solid. Lower leaf-blades 1-2 m long and 2-3 m broad, mostly basal, with white midrib and hispidly ciliate margins; upper cauline ones tapering to a setiform tip, villous near ligule; sheaths bearded about mouth; ligule short, hairy. Panicle thyrsoid, 30-100 cm long, erect, purple to cream-coloured; rachis angular or sulcate; branches sub-verticillate, compound, clothed with soft cream-coloured hairs. Spikes 12-30 cm long. Rachis of spikes and pedicels of spikelets densely silvery-hairy. Spikelets lanceolate, pale green violet or brownish, mostly exceeding the internodes of rachis, 4-6 mm long; hairs of callus silky, much shorter than spikelet. Sessile spikelet: longer than pedicel of pedicelled spikelet; lower glume lanceolate, cuspidately acuminate, 2-keeled, dorsally villous above; upper glume shorter than lower, dorsally villous, lanceolate, shortly acuminate; lower floret empty, upper bisexual; lemma oblong-lanceolate, acuminate, 3-3.5 mm long; palea broader than lemma, mucronulate, ciliolate. Anthers yellow or purple, 2-2.5 mm long. Caryopsis 1.8-2 mm long. Upper glume of pedicelled spikelet villous dorsally; villi usually overtopping glume to twice its length.

Fl. & Fr. : Oct. - Dec.

Ecology : Common; along river-banks, open forests, roadsides, railway tracks, etc.

Distribution. : India : North, North-Western and Central India, Bihar, Orissa and West Bengal.

Specimens examined : Ramgarh, 1150; Tandwa 1888.

Use : Plant yields a fibre used for cordage and ropes, baskets, mats,

etc. Leaves are used for thatching and are a source of paper-pulp. Young leaves are used as fodder. Lower thicker part of culms is used for cheap chairs, stools, tables and baskets.

2. Saccharum spontaneum L., Mant. Alt. 183. 1771; Hook.f. in Hook.f., Fl. Brit. India 7 : 118. 1896; Prain, Bengal Pl. 2 : 1188. 1903; Haines For. Fl. Chota Nagpur 570. 1910 & Bot. Bihar & Orissa pt. 5 : 1011. 1924; Bor, Grass. Burma Ceylon India & Pakistan 214. 1960.

Local name : Kans, Kas.

Culms with several nodes, solid, smooth, polished, with silky appressed hairs below panicle, 1-4 m high. Leaf-blades erect, narrowly linear, rigid, acuminate, capillary at tip, with scabrid, usually involute margins, 45-170 cm long and 4-5 mm broad; sheaths auricled, woolly on margins and towards throat; ligule ovate, membranous. Panicle dense, contracted, 45-90 cm long; lower branches 4-5- nate, upper 1-2 -nate; branchlets filiform, silky-hairy; pedicels ciliate, 1.5-3 mm long. Spikelets lanceolate, muticous, 3-6 mm long; callus small, silky-hairy. Lower glume lanceolate, entire or 2-toothed, with shallowly inturned margins, 2-nerved; upper glume oblong-ovate, 1-nerved, with ciliate margins and keel. Lower floret empty; lemma ovate-lanceolate, ciliate, nerveless, 3-6 mm long; upper floret hermaphrodite; lemma usually reduced, nerveless; palea small, ovate, ciliate. Lodicules ciliate on margins. Stigmas longer than styles.

Fl. & Fr. : Sept. - Nov.

Ecology : Very common; along river beds and banks, swampy grounds, etc.

Distribution. : Throughout the warmer parts of India. Warmer regions of Old World.

Specimens examined : Raja Rappa , 379; Barkattwa , 1694; National Park, 2026.

Uses : Young part of the plant is used as fodder only in times of scarcity. Plant yields a good paper-pulp. Culms are used for thatching.

51. SETARIA Beauv.

1a. Involucre-bristles retrorsely barbed. Upper glume as long as upper lemma, the latter finely granular or rugulose ...3. *S. verticillata*

1b. Involucre-bristles antrorsely barbed :

2a. Upper glume as long as upper lemma, the latter quite smooth ... 4. *S. viridis*

2b. Upper glume shorter than upper lemma, the latter rugose :

3a. Inflorescence a narrow panicle, lobed in lower part, tapering upwards ...2. *S. intermedia*

3b. Inflorescence a cylindrical false spike ...1. *S. glauca*

1. **Setaria glauca** (L.) P. Beauv., Ess. Agrost. 51, 169 & 178. 1812; Hook.f. in Hook.f., Fl. Brit. India 7 : 78. 1896; Prain, Bengal Pl. 2 : 1170. 1903; Haines, For. Fl. Chota Nagpur 560. 1910 & Bot. Bihar & Orissa pt. 5 : 988. 1924; Bor, Grass. Burma Ceylon India & Pakistan 360. 1960. *Panicum glaucum* L., Sp. Pl. 56. 1753.

Local name : Bandra.

Annual. Culms loosely tufted, geniculately ascending or erect, branched at base, 30-60 cm tall. Leaf-blades linear, slightly contracted at base, 30-60 cm tall. Leaf-blades linear, slightly contracted at base, flat, flaccid, glabrous or sparsely hairy at base, slightly rough on margins, 5 - 30 cm long and to 1 cm wide; leaf-sheaths thin, lower compressed and finely keeled, upper terete, glabrous, smooth; ligule reduced to a ciliate rim. Inflorescence a cylindrical false spike, dense, fulvous, to 10 cm long and 1 cm wide; rachis terete, minutely pubescent; branches reduced to a

sessile involucre each supporting a solitary perfect spikelet. Bristles 6-8 per involucre, very unequal, slender, rigid, antrorsely barbed, pale at base, to 1 cm long. Spikelets oblong-elliptic, turgid when mature, 2-3.7 mm long. Lower glume tightly appressed, ovate, 3-nerved, 1-1.2mm long; upper similar to lower, 5-nerved. Lower floret : lemma 2-2.5 mm long; palea elliptic, marginately keeled, 2-2.3 mm long. Upper floret : lemma transversely rugose, yellow or orange, 2-2.5 mm long; palea granular-punctate, with stout keels. Caryopsis ellipsoid, plano-convex, 1-1.2 mm long.

Fl. & Fr. : July - Oct.

Ecology : Very common; in grassy places, fields, grounds, roadsides, etc.

Distribution : Throughout India. Native of warm temperate zones of Old World, introduced into America, Australia and other countries.

Specimens examined : National Park, 400; Simaria, 804; Jhumri Telaiya, 2008.

Uses : Plant is used as good fodder. Grains are consumed as food; also used for making alcohol. Plant also forms a good lawn grass.

2. **Setaria intermedia** Roem. & Schult., Syst. Veg. 2 : 489. 1817; Hook. f. in Hook. f., Fl. Brit. India 7 : 79. 1896; Prain, Bengal Pl. 2 : 1170. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 989. 1924.

Panicum tomentosum Roxb., Fl. Ind. 1 : 303. 1820.

P. intermedium (Roem. & Schult.) Roth, Nov. Pl. Sp. 47. 1821, *non* Vahl ex Hornem 1813.

Setaria tomentosa (Roxb.) Kunth, Rev. Gram. 1 : 47. 1929; Bor, Grass. Burma Ceylon India & Pakistan 365. 1960.

Annual. Culms tufted, geniculate, minutely scabrid, to 1 m high. Leaf-blades linear, rounded at base, flat, flaccid, hairy, rough on margins; sheaths thin, ciliate along margins, usually bearded at mouth, somewhat keeled and compressed; ligule reduced to a long-ciliate rim. Panicle straight or

flexuous, ± loose, narrow, lobed in lower part, tapering upwards, 2.5 - 10 cm long; lower branches to 1.5 cm long, upper reduced to subsessile clusters of usually 2 or solitary spikelets supported by antrorsely scabrid bristles of 3-3.5 mm long; pedicels with discoid tips. Spikelets ovate-elliptic, 2-2.5 mm long. Lower glume ovate, half as long as spikelets; upper elliptic, concave, 2/3 length of upper floret. Lower floret barren; lemma elliptic-oblong, dorsally compressed; palea elliptic, shorter than lemma, marginately keeled. Upper floret : lemma boat-shaped, transversely rugose; palea slightly rugose. Caryopsis ovoid, plano-convex, 1.2 - 1.5 mm long.

Fl. & Fr. : July - Oct.

Ecology : Common; in damp shady places, gardens, etc.

Distribution : India : Himalaya, Punjab to West Bengal, Assam, Bihar, Orissa, Central and Southern India. Myanmar, Sri Lanka, extending to Malesia and Polynesia.

Specimens examined : Katkamasandi, 1401; Ghanghree, 2164.

Use : Plant is used as cattle feed.

3. **Setaria verticillata** (L.) P. Beauv., Ess. Agrost. 51, 178. 1812; Hook.f. in Hook.f., Fl. Brit. India 7 : 80. 1896; Prain, Bengal Pl. 2 : 1170. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 989. 1924; Bor, Grass. Burma Ceylon India & Pakistan 365. 1960.*Panicum verticillatum* L., Sp. Pl. ed. 2, 82. 1762.

Annual. Culms loosely tufted, geniculately ascending, 4-9 -noded, with mostly exserted, compressed and usually deeply channelled nodes, to 2 m high. Leaf-blades linear-lanceolate, flat, usually flaccid, loosely pilose, rough on margins and on nerves, 5-30 cm long and 0.5-1 cm wide; leaf-sheaths thin, striate, hairy, usually compressed and keeled upwards; ligule short, ciliate. Panicle 2.5-12.5 cm long and 0.5-3 cm,wide, greenish, coarsely bristled; axis angular, rough and usually pubescent;

branches spirally arranged, terminating in a bristle, lower bearing perfect spikelets in clusters of 2-3 or solitary, each cluster supported by 2-4 bristles; bristles scabrid, retrorsely barbed, to 1 cm long. Spikelets oblong, 2-2.5 mm long, pale green. Lower glume ovate, 0.8-1 mm long; upper glume 2-2.5 mm long, 5-7- nerved. Lower floret barren; lemma similar to and as long as upper glume; palea small or absent. Upper floret : lemma finely granular or rugulose, palea same as lemma. Caryopsis ellipsoid, white-translucent, over 1.8 mm long.

Fl. & Fr. : Apr. - June and Sept. - Nov.

Ecology : Common; in damp shady places of ravines and river-banks.

Distribution : Throughout India. Tropical and temperate regions of the Old World, introduced into America.

Specimens examined : Barhi, 1397; Ghanghree, 2177.

Uses : Young plant is grazed by cattle. Grains are consumed as food by tribals in times of scarcity.

4. **Setaria viridis** (L.) P. Beauv., Ess. Agrost. 51, 171 & 178. 1812; Hook. f. in Hook. f., Fl. Brit. India 7 : 80. 1896; Bor, Grass. Burma Ceylon India & Pakistan 365. 1960. *Panicum viride* L., Syst. Nat. ed. 10, 2 : 870. 1759.

Annual. Culms loosely tufted, slender, erect or geniculately ascending, branched from base, scaberulous below inflorescence. Leaf-blades linear-lanceolate, contracted at base, flat, scaberulous on upper surface and margins, 3-20 cm long and 0.5-1 cm wide; sheaths terete, slightly keeled upwards; ligule reduced to a ciliate rim. Panicle dense, greenish, 2-5 cm long; rachis terete, puberulous; branches reduced to involucres each supporting a cluster of 2-6 spikelets, half being imperfect; bristles to 14 in each cluster, unequal, antrorsely barbed, to 1 cm long. Spikelets oblong, pale greenish, 2-2.5 mm long. Glumes very unequal; lower ovate, 1-nerved, 0.7-0.8 mm long; upper 5-7-nerved, 2-2.5 mm long. Lower floret barren;

lemma similar to and as long as upper glume, depressed; palea 0.5-0.6 mm long. Upper floret; lemma oblong, as long as upper glume, pale, smooth. Stamens 3. Caryopsis ellipsoid, plano-convex, greyish, 1.2-1.5 mm long.

Fl. & Fr. : Aug. - Oct.

Ecology : Not common; in open grassy fileds.

Distribution : India : Temperate Himalaya, Gengetic plains and Nilgiri hills. Cooler parts of the Old World, escaped as a weed in New World.

Specimens examined : Hazaribagh, 1221; Barhi, 1814.

Use : Plant is used as hay.

52. SPOROBOLUS R. Br.

Sporobolus diander (Retz.) P. Beauv., Ess. Agrost. 26, 147 & 178. 1812; Hook.f. in Hook.f., Fl. Brit. India 7 : 247. 1896; Prain, Bengal Pl. 2 : 1213. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 973.1923; Bor, Grass. Burma Ceylon India & Pakistan 629. 1960. *Agrostis diander* Retz., Obs. Bot. 5 : 19. 1789 ('diandra').

Sporobolus indicus (L.) R. Br. var. *diander* (Retz.) Jov. & Gued. in Taxon 22 : 163. 1973.

Local name : Ciriya-ka-dana.

Culms slender, tufted, smooth, glabrous, 25-80 cm long. Leaves narrowly linear, usually flat, sometimes convolute, glabrous with entire margins, to 25 cm, long and 2-3 mm broad; sheaths smooth, ribbed, lower short, upper long; ligule a line of hairs. Panicle very narrowly pyramidal, 10-30 cm long; branches spreading, solitary or fascicled. Spikelets minute, spindle-shaped, *ca* 1.5 mm long. Lower glume ovate, nerveless, to 0.5 mm long; upper ovate-lanceolate, to 1 mm long. Lemma

ovate, obscurely 1-nerved, *ca* 1.5 mm long. Stamens 2 or 3. Stigmas spreading. Caryopsis chestnut brown, oblong, *ca* 0.5 mm long.

Fl. & Fr. : July - Nov.

Ecology : Very common; in open grassy fields, sandy river beds, gardens, roadsides, etc.

Distribution : Throughout India. Myanmar, Sri Lanka, Afganistan and South Africa.

Specimens examined : National Park, 30; Simaria, 793; Markachho, 1464.

Uses : Plant is used as fodder for horses and cattle. Culms are used for making brooms.

53. THEMEDA Forsk.

Themeda quadrivalvis (L.) O. Kuntze, Rev. Gen. Pl. 2 : 794. 1891; Haines, Bot. Bihar & Orissa pt. 5 : 1050. 1924; Bor, Grass. Burma Ceylon India & Pakistan 252. 1960. *Andropogon quadrivalvis* L. in Murr., Syst. Veg. ed. 13, 758. 1774.

Anthistiria ciliata L. f., Suppl. 113. 1781; Hook.f. in Hook. f., Fl. Brit. India 7 : 213. 1896; Prain, Bengal Pl. 2 : 1207. 1903.

Local name : Gunkar.

Stout, gregarious annual, 1.2-1.8 m tall. Culms usually geniculate at base, terete, 4-5 mm diam. Lower sheaths mostly lax and open, upper keeled. Ligule scarious, lacerate, 1.5-2.5 mm long; leaf-blades scaberulous on margins, glaucous beneath, to 6 mm wide. Inflorescence usually a dense panicle. Spatheoles cymbiform, acuminate, 1.7-2.5 cm long. Involucral

spikelets subsessile, linear-lanceolate, acute, 4.5-5.5 mm long. Lower glume with golden-brown tubercled hairs, 2-keeled, 4-5 mm long; upper glume similar to lower, 3-nerved, glabrous. Lemma hyaline, 1-nerved, epaleate. Stamens 3. Sessile spikelet hermaphrodite, 4-4.5 mm long; callus hairy; lower glumes lanceolate, 6-7-nerved, 3.5-4.5 mm long; upper similar to lower; upper lemma with ± 5 mm long awn. Caryopsis subcylindric, brown, 5-6 mm long. Pedicellate spikelets similar to involucral ones.

Fl. & Fr. : Oct. - Dec.

Ecology : Very common; in fields, sandy and grassy grounds, roadsides, etc.

Distribution : Throughout India. Nepal, Pakistan.

Specimens examined : National Park, 83; Pratappur, 617; Satgawan, 1973.

Uses : Plant is used as cattle feed, for thatching purposes, and as a source of paper-pulp.

54. Thysanolaena Nees

Thysanolaena maxima (Roxb.) O. Kuntze, Rev. Gen. Pl. 2 : 794. 1891; Bor, Grass. Burma Ceylon India & Pakistan 650. 1960 (Pl. 5 : *Agrostis maxima* Roxb., Fl. Ind. 1 : 319. 1820.

T. agrostis Nees in Edinburgh New Phil. J. 18 : 180. 1835; Hook. f. in Hook. f., Brit. India 7 : 61. 1896; Prain Bengal Pl. 2 : 1172. 1903; Haines, For. Fl. Chota Nagpur 562. 1910 & Bot. Bihar & Orissa pt. 5 : 982. 1924.

Culms rounded, hard, 1.5-3.5 m tall, glabrous. Leaves numerous, coriaceous, broadly lanceolate, semi-amplexicaul at base, acuminate, flat, glaucous beneath, scabrid on margins, 30-60 cm long and 5 -

10 cm broad; sheaths tight, hard, shining, glabrous except hairy throat; ligules cartilaginous, short. Penicle 30-60 cm long, glabrous; branches erect to suberect, filiform. Spikelets ovoid-lanceolate, acuminate, pedicellate, 1.2-1.6 mm long; rachilla shortly produced as a stipe. Glumes subequal, ovate, obscurely 1-nerved, 0.7-0.8 mm long. Lower floret : lemma lanceolate, epaleate, 1-nerved. Upper floret ovate, ciliate with long white hairs; palea short. Stamens 2-3. Styles free. Caryopsis very minute.

Fl. & Fr. : Apr. - June.

Ecology : Very common; shady slopes of forests, damp banks along ravines and watercourses.

Distribution : Throughout India. Pakistan and eastwards to Southeast Asia.

Specimens examined : National Park, 399; Koderma Forest, 642; Keredari, 1704.

Uses : Tender leaves and young culms are used as fodder. Culms along with inflorescences are made into brooms.

55. TRAGUS Haller.

Tragus roxburghii Panigr. in Kew Bull. 29 : 496. 1974; Cope in Nasir & Ali, Fl. W. Pakistan 143: 150. 1982.

Lappago biflorus sensu Roxb., Hort. Beng. 82. 1814, *nom. nud.* & Fl. Ind. 1 : 284. 1820, *quoad descript., excl. typo.*

Tragus biflorus sensu Schult., Mant. Syst. Veg. 2 : 205. 1824; Bor, Grass. Burma Ceylon India & Pakistan 682. 1960, *quoad descript., excl. typo.*

Tragus racemosa auct. non (L.) All. : Hook.f. in Hook.f., Fl. Brit. India 7 : 97. 1896; Prain, Bengal Pl. 2 : 1186. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 979. 1924.

Culms short, rigid, decumbent, spreading or erect, leafy almost to top, 5-20 cm tall. Leaf-blades narrowly lanceolate, flat, subcordate at base, distantly spinulose on margins, 1-5 cm long and 3-4 mm wide; sheaths loose, like a spathe, with scarious and minutely ciliate margins; ligule a dense ridge of stiff hairs. Receme 2.5-8 cm long, terminal; rachis pubescent; spikelets crowded, 3-3.5 mm long, mostly geminate face to face, sessile on their common pedicel. Lower glume usually suppressed; upper narrowly lanceolate, 3-3.5 mm long, embracing the lemma, 5-ribbed on dorsal surface; ribs bearing hooked spines. Lemmas ovate-lanceolate, over 2 mm long, puberulous, embracing a narrowly oblong palea and a bisexual flower. Stamens 3. Styles 2. Lodicules 2. Caryopsis linear-oblong, 1-1.2 mm long.

Fl. & Fr. : Aug. - Sept.

Ecology : Not common; on open grassy grounds.

Distribution : Throughout the dry plains of India. South-East Asia and East Africa.

Specimens examined : Ghanghree, 1046; Markachho, 1478.

Use : Plant is grazed by cattle.

Note : Panigrahi (*l.c.*) pointed out clearly why the Indian species so long known under the names *T. biflorus* (Roxb.) Schult. and *T. racemosa* (L.) All. should be rejected and the species should be described newly *i.e.* as *T. roxburghii* Panigr., Sp. Nov.

56. Triticum L.

Triticum aestivum L., Sp. Pl. 85. 1753; Bor , Grass. Burma Ceylon India & Pakistan 679. 1960.

T. sativum Lam., Fl. France 3 : 625. 1778; Haines, Bot. Bihar & Orissa pt. 5 : 963. 1924.

T. vulgare Vill., Hist. Pl. Dauph. 2 : 153. 1787; Hook.f. in Hook. f., Fl. Brit. India 7 : 367. 1896; Prain, Bengal Pl. 2 : 1231. 1903; Haines, For. Fl. Chota Nagpur 583. 1910.

Local name : Gehun, Gium.

Annual. Culms erect or tufted, hollow or sometimes solid above, 80-150 cm tall. Leaves linear-lanceolate or broadly linear, rough, to 1 cm broad; sheaths smooth; ligules short, glabrous, truncate. Spikes usually± compact, curved at maturity, to 10 × 1 cm; rachis compressed, flexuous, ciliate. Spikelets imbricate on opposite sides of rachis, laterally compressed, ovoid, whitish or reddish, 3-5 flowered; the uppermost floret sterile. Glumes subequal, ovate, rigid, to 1 cm long, obtuse or shortly awned. Lemmas 5-nerved, 1-1.3 cm long, hairy. Paleas entire, obtuse or truncate. Ovary hairy. Caryopsis 5-7 mm long.

Fl. & Fr. : Feb.-May.

Ecology : Very common; cultivated, sometimes found as an escape in waste places, fields, field - boundaries, etc.

Distribution : Throughout India. Cultivated almost in all parts of the World.

Specimens examined : Hazaribagh, 500; Ramgarh, 1894.

Uses : Grains are used as a source of wheat flour which forms an important food for human beings. Wheat straw is fed to live-stock as roughage; also used for thatching. Straw-pulp is used for preparing writing, printing and wrapping paper and card-board. Bran, germ and middlings–by-products of wheat milling – are fed to livestock.

57. ZEA L.

Zea mays L., Sp. Pl. 971. 1753; Hook.f. in Hook.f., Fl. Brit. India 7 : 102. 1896; Prain, Bengal Pl. 2 : 1209. 1903; Haines, For. Fl. Chota Nagpur 564. 1910 & Bot. Bihar & Orissa pt. 6 : 1065. 1924; Bor, Grass. Burma Ceylon India & Pakistan 270. 1960.

Local name : Makai, Makka.

Culms smooth, soild, rooting at lower nodes. Leaf-blades flat, broadly lanceolate, hairy above, ciliate on margins, 30-45 cm long and 2.5-12 cm broad; sheaths villous towards margins; ligule short, ciliate. Male spikelets ovate-oblong, acute; glumes oblong to ovate-lanceolate, pubescent, strongly nerved; lower floret male or barren; lemma hyaline, oavte-oblong, ciliolate, 5-nerved; palea a little longer, 2-nerved; upper floret male; lemma hyaline, oblong , 2-nerved, as long as lower lemma; palea as long as lower palea. Female spikelets half-sunk in spongy axis, conical in shape; lower glume emarginate, ciliate at top; upper glume acute or 2-lobed, lemma of lower floret oblong, shortly paleate or epaleate; lemma of upper floret oblong, narrowly enveloping the ovary with longer palea. Caryopsis shining, hard, surrounded by bases of glumes.

Fl. & Fr. : Sept. - Oct.

Ecology : Common; cultivated, sometimes met with as an escape in waste places.

Distribution : Throughout the hotter parts of India. Native of America, now cultivated in Warm countries.

Specimens examined : Chatra, 998; Hazaribagh, 1599.

Uses : Immature cobs are largely eaten after roasting. Grains are also used in making corn starch and industrial alcohol.

130. TYPHACEAE

TYPHA L.

Typha angustata Chaub., Bory *et al.*, Exped. Sci. Moree 2 : 338. 1833; Hook.f. in Hook.f., Fl. Brit. India 6 : 489. 1893; Prain, Bengal Pl. 2 : 1102. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 876. 1924; Mooney, Suppl. Bot. Bihar & Orissa 142. 1950; Subram., Aquat. Ang. 74. 1962; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 760. 1976.

Typha angustifolia auct. non L. : Roxb., Fl. Ind. 3 : 567. 1832.

Local name : Patera.

Robust. Stem terete, to 3 m tall. Leaves linear, tapering in apical part, acute, convex beneath, longitudinally and transversely septate, canaliculate at base in upper surface, flat above, 8-20 × 0.6-1.5 cm. Male spike : longer than female one, 15-30 cm long, separated from female one by an interval of 0.5-10 cm; rachis compressed, without excrescences, densely woolly, peristent till long after fall of male flowers. Stamens 2-3 on a common stalk, intermixed with linear hairs. Female spike : 1 or sometimes 2 and then close together, 7-25 cm long and 2-2.5 cm thick, dark brown when ripe; rachis with 1 mm long excrescences; bracteoles many, intermixed in flowers, filiform, exceeding or shorter than the close-set white hairs of gynophore. Style long; stigma flattened, usually curved. Fruit fusiform, cuneate at base, obtuse or subtruncate at apex.

Fl. & Fr. : June - Aug.

Ecology : Common; in marshes, jheels, bank of rivers etc.

Distribution : Throughout India.

Specimens examined : Ramgarh, 1139; Chowparan, 1369.

Uses : Rhizomes, young shoots and inflorescences are eaten in various ways by poor people of villages. Leaves are plaited into ropes, chicks, winnowing trays and mats. Immature flowers are used to make sweets.

Note : Here, the reasoning of Gandhi (*l.c.*) is followed in keeping *T. angustata* Chaub., Bory *et al.*, distinct from the European *T. angustiflolia* L.

131. BROMELIACEAE

ANANAS Mill.

Ananas comosus (L.) Merr., Interpr. Herb. Amb. 133. 1917; Bailey, Man. Cult. Pl. ed. 2, 195. 1949; Purseglove, Trop. Crops, Monocots 76. 1975; Rauh, Bromel. 327. 1981. *Bromelia comosa* L. Herb. Amb. 21. 1754.

Ananas sativus Schult. f. in Linn., Syst. Veg. 7 : 1283. 1830; Prain, Bengal Pl. 2 : 1052. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1115. 1924.

Local name : Ananas.

Leaves thick, tough, numerous, usually with strong upcurved, marginal spines, white-scaly on lower surface, 50-150 × 1.5-6 cm. Peduncular bracts usually entirely or partly red. Spikes varying in length, usually basally branched. Floral bracts obliquely erect, often with recurved tops, sharply dentate, red, yellowish or green. Calyx-segments ovate-triangular. Petals oblong-linear, acute, 1.5-2.5 cm long, basally white, apically violet. Spurious fruit yellow or reddish, 10-30 × 10-15 cm.

Fl. : Feb.- Mar. *Fr.* : Apr. - May.

Ecology : Common; cultivated in gardens.

Distribution : India : Almost throughout India, but mostly in Kerala, Tamil Nadu, Coastal Andhra Pradesh, Karnataka, Orissa, Bihar, Uttar Pradesh, West Bengal, Assam, Tripura. Native to tropical America, cultivated in several tropical countries of the World.

Specimens examined : Katkamasandi, 1411; Simaria, 2380.

Uses : Fruits are edible. Leaves are source of strong silky fibre used for making cloth, strong cords, fishing nets, etc. Leaves are considered anthelmintic.

132. STRELITZIACEAE

RAVENALA Adans.

Ravenala madagascariensis Sonn., Voy. 3 : BK 5, 244. 1782; Baker in Hook.f., Fl. Brit. India 6 : 198. 1890; Prain, Bengal Pl. 2 : 1050. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1127. 1924.

Local name : Panthpadop.

Trunk 6-14 m long. Leaves during anthesis 20-30, closely approximate; blade ovate-oblong, from a broadly rounded to subcordate base, green, 150-300 × 60-105 cm; petiole lubulose in consequence of its margins being inrolled, 2-3.5 m long including basal broadened sheath. Inflorescences *ca* 1.7 m long including *ca* 1 m long peduncle, bearing 10-12, to 50 cm long spathes. Flowers white. Floral bracts acute, distinctly nerved, 20-25 cm long. Outer tepals erect, yellowish, 15-20 cm long, posticous inner one linear-lanceolate, 8-10 cm long. Capsule oblong-linear, very hard, 7.5-10 cm long. Seeds with large, intensely coloured, fimbriate aril.

Fl. : Mar. - May. *Fr.* : Aug. - Nov.

Ecology : Not common; planted in gardens, parks, etc.

Distribution : Cultivated as an ornamental in major parts of India. Native of Madagascar, introduced in several countries of the World.

Specimen examined : Hazaribagh, 2300.

Uses : Wood is used for house construction. Leaves are used for rooting and as packing material. Seeds are edible. Plant is called 'Traveller's tree' as large amount of water is retained in the leaf-sheaths, which can be drunk.

133. MUSACEAE

MUSA L.

Key to the Species

1a. Leaf-lamina less than or equal to 2 times as long as broad; petiole 15 cm or less long. Pseudostem to 1.8 m tall ...1. *M. nana*

1b. Leaf-lamina more than 3-6 times as long as broad; petiole 30 cm or more long. Pseudostem 3-9 m tall ...2. *M.* × *paradisiaca*

1. **Musa nana** Lour., Fl. Cochinch. 644, 1790; Bailey, Man. Cult. Pl. ed. 2, 286. 1949.

M. chinensis Sweet, Hort. Brit. ed. 2, 596. 1830.

Local name : Kela.

Stem stoloniferous. Pseudostem to 1.8 m tall and 12-18 cm thick. Leaves spreading, 0.6-1.2 m long and 30-60 cm broad, somewhat glaucous, ± spotted and coloured when young. Petiole 15 cm or less long. Spike drooping, short, with red-brown bracts of 7-15 cm long.

Calyx yellowish-white, 2.5-3.5 cm long; free petal half as long. Fruits 10-13 cm long, 6-angled, somewhat curved, fragrant, seedless, very many (usually 200 or more) in a bunch or spike.

Fl. : Mar. - June. *Fr.* : July - Dec.

Ecology : Very common; cultivated in gardens, steep ravines, inaccessible lands, roadsides, etc.

Distribution : India : Assam, West Bengal, Bihar, Orissa, Madhya Pradesh, Uttar Pradesh and elsewhere in India. Native of S. China, much grown in different Asian countries.

Specimens examined : Simaria, 2198; Ichak, 2389.

Use : Fruits are edible.

2. **Musa × paradisiaca** L., Sp. Pl. 1043. 1753 (*M. acuminata* X *M. balbisiana*; '*M. paradisiaca*'); Moore in Baileya 5 : 185. 1957; Babu, Herb. Fl. Dehra Dun 499. 1977.

M. × sapientum L., Syst. Nat. ed. 10, 1303. 1759 ('*M. sapientum*')

Local name : Kela.

Stem stoloniferous. Pseudostem thick and heavy, 3-9 m tall. Leaves erect or ascending, 1.5-3 m long and 45-90 cm broad, bright green. Petiole 30 cm or more long. Spike drooping, 60-150 cm long. Bracts red or violet, lanceolate, oblong-lanceolate or ovate-lanceolate, 15-30 cm or more long; male flowers and their bracts ± persistent. Calyx yellowish-white, 3.5-5 cm long; free petal usually more than half as long. Fruits 20-35 cm long, hard, strongly angled, yellowish-green, seedless, usually less than 100 in a bunch or spike.

Fl. : Mar. - July. *Fr.* : Aug. - Dec.

Ecology : Common : cultivated in gardens, deep rocky ravines, etc.

Distribution : India : Almost throughout India.Indigenous in Bihar and the eastern Himalaya, now widely cultivated throughout the Tropics.

Specimens examined : Ichak, 2043; Keredari, 2380.

Uses : Unripe fruits are eaten as vegetable. Inflorescence before opening is used as vegetable. Core of pseudostem is used after cooking. The entire pseudostem is also used as cattle feed. Fruits are also used in intestinal disorders, uraemia, nephritis, hypertension and other neurological diseases.

134. ZINGIBERACEAE

Key to the Genera

1a.Style exserted beyond anther-thecae and enfolded in long anther-crest, giving beaked appearance to anther ...4. ZINGIBER

1b.Style not exserted beyond anther-thecae; anther-crest, if present, flat :

2a.Bracts of the spike joined to each other for about half their length, thus forming poutches. Anther versatile, spurred basally ...1.CURCUMA

2b.Bracts free to base. Anther neither versatile, nor spurred basally :

3a.Filament strongly curved in upper part. Style usually becoming seperated from filament and forming a bow-string across the curvature. Ovary 1-locular. Flowers sometimes replaced by bulbils ... 2. GLOBBA

3b.Filament not curved. Ovary 3-locular. Flowers never replaced by bulbils ... 3. HEDYCHIUM

1. CURCUMA Roxb., *nom. cons.*

Key to the Species

1a. Rhizome pale yellow within. Fertile bracts to 2.5 cm long. Coma bracts tinged with pink or red. Labellum semi-elliptic, 3-lobed; mid-lobe emarginate. Ovary villous throughout ... *C. amada*

1b. Rhizome deep orange-yellow within. Fertile bracts to 6 cm long. Coma bracts white and green. Labellum obovate, subentire. Ovary pubescent at top only ... 2. *C. longa*

1. **Curcuma amada** Roxb. in Asiat. Res. 11 : 341. 1810; Baker in Hook.f., Fl. Brit. India 6 : 213. 1892; Prain, Bengal Pl. 2 : 1042. 1903; Haines, For. Fl. Chota Nagpur 540. 1910 & Bot. Bihar & Orissa pt. 6 : 1135. 1924.

Local name : Ama-haldi, Ban-haldi.

Rhizome pale-yellow within. Leaves oblong, elliptic or oblong-elliptic or oblong-oblanceolate, attenuate at base, with acute or acuminate apex ending in a short fine twisted cusp, glabrous and green on both surfaces, with white or hyaline margins, 30-60 × 12-20 cm. Petiole nearly as long as blade. Spike 7-15 × 3-5 cm, in centre of the tuft of leaves; peduncle 10-20 cm long. Fertile bracts to 2.5 cm long, greenish white; coma bracts longer and narrower, tinged with pink or red. Calyx nearly 1.3 cm long; teeth obtuse, puberulous. Corolla white or very pale yellow; tube about 2.5 cm long; lobes oblong, acute. Labellum semi-elliptic, 3-lobed; mid-lobe emarginate. Ovary villous throughout.

Fl. : Aug. - Sept.

Ecology : Very common; in forests.

Distribution : India : West Bengal, Chota Nagpur, Madhya Pradesh, Western Peninsula, Tamil Nadu. Malaya Peninsula, Archepelago.

Specimens examined : National Park, 2205; Simaria, 2376.

Uses : Rhizomes are sometimes used as spice and condiment due to their odour of a green mango; also employed in native medicine as carminative and stomachic.

2. **Curcuma longa** L., Sp. Pl. 2. 1753, *p. max. p.*; Baker in Hook.f., Fl. Brit. India 6 : 214. 1890; Prain, Bengal Pl. 2 : 1042. 1903; Haines, For. Fl. Chota Nagpur 540. 1910 & Bot. Bihar & Orissa pt. 6 : 1135. 1924; Burtt in Notes Roy. Bot. Gard. Edinburgh 35 : 209. 1977; Burtt & Smith in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 500. 1983.

C. demestica Val. in Bull. Jard. Bot. Buitenzorg ser. 2, 27 : 31. 1918.

Local name : Haldi, Halud.

Rhizome deep orange yellow within; tubers globose. Leafy tuft 1-1.5 m tall. Leaves oblong-lanceolate, attenuate at base, acuminate-caudate at apex, entire, 15-45 × 6-20 cm. Ligule *ca* 0.5 cm long. Petiole 5-15 cm long. Spike 10-15 × 5-7 cm, appearing with leaves and central to leaf-tuft. Fertile bracts green, 5-6 cm long; coma bracts white and green. Bracteoles to 3.5 cm long. Corolla white; labellum obovate, subentire, with a central yellow band.

Fl. : Sept. - Oct.

Ecology : Common; cultivated in gardens, fields, etc; also met with as an escape near habitation sites, waste places, etc.

Distribution : Throughout India. Widely cultivated in all the tropical countries.

Specimens examined : Hazaribagh, 1954; Gola, 2379.

Uses : Rhizomes are used as condiment; also used as stomachic, tonic, blood purifier and antiseptic. Extract of rhizomes is applied to sprains and wounds. Hindus use turmeric as an offering on religious and ceremonial occasions.

2. GLOBBA L.

Globba marantina L., Mant. Alt. 170. 1771; Baker in Hook.f., Fl. Brit. India 6 : 206. 1892; Burtt & Smith in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4 : 498. 1983.

G. bulbifera Roxb., Asiat. Res. 11: 358. 1810 & Fl. Ind. 1 : 78. 1832; Baker in Hook.f., Fl. Brit. India 6 : 206. 1890; Prain, Bengal Pl. 2: 1037. 1903; Haines, For. Fl. Chota Nagpur 538. 1910 & Bot. Bihar & Orissa pt. 6 : 1130. 1924.

Plant to 30 cm long. Leaves sessile or very shortly petiolate, oblong or broadly elliptic-lanceolate, attenuate at base, acuminate at apex, entire, minutely puberulous below, 9-18 × 3-6 cm. Ligule short, membranous, white. Inflorescence to 15 cm long. Bracts lax, broadly ovate, 1-2 cm long, those at base of inflorescence subtending ovoid bulbils, the remainder subtending few-flowered cincinni. Bracteoles 0.5-1 cm long, ovate. Calyx funnel-shaped, 4-5 mm long; lobes ovate. Corolla yellow; tube *ca* 1 cm long; lobes ovate, to 4 mm long. Lateral staminodes a little longer than petals. Labellum deeply bifid. Filament to 1.5 cm long; anther with 2 spreading appendages on each side. Capsule oblong, smooth, to 4 mm long.

Fl. & Fr. : Aug. - Oct.

Ecology : Common; in damp shady places, ravine slopes, forests, etc.

Distribution : India : Eastern Himalaya, West Bengal, Bihar, Orissa, Madhya Pradesh and Deccan Penninsula. Sri Lanka, Indo-Malesia, Timor.

Specimens examined : Koderma Forest, 1828; Ichak, 2271.

Use : Bulbils are edible.

3. HEDYCHIUM Koen.

Hedychium coronarium Koen. in Retz., Obs. Bot. 3 : 73. 1783; Baker in Hook.f., Fl. Brit. India 6 : 225. 1892; Prain, Bengal Pl. 2 : 1039. 1903; Haines, For. Fl. Chota Nagpur 541. 1910 & Bot. Bihar & Orissa pt. 6 : 1138. 1924.

Stem to 3 m tall, many-leaved. Leaves ± sessile, lanceolate, acuminate at apex, attenuate at base, pubescent on lower surface, to 60 × 10 cm. Ligule bilobed, membranous, 2-3 cm long. Spike to 20 × 8 cm, ± elliptic. Bracts oblong, rounded, closely imbricating, to 5 cm long, each subtending 3-6 flower. Bracteoles tubular, membranous. Calyx 2.5-3.5 cm long. Corolla pure white; tube to 7 cm long; petals linear, 3-4 cm long. Lateral staminodes oblong-lanceolate, 3-5 cm long. Labellum usually flushed centrally with yellow or yellow-green, to 5 cm wide and as long as staminodes, narrowed at base into a short claw; limb obovate, bifid. Stamen not exceeding the labellum; filament reddish-brown, 3.5-4 cm long; anthers 1.3-1.5 cm long. Capsule oblong; valves orange-yellow within. Aril of seeds crimson.

Fl. & Fr. : July - Oct.

Ecology : Common; along water courses, swamps, near streams, etc., also cultivated in gardens.

Distribution : Throughout India. Malesia and widely cultivated and naturalised in tropical countries.

Specimens examined : Chatra, 979; Satgaon, 1989.

Uses : Powdered rhizomes are used in medicines as febrifuge, anthelmintic and tonic. Aerial stems are used for manufacturing papers. Paste made from root is applied in women in abdominal pain.

4. ZINGIBER Boehm., *nom. cons.*

Key to the Species

1a. Spike terminal on leafy stem. Labellum and anther-crest yellow ... 1. *Z. capitatum*

1b. Spike on separate, radical, leafless peduncle. Labellum dull dark purple, with creamy-yellow blotches; anther-crest dark purple ... 2. *Z. officinale*

1. **Zingiber capitatum** Roxb. in Asiat. Res. 11 : 348. 1810; Baker in Hook. f., Fl. Brit. India 6 : 249. 1892; Prain, Bengal Pl. 2 : 1045. 1903; Haines, For. Fl. Chota Nagpur 543. 1910 & Bot. Bihar & Orissa pt. 6 : 1144. 1924.

Leafy stem erect, 80-120 cm tall. Leaves sessile, linear-lanceolate to oblong, acuminate at apex, glabrous above, hairy beneath especially along midrib, 10-45 × 2-4 cm. Ligule very short, hairy. Sheaths pubescent. Spike dense, oblong-ellipsoid, 8-15 cm long and 2.5-5 cm in diam, terminating the leafy stem. Bracts elliptic-lanceolate or oblong, green or scarlet, hairy outside, 4-8 × 1-2 cm, upper ones narrower, with narrow brown margins. Calyx spathaceous, pubescent, 1-1.5 cm long. Corolla pale yellow; lobes lanceolate, to 2.5 cm long. Labellum yellow, orbicular, shallowly emarginate, 1.8 - 2 cm in diam; lateral lobes (staminodes) oblong, obtuse, red. Anther-crest yellow. Capsule red, pubescent, 1.8-2.2 cm long.

Fl. : July - Sept. *Fr.* : Sept. - Oct.

Ecology : Very common : in damp open waste places, roadsides, forest edges, etc.

Distribution : India : Central and Eastern Himalaya from Kumaon to Sikkim, Uttar Pradesh, Chota Nagpur, Assam, Meghalaya. Bengladesh, Nepal.

Specimens examined : Chatra, 1105; Patratu, 2372.

2. **Zingiber officinale** Rosc. in Trans. Linn. Soc. London 8 : 348. 1807. Baker in Hook.f., Fl. Brit. India 6 : 247. 1892; Prain, Bengal Pl. 2 : 1045. 1903; Haines, For. Fl. Chota Nagpur 542. 1910 & Bot. Bihar & Orissa pt. 6 : 1143. 1924.

Local name : Adrak.

Leafy stem 0.5-2 m tall. Leaves sessile, narrowly lanceolate, attenuate at base, acuminate at apex, glabrous, 10-30 × 1-3 cm. Ligule membranous, shallowly bilobed, 2-4 mm long. Sheaths glabrous. Peduncle to 20 cm long, erect, covered with 3-5 cm long lanceolate sheaths. Spike ovoid, 4-5 × 1-5.2 cm, borne on separate, radical, leafless peduncle. Bracts greenish with paler membranous margins. lower ones usually mucronate. Bracteoles ±equalling the bracts in length but narrower, membranous. Calyx to 1.2 m long. Corolla-tube *ca* 2.5 cm long; lobes dull yellow, dorsal one to 2 × 1 cm, markedly narrowed at apex, lateral ones narrower. Labellum dull dark purple, blotched with creamy-yellow; lateral lobes (staminodes) free almost to base, *ca* 6 × 4 mm; median lobe ± round, 1-1.2 cm wide. Anther-crest dark purple, 5 - 8 mm long. Epigynous glands *ca* 5 mm long, linear. Ovary glabrous, to 3 × 2 mm.

Fl. : Aug. - Oct.

Ecology : Very common; cultivated in gardens, fields, etc., also met with as an escape in waste places, roadsides, etc.

Distribution : India : Almost throughout India particularly in Kerala, Maharashtra, Andhra Pradesh, Uttar Pradesh, Himachal Pradesh, Bihar, Madhya Pradesh, West Bengal, etc. Probably native to Pacific Islands, now widely cultivated in tropical countries.

Specimens examined : Barhi, 1830; Hazaribagh. 2296.

Uses : Rhizomes are used spice and condiment and also used in medicines as carminative and digestive stimulant. Oil extracted from rhizomes is used for flavouring purposes.

135. COSTACEAE

COSTUS L.

Costus speciosus (Koen.) Smith in Trans. Linn. Soc. London 1 : 249. 1791; Baker in Hook.f., Fl. Brit. India 6 : 249. 1892; Prain, Bengal Pl. 2 : 1045. 1903; Haines, For. Fl. Chota Nagpur 544. 1910 & Bot. Bihar & Orissa pt. 6 : 1145. 1924. *Banksea speciosa* Koen. in Retz., Obs. Bot. 3 : 75. 1783.

Local name : Keu.

Stem 2-3 m tall, branched. Leaves elliptic-oblong or elliptic-obovate, narrowly rounded at base, abruptly acuminate at apex, glabrous or appressed-hairy above, silky below, 10-30 × 3-8 cm. Ligule short, truncate, ciliate. Spike 3-5 cm long, subglobose or ovoid, but lengthening with age. Bracts ovate, acute, densely pubescent, green, flushed red or bright red, 1.5-2.5 cm long, with a narrow subapical protuberance. Bracteoles keeled, ciliate on margins, 1-1.2 cm long. Calyx funnel-shaped, red, 2-2.5 cm long; teeth ovate, ending in a hardened point, *ca* 5 mm long. Corolla-tube equal to or shorter than calyx; lobes ovate or elliptic, acute, pale pinkish or bluish white, 2.5-3.5 cm long. Lip of labellum suborbicular, hairy at base, white outside, yellow at centre, 5-8 cm across, with incurved margins. Petaloid filament 3-5 × 1.2-1.5 cm, yellow at apex, hairy on back. Capsule globose, red, to 3 cm in diam., crowned with persistent calyx. Seeds globose.

Fl. : July - Sept. *Fr.* : Aug. - Oct.

Ecology : Common; in moist localities, ravine slopes, forests, etc., also cultivated in gardens.

Distribution.: India : Throughout India including central and eastern Himalaya. Nepal, Indo-China, Sri Lanka, Malesia to New Guinea, Taiwan.

Specimens examined : Ramgarh, 1829; Chatra, 2048; Markachho, 2270.

Uses : Tuberous rootstock is used medicinally.

136. CANNACEAE

CANNA L.

Canna indica L., Sp. Pl. 1. 1753; Bailey, Man. Cult. Pl. ed. 2, 291.1949; Ghazanfar in Nasir & Ali, Fl. W. Pakistan 145 : 1.1982.

C. orientalis Rosc., Monandr. Pl. t. 12. 1828.

C. indica L. var. *orientalis* (Rosc.) Baker in Hook. f., Fl. Brit. India 6 : 260. 1892; Prain, Bengal Pl. 2 : 1047. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1147. 1924.

Local name : Sabbajaya.

Rhizome creeping, tuberous, emitting fleshy, thick roots. Stem leafy, 90-200 cm tall. Leaves oblong, tapering at base, acuminate at apex, entire, 15-40 × 8-15 cm. Panicle to 20 cm long. Bracts ovate, green, 2-3 × 1.5-2 cm. Bracteoles ovate-oblong, 1-1.5 × 0.7-1 cm. Sepals lanceolate, acute, 1-1.5 cm long. Corolla yellow, orange or red; tube 6-8 mm long; lobes lanceolate, acute, 4-5 cm long. Outer 3 staminodes oblanceolate, bright red, 4-6 cm long. Labellum rather shorter. Anther 6-7 mm long. Style 5-6 cm long. Capsule subglobose to trigonous, 2-3 × 1.5-2.5 cm. Seeds black, the size of a pea, with a tuft of hairs at hilum.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; cultivated in gardens, parks, etc.as an ornamental, sometimes met with as an escape near habitations, water courses of canals, etc.

Distribution : Throughout India including Himalaya. Widely distributed throughout the Tropics.

Specimens examined : Hazaribagh, 2049; Telaiya Dam, 2206; Ramgarh, 2378.

Uses : Planted as an ornamental for its beautiful flowers. Tuberous rhizomes are used as vegetable. Hard black seeds are made into necklaces and rosaries.

137. PONTEDERIACEAE

Key to the Genera

1a. Flowers distinctly pedicelled. Perianth actinomorphic, almost coriphyllous; posterior tepal not with a coloured blotch. Stamens 6, one mostly longer than others. Filaments glabrous; anthers basifixed ...2. MONOCHORIA

1b. Flowers sessile. Perianth strongly zygomorphic, very distinctly gamophyllous; posterior segment with a coloured blotch. Stamens 3 or 6, when 6, then 3 much longer than others. Filaments, at least those of the longer stamens, hairy; anthers dorsifixed ... 1. EICHHORNIA

1. EICHHORNIA Kunth

Eichhornia crassipes (Mart.) Solms in DC., Monog. Phan. 4 : 527. 1883; Haines, Bot. Bihar & Orissa pt. 6 : 1102. 1924; Backer in Steenis, Fl. Males. ser. 1, 4 : 259. 1951; Subram., Aquat. Ang. 70, f. 48. 1962. *Pontederia crassipes* Mart., Nov. Gen. Sp. Pl. 9, t. 4. 1823.

Floating herbs with a very short leafy main-stem, sending down fibrous roots in shallow water or in mud, 30-50 cm or more long. Leaves radical, rosulate, emerged; petioles spongy, in young short and much swollen near middle, in adult much longer, to 30 cm long, tapering from base; blade herbaceous, broadly ovate or rhomboid, shallowly cordate, truncate, rounded or cuneate at base, obtuse at apex, glabrous, curvinerved, 7-25 cm long and wide. Peduncle with two closely approximate bracts; lower bract with a long tubular sheath and a small blade; upper bract enclosed by lower, tubular for greater part, apiculate. Flower-bearing axis angular, to 15 cm long. Flowers 3-30 per inflorescence, showy, expanding and withering simultaneously. Perianth-tube 1.5-1.7 cm long, with a green base and a pale top, slightly curved; segments lilac blue, ovate to oblong or obovate, posterior one with a yellow, blue-bordered median blotch, 3-3.5 cm long, more forward placed segments gradually smaller. Filaments glandular-hairy. Style glabrous, stigma hairy.

Fl. & Fr. : Mar. - May.

Ecology : Very common; in stagnant or slow-moving fresh water like rivers near their banks, lakes, canals, railway-ditches, pools, tanks, inundated paddy-fields, etc.

Distribution : Throughout India. Native of Brazil, now naturalised in many tropical parts of the World.

Specimens examined : Patratu, 1324; Hunterganj, 2128.

Uses : The plant is used as a manure and for fattening pigs.

Note : The plant has become a very troublesome weed because of its rapid growth and propagation.

2. MONOCHORIA Presl

Key to the Species

1a. Rootstock very short, suberect or oblique. Leaf-blade of adult plants broadly ovate to ovate-oblong from an obtuse, rounded, or cordate but never sagittate or hastate base; basal lobes, if present, broadly rounded. ...2. *M. vaginalis*

1b. Rootstock well-developed, creeping. Leaf-blade of adult plants triangular-ovate, always with sagittate or hastate base; basal lobes divergent, with an acuminate apex ...1. *M. hastata*

1. **Monochoria hastata** (L.) Solms in DC., Monogr. Phan. 4 : 523. 1883; Haines, Bot. Bihar & Orissa pt. 6 : 1101. 1924.; Backer in Steenis, Fl. Males. ser. 1, 4 : 256. 1951; Subram., Aquat. Ang. 69, f. 46. 1962. *Pontederia hastata* L., Sp. Pl. 288. 1753.

M. hastaefolia Presl, Rel. Haenk. 1 : 128. 1827; Hook.f. in Hook.f., Fl. Brit. India 6 : 362. 1892; Prain, Bengal Pl. 2 : 1079. 1903.

Robust herb with erect or obliquely erect stems, 25-100 cm long; rhizome often long and strong, covered with remains of old sheaths. Leaf-blades of adult plants triangular-ovate, sagittate or hastate at base with divergent acuminate basal lobes, acuminate at apex, 7-25 × 4-20 cm. petiole of radical leaves to 60 cm long, of floral leaves much shorter, with much broadened sheathing base. Racemes shortly stalked, dense, 15-60- flowered, (sub) erect, at last horizontal or ± deflexed. Pedicels

erect or obliquely erect, 0.7-3 cm long. Perianth pale blue, 1.5-1.8 cm long. Filaments white. Style short-hairy at top. Capsule ellipsoid, 0.8-1 cm long. Seeds oblong, 0.8-1 mm long, brown, with ± 10 thin longitudinal ribs, transversely striate between ribs.

Fl. & Fr. : July - Oct.

Ecology : Not common, but locally numerous; in and along freshwater pools, canal banks, irrigation ditches, paddy fields, etc.

Distribution : Throughout India. Sri Lanka,tropical South-East Asia, Malesia, Australia, Manchuria to N.E. Africa.

Specimens examined : Ichak, 336; Patratu, 1731.

Uses : Tender stalks and leaves are eaten as vegetable by poor people in villages. Root-stocks are used as feed for cattle and pigs. Leaf-juice is applied to boils.

2. **Monochoria vaginalis** (Burm.f.) Presl, Rel. Haenk. 1 : 128. 1827; Hook.f. in Hook.f., Fl. Brit. India 6 : 363. 1892; Prain, Bengal Pl. 2 : 1079. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1101. 1924; Backer in Steenis, Fl. Males. ser. 1, 4 : 256. 1951; Subram., Aquat. Ang. 69, f. 47. 1962.*Pontederia vaginalis* Burm. f., Fl. Ind. 80. 1768. **(Fig.18).**

Less robust than the preceeding species with erect or obliquely erect stem and suberect or oblique, usually short root-stock, 10-50 cm long. Leaves extremely variable in shape and size, of adult plants broadly ovate to ovate-oblong, obtuse, rounded, truncate or cordate at base, acuminate at apex, 2-12 ×1-10 cm, in entirely submerged young plants without any distinct blade; petioles broadly sheathing at base. Inflorescences racemes, or sometimes subumbelliform, 3-25-flowered, rather short, soon deflexed. Flowers mostly simultaneously expanded. Pedicels 0.5-2.5 cm long. Perianth dark blue; tepals 1-1.5 cm long. Anthers unequal, one much longer and its filament provided with a tooth or appendage. Capsule ellipsoid, 0.8-1 cm long. Seeds oblong, 0.8-1 mm long, brown, with 10 longitudinal thin ribs, transversely striate between ribs.

Fl. & Fr. : July - Oct.

Ecology : Common; in swampy or inundated localities, along ditches, in shallow pools, well-irrigated or flooded paddy fields, etc.

Distribution : Throughout India, South-East Asia to China, Japan and Malesia.

Specimens examined : Ghanghree, 1059; Mandu, 1345.

Uses : Aerial parts are eaten as vegetable. Juice of leaves are taken for cough and that of roots for stomach and liver complaints, asthma and tooth-ache.

138. LILIACEAE

Key to the Genera

1a. Leaves reduced to minute spinescent scales, bearing tuft of cladodes in their axils ...2. ASPARAGUS

1b. Leaves well-developed, without axillary cladodes :

2a. Leaves ending in a tendril. Perianth- segments strongly waved or crisped ...7. GLORIOSA

2b. Leaves without tendril. Perianth- segments neither waved nor crisped :

3a. Ovary inferior :

4a. Inflorescence umbellate. Fruit an irregularly dehiscent capsule ...5. CRINUM

4b. Inflorescence spicate, racemose or subcapitate on a scape. Fruit berry-like, indehiscent ...6. CURCULIGO

3b. Ovary superior. Fruit a loculicidal capsule :

5a. Root-stock short, with many fleshy or tuberous roots :

6a. Ovules 2 in each cell of ovary. Capsule not angled. Seeds 3-gonous ...3. ASPHODELUS

6b. Ovules 4 or more in each cell of ovary. Capsule 3-angled. Seeds ± compressed ...4. CHLOROPHYTUM

5b. Root-stock a bulb, corm or rhizome :

7a. Root-stock a rhizome. Leaves fleshy, spinosely dentate at margins. Flowers bright red or yellow ...1. ALOE

7b. Root-stock a corm or bulb. Leaves not fleshy and spiny. Flowers not red and yellow :

8a. Roots-stock a corm . Flowers appearing with the leaves. Seeds subglobose ...8. IPHIGENIA

8b. Root-stock a bulb. Flowers appearing before leaves. Seeds compressed ...9. URGINEA

1. ALOE L.

Aloe vera (L.) Burm.f., Fl. Ind. 83. 1768; Hook.f. in Hook.f., Fl. Brit. India 6 : 264. 1892; Haines, Bot. Bihar & Orissa pt. 6 : 1092. 1924. *A. perfoliata* Willd.var.*vera* L., Sp.pl.320.1753.

Local name : Ghikanvar, Guar-patta.

Leaves numerous, radical, in rosette, erect, thick, narrow-lanceolate, long-acuminate, 30-60 × 2-8 cm. Inflorescences 90-130 cm long, simple or few-branched; racemes to 40 cm long. Bracts lanceolate, 6 -10 × 3-6 mm. Pedicel 4-5 mm long. Flowers *ca* 2.5 cm long. Perianth-tube terete, 1-1.5 cm long, slightly curved; lobes yellow, oblong, 1-1.2 cm long, 3-nerved. Stamens equalling perianth. Style usually exserted. Capsule oblong-ellipsoid, to 1.5 × 1 cm.

Fl. & Fr. : July - Jan.

Ecology : Very common; planted as an ornamental in gardens; also met with as an escape in waste places, roadsides, forest edges, scrub jungles, etc.

Distribution : Almost throughout India. Native of Mediterranean Canary Islands, naturalised in Asia, Florida, W. Indies and Central America.

Specimens examined : Hazaribagh, 1749; Telaiya Dam, 2362.

Use : Leaves are soure of a drug which is used mainly as purgative.

2. ASPARAGUS L.

Asparagus racemosus Willd., Sp. Pl. 2 : 152. 1799; Hook.f. in Hook.f., Fl. Brit. India 6 : 316. 1892; Prain, Bengal Pl. 2 : 1070. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1089. 1924.

Local name : Satawar.

Scrambling or subscandent, perennial, spinous, much-branched undershrub, with tuberous rootstock. Branches angular. Leaves linear-subulate, acuminate, 4-6 mm long. Cladodes 2-6, acicular, triquetrous, falcate, divaricate, finely acuminate, 1.2-2.5 cm long. Flowers 5-6 mm across, borne in simple or shortly branched racemes of 5-15 cm long; rachis triquetrous. Bracts ovate-triangular, acute, 1.3-1.6 mm long. Pedicels 2-3 mm long, filiform. Perianth-segments white, linear-oblong, obtuse, *ca* 2.5 × 0.8 mm. Style very short; stigmas spreading. Berry 3.5-6 mm in diam., scarlet when ripe. Seeds 3-6, *ca* 2 mm in diam.

Fl. : Aug. - Oct. *Fr.* : Oct. - Dec.

Ecology : Common; in forests, scrub jungles, on hill-slopes; also cultivated in gardens.

Distribution : Throughout the tropical and subtropical parts of India including Himalaya. Africa through S. Asia to China, S. Malesia and N. Australia.

Specimens examined : National Park, 78; Pratappur, 616; Telaiya Dam, 2298.

Uses : Plant is used as tonic and diuretic. Root-juice is mixed with honey and is given in dyspepsia. Roots are also used for nervous and rheumatic complaints.

3. ASPHODELUS L.

Asphodelus tenuifolius Cav. in Anal. Cienc. Nat. 3 : 46, t. 27. f. 2. 1801; Hook.f. in Hook. f., Fl. Brit. India 6 : 332. 1892, *p.p.* excl. syn. *A. fistulosus* L; Prain, Bengal Pl. 2 : 1076. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1097. 1924.

Erect, annual herbs, with a short root-stock which emits many fleshy roots. Leaves erect, cylindrical and fistular, acute, sheathing at base, ribbed with prominent, minutely scabrid nerves, 10-20 cm long. Flowering stems several, erect, solid, branched in upper part, glabrous above, scarbid below, to 50 cm high. Racemes laxly flowered, 8-20 cm long. Bracts scarious, ovate, acute, 2.5-3 mm long, with a strong brownish keel. Pedicels 3-3.5 mm long. Perianth whitish, 4-5 mm long; segments oblong-lanceolate, obtuse, with a strong brownish costa. Anthers brown, 1.2 mm long; style 2.5-3 mm long. Capsule faintly 3-gonous, 4-5 mm in diam., with deeply transversely wrinkled valves. Seeds 2.5-3 mm long.

Fl. : Dec. - Feb. *Fr.* : Feb. - May.

Ecology : Very common; in agricultural fields, especially wheat fields.

Distribution : Throughout India. Westward to the Canary Islands.

Specimens examined : Etkhori, 1457; Hazaribagh, 1592; Ramgarh, 1897.

Uses : Seeds are used as diuretic. These yield a fatty oil.

4. CHLOROPHYTUM Ker-Gawler

Chlorophytum arundinaceum Baker in J. Linn. Soc. Bot. 15 : 323. 1876; Hook .f. in Hook. f., Fl. Brit. India 6 : 334. 1892; Prain, Bengal Pl. 2 : 1077. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1098. 1924.

Local name : Bis-kandri.

Roots tuberous; tubers cylindrical, 2.5-4 × 1.2-1.5 cm, greyish-white within. Leaves suberect, oblong-lanceolate, acute or acuminate at apex, usually narrowed into a broad amplexicaul base, many-nerved, 15-60 × 3-6 cm. Scape 15-40 cm long, stout; raceme simple or shortly branched, densely flowered, 8-20 cm long. Bracts 1.2-2 cm long or lower ones

longer. Flowers star-like, 1.7-2.3 cm across. Pedicels 6 - 8 mm long, jointed in the middle. Tepals oblong-lanceolate, usually acute, 0.8-1.2 cm long. Filaments 4-5 mm long; anthers longer than filaments, straight, green or yellow; anther-cells small, orbicular. Style declinate. Fruiting scape to 60 cm long. Capsules 1-3 at each node, 6-8 mm broad, retuse or truncate. Seeds 1-6 in each cell, suborbicular, black ,2.5-3 mm in diam.

Fl. : Mar. - July. *Fr.* : Oct. - Dec.

Ecology : Very common; in forests, slopes of low hills, etc.

Distribution : India : Eastern Himalaya, Assam, Sikkim, Bihar, Chota Nagpur, Orissa. Nepal, Bhutan, Myanmar.

Specimens examined : National Park, 1823; Pratappur, 2292.

Uses : Tubers are used as tonic. Flowers are eaten.

5. CRINUM L.

Key to the Species

1a.Perianth funnel-shaped; tube upcurved; lobes elliptic-oblong or lanceolate. Stamens declinate ...3. *C. latifolium*

1b.Perianth salver-shaped; tube erect; lobes linear. Stamens spreading :

2a.Umbels more than 20-flowered. Leaves flat, 8-18 cm broad ... 1. *C. asiaticum*

2b.Umbels 6-15 - flowered. Leaves channelled, 2-2.5 cm broad ... 2. *C. defixum*

1. **Crinum asiaticum** L., Sp. Pl. 292. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 280. 1892; Prain, Bengal Pl. 2 : 1061. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1108. 1924.

Local name : Pindar.

Bulb very large, 6-12 cm in diam, narrowed into a 10-15 cm long neck. Leaves very many, flat, coriaceous, narrowed at base, gradually tapering at apex, glabrous, with entire usually smooth margins, 50-120 × 8-18 cm. Scape 45-80 cm long, compressed, to 2.5 cm across. Flowers more than 20 in the umbel. Bracts hooded, thick, ovate-lanceolate, 7-9 × 4-5 cm. Bracteoles to 5 cm long. Pedicel 0.6-2 cm long. Perianth white, fragrant at night, salver-shaped, erect; tube 7.5-10 cm long; lobes 6 - 10 cm long, revolute, glabrous. Stamens very long, spreading, often reddish; filaments to 4.5 cm long; anthers 1-2 cm long. Capsule 1-2-seeded, beaked, 2.5-4 cm in diam.

Fl. & Fr. : June - Sept.

Ecology : Common; wild on moist or dry soil along slopes of hills, in vacant waste places, forests, etc., also cultivated in gardens.

Distribution : Throughout the tropical parts of India. Sri Lanka.

Specimens examined : Hazaribagh, 2245; Tondwa, 2388.

Uses : Bulb is used as tonic and laxative in biliousness and other urinary troubles. Fresh root is used as emetic and diaphoretic. Seeds are used as purgative.

2. **Crinum defixum** Ker-Gawl. in J. Sci. Arts (London) 3 : 105. 1817; Hook.f. in Hook.f., Fl. Brit. India 6 : 281. 1892; Prain, Bengal Pl. 2 : 1061. 1903; Haines, For. Fl. Chota Nagpur 523. 1910 & Bot. Bihar & Orissa pt. 6 : 1108. 1924.

Bulb ovoid, 5-8 × 3.5-6 cm, with a cylindrical, 6-15 cm long neck. Leaves few, erect, linear, channelled, coriaceous, obtuse or acute at apex, with distantly and obscurely scarbrid margins, 40-90 × 2-2.5 cm. Scapes 40-60 cm long, stout, 1-2 cm across; umbels 6-15 flowered. Bracts ovate-lanceolate, 4-8 cm long. Bracteoles 3-6 cm long. Pedicel very short or 0. Perianth white, tinged with red, salver-shaped, fragrant at night; tube 6-9 cm long; lobes narrowly linear lanceolate, nearly as long as tube. Filaments shorter than perianth-lobes, bright red; anthers 1-1.5 cm long. Capsule 1-2 seeded, 2-2.5 cm in diam.

Fl. & Fr. : May - Aug.

Ecology : Common; along swampy river-banks, margims of streams, irrigation canals, etc.

Distrib. : Throughout India . Sri Lanka.

Specimens examined : Hazaribagh, 2228; Bishnugarh, 2400.

Uses : Bulbs are diaphoretic and emolient, used for burns, whitlow and carbuncles.

3 **Crinum latifolium** L., Sp. Pl. 291. 1753; Hook.f. in Hook.f., Fl. Brit. India 6 : 283. 1892; Prain, Bengal Pl. 2 : 1061. 1903; Haines, For. Fl. Chota Nagpur 523. 1910 & Bot. Bihar & Orissa pt. 6 : 1109. 1924.

Bulb globose, 12-15 cm in diam., with short and stout neck. Leaves many, lorate, coriaceous, acuminate, bright green, with thin subscabrid margin, 60-90 × 7-10 cm. Scape stout, 60-90 cm long; umbels 10-20-flowered. Bracts lanceolate, 5-7 × 1.5-2 cm. Bracteoles to 1 cm long. Pedicels very short. Perianth white, funnel-shaped, streaked or tinged with red towards centre or sometimes red-purple near all over the backs of lobes; tube 9-15 cm long, upcurved; lobes elliptic-oblong or lanceolate, as long as or shorter than tube. Stamens shorter than tube, declinate; filaments 6-8 cm long; anthers 1.2-2 cm long. Ovary-cells each 5-6-ovuled; style longer than stamens. Capsule 3-5 cm in diam.

Fl. & Fr. : May - Oct.

Ecology : Common; wild in dry forests, slopes of hills, etc.; also cultivated in gardens.

Distribution : Throughout India. Myanmar, Sri Lanka, tropical Asia, Malesia and Africa.

Specimens examined : Hunterganj, 2297; Bishnugarh, 2401.

Uses : Bulbs are used in rheumatism. Leaf-juice is used in ear-ache.

6. CURCULIGO Gaertn.

Curculigo orchioides Gaertn., Fruct. Sem. Pl. 1 : 63, t. 16. f. 11. 1788; Hook. f. in Hook. f., Fl. Brit. India 6 : 279. 1892; Prain, Bengal Pl. 2 :1059.1903; Haines, For. Fl. Chota Nagpur 524. 1910 & Bot. Bihar & Orissa pt. 6 : 1112. 1924.

Local name : Musol-khand, Kala musali.

Tuber elongate, with conspicuous fleshy roots, and with the top crowned with remains of old leaves. Leaves sessile or narrowed into a short petiole, lanceolate-oblong to elliptic, plicate, acute or acuminate at apex, glabrous or thinly hairy, 15 - 50 × 2-6 cm. Petiole, if present, to 2.5 cm long. Leaf-sheaths persistent, fibrous, imbricating. Scapes 4-7 cm long, clavate, hairy, hidden by leaf-sheaths. Bracts lanceolate, spathaceous, membranous, whitish, acuminate, 1.5-6 × 0.2-0.8 cm, glabrous, densely imbricating. Hypanthium filiform, hairy, 1.2-2.5 cm long. Perianth-segments 6, yellow, lanceolate-oblong, acute, ciliate only at top, 0.8-1.6 cm long. Stamens shorter than perianth-segments. Ovary oblong-lanceolate, to 4 mm long, densely hairy; cells 6-8- ovulate; style stout. Fruit oblong-lanceolate, 1.5-2 cm long, hairy at tip, with a slender beak and spongy septa. Seeds 1-4, oblong, faintly wavy-ridged, *ca* 2.5 mm long.

Fl. : May - July. *Fr.* : June - Aug.

Ecology : Very common; in forests, open grassy places, disturbed grounds, slopes of hills, etc.

Distribution : India : Subtropical Himalaya. Uttar Pradesh, Bihar, West Bengal, Orissa, central and western India, Deccan Peninsula, Meghalaya, Manipur. Nepal, Japan, Malesia, Australia.

Specimens examined : Ghanghree, 1005; Koderma Forest, 1776.

Uses : Tuberous roots are used for skin troubles; also used as demulcent, diuretic and tonic. These are also used in piles, diarrhoea, jaundice and asthma.

7. Gloriosa L.

Gloriosa superba L., Sp. Pl. 305. 1753; Hook. f. in Hook. f., Fl. Brit. India 6 : 358. 1892; Prain, Bengal Pl. 2 : 1073. 1903; Haines, For. Fl. Chota Nagpur 521. 1910 & Bot. Bihar & Orissa pt. 6 : 1093. 1924.

Local name : Karihari, Languli.

Stems slender, branched, glabrous, 4-6 m high, scrambling among other bushes; tubers fleshy, cylindrical. Leaves ovate-lanceolate, rounded or subcordate at base, glabrous, entire, with many fine parallel veins on each side of mid-vein, 8-15 × 2-5 cm. Pedicel 6-8 cm long, reflexed at tip. Tepals oblong-lanceolate, narrowed at base, acuminate at apex, glabrous, greenish at first, then yellow, passing through orange and scarlet to crimson 5-8 × 1-1.5 cm. Filaments 4-6 cm long; anthers 1-1.2 cm long. Style to 5 cm long; arms 5-6 mm long. Capsule oblong, green, smooth, 3-5.5 × 1-2.5 cm. Seeds many, somewhat dorsally compressed, warty, 3.5-4 mm across.

Fl. : July - Aug. *Fr.* : Sept. - Oct.

Ecology : Common; in hedges, scrub jungles, bushes along railway lines, forests, etc.

Distribution : Throughout the tropical parts of India. Sri Lanka, Indo-China, tropical and S. Africa, Malesia, Madagascar.

Specimens examined : Raja Rappa, 870; Barhi, 1396; Koderma Forest, 1790.

Uses : Tubers are used as tonic, stomachic and anthelmintic; also used as an abortifacient. These are used externally for neuralgic pains and skin troubles. These possess several alkaloids, chiefly colchicine, which are used in treatment of gout and rheumatism, and also in the laboratory to induce polyploidy.

8. IPHIGENIA Kunth, *nom. cons.*

Iphigenia indica (L.) A. Gray ex Kunth, Enum. 4:213.1843;Hook. f. in Hook. f., Fl. Brit, India 6 : 357. 1892; Prain, Bengal Pl. 2 :1074. 1903; Haines, For. Fl.Chota Nagpur 522.1910 & Bot. Bihar & Orissa pt. 6 : 1097. 1924.

Melanthium indicum L., Mant. Pl.2 : 226. 1771. **(Fig.16)**

Stems slender, flexuous, simple, glabrous, 10-25 cm high. Corm globose, 0.8-1.2 cm across,. with a 2.5-5 cm long neck, covered with brown sheaths. Leaves sessile, alternate, linear-oblong, acuminate, with sheathing base, glabrous, entire, flat or canaliculate, prominently veined, 10 - 20 × 0.2-0.5 cm. Flowers 5-7 mm across, borne in terminal erect racemes. Bracts linear-subulate, 0.8-1.5 cm long. Pedicels 1-3 cm long. Perianth 0.8-1.2 cm long, purplish; segments linear-subulate, spreading and reflexed, 7 × 2 mm. Stamens 3.5-4 mm long. Ovary oblong, about as long as stamens; styles to 0.1 cm long. Capsule oblong-ellipsoid, obtuse, 3-grooved, 1.5-2 cm long; valves round, depressed along median line. Seeds 1.8-2 mm in diam., warty.

Fl. : July - Sept. *Fr.* : Oct. - Dec.

Ecology : Not common; in forest-edges, forest-clearings and hill-slopes.

Distribution : Almost throughout India including Himalaya. Pakistan, Bangladesh, Nepal, Myanmar, Indo-Malayasia, Malesia, Australia.

Specimens examined : National Park, 455; Koderma Forest, 1775.

Uses : Corms are used in colic. Flowers yield a red dye.

9. URGINEA Steinh.

Urginea indica (Roxb.) Kunth, Enum. 4 : 333. 1843; Hook. f. in Hook. f., Fl. Brit. India 6 : 347. 1892; Prain, Bengal Pl. 2 : 1075. 1903; Haines, For. Fl. Chota Nagpur 522. 1910 & Bot. Bihar & Orissa pt. 6 : 1096. 1924; Deb & Dasgupta in Bull. Bot. Surv. India 16 : 118. 1974 & Fl. India Fasc. 7 : 17. 1981. *Scilla indica* Roxb., Fl. Ind. 2 : 147. 1832. **(Fig. 17).**

Scilla coromandeliana Roxb., Fl. Ind. 2 : 147. 1832. *Urginea coromandeliana* (Roxb.) Hook. f. in Hook.f., Fl. Brit. India 6 : 347. 1892.

U. wightiana Hook.f.in Hook.f., Fl. Brit. India 6 : 347. 1892.

U. gobindappae Boraiah & Fatima in Bull. Bot. Surv. India 12 : 128. 1970.

Local name : Jangli piyaz, Ban piyaz, Kandri.

Bulb ovoid-subglobose, pale, 4-7 cm thick. Leaves linear, flat, acute at apex, glaucous, to 30 × 1 cm. Scape slender, erect, to 50 cm long. Bracts minute, *ca* 2 mm long, ovate-lanceolate, auricled, soon withering. Perianth-segments linear-oblong, obtuse, greenish with a brownish streak

outside, white within, 8-10 mm × 2.5-3 mm. Staminal filaments white, flattened below, 5-6 mm long. Style obconic. Capsule ellipsoid, tapering to both ends, 1.2-2 cm long. Seeds 6-9 per cell, elliptic, flattened, black, *ca* 5 mm × 3 mm.

Fl. : Jan. - May. *Fr.* : Apr. - July.

Ecology : Very common; in forests, bank of rivers, streams, slopes of hills, etc.

Distribution : India : Sandy and rocky hilly parts all over India including Himalaya and along sandy sea coast, but chiefly in Andhra Pradesh, Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Tamil Nadu, Karnataka and Orissa . Nepal, Myanmar, Africa.

Specimens examined : National Park, 408; Pratappur Forest, 2077.

Uses : Bulbs are used as a cardiotonic, stimulant, expectorant and diuretic. Alcoholic extract of bulbs is used in human epidermoid carcinoma of nasopharynx; also used in dropsy, rheumatism and skin troubles. Leaves are eaten by poor people in times of scarcity.

Note : Jessop (in J.S. Afr. Bot. 46 : 265-319. 1977) considered *Drimia* Jacq. ex Willd. (1799) and *Urginea* Steinh (1834) as congeneric and accepted *Drimia indica* (Roxb.) Jessop as the correct name for the present taxon. Deb & Dasgupta (*l.c.*), however, treated them as distinct genera.

139. AGAVACEAE

Key to the Genera

1a.Ovary inferior :

2a.Perianth longer than stamens and style.Filaments and style swollen at base or below middle ...3. FURCRAEA

2b.Perianth much shorter than stamens and style. Filaments and style not swollen at base or below middle ...1. AGAVE

1b.Ovary superior :

3a.Ovule solitary in each cell of ovary ...4. SANSIVIERIA

3b.Ovules many in each cell of ovary :

4a.Perianth-segments united at base into a tube. Flowers small ...2. CORDYLINE

4b.Perianth-segments ± free. Flowers large ...5. YUCCA

1. AGAVE L.

Key to the Species

1a.Perianth-segments not constricted towards the tip :

2a.Leaves broadest in the middle, tapering to both extremities :

3a.Leaves oblong-lanceolate, neck sharply constricted ...1. *A. americana*

3b.Leaves linear-oblong, neck not constricted ...4. *A. veracruz*

2b.Leaves linear-lanceolate, not broadest in the middle ...2. *A. cantula*

1b.Perianth-segments narrowed from about the middle to the ligulate tip ...3. *A. sisalana*

1. **Agave americana** L., Sp. Pl. 323. 1753; Haines, For. Fl. Chota Nagpur 526. 1910 & Bot. Bihar & Orissa pt. 6 : 1104. 1924.

Local name : Banskeora,Bana kanwar.

Trunk short, stout, usually hidden by thick leaf-bases. Leaves many in a lax rosette, very stout, oblong-lanceolate, sharply constricted into a neck just above the very swollen bases, broadest in middle, tapering to both extremities, with distinctly sinuate margins bearing mostly reflexed spines on emergences, rather glaucous, spreading at base, then ascending and finally with tips usually recurved, 100-180 × 20-30 cm; marginal spines strong, dark brown; margins becoming involute for about 7-8 cm from tip and hardening, ultimately horny and forming terminal slightly grooved dull brown spine of 2-5 cm long. Panicle 4.5-7.5 m tall; primary branches almost horizontal; fascicles of flowers crowded at ends of subsidiary ascending branches. Parianth-segments ovate-lanceolate, obtuse, amber-coloured. Filaments amber-coloured; ovary faintly sulcate, about equalling perianth or shorter; style faintly 3-lobed. Capsule bluntly 3-gonous or oblong-cylindrical, rather broader upwards.

Fl. : Sep.- Dec. *Fr.* : Feb. - Apr.

Ecology : Very common; usually cultivated in gardens; sometimes found as an escape in waste places.

Distribution : Throughout India. Neo-tropics.

Specimens examined : Telaiya Dam, 2207; Hazaribagh, 2375.

Uses : Leaves yield a fibre used for ropes and cordage, mats, carpets, etc. Leaves are used as laxative and emmenagogue, also given for scurvy. Slices of leaves are applied as poultice. Roots are used as diuretic and diaphoretic. Core of plant is used for ascites, dropsy, venereal sores and dysentery.

2. **Agave cantula** Roxb., Fl. Ind. 2 : 167. 1832; Drum. in Kew Bull. 1910 : 342. 1910; Haines, For. Fl. Chota Nagpur 526. 1910 & Bot. Bihar & Orissa pt. 6 : 1105. 1924.

A. americana acut. non L. : Hook.f. in Hook.f., Fl. Brit. India 6 : 277. 1892, *p.p.*

Leaves arising in lax rosette from a short ascending rhizome, linear-lanceolate, not broadest in middle, curving gradually from base, ± concave in upper surface, pale-green, older darker, sometimes glaucous, 1-1.5 m long and 6-8 cm broad; marginal spines conspicuous, falcate, pointing forwards, very sharp, pale brown, each arising from a small light-coloured cushion, 5-7 mm long; apical spine usually acicular, reddish or dark-brown, 1.2-2.5 cm long. Panicle 3.5-5.5 m long; branches flexuous, slender; fascicle 1-2-flowered. Perianth-segments linear-oblong, obtuse, greenish yellow, 2.5-4 cm long. Ovary equal or shorter than perianth. Filaments brown-blotched, to 7 cm long; anthers to 3.5 cm long. Capsule trigonous or oblong-cylindric.

Fl. : July - Sept. *Fr.*: Oct. - Nov.

Ecology : Common; in waste places, roadsides, etc., also planted along hedges, borders of fields, in gardens, etc.

Distribution : Throughout India, introduced and naturalised. Probably native of Mexico, now naturalised in most of the tropical countries of Asia.

Specimens examined : Hazaribagh, 2235; Ramgarh, 2375.

Uses : Leaves yield a hard fibre used for twines, ropes and cordage. Plant is also grown as hedge and useful in checking soil-erosion.

3. **Agave sisalana** Perr. ex Engelm. in Trans. Acad. Sci. St. Louis 3: 305. 1875; Haines, For. Fl. Chota Nagpur 527. 1910 & Bot. Bihar & Orissa pt. 6 : 1106. 1924.

Rhizome sometimes ascending, hidden by leaf-bases. Leaves not forming a rosette, but closely tufted on rhizome, linear-lanceolate, 1-2m long and 8-15cm broad, with the widest part just above middle, not constricted above base, deep green, glaucous or not, 1-2 m long and 10-25 cm broad; marginal spines 0, or if present weak, scattered and pale; terminal spine not channelled, glossy, purple or dark brown. Panicle to 5 m long; fascicles of flowers rather crowded. Perianth-segments narrowed from about the middle, narrowly ligulate, with slightly hooded tip. Ovary equal or shorter than perianth, slightly broadened upwards; style long; stigma faintly lobed. Fruit globose or cylindrical, beaked.

Fl. : Aug. - Oct. *Fr.* : Oct. - Nov.

Ecology : Cultivated in gardens; sometimes met with as an escape in waste places.

Distribution : Almost throughout India, introduced and naturalised. Native of Mexico, introduced in many tropical countries.

Specimens examined : Telaiya Dam, 2208; Hazaribagh, 2401.

Uses : Leaves yield a fibre used for ropes, cordage, twines, fishing nets, etc. Plant is also grown as hedge plant.

4. **Agavevera-cruz** Mill., Gard. Dict. no. 7. 1754; Haines, For. Fl. Chota Nagpur 526. 1910 & Bot. Bihar & Orissa pt. 6 : 1105. 1924.

A. cantula auct. non Roxb. : Prain, Bengal Pl. 2 : 1157. 1903.

A stout plant with a short trunk hidden by thick leaf-bases. Leaves linear-oblong, broadest in middle, tapering to both extremities, not constricted above base, ± recurved, deep green and glaucous, 1.2-1.8 m long and 18-25 cm broad; margins not or slightly sinuate; marginal spines spreading or decurved, black or dark-coloured, present in 1-1.3 cm intervals; apical spine dark brown, 1.2-2.5 cm long. Main branches of panicle 3-chotomous, curved or flattened; flowers in pairs with a subsidiary bud laterally developed at different levels. Tepals linear-lanceolate, pale amber tinged. Anthers 1-1.2 cm long, much exserted. Ovary smooth, cylindrical, longer than perianth; style faintly lobed. Capsule ± turgid, oblong-cylindric, with rounded tip. Seeds black, shining.

Fl. : Sept. - Nov. *Fr.* : Oct. - Dec.

Ecology : Very common; cultivated in gardens, also found as an escape in waste places.

Distribution : Throughout India, introduced and naturalised. Native of Mexico, now distributed in most of the tropical countries of the World.

Specimens examined : Hazaribagh, 2244; Koderma, 2387.

Uses : Leaves yield a fibre used for making ropes, cordage and mats. Plants are useful for hedging, fencing and checking soil-erosion.

2. CORDYLINE Comm.

Cordyline terminalis Kunth, Enum. 5 : 25. 1850; Hook.f. in Hook.f., Fl. Brit. India 6 : 331. 1892; Prain, Bengal Pl. 2 : 1072. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1091. 1924.

Erect shrub, 2-3 m tall. Leaves distichous, oblong-lanceolate, narrowed at both ends, green or purplish, 30-90 × 5-13 cm. Petiole complicate, with dilated and amplexicaul base. Panicle 30-60 cm tall.

Flowers subsessile or shortly pedicelled, white or purplish, subspicate or racemed on branches of panicle. Perianth 7-8 mm long, cleft to the swollen base; segments recurved. Berry 7-8 mm diam., usually 1-seeded.

Fl. : Mar.- Apr. *Fr. :* Apr. - May.

Ecology : Very common; cultivated in gardens, parks, etc.

Distribution : Throughout India. Eastwards to the Pacific Islands.

Specimen examined : Hazaribagh, 2373.

Use : Rhizome is used in diarrhoea.

3. FURCRAEA Vent.

Furcraea foetida (L.) Haw., Syn. Pl. Succ. 73. 1812; Matthew in Rec. Bot. Surv. India 20 : 213. 1969. *Agave foetida* L., Sp. Pl. 323. 1753.

Furcraea gigantea Vent. in Bull. Sci. Soc. Philom. Paris 1 : 65. 1793; Prain, Bengal Pl. 2 : 1058. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1100. 1924.

Plant to 9 m tall. Leaves to 2 m long, glaucous, scarcely armed. Panicle 3-5 m long. Flowers pendent on slender pedicels, *ca* 5 cm long. Hypanthium 1.8-2.5 cm long, slender, slightly pulvinate on pedicel. Outer perianth-segments narrowly elliptic, obtuse, to 3 × 1 cm; inner ones elliptic, to 3 × 1.5 cm; all segments white, free to base. Stamens 1-1.2 cm long, flattened throughout, oblong at base, then much dilated in middle and finally acuminate, appressed but not adnate to stylar column; anther stout, versatile, 2.5-3 mm long. Stylar-column stout, deeply 3-lobed for *ca* 7 mm, each lobe with a 2-lobulate cornice above which the column has a tapering beak of *ca* 1 cm long bearing a obscurely 3-lobed stigma with perforate apex.

Fl. : Mar. - May. *Fr.* : May - June.

Ecology : Common; cultivated in gardens.

Distribution : Throughout India. Native to S. America, extensively cultivated in all the tropical countries of the World.

Specimens examined : Hazaribagh, 2197; Gola, 2387.

Uses : Leaves yield a fibre used for twines and cordage.

4. SANSEVIERIA Thunb., *nom. cons.*

Sansevieria roxburghiana J. & J. Schult. in Roem. & Schult., Syst. 7 : 357, f. 12 D & E. 1829; Hook.f. in Hook.f., Fl. Brit. India 6 : 271. 1892; Prain, Bengal Pl. 2 : 1054. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1090. 1924.

S. zeylanica Roxb., Pl. Corom. 2 : 45, t. 184. 1805, non (L.) Willd. 1799; Roxb., Fl. Ind. 2 : 161. 1832.

Local name : Marul, Murva.

Rhizome horizontal, creeping, sending up tufts of leaves at intervals. Leaves flat, but convex on lower surface, linear-oblong, widest about middle, clouded with irregular bars of darker green on both surfaces, with the tip ending in a solid cusp of *ca* 2.5 cm long, 30-40 × 2.5-3.3 cm. Raceme dense, shorter than leaves, to 30 × 5 cm; clusters 2-3- flowered, on small tubercles. Bracts erect, scarious. Pedicels jointed, 3-7 mm long, tinged-violet, broader above joint. Perianth 1.5-1.8 cm long; lobes linear-obcuneate, with obtuse, somewhat inflexed, thickened, papillosely pubescent tips. Stamens somewhat shorter than perianth-lobes; anthers oblong; anther-lobes distinct at base up to the filament. Ovary broadly oblong, somewhat 3-grooved; style *ca* 1.5 cm long; stigma exserted, capitellate.

Fl. : June - July. *Fr.* : Nov. - Dec.

Ecology : Not common; on steep slopes along ravines, rocky soils under shade in forests, etc., also cultivated in gardens, hedges, etc.

Distribution : Throughout India. Said to be indigenous on Coromandel coast, now naturalised in other parts of India, S.E. Asia, Java and elsewhere.

Specimens examined : Chatra, 2200; Simaria, 2392.

Uses : Leaves yield a fibre used for bow-strings, cordage, matting and fine cloth. Rhizomes are used for cough. Juice of tender shoots given to children for cleaning phlegm from the throat.

5. YUCCA L.

Yucca gloriosa L., Sp. Pl. 319. 1753; Haines, Bot. Bihar & Orissa pt. 6 : 1091. 1924..

Trunk short, to 1 m tall or rising to 1.5-2.5 m. Leaves broadly ensiform, 60-80 × 4-6 cm, usually with a few threads when old and a few deciduous teeth when young; tip short, stiff and red. Panicle 1-1.5 cm long; flowers many, hanging, white, sometimes purple-tipped, 7-10 cm across during anthesis. Perianth bell-shaped. Fruit capsular, not dehiscent, 6-ridged, 7-10 cm long.

Fl. : July - Aug. *Fr.* : Oct. - Dec.

Ecology : Common; cultivated in gardens.

Distribution : Throughout India, introduced and naturalised. Native of West Indies, now introduced in many countries of the World for cultivation as ornamental.

Specimens examined : Hazaribagh, 2234; Koderma, 2377.

Uses : Leaves yield a fibre used for ropes, cords, mats and carpets. Fruits are used in rheumatism, sores, ulcers, dysentery, bronchitis and asthma.

140. SMILACACEAE

SMILAX L.

Key to the Species

1a. Leaves 15-30 × 12-28 cm, usually 7-costate. Branches usually terete. ...1. *S. ovalifolia*

1b. Leaves 12-18 × 6-10 cm, 3-5-costate. Branches 4-angled ...2. *S. zeylanica*

1. **Smilax ovalifolia** Roxb. ex D. Don, Prodr. Fl. Nepal 49. 1825; Koyama in Hara *et al.*, Enum. Fl. Pl. Nepal 1 : 79. 1978.

Smilax macrophylla Roxb., Fl. Ind. 3 : 793. 1832, non Willd. 1806; Hook.f. in Hook.f., Fl. Brit. India 6 : 310. 1892; Prain, Bengal Pl. 2 : 1071. 1903; Haines, For. Fl. Chota Nagpur 519. 1910 & Bot. Bihar & Orissa pt. 6 : 1087. 1924.

Local name : Jangli-aushbah.

A stout prickly climber. Stem sometimes 2.5 cm diam. below, quite terete or with 4 lines or angled, striate when dry, armed with few small distant prickles; flowering branches almost unarmed. Leaves broadly elliptic or orbicular, rounded or subcordate at base, with a short hard cusp, glossy above, usually 7-costate, 15-30 × 12-28 cm. Petioles 1.2-2.5 cm long, stout, narrowly sheathing below. Cirrhi very long and slender. Umbels 1-3, rarely 5, in axillary short cymes, pedunculate, many-flowered. Peduncles 1.2-3 cm long. Bracts below peduncles ovate, 2.5-4 mm long. Pedicels in both male and female flowers arising from an aggregation of numerous minute bracts. Male flowers : Pedicels 2.5-3 mm long; tepals linear, obtuse, erect when young, afterwards reflexed, 6-8 mm long, outer 3 *ca* 2.5 mm broad, inner 3 *ca* 1.3 mm broad. Stamens 5-6 mm long; anthers linear-oblong, 1.8-2 mm long. Female flowers : pedicels 6-8 mm long, slightly elongated in fruit; tepals rather shorter than in male, reflexed,

outer 3 ovate-oblong, *ca* 2.5 mm broad, inner 3 *ca* 1.3 mm broad; stigmas 3, recurved. Berry globose, 0.7-1.2 cm in diam, 1-3 -seeded. Seeds biconvex.

Fl. : Apr. - July. *Fr.* : Nov. - Jan.

Ecology : Common; in forests, slopes of ravines, scrub jungles, etc.

Distrib. : Throughout India including Himalaya. Nepal, Indo-China, Myanmar.

Specimens examined : Raja Rappa, 359; National Park, 2199.

Uses : Roots are used as a substitute for Sarsaparila (*Hemidesmus indicus* L.) for venereal diseases; also used for rheumatism and employed for urinary complaints and dysentery.

2. **Smilax zeylanica** DC., Monogr. Phan. 1 : 174. 1878; Hook.f. in Hook.f., Fl. Brit. India 6 : 309. 1892; Haines, For. Fl. Chota Nagpur 520. 1910 & Bot. Bihar & Orissa pt. 6 : 1088. 1924.

Stout prickly climber. Branches slender, ± 4 - angled, with few prickles; branchlets usually zigzag. Leaves elliptic or broadly oblong or ovate-oblong; rounded or subcordate at base, cuspidate, 3-5 costate from above base, 12-18 × 6-10 cm. Petiole 1.2-2.5 cm long, very shortly sheathing at base, jointed in middle, at length cirrhose. Umbels solitary or 2-3 on a common peduncle, many-flowered. Peduncle 1.5-2 cm long, bracteate at base. Male flowers : pedicels 5-6 mm long; outer tepals linear, 4-6 mm long, inner tepals much narrower; stamens as long as outer tepals. Female flowers : 1-1.2 cm long, slightly elongating in fruit. Berries globose, red, 1-1.2 cm in diam.

Fl. : June - July. *Fr.* : Oct. - Dec.

Ecology : Very common; in forests, scrub jungles, etc.

Distribution : Throughout India particularly in hilly regions, E. Himalaya. Nepal, Indo-China, Myanmar, Malesia.

Specimens examined : National Park, 1218; Koderma Forest, 2247.

Uses : Roots are employed in venereal and skin diseases. Decoction of roots is used for sores, swellings and abscesses.

141. DIOSCOREACEAE

DIOSCOREA L.

Key to the Species

1a. Leaves 3-5 foliolate. Stamens 3 perfect and 3 staminodial. Flowers pedicellate. ...3. *D. pentaphylla*

1b. Leaves simple. Stamens 6, all perfect. Flowers sessile :

2a. Outer perianth-segments linear. Male spikes slender, drooping, 2.5-9 cm or more long. Capsule oblong. Seeds not winged all round ...2. *D. bulbifera*

2b. Outer perianth-segments not linear. Male spike stiffly spreading, 5 cm or less long. Capsule broader than long. Seeds winged all round :

3a. Whole plant pubescent or tomentose. Ovary tomentose ...5. *D. pubera*

3b. Whole plant glabrous, if slightly pubescent (e.g. *D. appositifolia*) then ovary glabrous :

4a. Leaves glaucous beneath. Inflorescence glabrous. Tubers at ends of long fleshy fibres ...1. *D. belophylla*

4b. Leaves not glaucous. Inflorescence slightly pubescent. Tubers direct from root-stock ...4. *D. oppositifolia*

1. **Dioscorea belophylla** Voight ex Haines, For. Fl. Chota Nagpur 530. 1910 & Bot. Bihar & Orissa pt. 6 : 1119. 1924; Prain & Burk. in Ann. Roy. Bot. Gard. Calcutta 14(2) : 348. t. 127. 1938.

D. nummularia Lam. var. *belophylla* Prain, Bengal Pl. 2 : 1067. 1903.

D. glabra auct. non Roxb. : Hook.f. in Hook.f., Fl. Brit. India 6 : 294. 1892, *p.p.*; Haines, For. Fl. Chota Nagpur 530. 1910 & Bot. Bihar & Orissa pt. 6 : 1118. 1924, *p.p.*

Stems terete, quite smooth, unarmed, twining to right, enlarged at base into a small rhizome. Leaves opposite and alternate, simple, long-petiolate, variable in shape, ovate-lanceolate, ovate-elliptic or suborbicular, sagittate-subcordate at base with rounded lobes, cuspidate-acuminate at apex, sap-green and dull above, glaucous beneath, 5-17 × 2-10 cm, basally 7-9-nerved. Petiole narrowly margined, twisted at base, 2-10 cm long. Male flowers : in lax-flowered spikes of 2-5 cm long which are unilaterally 2-3- nate on usually branched, axillary rachis of 10-15 cm long; bracts ovate, acute, glabrous, 0.8-1mm long; perianth- base very broad; outer perianth-segments ± free, oblong, obtuse, scarious-margined, 1.4-1.6 mm long; inner ones elliptic-oblong, serrulate at apex, nearly as long as outer ones; stamens 6, all perfect; pistillodes absent. Female flowers : in lax, solitary or fascicled spikes of *ca* 15 cm long, nodding; outer perianth-segments oblong, rounded, 0.8 - 1mm long; inner ones obovate, 0.6-0.8 mm long; staminodes 6; ovaries triquetrous; styles 3, very short. Capsules obovoid, narrowed at base into a stalk of 4-5 mm long, winged upwards forming a deeply cordate or retuse apex, *ca* 2.5 × 3.5 cm. Seeds irregularly orbicular.

Fl. : Sept. - Nov. *Fr.* : Jan. - Mar.

Ecology : Very common; in scrub jungles, hedges, forest edges ,forest clearings, slopes of low hills , etc.

Distribution : Throughout India (except Kerala). Pakistan, Nepal, Bhutan, Bangladesh, Sri Lanka.

Specimens examined : Koderma Forest, 1883; Hunterganj, 2269.

Use : Tubers are eaten after cooking.

2. **Dioscorea bulbifera** L., Sp. Pl. 1033. 1753; Hook.f. in Hook.f., Fl. Brit. India 6 : 296. 1892; Prain, Bengal Pl. 2 : 1066. 1903; Haines, For. Fl. Chota Nagpur 533. 1910 & Bot. Bihar & Orissa pt. 6 : 1122. 1924. Prain & Burk. in Ann. Roy. Bot. Gard. Calcutta 14 : 111, t. 49-51. 1936.

D. sativa auct. non L. : Hook.f. in Hook.f., Fl. Brit. India 6 : 295. 1892.

Local name : Rat alu, Suar alu.

Tubers mostly globose to pyriform, usually covered densely with short roots. Leaves suborbicular or broadly ovate, deeply cordate, abruptly caudate at apex, entire, shining and slightly bullate between secondary veins above, dull beneath, 5-nerved, to 20 × 20 cm. Petiole 5-10 cm long. Male flowering axes pendulous, 1-4 from the axil of a bract, 3 - 10 cm long, many-flowered. Tepals green or purple, linear-lanceolate, 1.5-4 mm long. Stamens 6, very small, all perfect. Female flowering axes directed downwards, solitary or 2 to more together from a leaf-axil. Bracts long acuminate. Outer petals broader than those of male, green, to 1.5 mm long; inner ones a trifle shorter than those of male. Capsules broadly oblong, bright chestnut, imbricating, 1.8-2.2 × 0.8-1 cm; wings rounded at both ends. Seeds winged above.

Fl. & Fr. : Aug. - Dec.

Ecology : Common; in jungles.

Distribution : Throughout India. Tropics of Old World.

Specimens examined : Pratappur, 912; National Park, 1176.

Uses : Tubers are eaten as vegetable in times of scarcity; also used in piles and dysentery.

3. **Dioscorea pentaphylla** L., Sp. Pl. 1032. 1753; Roxb., Fl. Ind. 3 : 806. 1832; Hook.f. in Hook.f., Fl. Brit. India 6 : 292. 1892; Prain, Bengal Pl. 2 : 1066. 1903; Haines, For. Fl. Chota Nagpur 534. 1910 & Bot. Bihar & Orissa pt. 6 : 1123. 1924; Prain & Burk. in Ann. Roy. Bot. Gard. Calcutta 14(1) : 160, t. 66 & 67. 1936.

D. jacquemontii Hook.f. in Hook.f., Fl. Brit. India 6 : 290. 1892.

Local name : Bhusa, Gazaria, Kanta alu.

Tubers elongated to globose-pyriform, covered by short bristly roots. Stems abundantly prickly on lower internodes, glabrescent. Bulbils plentiful, globose-ellipsoid, brown. Leaves 3-5-foliolate, glabrous or pubescent beneath; leaflets 4-15 × 1-5 cm; middle one largest, broadly oblanceolate-obovate, obtuse or rounded at base, shortly acuminate at apex; outer ones inequilateral, with one additional primary nerve outside the midrib. Male flowering axes gathered on leafless branches, to 3 cm long. Bracts and bracteoles near apex of pedicels. Outer tepals lanceolate, to 1 mm long; inner ones rather broader and blunter. Stamens inserted at base of tepals, the 3 fertile stamens shorter than staminodes. Female flowering axes 1-3 together from a leaf axil, to 25 cm long, pubescent. Tepals similar to male. Capsule oblong, ± black when ripe, with rounded shoulders near apex; wings to 2 × 0.6 cm.

Fl. & Fr. : July - Dec.

Ecology : Common; in hedges and jungles.

Distribution : Throughout India. S. China to Yunan, southward through Malesia to New Guinea.

Specimens examined : Simaria, 808; National Park, 2024.

4. **Dioscorea oppositifolia** L., Sp. Pl. 1033. 1753; Hook.f. in Hook.f., Fl. Brit. India 6 : 292. 1892; Prain, Bengal Pl. 2 : 1278. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1118. 1924; Prain & Bruk. in Ann. Roy. Bot. Gard. Calcutta 14(2) : 392, t. 139. 1938.

Local name : Pan alu.

Large climber, twining to the right. Rootstock thick, deep underground. Stem slender, unarmed; branches terete, not bulbiferous, neither winged or conspicuously angled. Leaves mostly opposite or subopposite, simple, variable in shape from lanceolate to elliptic-oblong, ovate or suborbicular, rounded at base, acute or acuminate at apex, with well-defined cartilaginous margins, glabrous, 3-5-nerved at base, 5-13 × 2.5-7 cm. Petiole 0.6-3 cm long. Male flowers : in dense pedunculate spikes of 1 - 3 cm long fascicled in leaf-axils or along slender axillary rachis; bracts below spikes *ca* 3 mm long, lanceolate -subulate, below flowers *ca* 1.2 mm long, ovate-acuminate, mottled with brown. Perianth with a broad base; outer lobes broadly ovate-suborbicular, concave, *ca* 2 × 1.5 mm, inner ones smaller, somewhat ovate; stamens 6, perfect; anthers didymous; pistillodes obscure or represented by 3 glands. Female flowers : distant, in solitary or fasciculate axillary spikes of 15-20 cm long; bracts suborbicular, acuminate, *ca* 1.2 mm long; perianth-lobes similar to those of male. Capsules suborbicular or often broader than long, truncate, retuse or 2-lobed at apex, cuneate at base, glabrous, 2.5-3.5 cm in diam. Seeds orbicular, winged all round, 1.8-2.5 cm in diam.

Fl. : June - Oct. *Fr.* : Nov. - Dec.

Ecology : Not common; in moisture parts of the forests.

Distribution : India : Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Assam. Sri Lanka, Bangladesh, tropical Asia.

Specimens examined : National Park, 1826; Markachho, 1951.

Uses : Tubers are relished by jungle tribes after repeated boiling and washing. Flowers are used as vegetable. Leaves are eaten by poor people in times of scarcity. Tubers are used in swelling and as tonic.

5. **Dioscorea pubera** Bl., Enum. Pl. Java 1 : 21. 1827; Prain & Bruk. in Ann. Roy. Bot. Gard. Calcutta 14(2) : 402, t. 138. 1938.

D. anguina Roxb., Fl. Ind. 3 : 803. 1832; Hook.f. in Hook. f., Fl. Brit. India 6 : 293. 1892; Prain, Bengal Pl. 2 : 1066. 1903; Haines, For. Fl. Chota Nagpur 529. 1910 & Bot. Bihar & Orissa pt. 6 : 1117. 1924.

Stems unarmed, twining to right, densely pubescent; root-stock small, woody. Leaves opposite, broadly ovate or suborbicular, cordate at base, acute or acuminate at apex, with cartilaginous margins, pubescent on nerves beneath, 7-18 × 5-14 cm; basal nerves 7; petioles half to nearly as long as blade, pubescent. Male flowers : in dense-flowered pubescent spikes of 1.2-3.5 cm long, closely 1-3- nate; bracts ovate, acuminate, deflexed, pubescent; outer perianth-segments broadly oblong or ovate-oblong, obtuse, *ca* 1.3 mm long; inner segments shorter, ovate, glabrescent outside; stamens 6, all perfect, adnate to perianth-segments; pistillode large, globose. Female flowers : in solitary, axillary, densely pubescent spikes of 5-10 cm long or in short axillary panicles of 10-15 cm long; perianth-segments much thickened at base, *ca* 1.3 mm long, each bearing a staminode, outer ones broadly ovate, rounded, inner ones rather smaller; ovary pubescent. Capsules 1.2-1.4 cm long excluding short obconic base and 2-3 cm broad, subcordate at top and bottom, glabrous, with thickened margin of wings. Seeds winged all round.

Fl. : Sept. - Nov. *Fr.* : Jan. - Mar.

Ecology : Very common; in moist deciduous and semi-deciduous forests.

Distribution : India : Assam, Sikkim, West Bengal, Bihar, Uttar Pradesh, Madhaya Pradesh, Kerala, Tamil Nadu, Orissa. Nepal, Bhutan, Myanmar, Sumatra, Java.

Speciemens examined : National Park, 1970; Pratappur Forest, 2282.

Uses : Leaves and twigs are used as cattle feed. Tubers are eaten after cooking. Bulbils are eaten by tribal people.

142. ORCHIDACEAE

Key to the Genera

1a. Plants epiphytic, without pseudo-bulbs. Pollinia 2, waxy ...4. VANDA

1b. Plants terrestrial, with pseudo-bulbs :

2a. Pollinia granular; anthers erect, neither opercular nor deciduous ...3. HABENARIA

2b. Pollinia 2 or 4, waxy; anther opercular, deciduous :

3a. Inflorescence erect. Lip distinctly 3-lobed, saccate or spurred at base ...1. EULOPHIA

3b. Inflorescence decurved. Lip obscurely 3-lobed, wide-ventricose but not spurred at base ...2. GEODORUM

1. EULOPHIA Brown ex Lindley, *nom. cons.*

Eulophia explanata Lindl., Gen. & Sp. Orchid. 180. 1833; Hook. f. in Hook. f., Fl. Brit. India 6 : 3. 1890; Haines, Bot. Bihar & Orissa pt. 6 : 1171. 1924.

Pseudobulb irregularly ovoid, 3.5-4 cm long. Leaves large, broadly elliptic, shortly acuminate, petiolate, 20-30 × 8-10 cm. Lowest sheaths of scape convolute, 1.2-2.5 cm long. Scape 10-20 cm long, rather stout, unbranched, 10-20-flowered. Bracts 0.8-1.2 cm long, shorter than the ovary. Flowers yellow and purplish, 1-1.4 cm long. Pedicels with ovary 1.5 -1.8 cm long. Sepals oblong-ovate, subacuate. Petals spreading, broadly elliptic, rounded, 5-nerved. Lip sessile, adnate to lateral sepals at base, saccate with spreading nerves, subpanduriform upwards with 2 thick

crenate lamellae on palate, and midrib greatly thickened and tubercled towards truncate-emarginate tip. Sac or spur broadly conical, obtuse. Column very short.

Fl. : Apr. - June. *Fr.* : Sept. - Dec.

Ecology : Common; in foot of hills, shades of deciduous forests, etc.

Distribution : India : North- west India, Uttar Pradesh, Orissa. Nepal, China.

Specimens examined : National Park, 1829, 2209.

2. GEODORUM Jacks.

Geodorum densiflorum (Lam.) Schltr. in Fedde Report. Beih. 4 : 259. 1929; Jayaw. in Dassan.& Fosb., Rev. Handb. Fl. Ceylon 2 : 180. 1981. *Limodorum densiflorum* Lam., Encycl. 3 : 516. 1792.

Geodorum dilatatum R. Br. in Ait., Hort. Kew ed. 2, 5 : 207. 1813; Hook. f. in Hook.f., Fl. Brit. India 6 : 17. 1890; Prain ,Bengal Pl. 2 : 1017. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1176. 1924.

G. purpureum R. Br. in Ait., Hart. Kew ed. 2, 5 : 207. 1813; Hook.f. in Hook.f., Fl. Brit. India 6 : 16. 1890.

Pseudobulbs tuberous, with thick vermiform roots; tubers ovoid, to 1.5 cm diam. Stem 10-15 cm long. Leaves 2 or 3, sessile, oblong-lanceolate or elliptic, with narrowed base, acute or acuminate at apex, bright green and shining above, 3-5-nerved beneath, 15-30 × 7-10 cm. Racemes closely 10-12-flowered. Peduncle 30-50 cm long. Bracts lanceolate. Sepals linear-oblong, acute, 3-5-veined, white or greenish, 1-1.2 cm long. Petals white, about the same length and shape as sepals, 5-7-veined. Lip subpanduriform, slightly recurved at tip, undulate with a broad ridge ending in a yellow warted callus. Anther terminal, 2-auricled; pollinia subsessile on a broad land. Fruit a pendulous, fusiform capsule, 1.5-2 cm long.

Fl. & Fr. : June - Aug.

Ecology : Very common; under the shade of trees in forests.

Distribution : India : Uttar Pradesh, Bihar, West Bengal, Orissa, Deccan Peninsula, Sikkim, Assam, Andaman Islands. Nepal, Bangladesh, Sri Lanka.

Specimens examined : Pratappur, 621; Koderma Forest, 1294; National Park, 2013.

Use : Root-stocks are employed in the preparation of glue used for joining parts of musical instruments.

3. HABENARIA Willd.

Habenaria commelinifolia Wall. ex. Lindl., Gen. Sp. Orch. 325. 1835; Hook.f. in Hook.f., Fl. Brit. India 6 : 143. 1890; Prain, Bengal Pl. 2 : 1032. 1903; Haines, Bot. Bihar & Orissa pt. 6 : 1157. 1924.

Orchis commelinifolia Roxb., Fl. Ind. 3 : 451. 1832.

Tubers ellipsoidal. Stem 60-90 cm tall, erect, robust. Leaves 7-15 × 2.5 - 3.5 cm, oblong to oblong-lanceolate, sheathing at base, with a translucent white edge, mostly flat, sometimes conduplicate, becoming gradually smaller and passing into lanceolate, caudate-acuminate bract-like sheath below spike.Spike 10-20 cm long, many-flowered. Flowers 1.2-1.8 cm across, white, scentless. Bracts to 2.5 cm long, produced to a fine acicular point, exceeding the long-beaked ovary. Median sepal 0.8-1 cm across, orbicular, shortly beaked, lateral ones very gibbous, hatchet-shaped, ribbed, 1.2-1.4 cm long. Petals to 0.9 × 0.5 cm, obliquely ovate-oblong, obtuse. Lip linear for about 0.8 cm from base, then divided into 3 segments of which lateral two filiform, more than 2.5 cm long,

middle segment linear, shorter than lateral two, to 1.6 cm long. Spur 4-6 cm long, doubly curved, with a funnel-shaped mouth and slightly inflated apex. Anther-tubes long, straight, erect; stigmatic processes large, clavate, incurved. Rostellum short, triangular. Capsules 1-1.2 cm long, sessile, fusiform ,with a beak about twice as long as body.

Fl. : Aug. - Sept. *Fr.* : Oct. - Dec.

Ecology : Very common; in sandy soil of open grounds in forests, hills, pasture lands, among grasses in waste places, etc.

Distribution : India : Tropical Western Himalaya, Uttar Pradesh, Bihar, West Bengal, Orissa, Western Peninsula. Nepal, Myanmar, Thailand, Vietnam.

Specimens examined : National Park, 1824, 2204; Koderma Forest, 2357.

Use : Tubers are a source of salep.

4. VANDA R. Br.

Vanda tessellata (Roxb.) Lodd. ex G. Don in Loud., Hort. Brit. 372. 1830; Haines, Bot. Bihar & Orissa pt. 6 : 1181. 1924.*Epidendrum tessellatum* Roxb., Pl. Corom. 1 : 34, t. 42. 1795.

Vanda roxburghii R. Br. in Bot. Reg. 6 : t. 506. 1820; Hook.f. in Hook.f., Fl. Brit. India 6 : 52. 1890; Prain, Bengal Pl. 2 : 1021. 1903.

Local name : Banda, Rasna.

Stems 30-60 cm long, lower part sheathed with remnants of old leaves. Leaves 12-20 × 1.5-2.5 cm, strap-shaped, equitant, obtusely keeled, praemorse with two unequal lobes and a short pointed one in between. Racemes 12-20 cm long, suberect, 6-10- flowered. Peduncle stout, with 2 to few brownish-green, sterile bracts. Floral bracts broadly triangular-ovate, clasping the rachis, 1-veined, 2-2.5 mm long. Sepals obovate,

yellowish green, tesselated with brown on inner side, whitish outside, many veined; dorsal one faintly trifid with crisped margins, 2-2.5 × 1.2-1.6 cm. Petals similar to sepals, clawed. Lip 3-lobed; lateral lobes erect, obliquely oblong, acuminate, to 10 × 5 mm; midlobe panduriform, constricted below bifid apex, violet or crimson, 1.6 × 1.2 cm, with swollen disc having curved ridges; spur conical, 6-7 mm long. Column to 8 mm high and 0.5 cm broad. Pollinia globular, unequally didymous, to 1.5 mm across. Fruit a clavate, ribbed capsule, 7-9 cm long, sharply winged, with a short pedicel.

Fl. & Fr. : Apr. - Aug.

Habitat : Very common; on trees like *Mangifera indica, Madhuca longifolia*, etc. in forests.

Distribution : Almost throughout India. Nepal, China, Bangladesh, Myanmar, Sri Lanka, Java.

Specimens examined : Ichak, 329; Satgawan, 594; Tondwa, 1437.

Uses : Leaf-juice is dropped in the ear in otitis and other inflammatory conditions. Roots are used in bronchitis, rheumatism and fevers. They also possess antifungal, antibacterial and antitubercular properties.

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