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

FLORA OF HAZARIBAGH DISTRICT, BIHAR
VOL. II

FLORA OF HAZARIBAGH DISTRICT, BIHAR

Volume - II

(TROPAEOLACEAE TO ORCHIDACEAE)

N. D. Paria
S. P. Chattopadhyay

भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

GOVT. OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
BOTANICAL SURVEY OF INDIA

Date of Publication : October, 2005

Cover Photo : Close up view of an inflorescence of Leonotis nepetaefolia.

ISBN 81-8177-0072

Price : Rs. 844.00 or $96.00

Published by the Director, Botanical Survey of India, CGO Complex, 3rd.Floor, MSO Building Sector - 1, DF Block, Salt Lake City, Kolkata - 700 064 *Composed and Printed at* ***City Service,*** *P-19, Jadu Park, Kolkata-700034*

SEQUENCE OF FAMILIES

(Arranged after Cronquist's System, 1981)

MAGNOLIOPSIDA (Dicots)

MAGNOLIOPSIDA (Dicots)

LILIOPSIDA (Monocots)

X

LIST OF THE ILLUSTRATIONS

Fig. 6) *Rotula aquatica* Lour.
(a) a twig, (b) flower, (c) corolla, split open;
(d) calyx, (e) bract, (f) stamens, (g) pistil,
(h) l.s.of ovary, (i) t.s.of ovary.

Fig.7) *Glossostigma diandrum* (L.) Kuntze
(a) habit, (b) leaf, (c) flower, (d) calyx,
(e) corolla, split open, (f) stamen, (g) pistil,
(h) t.s.of ovary (i) fruit.

Fig.8) *Utricularia exoleta* R. Br.
(a) habit, (b) bladder, (c) persistent calyx and
pistil, (d) corolla, (e) stamens, (f) fruit,
(g) t.s. of ovary, (h) seed with corky wing.

Fig.9) *Richardia scabra* (L.)
(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.

Fig.10) *Amberboa* (Roxb.) Jafri:
(a) habit (b) head with spiny involucre,
(c) part of involucre, (d) disc floret, (e) stamen,
(f) fruit.

Fig.11) *Butomopsis latifolia* (D.Don) Kunth
(a) habit, (b) flower, (c) sepal. (d) petal,
(e) stamens, (f) carpel (g) follicle, (h) seed.

Fig.12) **Cyperus alulatus* Kern
(a) habit, (b) spikelet, (c) glume,
(d) deflorate flower,
(e) stamen, (f) nut.

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

Fig. 14) *Hygroryza aristata* (Retz.) Nees ex Wight & Arn.
(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.

Fig. 15) *Perotis indica* (L.) O. Kuntze
(a) habit, (b) spikelet, (c) lower glume, front & back,
(e) stamens and pistil, (f) lemma, (g) palea, (h) stemens,
(i) caryopsis.

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

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

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

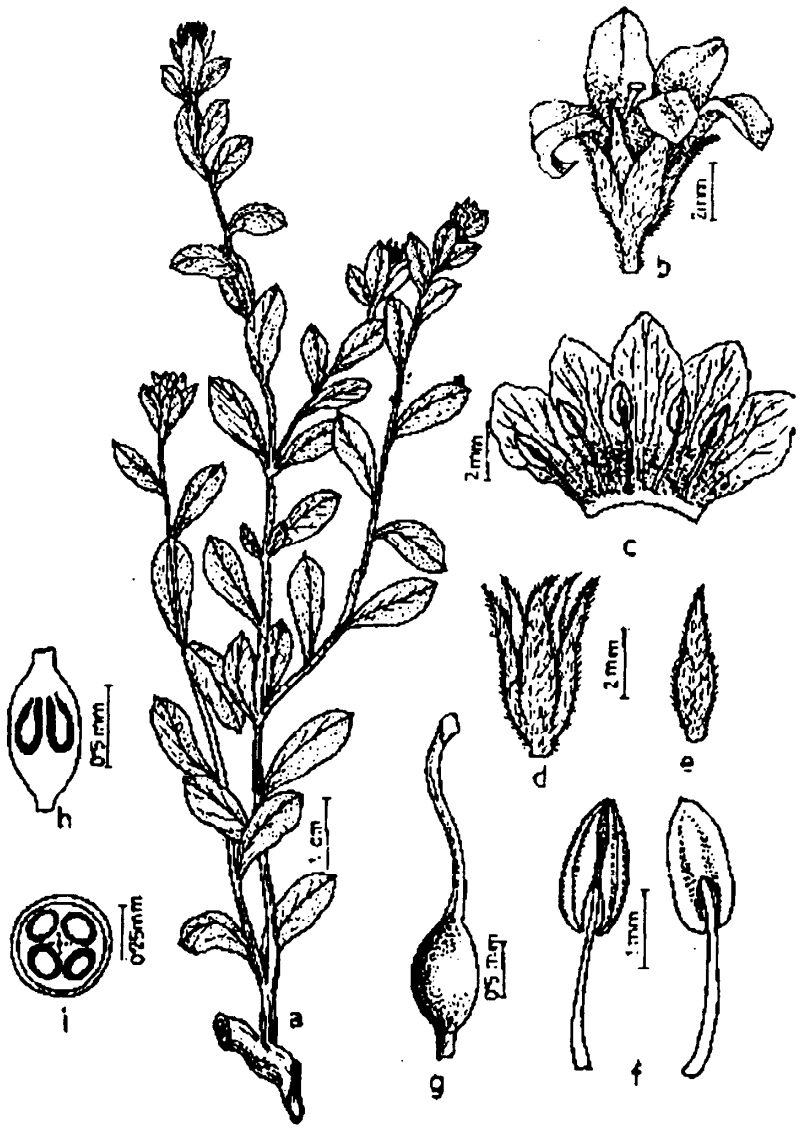


Fig. 6 : *Rotula aquatica* Lour.
(a) a twig, (b) flower, (c) corolla, split open; (d) calyx, (e) bract, (f) stamens, (g) pistil, (h) l. s. of ovary, (i) t.s. of ovary. (P. 662)

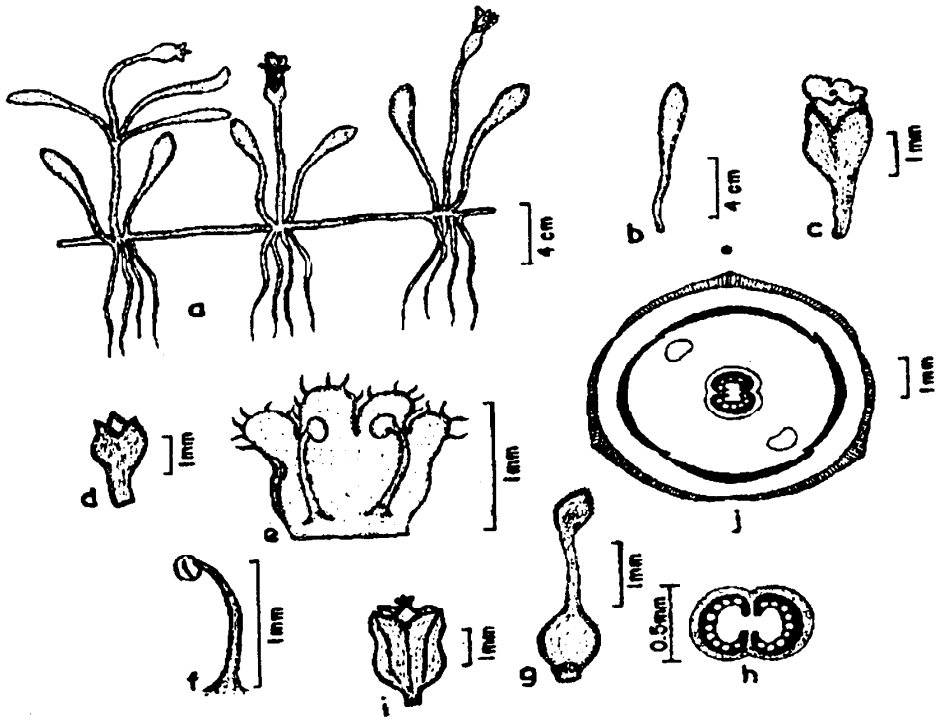


Fig. 7 : *Glossostigma diandrum* (L.) O. Kuntze
(a) habit, (b) leaf, (c) flower, (d) calyx, (e) corolla, split open, (f) stamen, (g) pistil, (h) t. s. of ovary, (i) fruit, (P. 726)

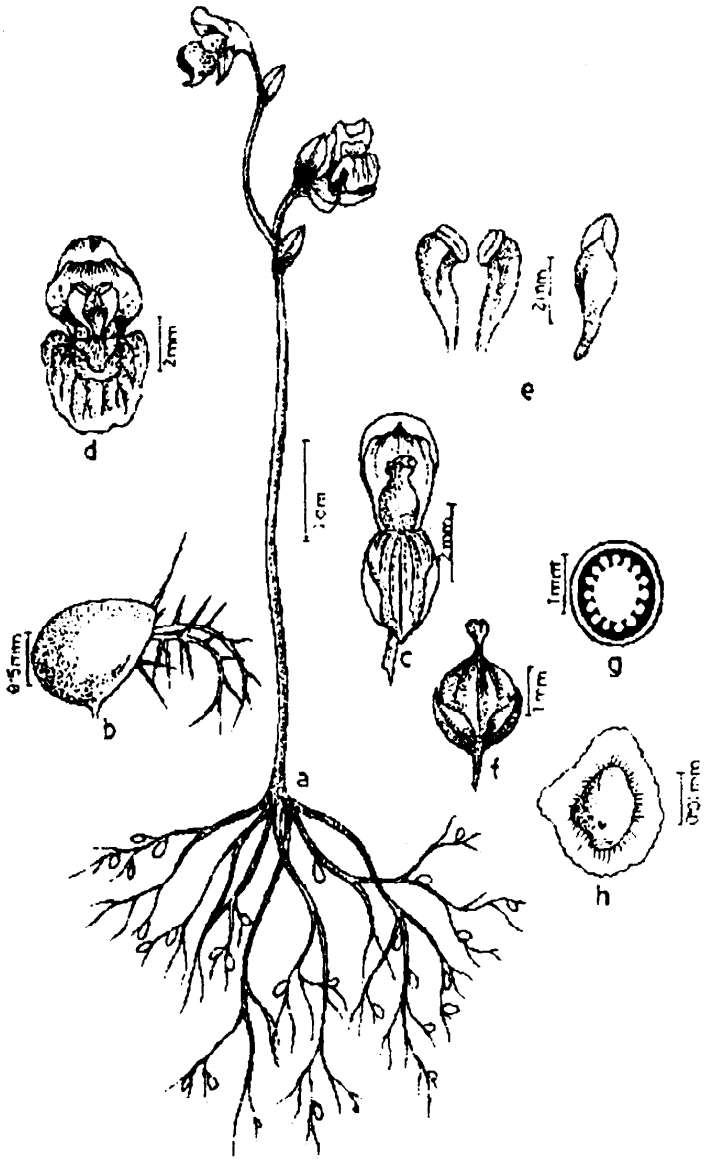


Fig. 8 : *Utricularia exoleta* R. Br.
(a) habit, (b) bladder, (c) persistent calyx and pistil, (d) corolla, (e) stamens, (f) fruit, (g) t. s. of ovary, (h) seed with corky wing. (P. 798)

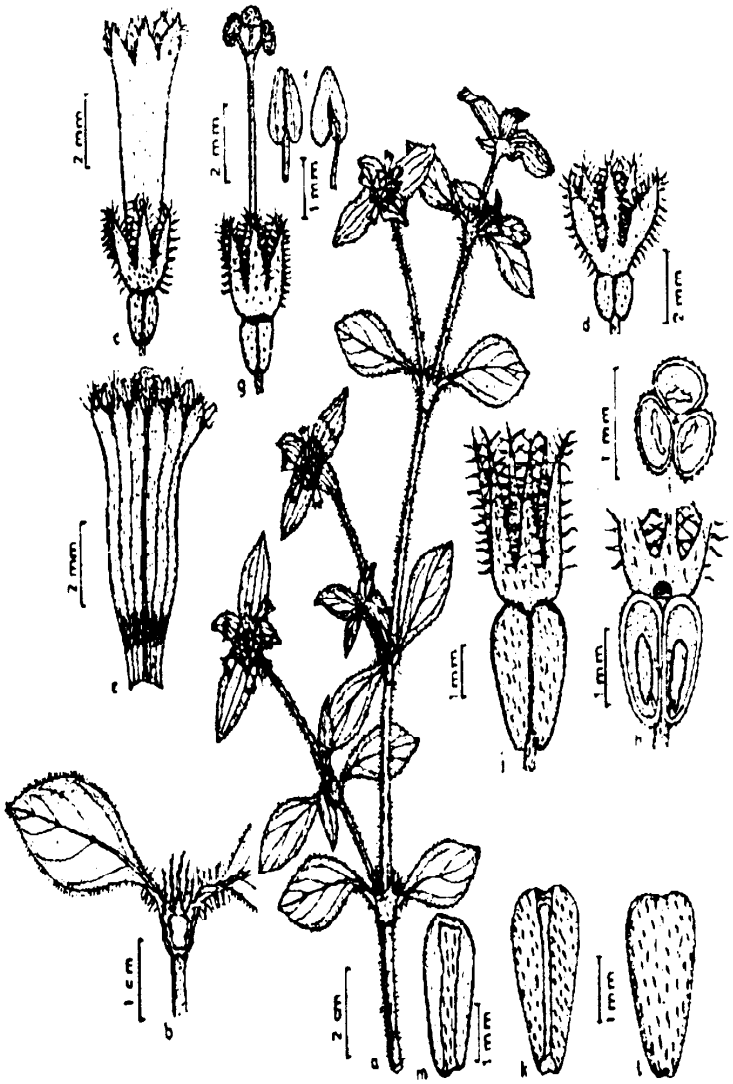


Fig. 9 : *Richardia scabra* L.
(a) twig, (b) opposite leaves and stipules, (c) flower, (d) calyx, (e) corolla, split open, (f) stamens, (g) pistil, (h) l. s. of ovary, (i) t. s. of ovary, (j) fruit with persistent calyx, (k) mericarp with adaxial face, (l) mericarp with abaxial face, (m) seed. (P. 844)

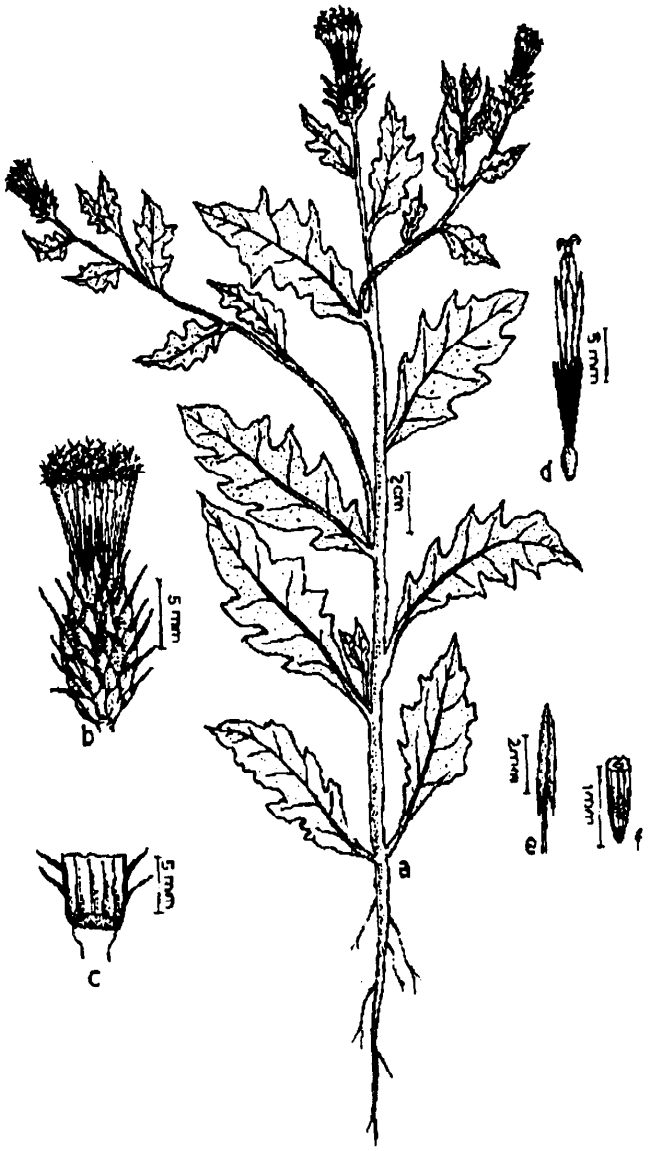


Fig. 10 : *Amberboa ramosa* (Roxb.) Jafri :
(a) habit, (b) head with spiny involucre, (c) part of involucre, (d) disc floret, (e) stamen, (f) fruit. (P. 864)

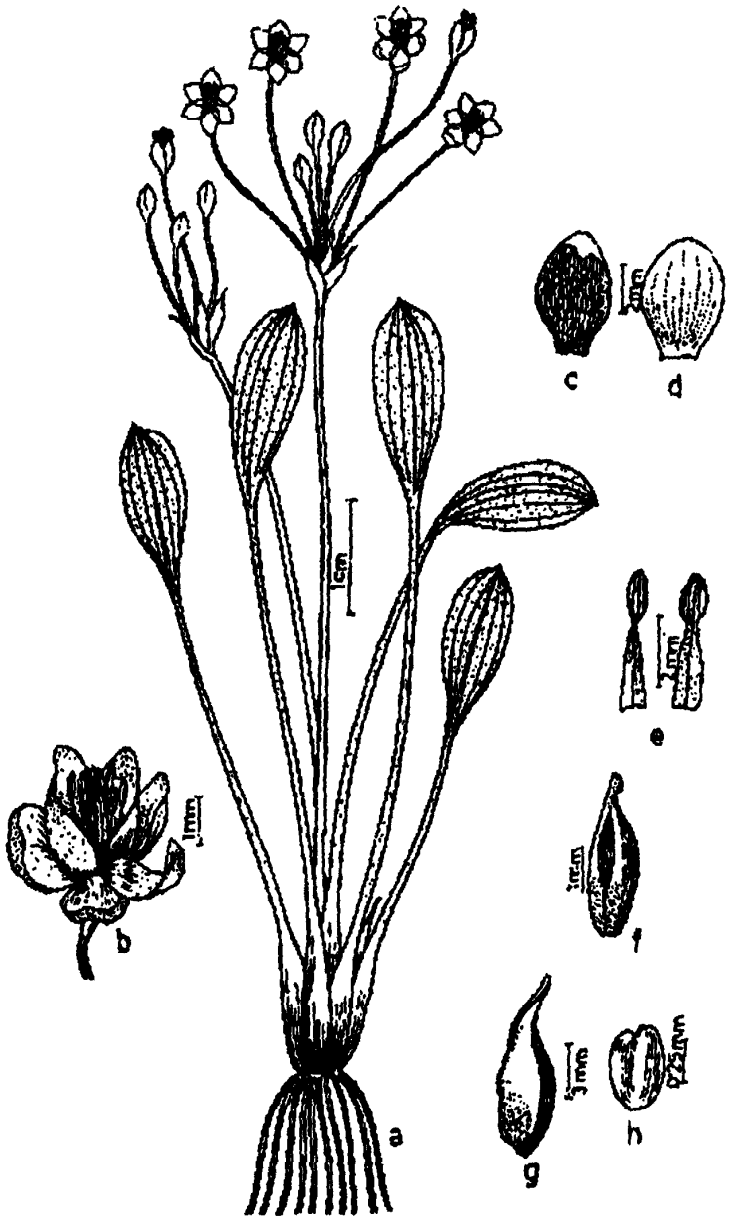


Fig. 11 : *Butomopsis latifolia* (D. Don) Kunth
(a) habit, (b) flower, (c) sepal, (d) petal, (e) stamens, (f) carpel, (g) follicle, (h) seed. (P. 921)

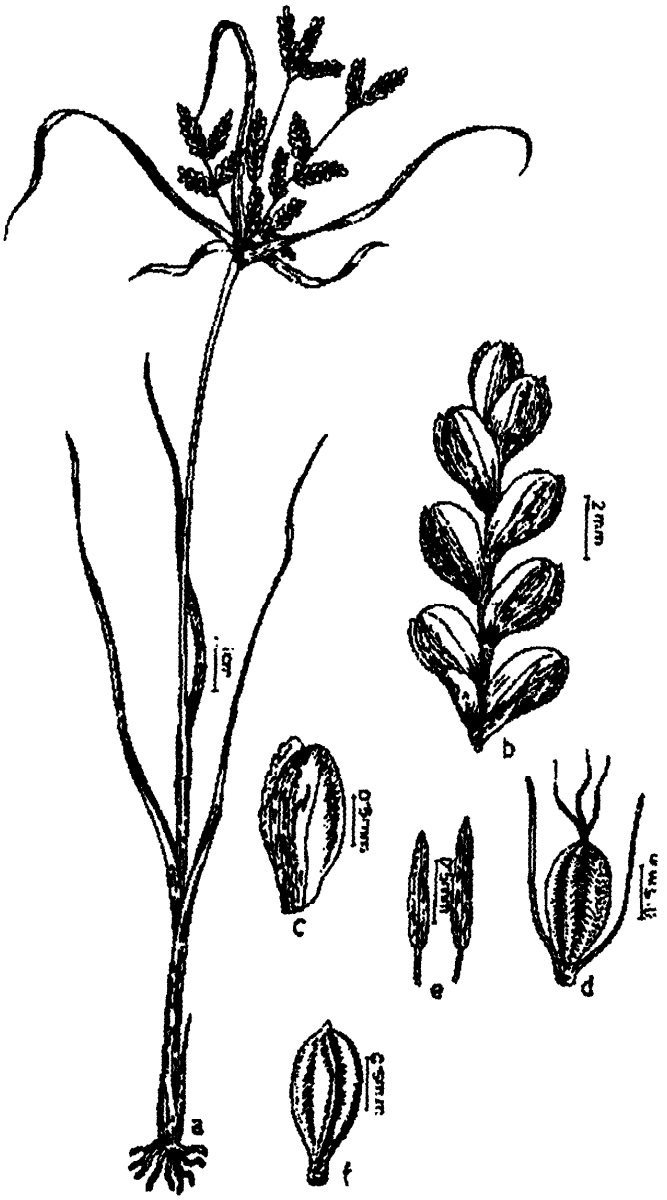


Fig. 12 : ✱*Cyperus alulatus* Kern
(a) habit, (b) spikelet, (c) glume, (d) deflorate flower, (e) stamens, (f) nut.
(P. 985)

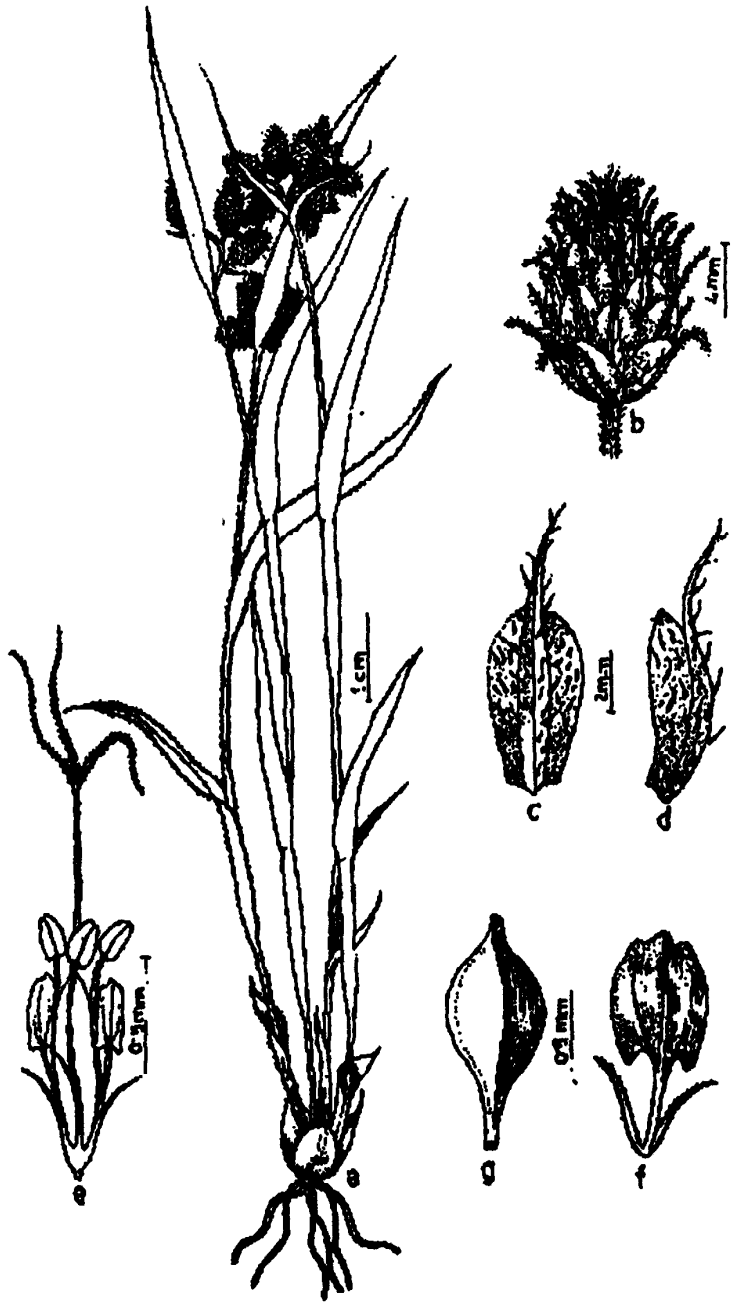


Fig. 13 : *Fuirena ciliaris* (L.) Roxb.
(a) habit, (b) spikelet, (c) glume (dorsal view), (d) glume (lateral view), (e) deflorate flower, (f) scaly perianth segment and two bristle like awns, (g) nut. (P. 1008)

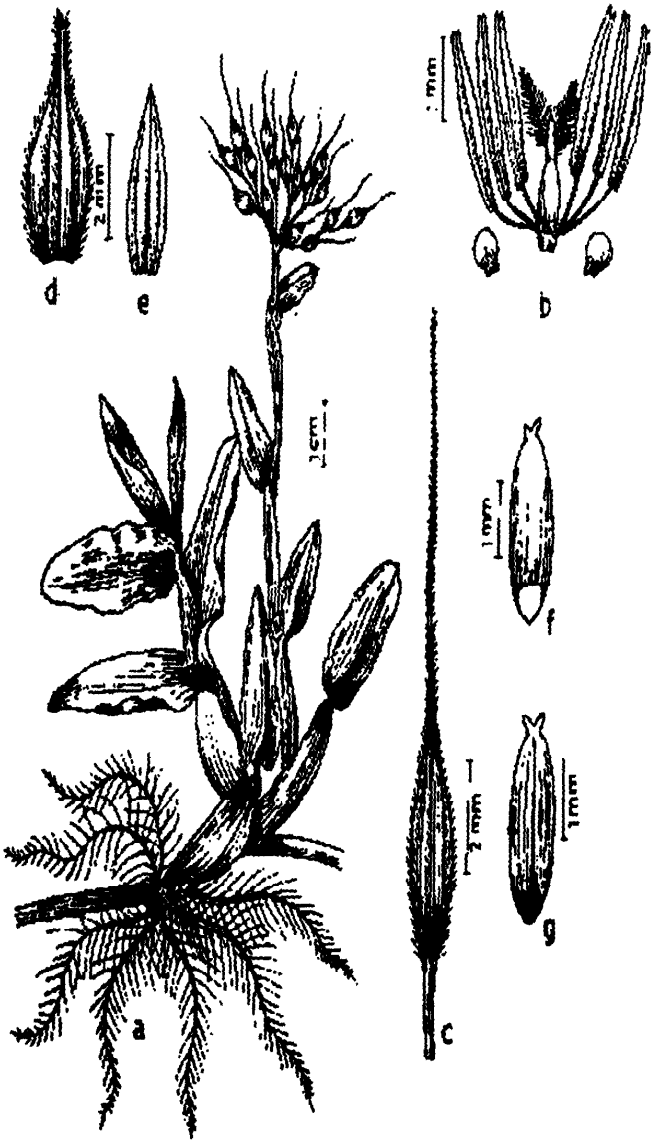


Fig. 14 : *Hygroryzu aristata* (Retz.) Nees ex Wight & Arn.
(a) habit, (b) flower including stamens, ovary and lodicules, (c) spikelet without glume, (d) lemma without awn, (e) palea, (f) grain showing embryo, (g) grain showing a linear hilum. (P. 1095)

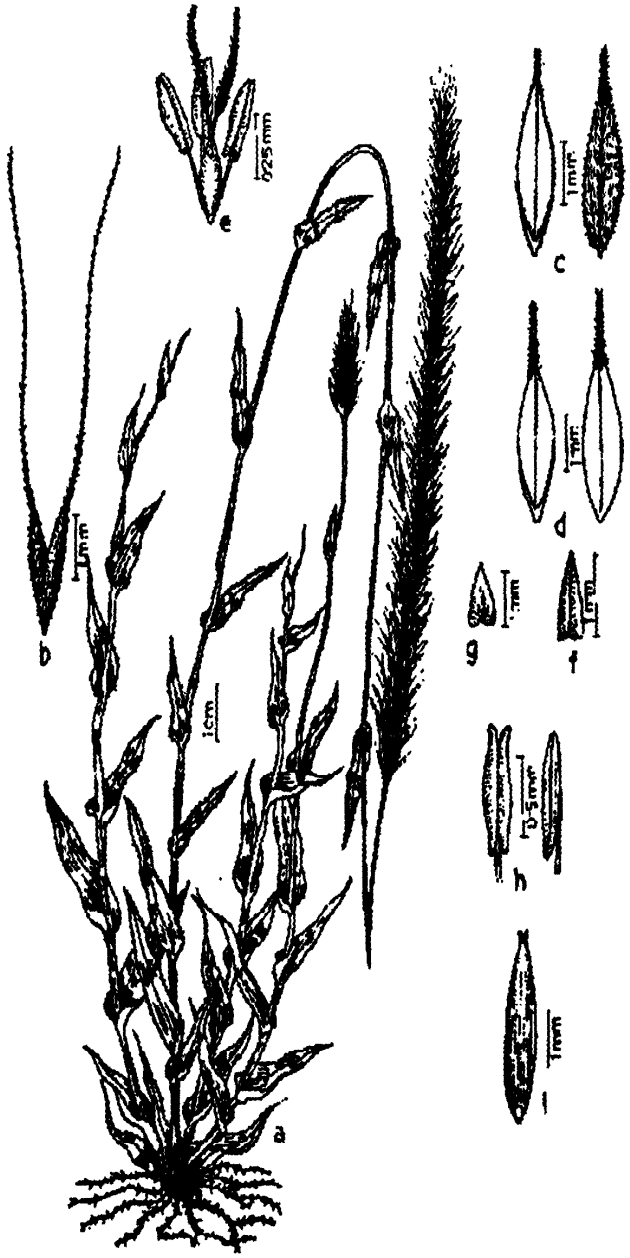


Fig. 15 : *Perotis indica* (L.) O. Kuntze
(a)habit, (b) spikelet, (c) lower glume, front & back, (e) stamens and pistil, (f) lemma, (g) palea, (h) stemens, (i) caryopsis. (P. 1119)

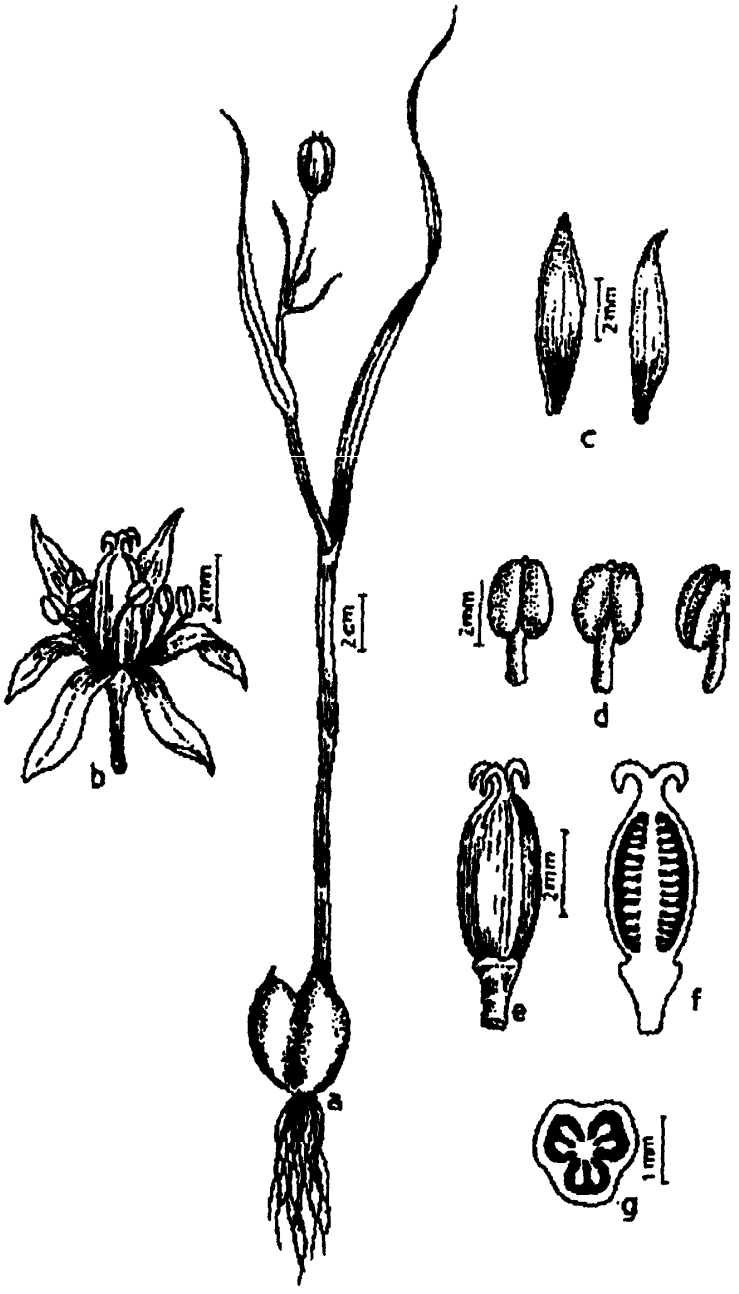


Fig. 16 : *Iphigenia indica* (L.) A. Gray
(a) habit, (b) flower, (c) perianth-segments (d) anthers, (e) pistil, (f) l.s. of ovary, (g) t.s. of ovary. (P. 1168)

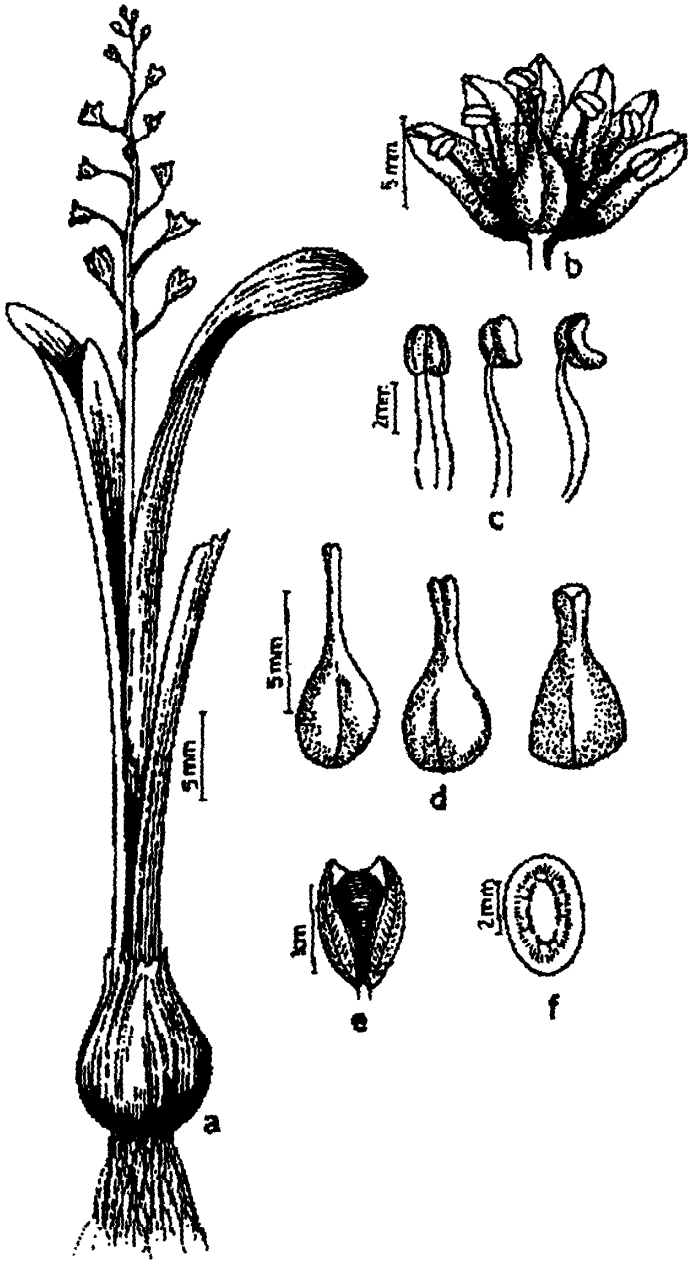


Fig. 17 : *Urginea indica* (Roxb.) Kunth
(a) habit, (b) dissected flower, (c) variation in stamens,
(d) variation in carpels, (e) fruit, (f) seed. (P.1169)

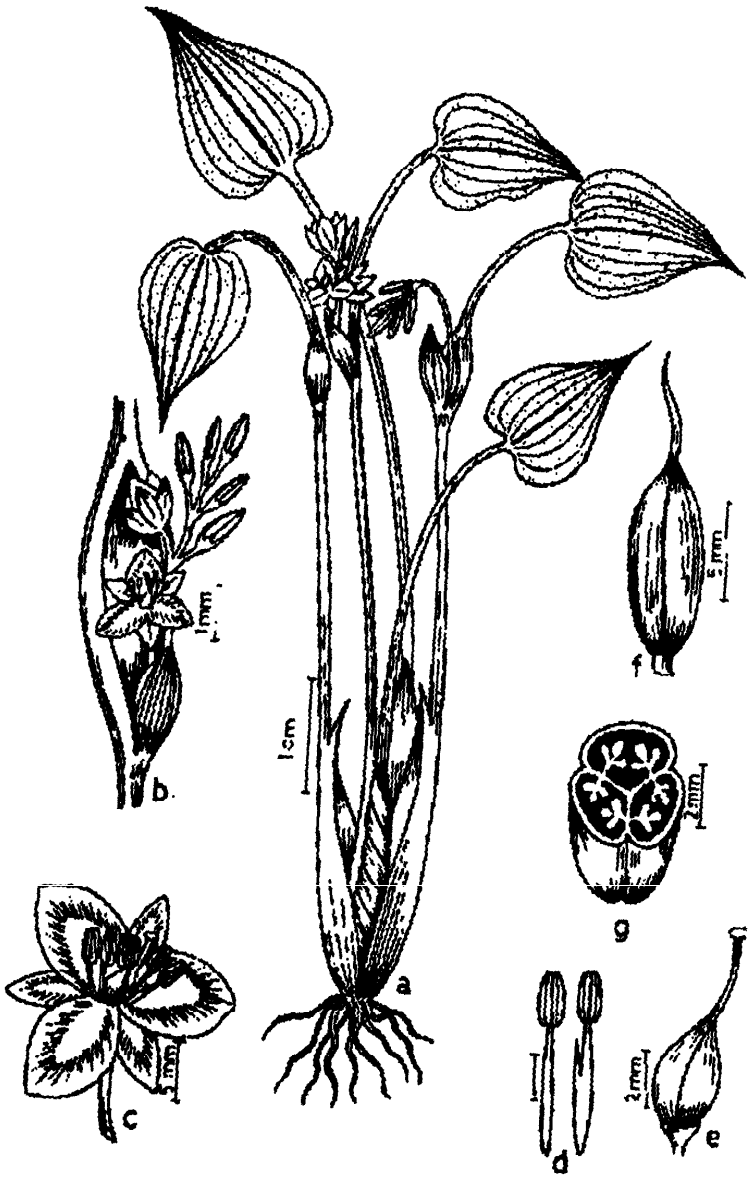
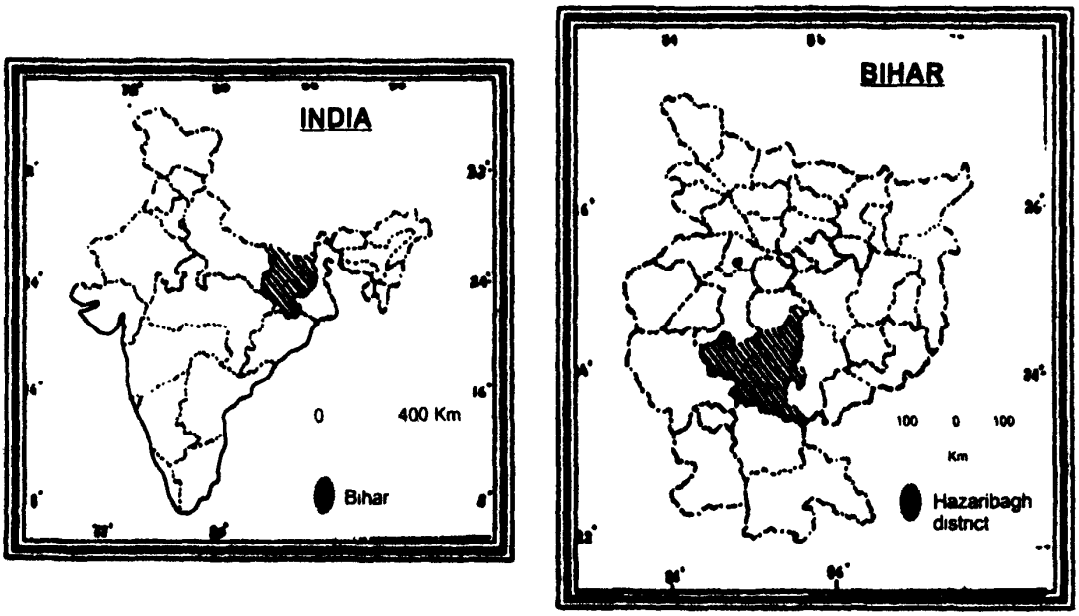
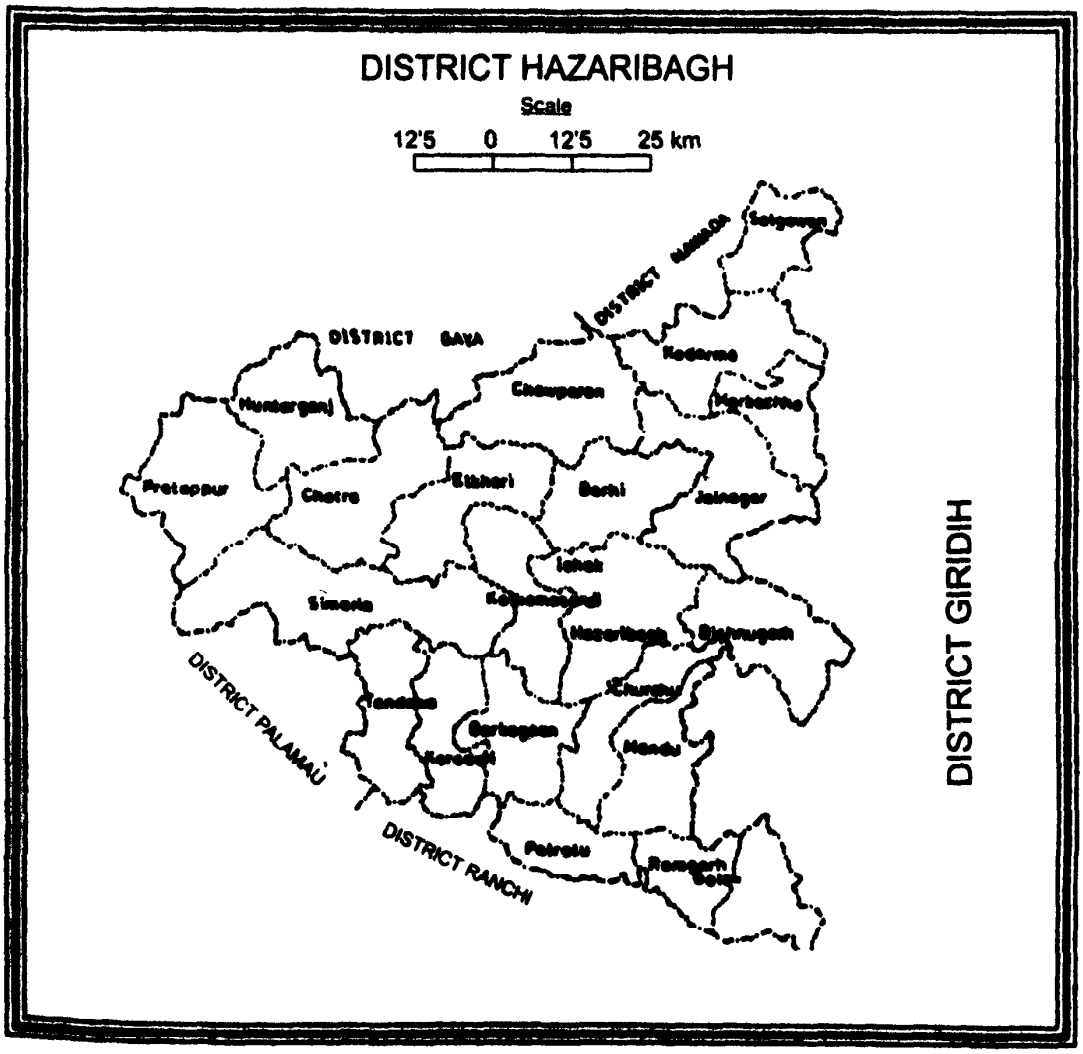
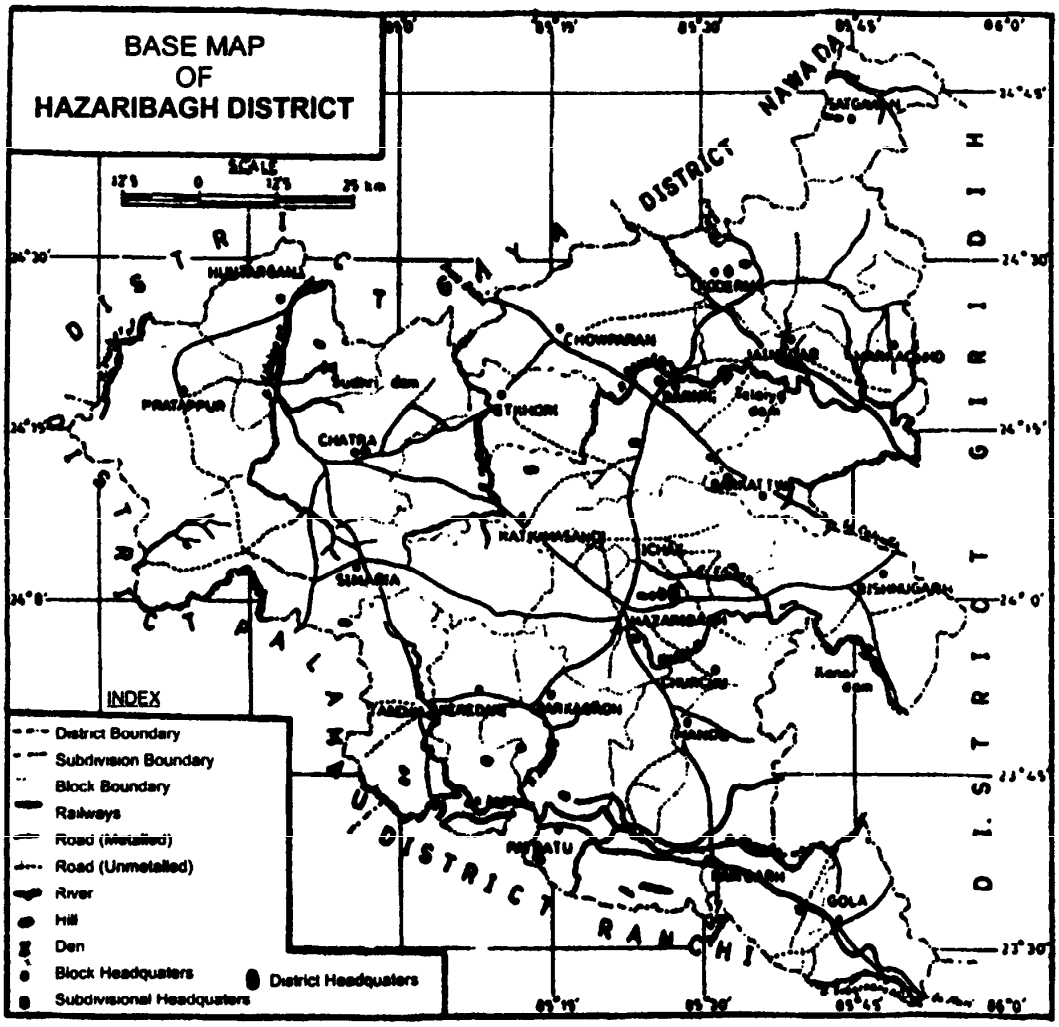


Fig. 18 : *Monochoria vaginalis* (Burm.f.) Presl
(a) habit, (b) inflorescence, (c) flower,
(d) stamens, (e) pistil (f) fruit, (g) t.s. of fruit.(P.1157)

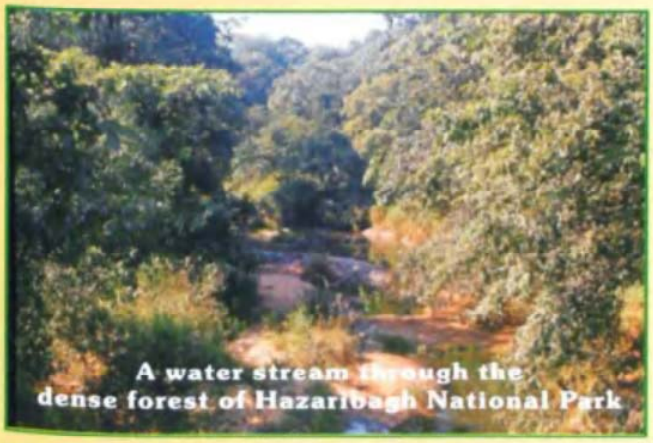




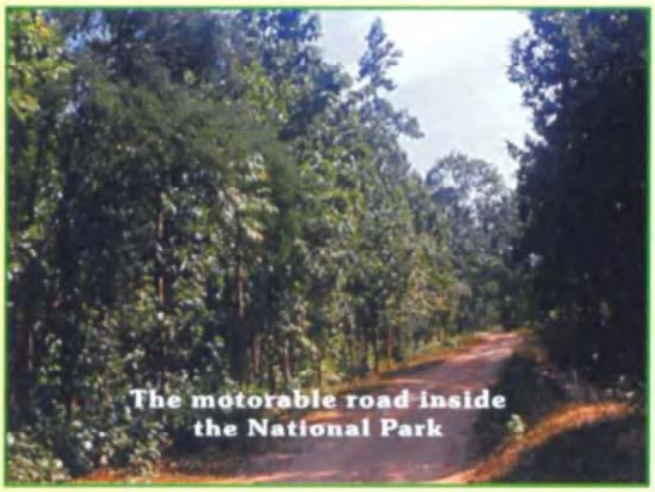
Base map of Hazaribagh District



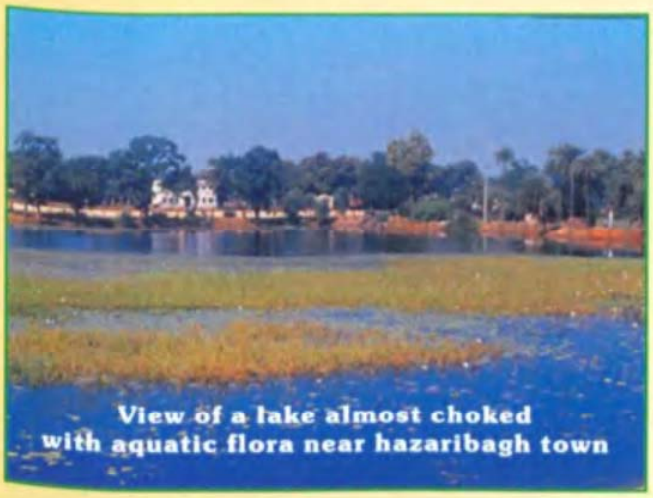
Location Map of the study area



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.

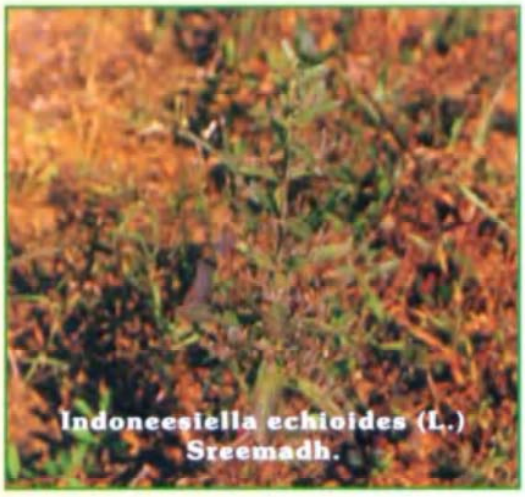
View of an aggressive climber (Ipomoea) on Phoenix sylvestris Roxb.

Carthamus tinctorius L. in cultivation

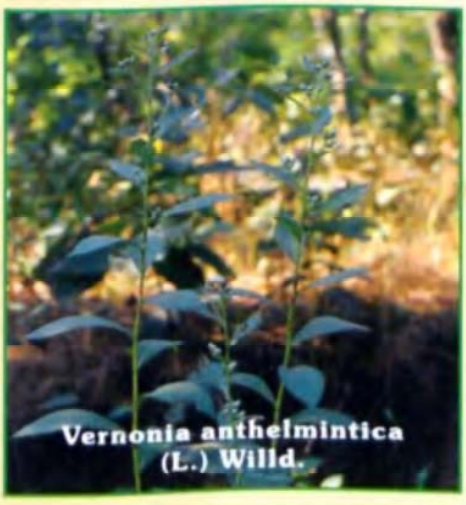
Pennisetum pedicellatum Trin.

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