

# Asclepiadaceae

### 1. Calotropis gigantea R. br. in Ait. Hort. Kew. ed. 2, V. 2 (1811) p. 78.

A tall laticiferous shrub reaching upto 3 m high with fine appressed cottony pubescence. Leaves obovate-oblong, upto 20 cm, thick, clothed beneath with fine cottony tomentum, base amplexicaul. Flowers purplish or white, in umbellate lateral cymes. Sepals ovate, cottony. Corolla 2 cm long or more; lobes upto 1 cm long, deltoid-ovate, revolute; lobes of the corona 1 cm long, broad in the middle, shorter than the column, the back much curved towards the column above the obtuse spur, the apex rounded with 2 obtuse auricles just below it. Follicles upto 10 cm long, green. Seeds numerous, broadly ovate, flattened, comose. (Fig. 304)

Vernacular name: Moto Ankdo.

Flowers: February-July.

Micromorphology (Fig. 305)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome.

Stomata were of cyclocytic type, pentacytic, hexacytic and tetracytic types.

D/67

#### 2. Calotropis procera R. Br. in Ait. Hort. Kew. ed. 2, V. 2 (1811) p. 78.

A plant very similar but smaller than C. gigantea, differing in having a shorter staminal column in which the corona remaining equal or higher than the stigma and the bifid apex of the corona lobe without auricles. (Fig. 306)

Vernacular name: Nano Ankdo. Flowers: September-January. Micromorphology (Fig. 307)

The plant showed presence of multicellular, uniseriate, non-glandular trichome with rectangular shaped cells.

Stomata were of paracytic and anisocytic type.

D/109

## 3. Cryptolepis buchanani Roem. & Schult. Syst. V. 4 (1819) p. 409.

A large twining shrub with terete branches. Leaves elliptic-oblong, upto 12 cm long; main nerves numerous, slender; nearly at right angles to the midrib, uniting in an intramarginal nerve. Flowers greenish-yellow, in short paniculate cymes; bracts ovate. Calyx segments ovate, subacute. Corolla-tube short; lobes linear-lanceolate; coronascales clavate. Follicles straight, divaricate, gradually tapering to a blunt point. Seeds black; coma more than 2.5 cm long. (Fig. 308)

Vernacular name: Bend vel. Flowers: June-August.

Micromorphology (Fig. 308)

Stomata were of tetracytic, cyclocytic type.

D/1077-1078.

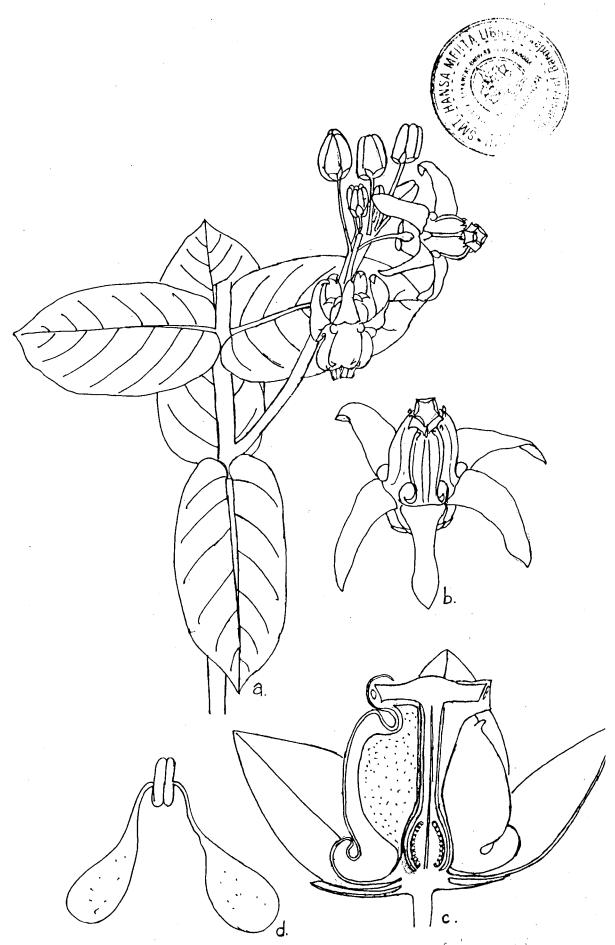


Fig. 304. Calotropis gigantea Br., a. habit, b. flower, c. L.S. of flower, d. pollinia.

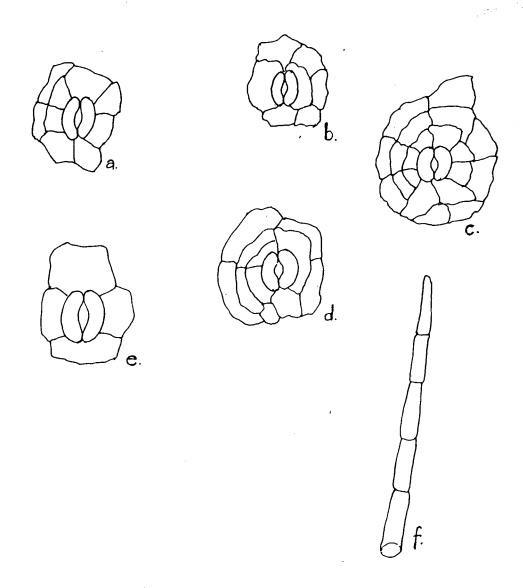


Fig. 305. Calotropis gigantea Br., a. anomocytic stomata, b,e. tetracytic stomata, c,d. cyclocytic stomata, f. multicellular uniseriate trichome.

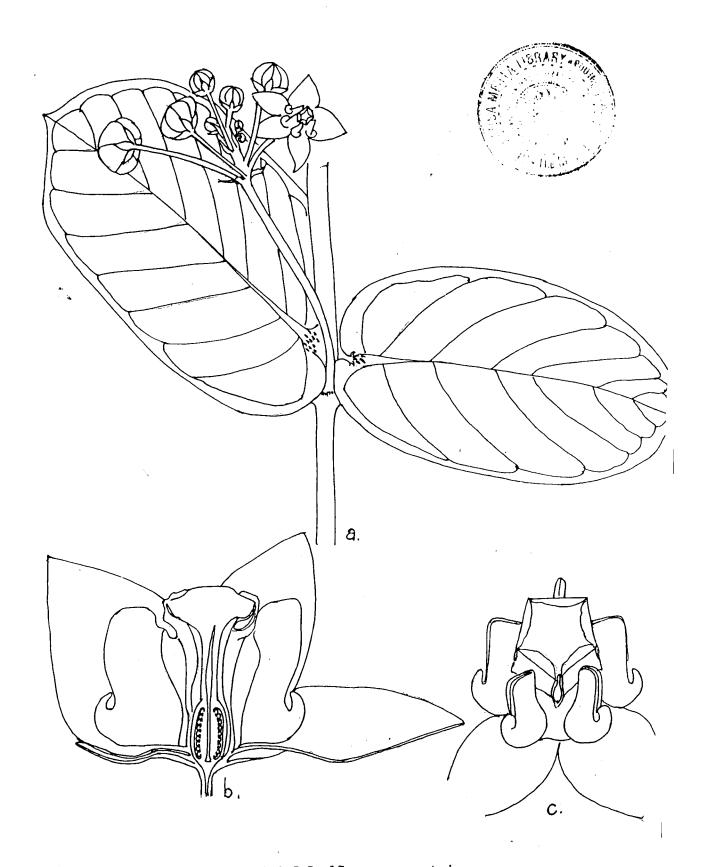


Fig. 306. Calotropis procera Br., a. habit, b. L.S. of flower, c. gynostegium.

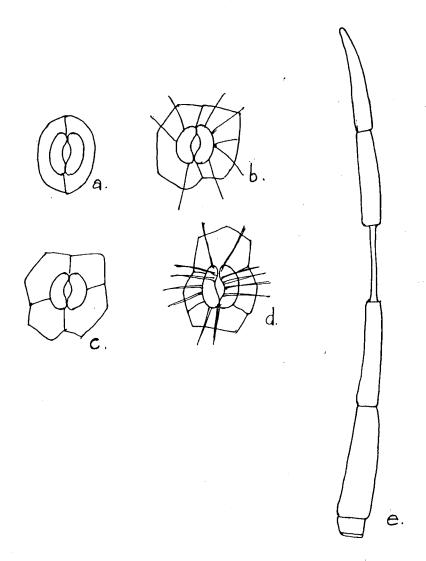


Fig. 307. Calotropis procera Br., a & b. paracytic stomata, c & d. tetracytic stomata, e. multicellular uniseriate trichome.

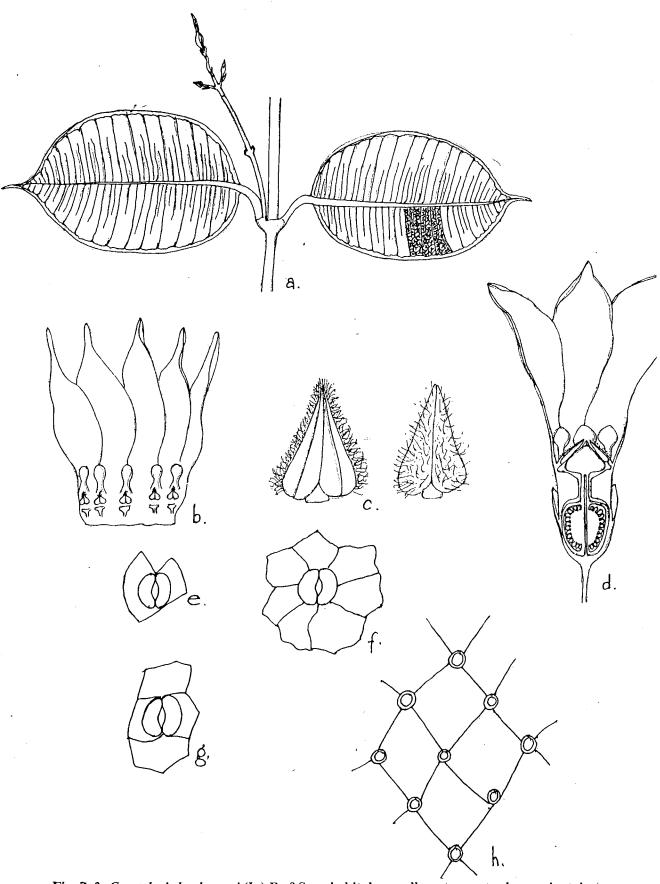


Fig. 308. Cryptolepis buchanani (L.) R. &S., a. habit, b. corolla cut open to show epipetalous stamen, c. stamen, d. L.S. of flower, e. paracytic stomata, f. cyclocytic stomata, g. tetracytic stomata, h. cicatrix.

# 4. Daemia extensa R. Br. in Mem. Wern. Soc. V. 1 (1811) p. 50.

A perennial laticiferous twiner. Leaves broadly ovate-cordate, upto 10 cm long, usually velvety-pubescent beneath, the margins ciliate. Flowers greenish-yellow or dull white, in lateral cymes; bracts minute, lanceolate. Calyx 5-partite, divided to the base; sepal lobes ovate-loanceolate. Corolla-tube campanulate; lobes ovate-oblong; outer corona membranoustruncate; inner corona-lobes includes the subulate horns which are curved high over the staminal-column, spur acute. Staminal column arising at the mouth of the corolla-tube; anthers erect, with a membranous inflexed appendage. Style apex exserted; pollenia waxy, 1 in each anther-cell, compressed. Follicles reflexed, lanceolate, attenuated into a long beak, echinate with soft spines. Seeds ovate, densely velvety-pubescent on both sides, coma about 3.5 cm long. (Fig. 309)

Vernacular name: Chamar dudheli

Flowers: July-December.

### Micromorphology (Fig. 310)

Two types of non-glandular trichomes were found one was multicellular, uniseriate and another acicular unicellular.

Stomata were anomocytic type.

D/690, 689, 1050.

### 5. Hemidesmus indicus R. Br. in Mem. Wern. Soc. V. 1 (1811) p. 57.

A perennial prostrate or twiner shrub with a woody rootstock. Leaves elliptic-oblong, upto 10 cm long. Flowers crowded in sub-sessile cymes in the opposite axils; pedicels short, clothed with numerous ovate acute imbricating bracts. Calyx lobes ovate, with membranous margins. Corolla greenish outside, purple inside; tube short; lobes valvate, fleshy, ovate-oblong, acuminate. Follicles upto 15 cm long., cylindric, sometimes slightly curved. Seeds ovate-oblong, coma silvery-white, 2.5 cm long. (Fig. 311)

Vernacular name: Upalsari.

Flowers: throughout the greater part of the year.

#### Micromorphology (Fig. 312)

The plant showed presence of unicellular, non-glandular, elongated or sometimes curved trichome with thick wall and round bottom.

Stomata were of anomocytic and anisocytic type.

D/99

## 6. Leptadenia reticulata Wight & Arn. in Wight, Contrib. (1834) p. 47

A laticiferous twining shrub with corky deeply cracked puberulous stem. Leaves ovate, acute, upto 8 cm long. Flowers greenish-yellow, in lateral or subaxillary many-flowered globose cymes. Calyx segments ovate-oblong, subacute. Corolla tube very short; lobes ovate-oblong with revolute margins; coralline corona of 5 quadrate truncate fleshy lobes at the sinuses; staminal corona annular, close to the staminal-column. Pollinia ovoid, waxy. Follicles upto 8 cm long, tapering into an obtuse shortly curved beak. Seeds ovate-oblong; coma 3 cm long. (Fig. 313)

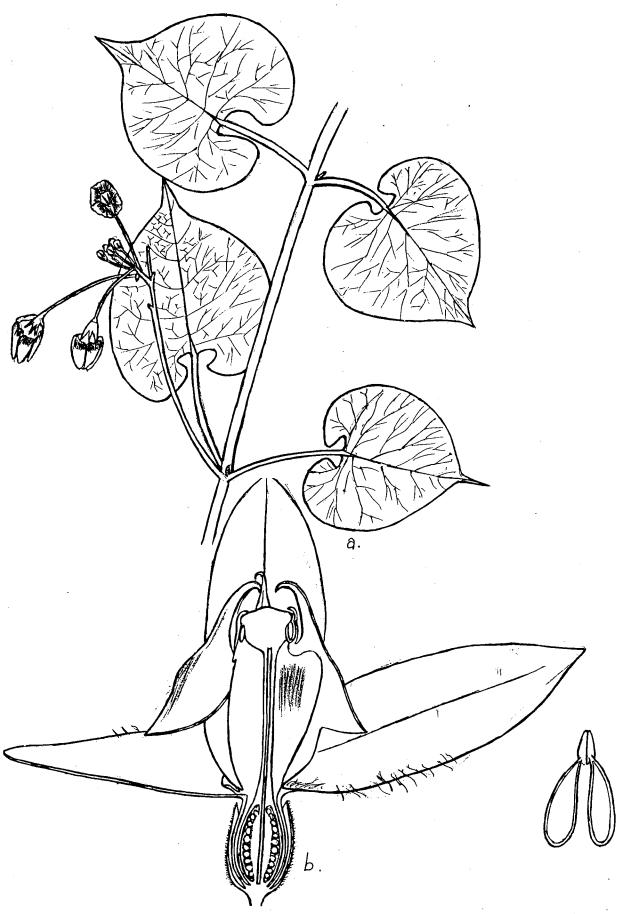


Fig. 399. Daemia extensa R. Br., a. habit, b. L.S. of flower, c. pollinia.

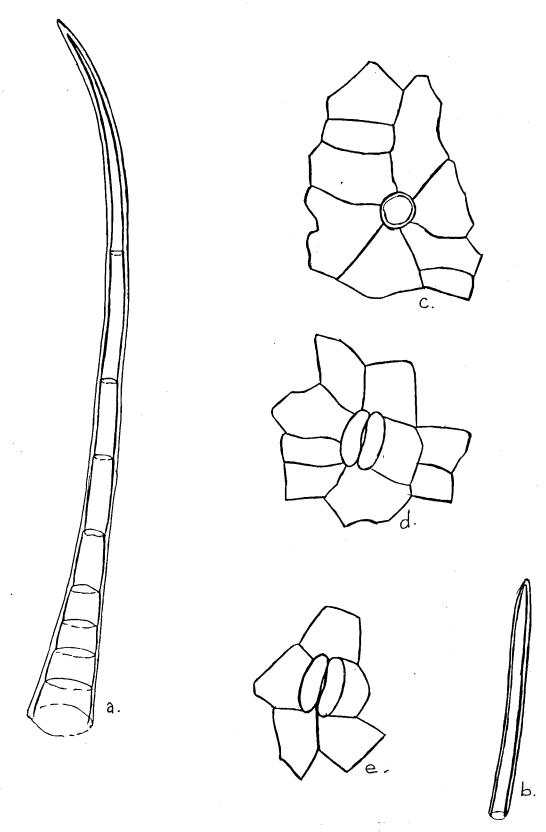


Fig. 310. Daemia extensa R. Br., a. multicellular uniseriate trichome with thick wall, b. unicellular trichome, c. cicatrix, d & e. anomocytic stomata.

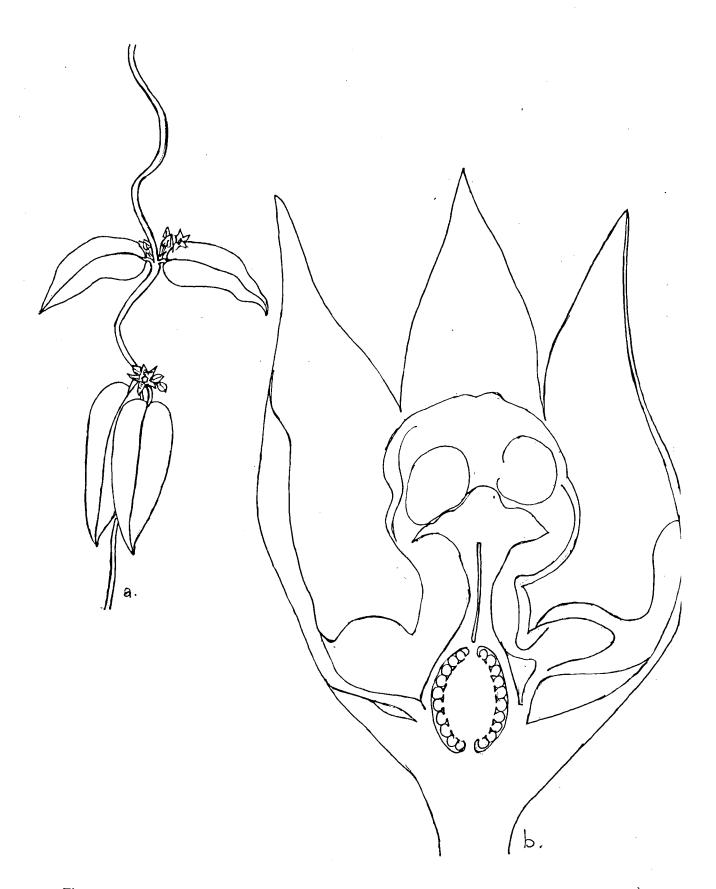


Fig. 311, Hemidesmus indicus Br., a. habit, b. L.S. of flower.

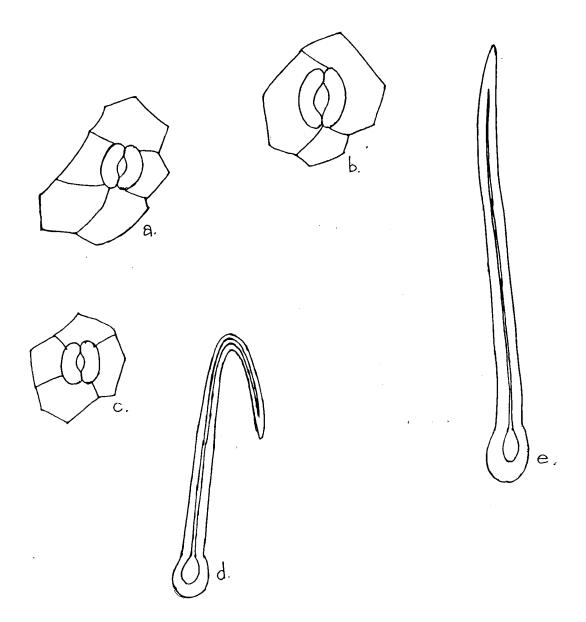


Fig. 312. Hemidesmus indicus Br., a & c. anomocytic stomata, b. anisocytic stomata, d & e. unicellular trichome with thick wall and narrow lumen.

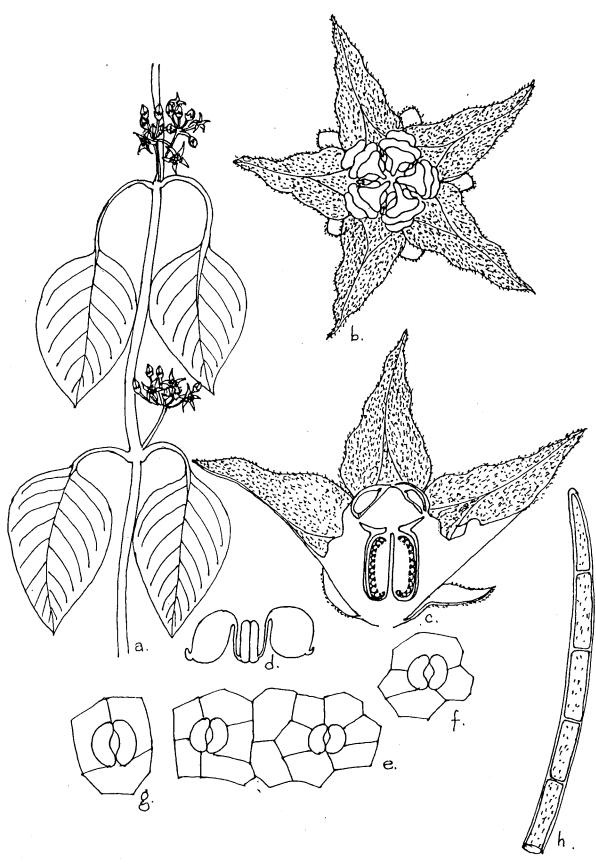


Fig. 313. Leptadenia reticulata W. & A., a. habit, b. flower, c. L.S. of flower, d. pollinia, e. anomocytic stomata, f. tetracytic stomata, g. anisocytic stomata, h. multicellular uniseriate trichome.

Vernacular name: Dodi. Flowers: April-July.

Micromorphology (Fig. 313)

The plant showed presence of multicellular, uniseriate, non-glandular trichome with warty surface.

Stomata were of anisocytic, cyclocytic, and tetracytic type.

D/101

### 7. Oxystelma esculentum R. Br. in Mem. Wern. Soc. V. 1 (1811) p. 40.

A perennial laticiferous twiner, rooting at nodes. Leaves linear-lanceolate, upto 10 cm. long; petioles very slender. Flowers large, drooping, in pedunculate lateral subumbellate cymes. Calyx segments 5, oblong-lanceolate. Corolla pale rose-colored or nearly white, upto 2.5 cm. in diameter, saucer-shaped; the mouth with a densely pubescent ring; lobes deltoid, ciliate, veined with purple; corona staminal, the lobes ovate-lanceolate, with incurved entire subulate tips. Pollenia 1 in each cell, pendulous. Style-apex slightly convex. Follicles ovoid-lanceolate, tapering to a point. Seeds ovate, flat, obscurely denticulate near the base, black; comose. (Fig. 314)

Vernacular name: Jal-dudhi.

Flowers: December.

Micromorphology (Fig. 315)

Multicellular, uniseriated non-glandular trichomes with pitted wall were found.

Stomata were tetracytic, anomocytic and anisocytic types.

D/1162.

# 8. Tylophora asthamatica Wight & Arn. in Wight, Contrib. (1834) p. 51.

A laticiferous twining perennial. Leaves elliptic-oblong, upto 10 cm long, base usually cordate. Flowers large in sessile umbels. Calyx segments lanceolate. Corolla greenish-yellow or greenish-purple; lobes oblong; corona gibbous below, abruptly narrowed at the apex to a free point which reaches nearly as high as the apex of the style. Pollenia transverse. Follicles upto 10 cm long, tapering to a fine point at the apex, finely striate. Seeds broadly ovate; coma 2.5 cm long. (Fig. 316)

Vernacular name: Dumvel. Flowers: August-November.

Micromorphology (Fig. 317)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome.

Stomata were of tetracytic type.

D/1160.

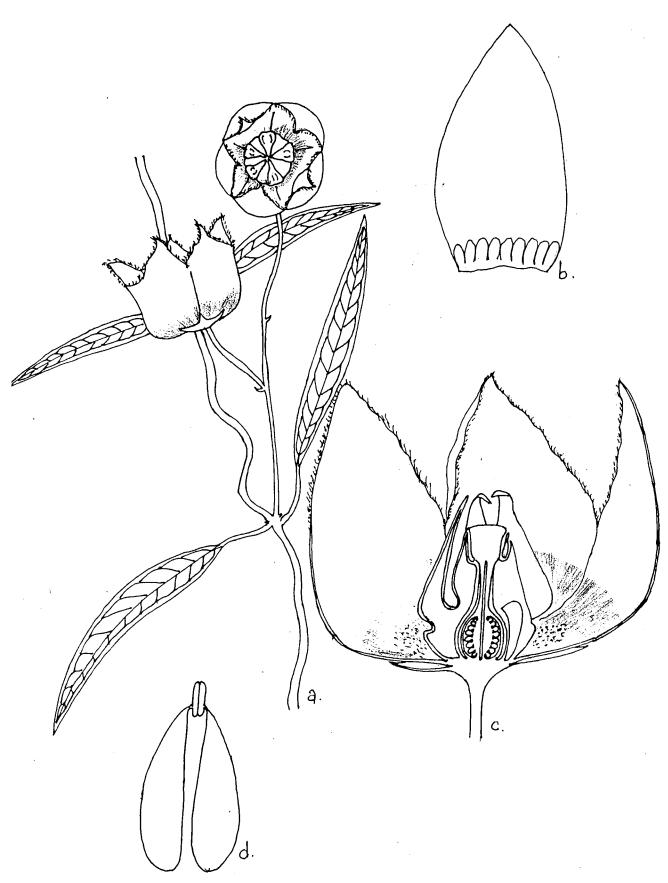


Fig. 314. Oxystelma esculentum Br., a. habit, b. sepal, c. L.S. of flower, d. pollinia.

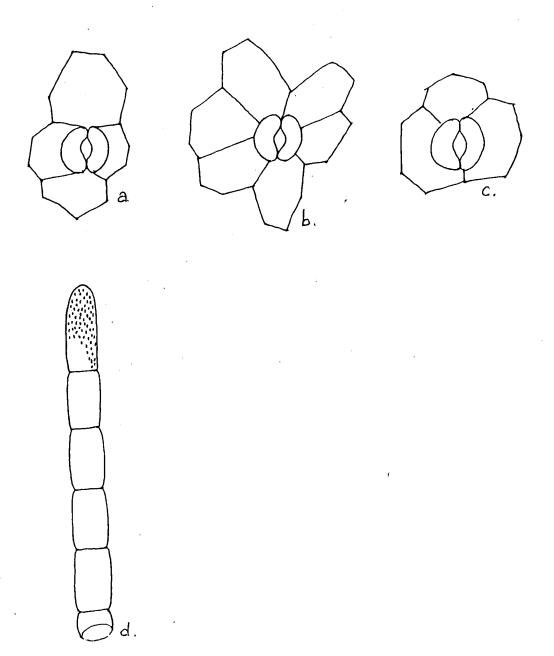


Fig. 315. Oxystelma esculentum Br., a. tetracytic stomata, b. anomocytic stomata, c. anisocytic stomata, d. multicellular uniseriate trichome.

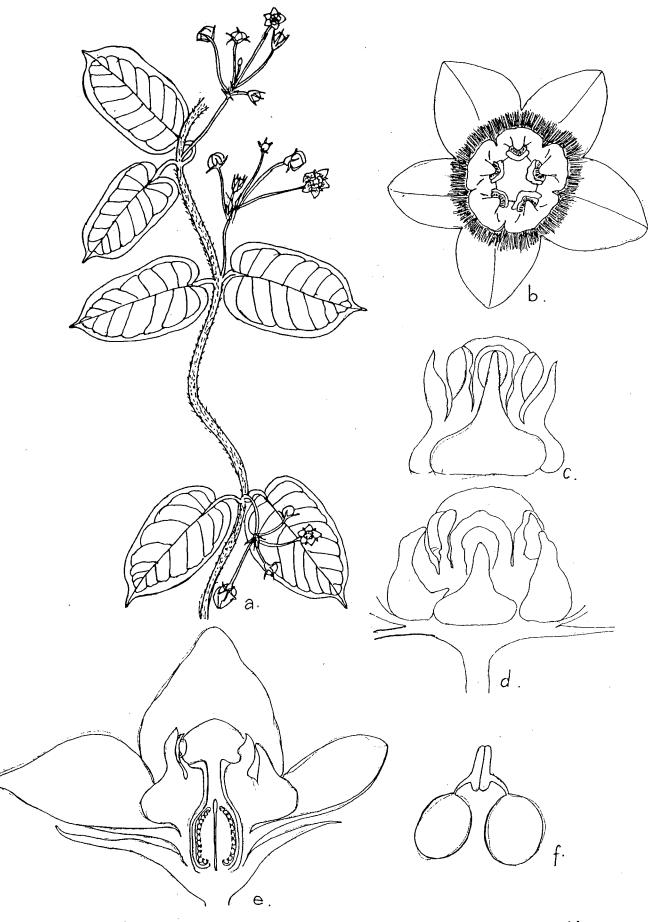


Fig. 316. Tylophora asthamatica W. & A., a. habit, b. flower, c & d. gynostegium with staminal column, e. L.S. of flower, f. pollinia.

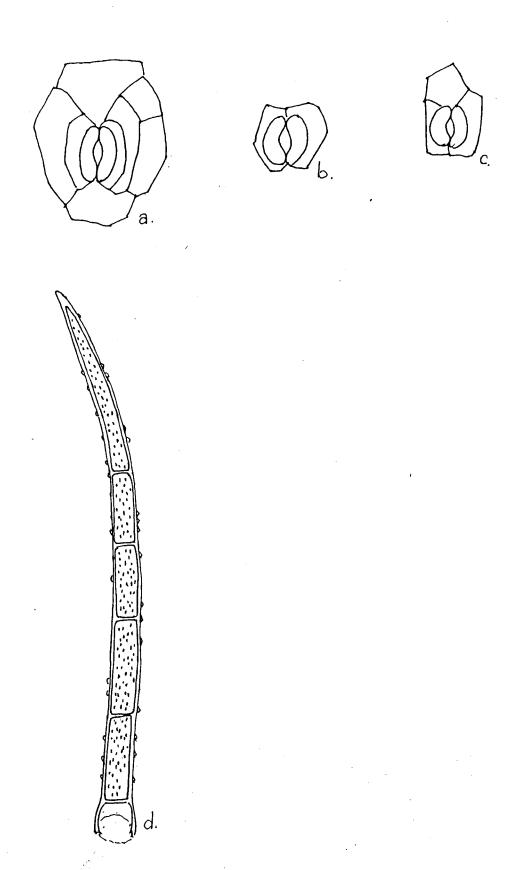


Fig. 317 Tylophora asthamatica W. & A., a. cyclocytic stomata, b. paracytic stomata, c. anisocytic stomata, d. multicellular uniseriate trichome with warty wall.

# Loganiaceae

# 1. Buddleia asiatica Lour. Fl. Cochinch. (1700) p. 72.

A large tomentose evergreen shrub. Leaves lanceolate upto 13 cm long, covered beneath with a white or yellowish more or less mealy tomentum, base usually acute. Flowers white, in bracteate tomentose dense usually continuous terminal and axillary spikes; bracts lanceolate, tomentose. Calyx campanulate, 4-lobed, woolly-tomentose, segments ovate. Corolla campanulate; white, hairy outside and in the throat; lobes obovate. Stamens 4, inserted on the corolla-tube; anthers subsessile. Ovary 2-celled; ovules many in each cell; style capitate at the stigmatose tip. Capsule septicidally 2-valved. Seeds minute, not tailed. (Fig. 318)

Vernacular name: Neemda. Flowers: January-April. **Micromorphology** (Fig. 319)

The plant showed presence of two types of trichomes: 1) Stellate hair with two arms which further bifurcates into two and the trichome was stalked. 2) Two celled glandular trichome and both the cells were of kidney shaped.

Stomata were of anomocytic type.

D/675, 676, 677.

# Gentianaceae

### 1. Canscora diffusa R. Br. Prodr. (1810) p. 451 in Obs.

A much-branched erect annual upto 60 cm high with quadrangular stem. Leaves broadly ovate, membranous, 3-nerved, upto 4 cm long, sessile. Flowers in lax diffuse paniculate cymes; bracts linear-subulate. Calyx not winged; teeth 4, lanceolate. Corolla zygomorphic, with four unequal lobes. Stamens 4, one longer than the other three, which are equal, the long stamen inserted higher up than the others. Ovary 1-celled, with two intruded parietal placenta. Capsule membranous, narrowly oblong. Seeds reticulate. (Fig. 320)

Vernacular name: Sankhpuspi. Flowers: October-January. **Micromorphology** (Fig. 320)

Stomata were of anisocytic, paracytic, and diacytic type.

D/1184.

# 2. Enicostema hyssopifolium (Willd.) Verd. Bothalia 7: 462 1961. (Enicostemma littorale Blume.)

An erect glabrous branched herb with subquadrangular stem upto 50 cm high. Leaves linear-oblong, opposite, sessile, upto 6 cm long, 3-nerved, the midnerve strong. Flowers sessile, in axillary cymes. Calyx lobes ovate-oblong, with narrow membranous margins. Corolla white, upto 1 cm long; lobes lanceolate, acute. Anthers oblong and filaments

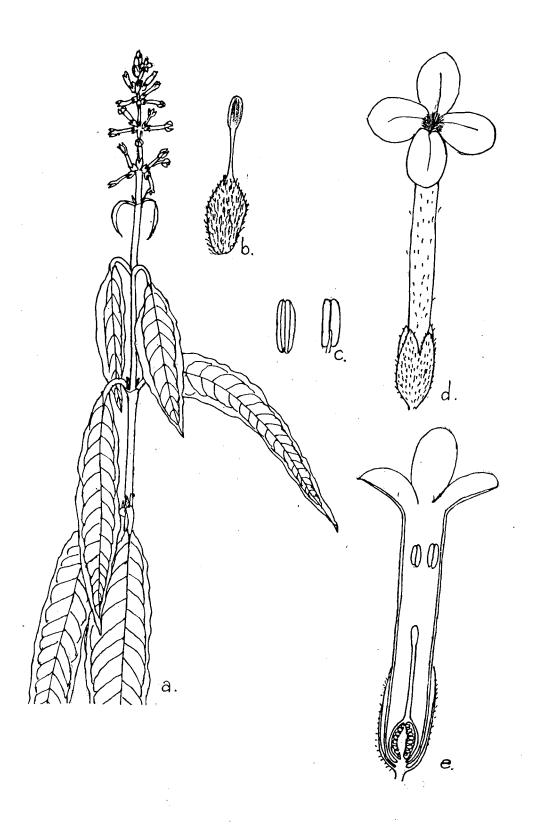


Fig. 318. Buddleia asiatica Lour., a. habit, b. gynoecium, c. stamen, d. flower, c. L.S. of flower.

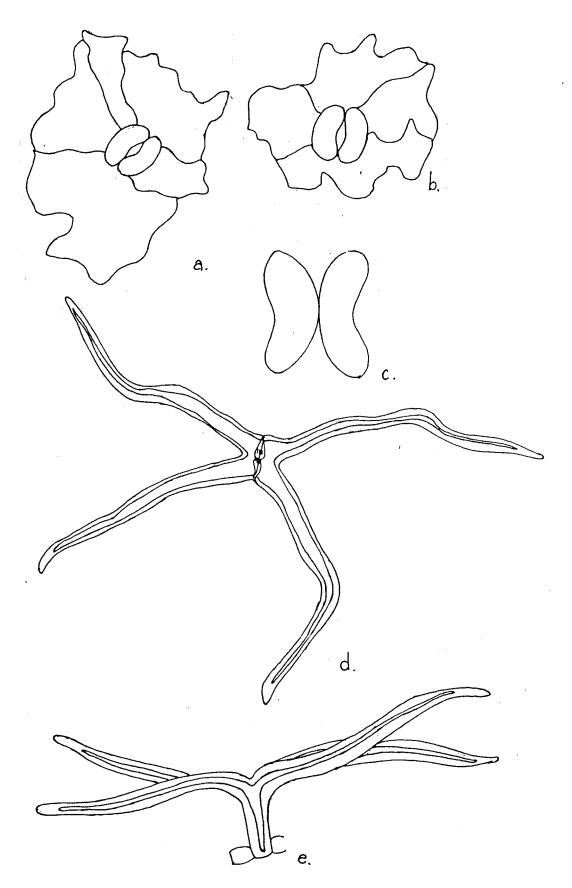


Fig. 319. Buddleia asiatica Lour., a & b. anomocytic stomata, c. two celled sessile gland, d & e. two celled trichome with each cell having two arms.

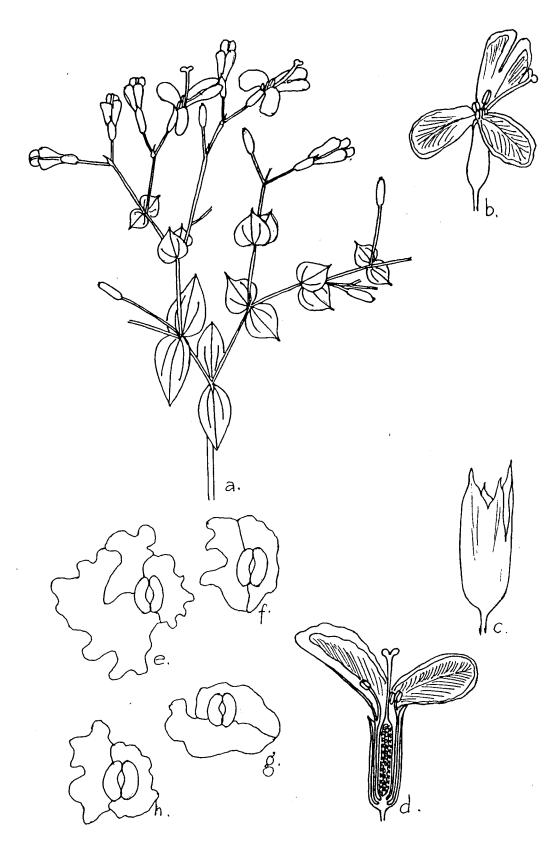


Fig. 320 Canscora diffusa Br., a. habit, b. flower, c. capsule, d. L.S. of flower, c. anisocytic stomata, f & h. paracytic stomata, g. diacytic stomata.

were covered by a small pouch like structure at the base. Ovary 1-celled, with two parietal placenta. Capsule ellipsoid, slightly narrowed at the base, rounded at the apex, apiculate with the remains of the style. (Fig. 321)

Vernacular name: Mamejavo. Flowers: August-November. **Micromorphology** (Fig. 321) Whole plant was glabrous. Stomata were of anomocytic type. D/453, 1075-1076.

# 3. Nymphoides cristata (Roxb.) Kuntze, Rev. Gen. Pl. 2:429 1891. (Limnanthemum cristatum Griesb.)

A rhizomatous aquatic floating herb with several long petiole-like branches which produce a node bearing a tuft of roots, a cluster of flowers, a single floating leaf and another branch. Leaves orbicular, deeply cordate, upto 10 cm in diameter, purplish and with green veins beneath. Flowers numerous, in dense clusters. Calyx 5, segments oblong-lanceolate. Corolla 5, white; lobes obovate, rounded at the apex, with a broad longitudinal crest down the middle of each lobe, the margins not ciliate. Stamens 5, inserted on the corolla-tube; filaments short. Ovary 1-celled; placentas 2, parietal; stigma 2-lobed. Capsule broadly ovoid or subglobose. Seeds 10 or more, strongly muriculate, pale yellowish-brown. (Fig. 322)

Vernacular name: Poyana. Flowers: August-March. **Micromorphology** (Fig. 322)

Non-glandular unicellular trichomes with bifurcated four arms were seen.

Stomata were of anomocytic type.

D/842 - 845.

# 4. Nymphoides indicum (L.) Kuntze, Rev. Gen. Pl. 2:429 1891. (Limnanthemum indicum Thw.)

This plant is similar and slightly larger than *Nymphoides cristata* but differs in having hairy corolla lobes without a crest in the middle. (Fig. 323)

Vernacular name: Poyana. Flowers: August-March. **Micromorphology** (Fig. 323)

Non-glandular unicellular trichomes with four arms were seen.

Stomata were of anomocytic type.

D/209

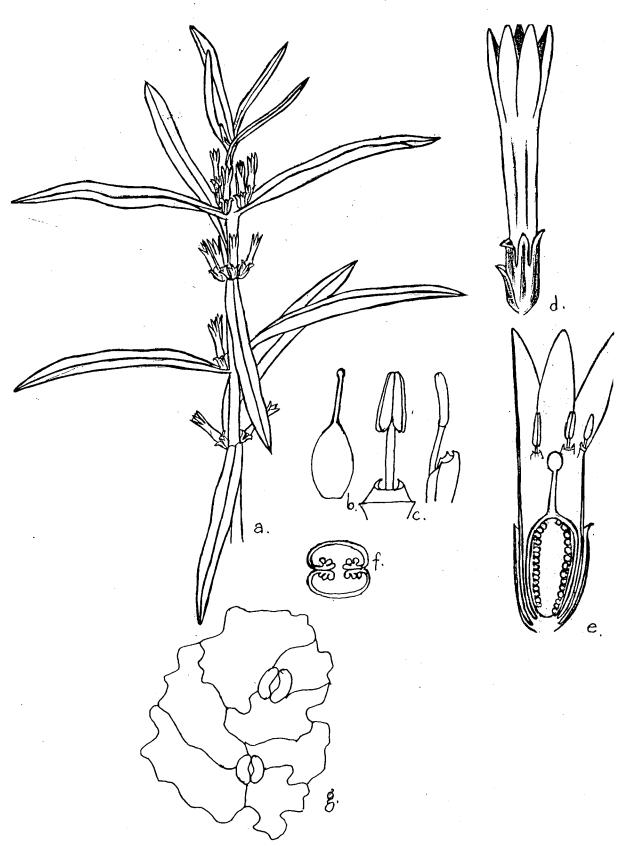


Fig. 32]. Enicostemma hyssopifolium Verd., a. habit, b. gynoecium, c. stamen, d. flower, e. L.S. of flower, f. T.S. of ovary, g. anomocytic stomata.

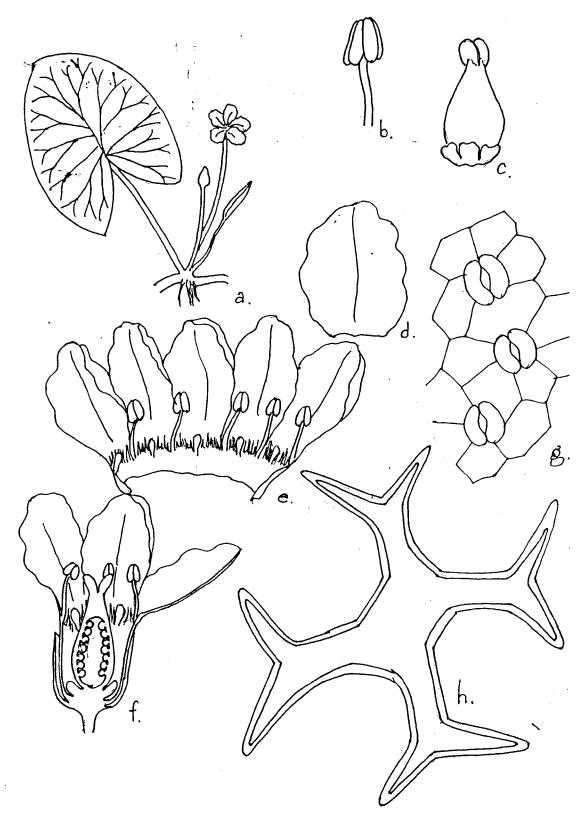


Fig. 322. Nymphoides cristata (Roxb.) Kuntze., a. habit, b. stamen, c. gynoecium, d. bract, e. epipetalous stamens, f. L.S. of flower, g. anomocytic stomata, h. unicellular trichome with four arms and each arm bifurcates further.

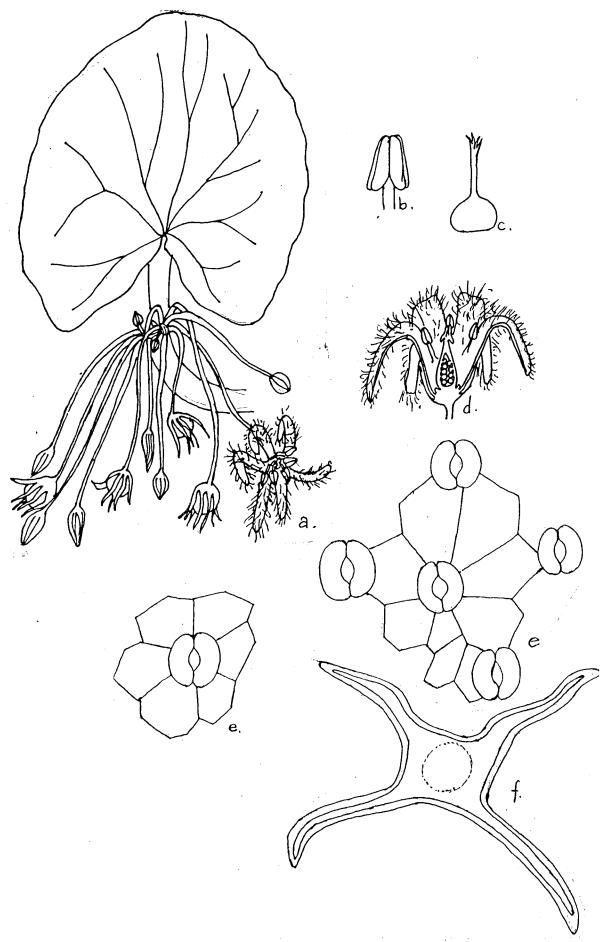


Fig. 323. Nymphoides indicum (L.) Kuntze., a. habit, b. stamen, c. gynoecium, d. L.S. of flower, e. anomocytic stomata, f. unicellular trichome with four arms.

# Boraginaceae

# 1. Carmona microphylla (Lamarck) G. Don, Gen. Hist. 4: 391. 1837. (Ehretia buxifolia Roxb.)

A small shrub upto 1.5 m high with divaricate, reddish-brown branches. Leaves obovate, subsessile, upto 3 cm long with a few crenatures at the apex, rough above with short bristly hairs. Flowers white, axillary, solitary or 2 together on slender hairy peduncles. Calyx hairy, lobes lanceolate or spathulate-oblong, acute. Corolla 0.5 cm long, campanulate; lobes broadly ovate, obtuse, spreading or recurved. Stamens exserted. Styles 2, longer than the stamens, undivided. Drupe globose, scarlet; pyrene 1, fourcelled. (Fig. 324)

Flowers: March.

# Micromorphology (Fig. 325)

The plant showed presence of unicellular, non-glandular, elongated trichome with warty surface.

Stomata were of tetracytic, cyclocytic, anisocytic, and anomocytic type. D/370.

## 2. Coldenia procumbens Linn. Sp. Pl. (1753) p. 125.

A procumbent herb with stems silky with white hairs and reaching 45 cm long. Leaves obovate-oblong, upto 4 cm, coarsely serrate or subpinnatifid, very hairy on both sides. Flowers pale-yellow, solitary, axillary. Calyx segments 4, ovate, ciliate.

Corolla lobes 4, oblong. Stamens 4. Drupe 4-lobed pyramidal in shape containing, one seeded pyrenes. Seeds albuminous. (Fig. 326).

Vernacular name: Basariyo okhrad.

Flowers: September-October.

Micromorphology (Fig.326)

The plant showed presence of unicellular, elongated, non-glandular trichome with warty surface.

Stomata were of anomocytic type.

D/1059.

#### 3. Cordia sebestena Linn. Sp. Pl.(1753) p. 190

A small ornamental tree reaching a height of 10m. Leaves ovate, 15 cm long, rough, coarse, scabrous above, pubescent on nerves beneath. Flowers showy, 2-3 borne in large paniculate cymes, showy. Calyx tubular, 3-4 lobed; lobes deltoid. Corolla scarlet or orange-red, infundibuliform, 5-6 lobed. Drupes ovoid, 2 cm long, white. Seeds embedded in sticky pulp. (Fig. 327)

Flowers: January-March.

Micromorphology (Fig. 327)

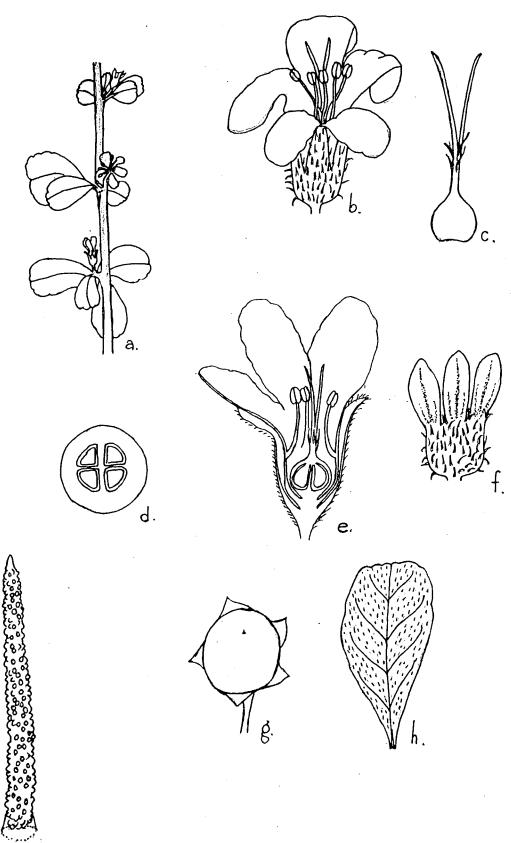


Fig. 324. Carmona microphylla (Lamarck) G. Don, a. habit, b. flower, c. gynoecium, d. T.S. of ovary, e. L.S. of ovary, f. calyx, g. capsule, h. leaf, i. unicellular trichome with thick warty wall.

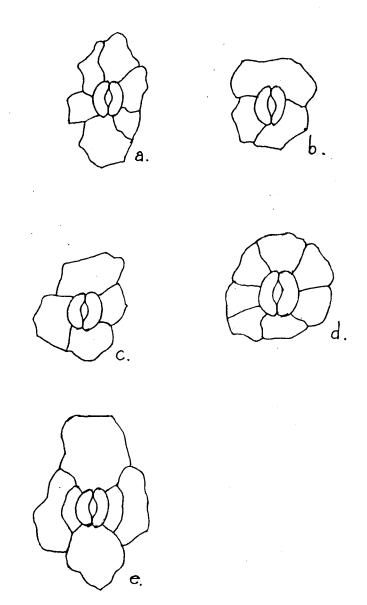


Fig. 325. Carmona microphylla (Lamarck) G. Don, a. anomocytic stomata, b. anisocytic stomata, c. tetracytic stomata, d. cyclocytic stomata, e. tetracytic stomata.

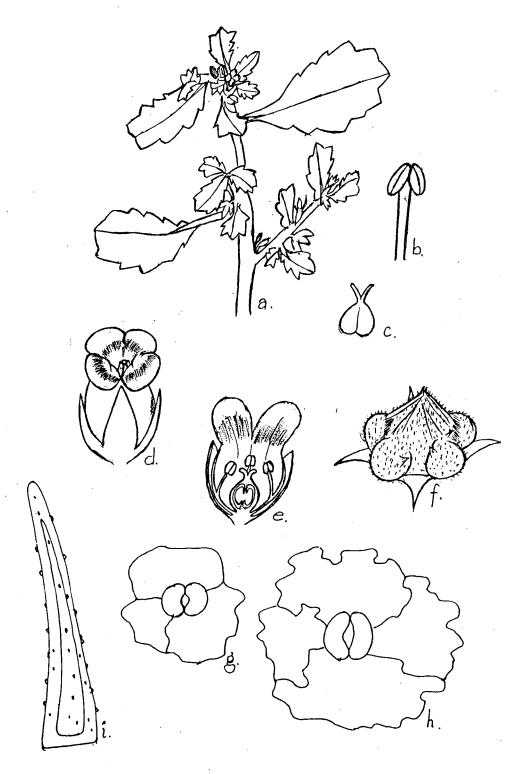


Fig. 326 Coldenia procumbers L., a. habit, b. stamen, c. gynoecium, d. flower, e. L.S. of flower, f. capsule, g. anisocytic stomata, h. anomocytic stomata, i. unicellular trichome with thick and warty wall.

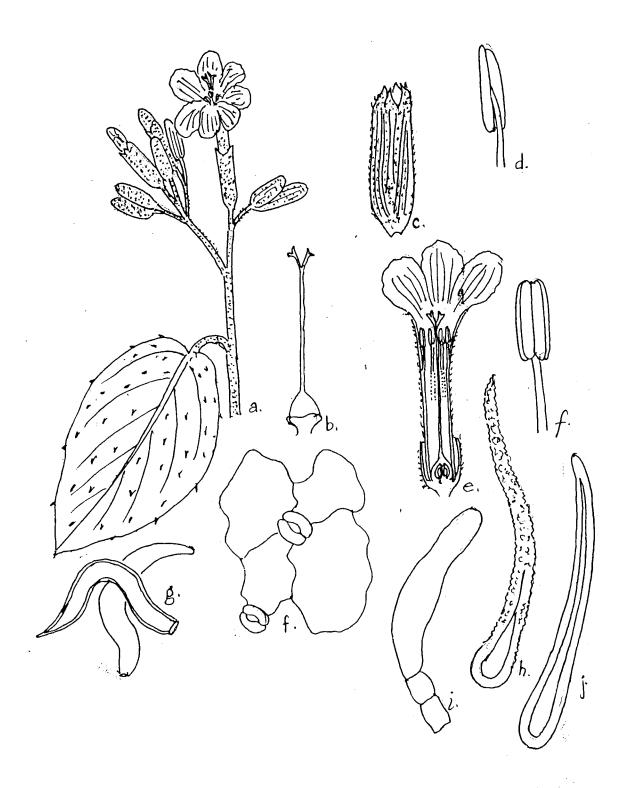


Fig. 327 Cordia sebestena L., a. habit, b. gynoecium, c. calyx, d & f. stamen, e. L.S. of flower, f. anomocytic stomata, g. unicellular smooth walled trichome, h. unicellular trichome with small lumen and thick warty wall, i. gland with single celled head and two celled stalk, j. unicellular trichome with narrow lumen and thick wall.

Whole plant is pubescent. Altogether there were 4 different types of trichomes present on different parts of the plant. The trichomes on vegetative parts (leaf and stem) were similar whereas trichomes on reproductive parts were different.

The trichomes on the leaf were unicellular, with thick wall and the surface was warty. The trichomes showed a blunt tip with round bottom.

In case of trichomes on reproductive parts, corolla contained two types of trichomes, one unicellular and non-glandular and another multicellular, non-glandular trichome. The former trichome was unicellular, elongated and with thick wall and the later was glandular multicellular, uniseriate, slightly differentiated into head and stalk. Head was unicellular whereas the stalk comprised of two cells.

The trichome on the leaf was seen on the surface of sepals also. But the sepals, in addition contained another type of non-glandular unicellular curved trichome.

Stomata were anomocytic.

D/306.

# 4. Heliotropium indicum Linn. Sp. Pl. (1753) p. 130.

A hirsute succulent annual upto 60 cm high with stout stem. Leaves ovate-oblong upto 10 cm long, base often unequal-sided. Flowers pale-violet, sessile, 2-ranked, in ebracteate scorpiod cymes. Calyx segments linear-lanceolate. Corolla infundibuliform; lobes orbicular-oblong. Stamens inserted below the middle of the corolla-tube. Style short; stigma capitate, with an annular frill 2-lobed; ovary imperfectly four-celled, four ovulate. Drupe beaked containing 4-pyrenes. (Fig. 328)

Vernacular name: Hathi sundha. Flowers: October-December. **Micromorphology** (Fig. 328)

The plant showed presence of two types of unicellular, non-glandular, elongated trichome; of which one was with warty surface whereas another was thick and smooth walled.

Stomata were of anomocytic, anisocytic, anomocytic and tetracytic type. D/732.

#### 5. Heliotropium ovalifolium Forsk. Fl. Aegypt.-Arab. (1775) p. 38.

An erect hairy herb reaching upto 45 cm. Leaves elliptic or obovate, upto 2 cm long. Flowers white, 2-ranked, in slender ebracteate, usually once-forked spikes upto 10 cm long. Calyx segments unequal, densely ciliate. Corolla tube cylindric, scarcely swollen over the stamens; lobes ovate-oblong. Stamens inserted; anthers lanceolate, the connective produced. Ovary glabrous; stigma conical, slightly penicillate at the very apex. Nutlets 1-seeded. (Fig. 329)

Vernacular name: Hathi sundha. Flowers: January-February.

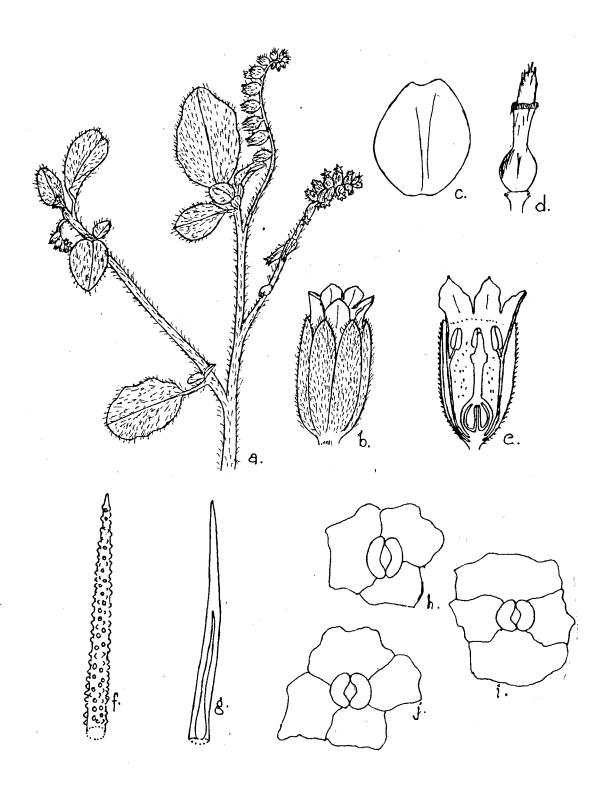


Fig. 328. Heliotropium indicum L., a. habit, b. flower, c. bract, d. gynoecium, e. L.S. of flower, f. unicellular trichome with thick warty wall, g. unicellular trichome with smooth wall, h. anisocytic stomata, i. tetracytic stomata, j. anomocytic stomata.

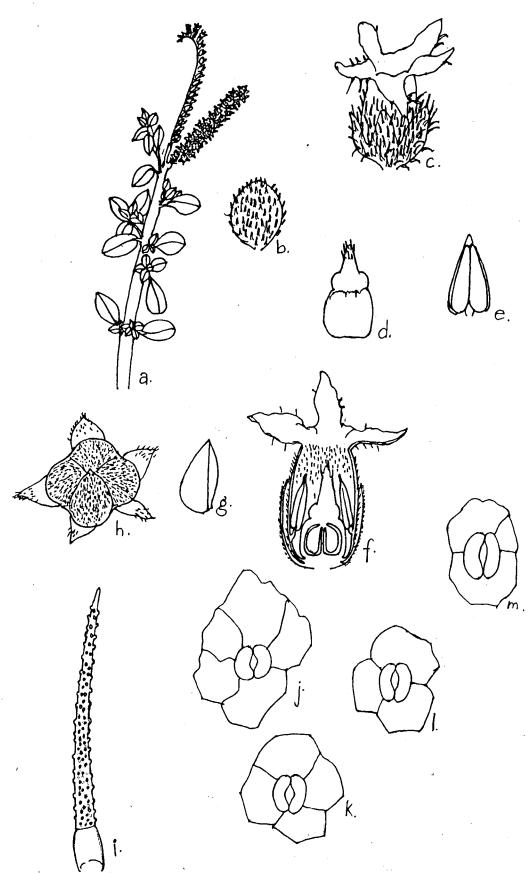


Fig. 329. Heliotropium ovalifolium Forsk., a. habit b. bract c. flower d. gynoecium e. stamen f. L.S. of flower g. seed h. capsule, o. two celled trichome with lower cell small and upper cell acicular, warty and thick walled.

### Micromorphology (Fig. 329)

The plant showed presence of two celled trichome; the upper cell was elongated and conical with warty surface and the lower cell was swollen and small in size as compared to the upper one.

Stomata were of anisocytic and anomocytic type. D/968, 969.

# 6. Heliotropium marifolium Retz. Obs. Fasc. 2 (1781) p. 8.

A much-branched decumbent perennial hairy herb with a woody base. Leaves ovate or lanceolate, upto 1.5 cm. Flowers in short axillary and terminal bracteate spikes; bracts foliaceous, lanceolate. Calyx segments unequal, lanceolate, and ciliate. Corolla tube cylindric, hairy outside, glabrous inside; lobes ovate-deltoid, with broad plicate sinuses and minute teeth between the lobes. Stamens inserted; anthers ovate, at first united at the apex by the produced connectives which are fused. Ovary ovoid; stigma subcylindric. Fruit subglobose, separating into 4 nutlets. (Fig. 330)

Vernacular name: Zinku okhard.

Flowers: July-October.

## Micromorphology (Fig. 330)

The plant showed presence of two types of trichomes. Both the trichomes were unicellular, elongated, non-glandular, but the only difference was that one trichome was with smooth wall and another was with warty surface.

Stomata were of anomocytic type.

D/308.

## 7. Trichodesma indicum R. Br. Prodr. (1810) p. 496.

An erect branched, hispid annual reaching upto 50 cm high. Leaves lanceolate-oblong, upto 10 cm, clothed above with stiff hairs springing from white circular tubercles, more or less densely villous beneath. Flowers pale violet-blue, solitary and leaf-opposed and in terminal few-flowered cymes. Calyx segments lanceolate, cordate or hastate at the base. Corolla infundibuliform, lobes ovate-deltoid, suddenly acuminate. Cone of anthers large, clothed on the back with dense hairs, finally twisted together. Ovary ovoid. Fruit pyramidal; nutlets ovoid. (Fig. 331)

Vernacular name: Dhadhona. Flowers: August-October.

# Micromorphology (Fig. 331)

Leaf showed presence of unicellular, non-glandular, conical trichome with thick wall and a very broad lumen at the base.

Stamen showed presence of unicellular, non-glandular, elongated trichome with narrow lumen.

Stomata were on anomocytic type.

D/444, 653, 725, 724.

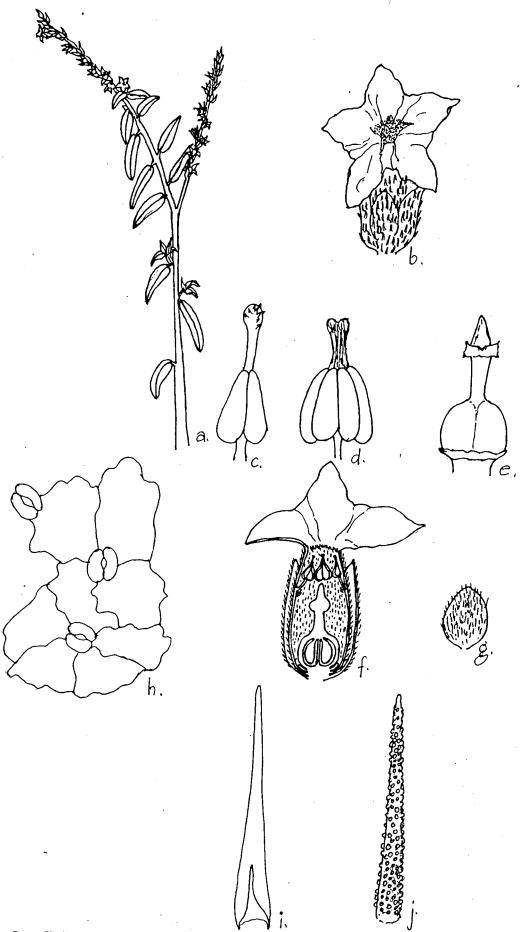


Fig. 330. Heliotropium marifolium Retz., a. habit, b. flower, c & d. stamen, c. gynoecium, f. L.S. of flower, g. bract, h. anomocytic stomata. i. unicellular trichome with small lumen

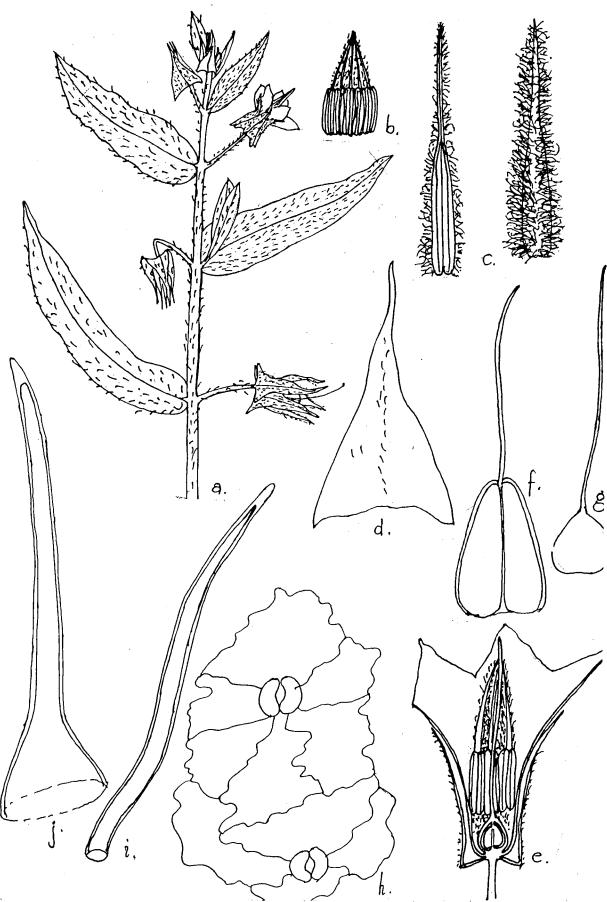


Fig. 331. Trichodesma indicum Br., a. habit, b & c. stamen, d. sepal, e. L.S. of flower, f. capsule, g. gynoecium, h. anomocytic stomata, i. unicellular trichome, j. unicellular trichome with broad lumen.

### Convolvulaceae

# 1. Convolvulus microphyllus Sieb. ex. Spreng. Syst. V. 1 (1825) p. 611.

A procumbent villous herb with stems suffruticose at the base, upto 50 cm long. Leaves linear-oblong about 2.5 cm long. Flowers axillary, solitary or 2-4 together. Sepals ovate-lanceolate, unequal. Corolla whitish-pink, infundibuliform, with hairy bands outside; limb shallowly 5-lobed, the lobes deltoid, acute, with a tuft of hair at the apex of each. Stamens unequal. Ovary seated on a cup-shaped disk, 4-celled; stigmas filiform. Capsules subglobose, smooth. Seeds 4. (Fig. 332)

Vernacular name: Shankhapuspi.

Flowers: July-September. **Micromorphology** (Fig. 332)

Two types of trichomes were present on the plant; one was multicellular, glandular, differentiated into a four celled head and a two celled uniseriate stalk whereas the second was unicellular, non-glandular, elongated trichome with a triangular base.

Stomata were of anisocytic type.

D/365, 696, 697.

#### 2. Cressa cretica Linn. Sp. Pl. (1753) p. 223.

An erect dwarf hairy much-branched shrub upto 40 cm high. Leaves ovate, about 0.6 cm long, acute, densely silky-hairy. Flowers white or pink, usually in small clusters in the axils of the upper leaves; bracts 2, linear. Calyx segments 5, elliptic. Corolla infundibuliform; lobes oblong, reflexed. Stamens 5; anthers oblong. Ovary 2-celled; styles 2, distinct from the base, equal; stigmas capitate. Capsules ovoid. Seeds in fully ripe capsules usually solitary. (Fig. 333)

Vernacular name: Rudanti. Flowers: November-January. **Micromorphology** (Fig. 333)

Medifixed hairs with thick smooth wall and narrow lumen were seen along with non-glandular unicellular hairs.

Stomata were anisocytic, tetracytic, and anomocytic types.

D/704-705, 1252.

#### 3. Cuscuta chinensis Lamk. Encyc. Method. V. 2 (1786) p. 229.

A leafless parasite with yellow filiform, twining much-branched thin stem. Flowers solitary or in shortly pedunculate cymes; pedicels short; bracts ovate. Calyx lobes-5, deltoid-ovate, with a tubercular keel on the back. Corolla lobes-5, about equaling the tube, ovate-oblong; scales at the base of the filaments fimbriate. Filaments short. Ovary 2-celled; styles 2, distinct. Capsules globose, divided into 2 lobes by a deep furrow on top. (Fig. 334)

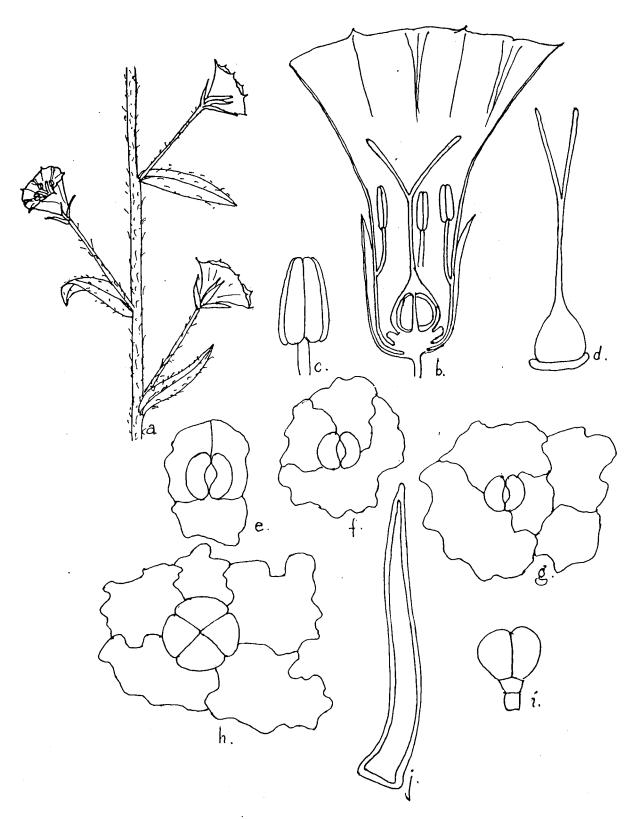


Fig. 332. Convolvulus microphyllous L., a. habit, b. L.S. of flower, c. stamen, d. gynoecium, e-g. anisocytic stomata, h. four celled sessile gland, i. gland with two celled head and two celled uniseriate stalk, j. unicellular trichome.

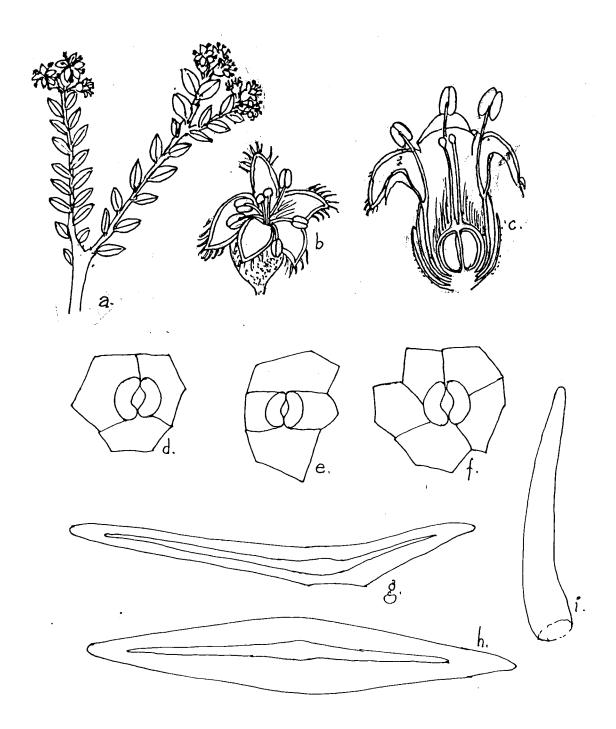


Fig. 333. Cressa cretica L., a. habit, b. flower, c. L.S. of flower, d. anisocytic stomata, e. tetracytic stomata, f. anomocytic stomata, g-h. medifixed hair with thick wall and narrow lumen, i. glandular unicellular trichome.

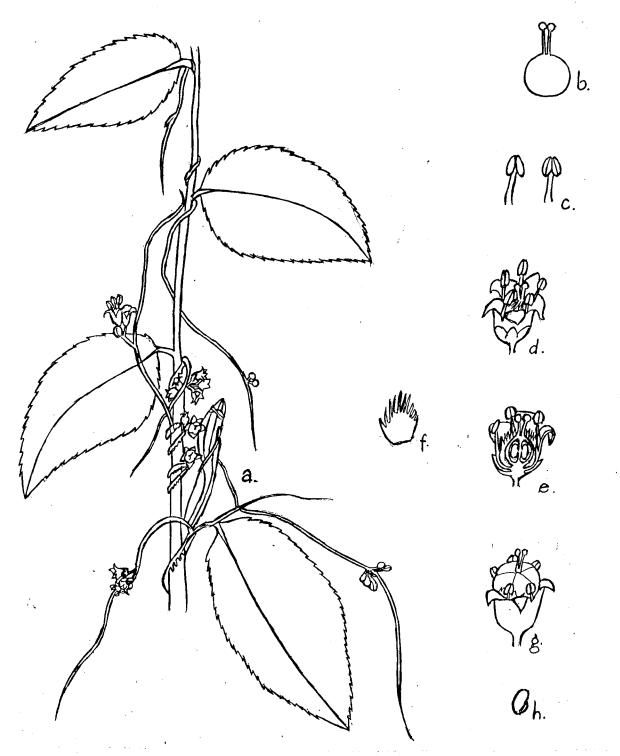


Fig. 334. Cuscuta chinensis Lamk., a. habit, b. gynoecium, c. stamen, d. flower, e. L.S. of flower, f. corona, g. capsule, h. seed.

Vernacular name: Amar vel.

Flowers: June-July.

D/207.

#### 4. Cuscuta reflexa Roxb. Cor. Pl. V. 2 (1798) p. 3, t. 104.

A leafless parasite with yellow stout, twining much-branched stem. Flowers in umbellate clusters of 2-4. Calyx lobes 5, broadly ovate. Corolla white, lobes deltoid, reflexed. Corolline corona scale like, fimbriate. Stamens in the throat of the corolla-tube; filaments scarcely any; anthers about half-exserted beyond the top of the corolla-tube. Ovary ovoid; style simple; stigmas 2, distinct, large, thick and fleshy, ovoid. Capsules depressed-globose, circumscissile near the base. Seeds 2-4, large, black, glabrous. (Fig. 335)

Vernacular name: Amar vel. Flowers: January-February.

D/651, 681, 932.

#### 5. Evolvulus alsinoides Linn. Sp. Pl. ed. 2 (1762) p. 392.

A prostrate, perennial hairy herb with a stem spreading more than 30 cm long. Leaves elliptic-oblong, upto 2 cm, apiculate, densely clothed with appressed silky hairs. Flowers light-blue, solitary from a pair of lanceolate bracts on the peduncle. Calyx densely silky; sepals-5, lanceolate. Corolla infundibuliform; limb plicate. Stamens 5. Ovary 2-celled; ovules 4; styles 2, distinct from the base, each cleft into 2 linear or subclavate stigmas. Capsules globose, thin 4-valved. Seeds usually 4. (Fig. 336)

Vernacular name: Kali Shankhavali.

Flowers: July-November. **Micromorphology** (Fig. 336)

The plant showed presence of medifixed hairs; but sometimes of the two arms one become very short.

Stomata were of anisocytic, tetracytic, paracytic and diacytic type. D/208.

# 6. Evolvulus nummularius L. Sp. Pl. ed. 2. 391. 1762.

A perennial prostrate, glabrous herb rooting at nodes. Leaves broadly ovate(coin-shaped) upto 1.5 cm long, shortly petiolate. Flowers white, solitary or in pairs found in leaf axils. Sepal lobes 5, elliptic-ovate, pubescent. Corolla broadly campanulate, deeply lobed. Stamens 5. Ovary 2-celled, styles 2 branched with 2 branches. Capsules globose one celled. Seeds brown, subglobose. (Fig. 337)

Vernacular name: Musakarni.

# Micromorphology (Fig. 337)

Two types of trichomes were found; one was glandular with two-celled head and singled celled stalk and non-glandular unicellular trichome with thick wall and broad base. Stomata were anisocytic and paracytic types.

D/685, 813.

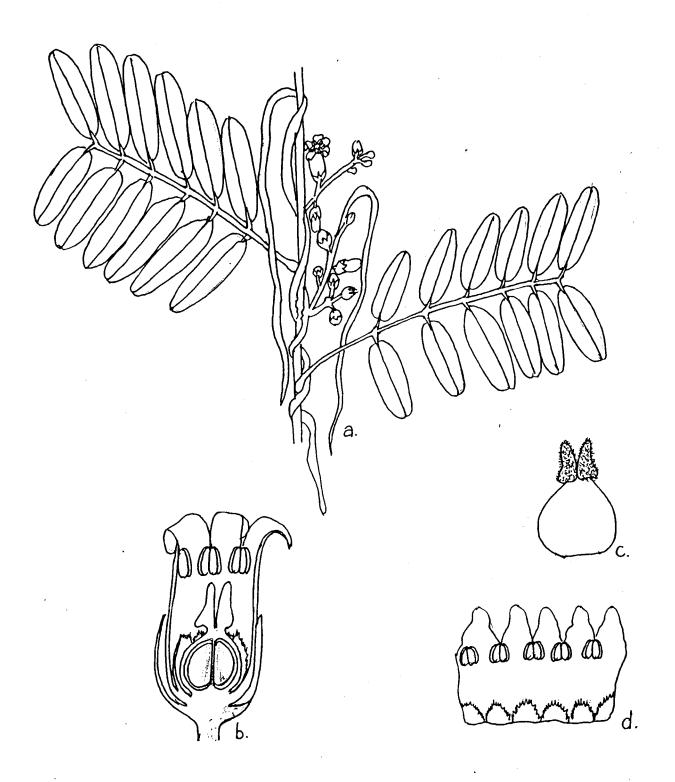


Fig. 235. Cuscuta reflexa Roxb., a. habit, b. L.S. of flower, c. gynoecium, d. corona and epipetalous stamen.

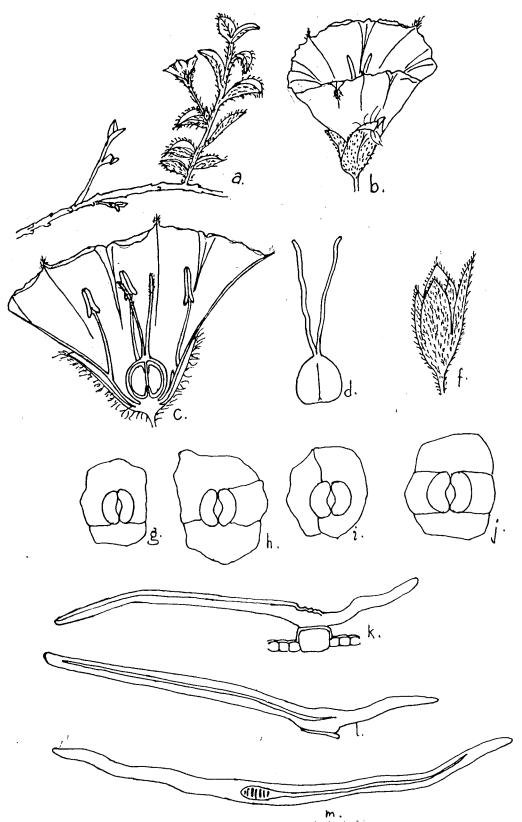


Fig. 336. Evolvulus alsinoides L., a. habit, b. flower, c. L.S. of flower, d. gynoecium, f. calyx, g. diacytic stomata, h. anisocytic stomata, i. paracytic stomata, j. tetracytic stomata, k-m. medifixed hair with one arm short in some trichomes.

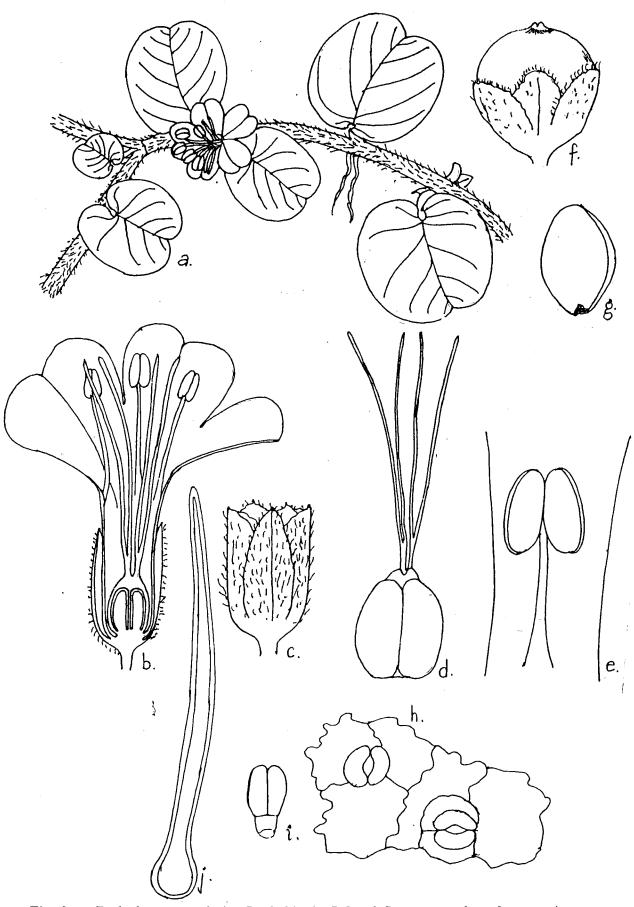


Fig. 337. Evolvulus nummularius L., habit, b. L.S. of flower, c. calyx, d. gynoecium, e. epipetalous stamen, f. capsule, g. seed, h. anisocytic stomata, i. gland with two celled head and a single celled stalk, j. trichome with thick wall and broad lumen.

#### 7. Ipomoea aquatica Forsk. Fl. Aegypt.-Arab. (1775) p. 44.

An annual or biennial twinner trailing on mud or floating on water. Leaves ellipticoblong, upto 13 cm, base usually dilated, cordate or hastate; petioles upto 12 cm long. Peduncles 10 cm long, usually 1-5 flowered; bracts small, linear-lanceolate. Sepals-5, subequal, oblong-lanceolate. Corolla infundibuliform, upto 5 cm long, purple. Stamens 5; filaments filiform. Ovary 2—celled; ovules 4; style filiform; stigma capitate, 2-3-globose. Seeds 4 or 2, minutely pubescent. (Fig. 338)

Vernacular name: Narivel. Flowers: November-April. **Micromorphology** (Fig. 338)

Leaf showed presence of sessile multicellular, glandular, trichome wherein the cells were radially arranged into a multicellular head.

Staminal hair was glandular, multicellular, differentiated into a single celled oval head with lot of ergastic substance in it and a multicellular, multiseriate stalk; the cells of stalk were thick walled and rectangular in shape.

Stomata were of paracytic type.

D/588, 1036.

#### 8. Ipomoea batatas (L.) Lam., Tabl. Encyc. 1: 465. 1793.

A perennial climber with tuberous root. Leaves ovate-cordate, 3-5 lobed, upto 9. Flowers solitary or in few-flowered, subumbellate cymes. Sepals oblong, acuminate, cuspidate. Corolla infundibuliform, purple, 2-3 cm long. Ovary 2—celled; ovules 4; style filiform; stigma capitate, 2-3-globose. Capsules ovoid, glabrous. Seeds rotundate, glabrous. (Fig. 339)

Vernacular name: Sakkariyo. Flowers: October-December. **Micromorphology** (Fig. 339)

Three types of glandular trichomes were observed; 1) unicellular, 2) multicellular sessile and 3) multicellular differentiated into single cell head and multiseriate stalk.

The third type of trichome was observed on stamens.

Stomata were paracytic.

D/130

# 9. Ipomoea biflora (L.) Pers. Syn. Pl. 1: 183. 1805. (Ipomoea calycina C.B. Clarke.)

The plant is a twiner, sparingly clothed with long spreading hairs. Leaves ovate, upto 8 cm, acuminate, cordate at the base with a wide sinus. Flowers 1-3 in peduncles; bracts small, ovate. Sepals unequal, lanceolate-sagittate with obtuse auricles, the inner linear-lanceolate. Corolla white, tubular, scarcely 3 cm long. Ovary 2-celled; ovules 4; style filiform; stigma capitate, 2-3-globose. Capsules ovoid, pointed. Seeds villous all over, fringed on the margin with soft white hairs. (Fig. 340)

# Micromorphology (Fig. 340)

Whole plant was villous. There were 3 types of trichomes on different parts of the plant.

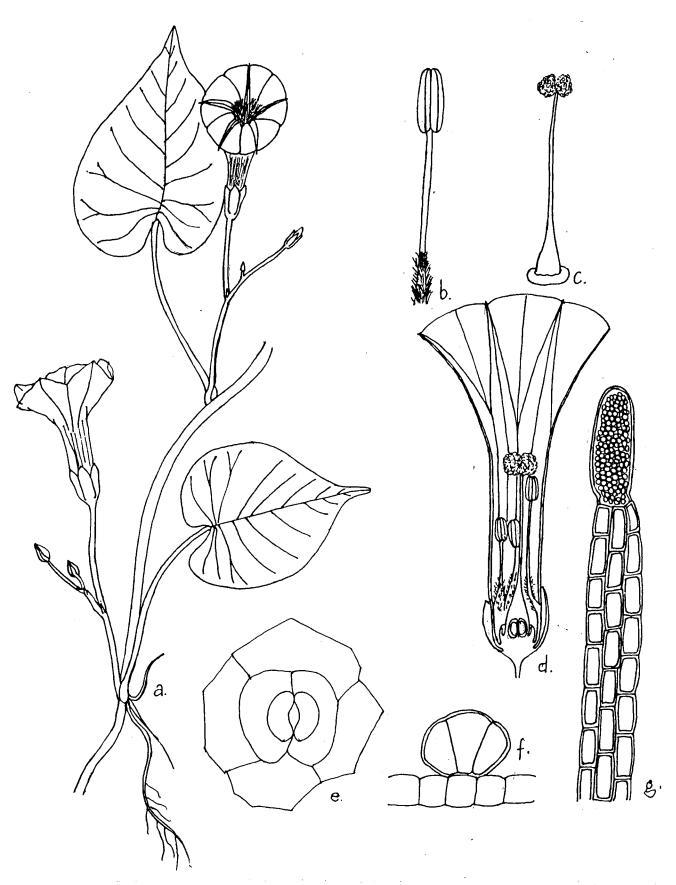


Fig. 338. Ipomoea aquatica Forsk., a. habit, b. stamen, c. gynoecium, d. L.S.of flower, e. paracytic stomata, f. sessile multicellular gland, g gland with a single celled head and multiseriate stalk.

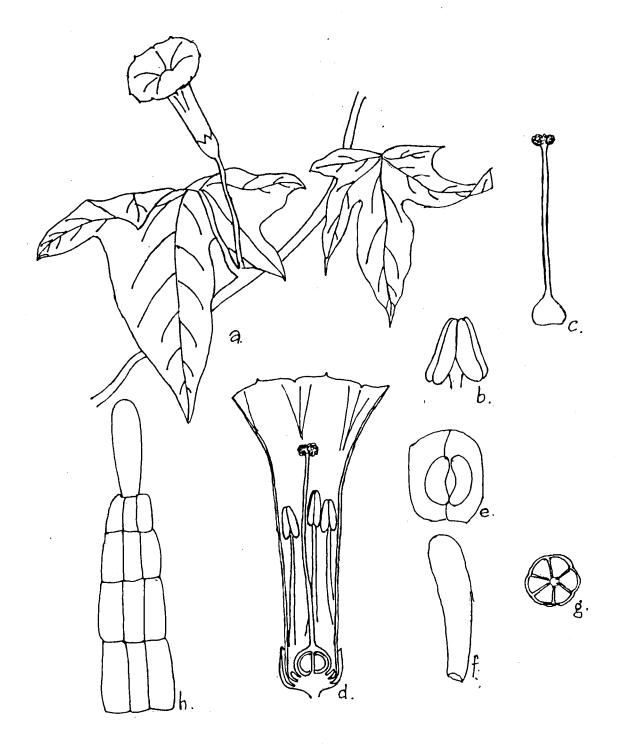


Fig. 389. Ipomoea batatas Poir., a. habit, b. stamen, c. gynoecium, d. L.S. of flower, e. paracytic stomata, f. unicellular trichome, g. multicellular sessile gland, h. gland with a single celled head and multiseriate stalk.

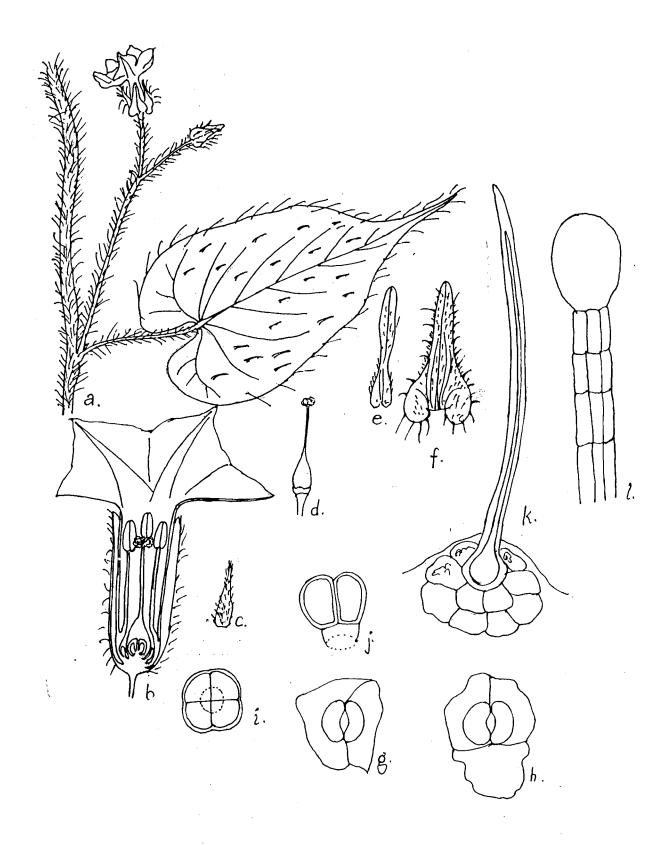


Fig. 340 Ipomoea biflora Pers., a. habit, b. L.S. of flower, c. stipule, d. gynoecium, e. bract, f. bracteole, g. paracytic stomata, h. anisocytic stomata, i. multicellular sessile gland, j. gland with two celled head and a single celled stalk, k. unicellular trichome, l. gland with a single celled head and multiseriate stalk.

Non-glandular, unicellular trichomes were seen distributed all over the plant. They were thick walled, elongated linear with a pointed tip. The leaves, in addition, contained another type of glandular trichome which was multicellular, and differentiated into 4 celled head and a single celled stalk. In the flower specially on stamens there occurred a glandular trichome with a unicellular large oval head and multicellular multiseriate stalk Stomata seen were both anisocytic and paracytic. D/1223.

# 10. Ipomoea cairica (L.) Sweet. Hort. Brit. 287, 1826. (Ipomoea palmata Forsk.)

A perennial twinner woody at the base. Leaves palmatisect with 3-7 (usually 5) oblanceolate lobes, upto 5 cm long. Peduncles 1-3 flowered, curved downwards; bracts minute; pedicels erect and thickened in fruit. Sepals elliptic-oblong, dotted with whitish specks inside and with membranous margins. Corolla upto 5 cm long, dull-violet with a purple tube, widely infundibuliform. Capsules sub-globose, 2-celled. Seeds pubescent with a marginal fringe of long white silky hairs. (Fig. 341)

Flowers: most of the year.

# Micromorphology (Fig. 341)

Whole plant was glabrous except the stamens which showed presence of staminal hairs. The staminal hairs were multicellular, glandular, differentiated into a single celled head with lot of ergastic substance and a multicellular, biseriate stalk.

Stomata were of anisocytic and paracytic type.

D/ 456, 569.

#### 11. Ipomoea carnea Jacq. Enum. Syst. Pl. 1760.

A hollow stemed shrub. Leaves ovate-lanceolate, truncate to shallowly cordate at base, acuminate. Flowers in paniculate clusters of cymes. Sepals-5, suborbicular. Corolla pink, infundibuliform. Stamens 5, usually included; filaments filiform;. Ovary 2 (rarely 3 or 4).—celled; ovules 4 (rarely 6); style filiform; stigma capitate, entire or 2-3-globose. Fruit ovoid to subglobose. Seeds comose. (Fig. 342)

Flowers: July-November.

# Micromorphology (Fig. 342)

The leaf showed presence of multicellular, glandular trichome differentiated into a multicellular 4-8 celled head with cells radiating and a one celled stalk.

Staminal hairs were multicellular, glandular, differentiated into a one celled head with ergastic substance and multicellular, multiseriate stalk. D/133.

# 12. *Ipomoea fistulosa* Mart. ex Choisy in DC. Prodr. 9: 347. 1845. (*Ipomoea carnea subsp. fistulosa* D.F. Austin)

A hollow stemed shrub upto 1-5 m high, normally grown as a hedge plant. Leaves ovatelanceolate, upto 25 cm long, acuminate. Sepal lobes 5, suborbicular. Corolla upto 9 cm long, pink. Stamens 5, usually included; filaments filiform, filaments unequal. Ovary 2

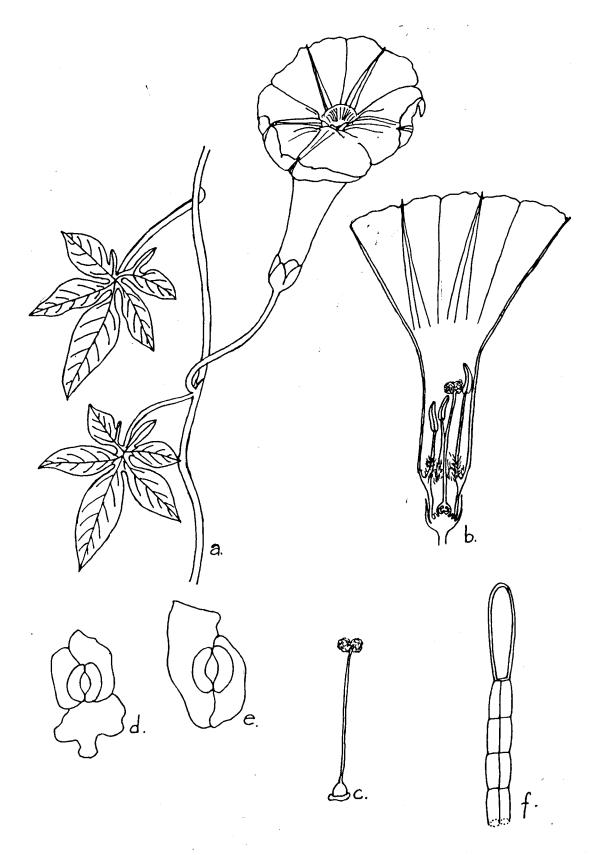


Fig. 341. Ipomoea cairica Sweet., a. habit b. L.S. of flower, c. gynoecium, d. anisocytic stomata e. paracytic stomata f. gland with a single celled head and multiseriate stalk.

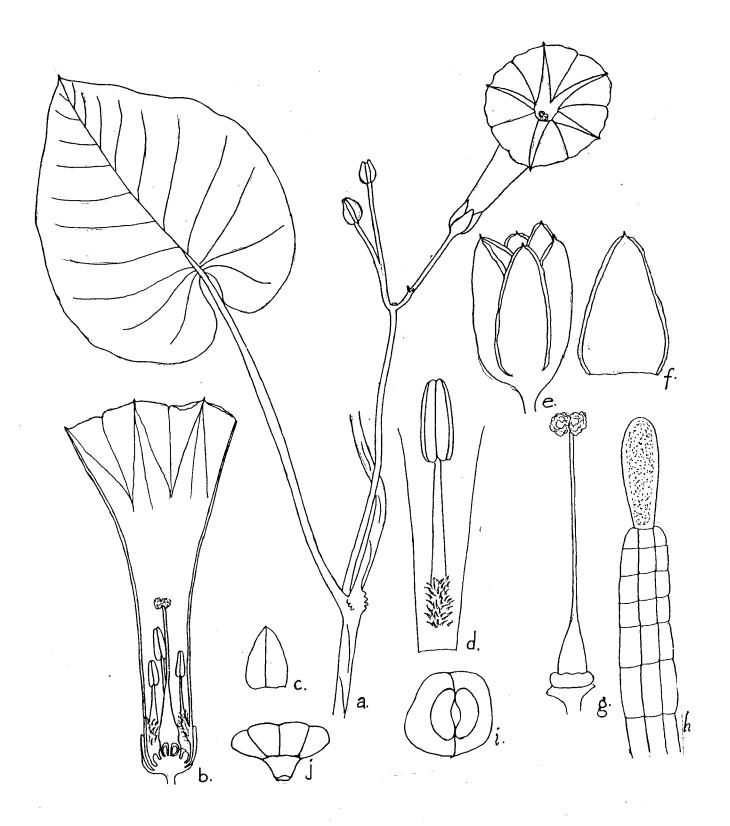


Fig. 342. Ipomoea carnea Jacq., a. habit, b. L.S. of flower, c. bract, d. epipetalous stamen, e. calyx, f. sepal, g. gynoecium, h. gland with a single celled head and multiseriate stalk, i. paracytic stomata, j. gland with multicellular single tiered head and a single celled stalk.

(rarely 3 or 4) —celled; ovules 4; style filiform; stigma capitate, entire or 2-3-globose. Fruit ovoid to subglobose, the seeds covered with long, woolly hairs. (Fig. 343)

Vernacular name: Besharmi.

#### Micromorphology (Fig. 344)

Leaf and calyx showed presence of unicellular, non-glandular, conical, trichome with thick wall and blunt apex.

Corolla showed presence of two celled, trichome with upper cell long, pointed and slightly curved, and basal cell was short and swollen.

Staminal hairs were multicellular, glandular, differentiated into a one celled head with ergastic substance and multicellular, multiseriate stalk.

Stomata were of paracytic type.

D/223.

# 13. Ipomoea hederifolia Linn., Syst. Nat. ed. 10.925. 1759.

A sparsely pubescent annual climber with ovate to suborbicular trilobate or with 5-7 lobed leaves upto 15 cm long. Flowers red to red-yellow, in few-to several-flowered cymes or solitary. Sepals oblong to elliptic, apically obtuse to truncate, the outer with a subterminal fleshy arista. Corolla salverform upto 4.5 cm long. Fruit capsular, subglobose, 6-8 mm long. Seeds dark brown or black, pyriform. (Fig. 345)

Vernacular name: Krishnabija.

Flowers: November to September, perhaps all the year in some areas.

#### Micromorphology (Fig. 345)

There were only glandular trichomes having a multicellular, head with radiating cells and a single celled stalk.

Stomata were of paracytic and anisocytic types.

D/989.

# 14. Ipomoea marginata (Desr.) Verdc. Kew Bull. 42(3): 658. 1987. (Ipomoea sepiaria Koenig.)

A perennial twinner with more or less hairy stem. Leaves ovate, cordate at base upto 8 cm, and with red patches in lamina. Flowers in pedunculate subumbellate cymes; bracts lanceolate. Sepals elliptic, slightly apiculate, with membranous margins, the 2 outer shorter, the 3 inner longer. Corolla tubular-infundibuliform, pale-purple or whitish; tube purple within; lobes of the limb shortly apiculate. Stamens 5. Filaments hairy at the base. Capsules ovoid, 4-2 seeded. Seeds grey with silky pubescence. (Fig. 346)

Vernacular name: Rati fuderdi.

Flowers: August-October.

#### Micromorphology (Fig. 346)

Almost whole plant was glabrous except few hairs on the leaf. The trichome on the leaf was multicellular, glandular, differentiated into 6-8 cells head and uniseriate 2 celled stalk.

Stomata were paracytic.

D/955-956.

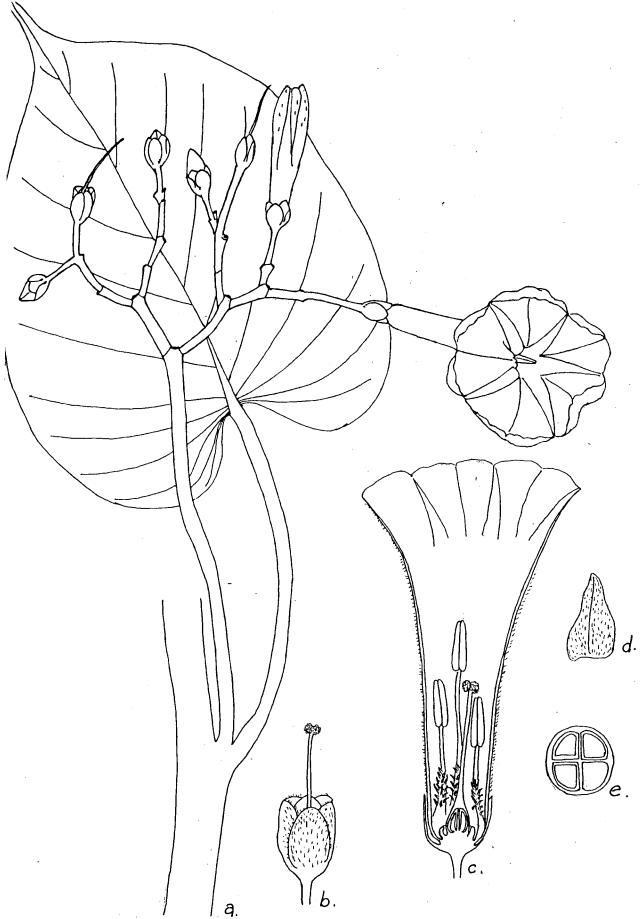


Fig. 343. Ipomoea fistulosa Mart. ex Choisy, a. habit, b. Gynoecium with clayx, c. L.S. of flower, d. Bract, e. T.S. of ovary.

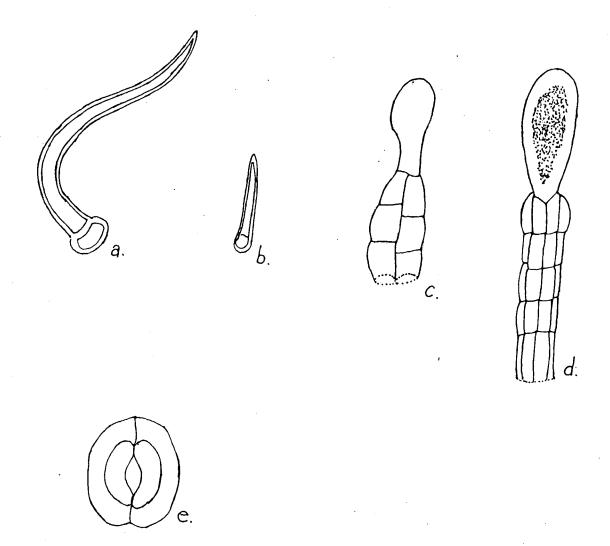


Fig. 344. Ipomoea fistulosa Mart. ex Choisy, a. two celled trichome, b. unicellular trichome, c-d. gland with a single celled head and multiseriate stalk, e.Paracytic stomata

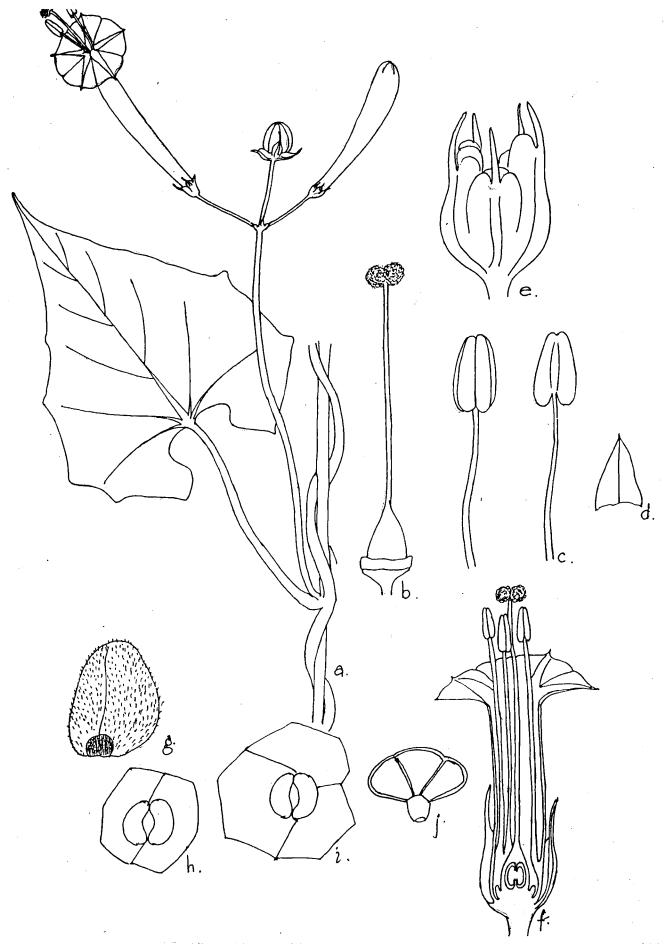


Fig. 345. Ipomoea hederifolia L., a. habit, b. gynoccium, c. stamen, d. bract, e. calyx, f. L.S. of calyx, g. seed, h. paracytic stomata, i. anisocytic stomata, j. gland with multicelluar head and a single celled head.

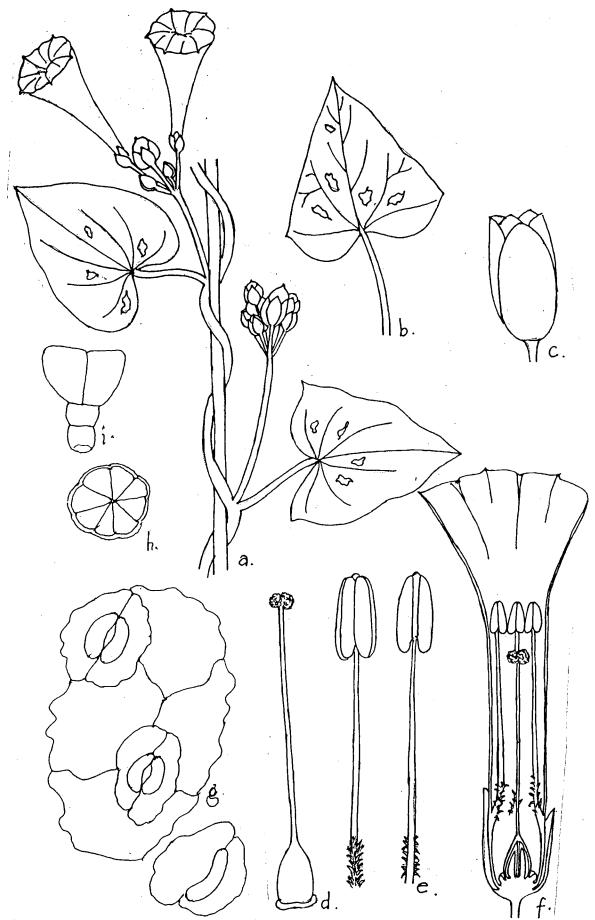


Fig. 346. Ipomoea marginata (Desr.) Verdc., a. habit, b. leaf, c. calyx, d. gynoecium, e. stamen, f. L.S. of flower, g. paracytic stomata, h. sessile gland, i. gland with two celled head and two celled uniseriate stalk

#### 15. Ipomoea nil (L.) Roth, Catal. Bot. 1: 36. 1791

These plants are annual climbers with stems sparsely pubescent or glabrous. Leaves 3-lobed, ovate-suborbicular, upto 14 cm long, acuminate. Flowers mostly in axillary, 1-6 flowered cymes. Sepals lanceolate, with linear-lanceolate apices. Corolla purple or blue, about 5 cm long, infundibuliform. Stamens 5, unequal in length, filaments hairy at the base. Gynoecium bicarpellary, bilocular with single ovule in each locule. Capsules globose. Seeds pyriform. (Fig. 347)

Vernacular name: Kalandana. Flowers: September-March. **Micromorphology** (Fig. 348)

Whole plant was glabrous except few parts of the plants like stem, pedicels, sepals, and stamens. Trichomes were completely absent on the leaf surface whereas the trichomes on the stem, pedicels and sepals were unicellular, non-glandular, very long, acuminate thick walled with a large lumen.

Glands on the stamens were multicellular, differentiated into stalk and head. Head was of oval shaped single cell whereas stalk was multicellular and multiseriate.

Stomata were paracytic in majority but sometimes anomocytic type of stomata were also seen.

D/373.

#### 16. Ipomoea obscura Ker-Gawl. in Bot. Reg. (1817) t. 239.

An annual twinner with purplish stems and broadly ovate leaves upto 6 cm, acuminate,; petioles upto 8 cm long. Flowers small, 1 or 2 together; bracts minute, lanceolate. Sepals-5, subequal, oblong, shortly apiculate. Corolla infundibuliform, yellow, or white with the plaits yellowish, with a small purple eye; bands usually defined by 2 prominent lines. Stamens 5; filaments filiform. Ovary 2–celled; ovules 4 (rarely 6); style filiform; stigma capitate. Capsules ovoid, subacute, glabrous. Seeds dark-brown. (Fig. 349)

Vernacular name: Vad fudardi.

Flowers: during the greater part of the year.

### Micromorphology (Fig. 350)

Leaf showed presence of 3 celled, non-glandular, trichome whose upper cell was elongated pointed and thick walled, the second cell being short and almost rectangular and a similar basal cell with thin walls. A multicellular, glandular, trichome differentiated into a 4 celled head and a single celled stalk was also present.

Stomata were of anisocytic and paracytic type.

D/959, 1232.

#### 17. Ipomoea pes-tigridis Linn. Sp. Pl. (1753) p. 162.

A hirsute twinner with leaves deeply palmatisect with 5-9 ovate lobes. Flowers sessile, 3 or more in a head on long peduncles. Outer bracts large, both inner ad outer bract ovate-oblong. Sepals-5, densely hairy with long stiff hairs, the 2 outer sepals broader than the inner, ovate-lanceolate. Corolla globose. Stamens 5; filaments filiform. Ovary 2–celled; ovules 4 (rarely 6); style filiform; stigma capitate. Seeds grey-pubescent. (Fig. 351)

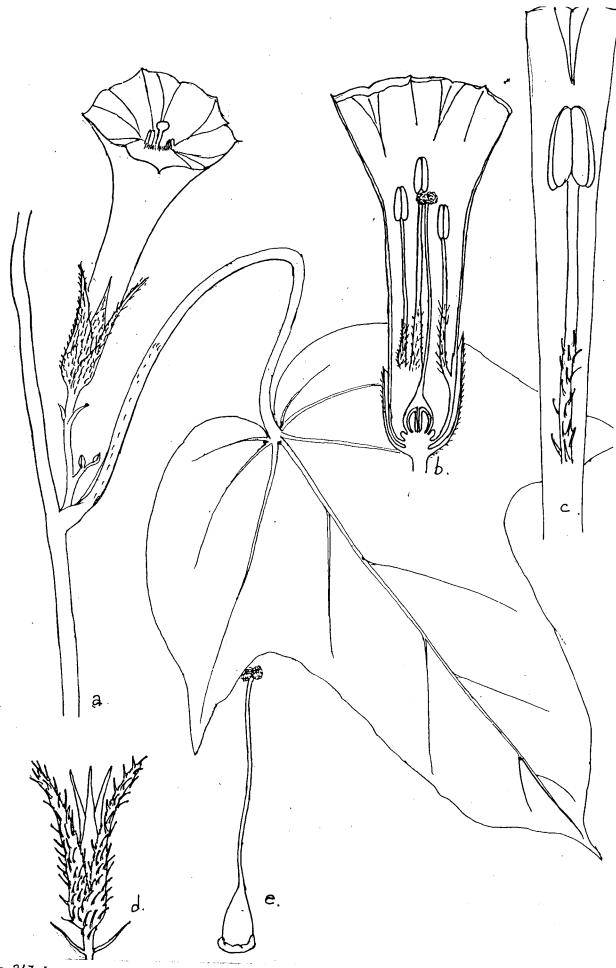


Fig. 347. Ipomoea nil (L.) Roth., a. habit, b. L.S. of flower, c. epipetalous stamen, d. calyx, e. gynoecium.

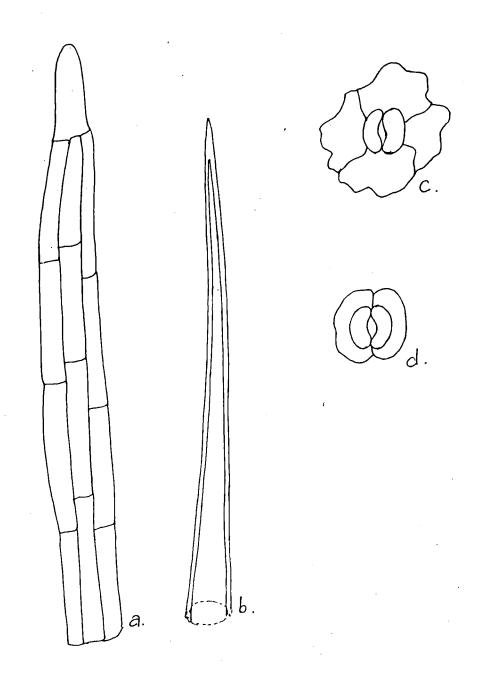


Fig. 348. Ipomoea nil (L.) Roth., a. gland with a single celled small head and multiseriate stalk, b. unicellular trichome, c. tetracytic stomata, d. paracytic stomata.

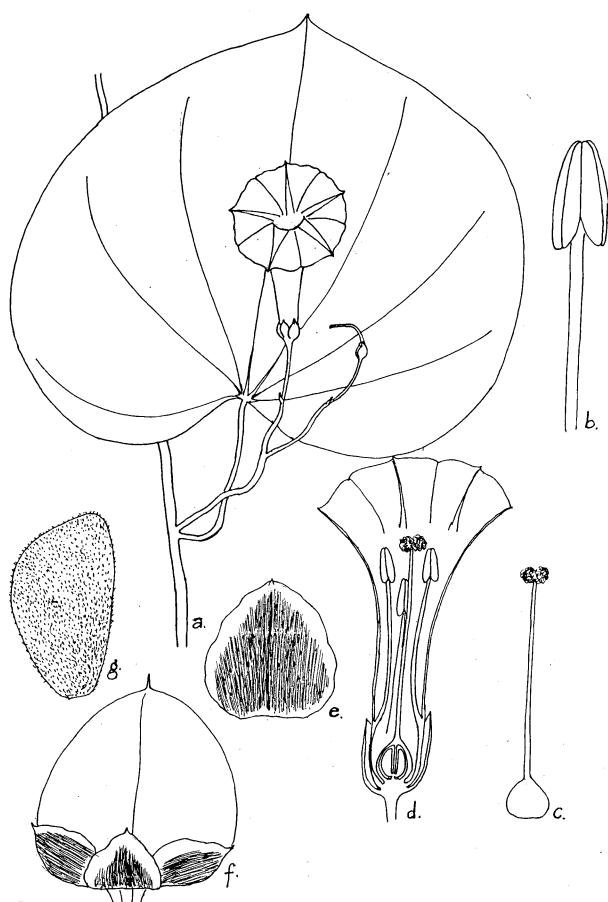


Fig. 349. Ipomoea obscura Ker., a. habit, b. stamen, c. gynoecium, d. L.S.of flower, e. sepal, f. capsule, g. seed.

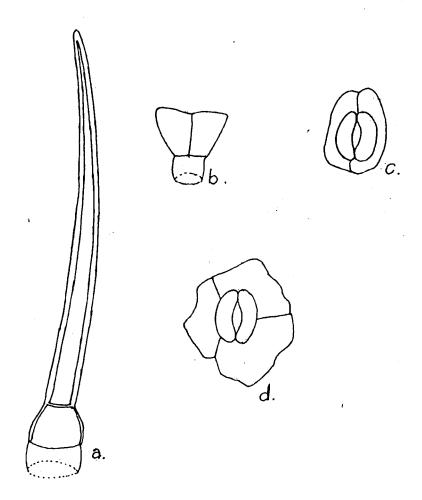


Fig. 350 Ipomoea obscura Ker. a. two celled uniseriate trichome with basal cell small, b. gland with two celled head a single celled stalk, c. paracytic stomata, d. anisocytic stomata.

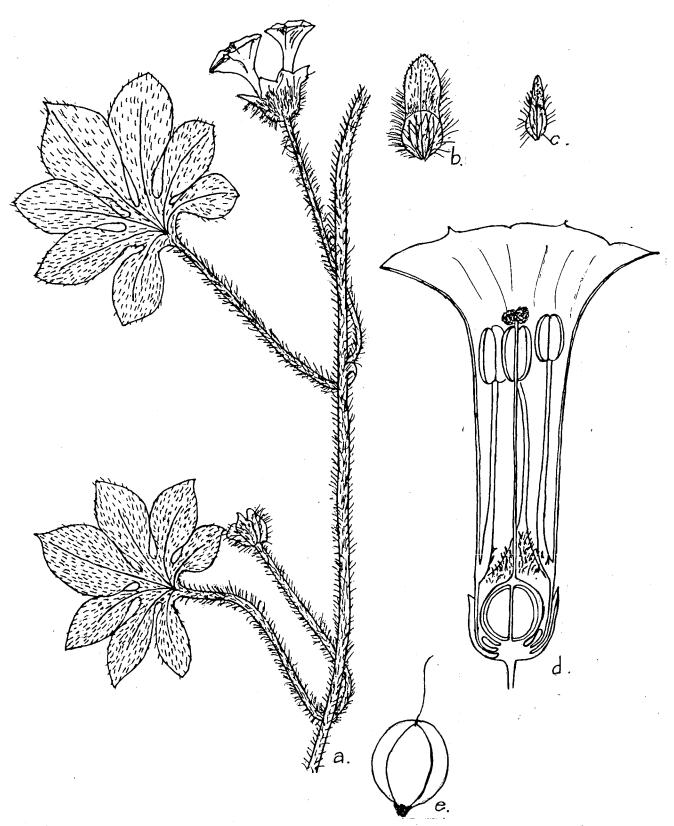


Fig. 251. Ipomoea pes-tigridis L., a. habit, b. bract, c. bracteole, d. L.S. of flower, e. capsule.

Vernacular name: Photial wagpadi. Flowers: September-November. **Micromorphology** (Fig. 352)

The plant showed presence of unicellular, non-glandular, elongated trichome with warty surface; along with this a small, unicellular, non-glandular, smooth walled trichome was present.

Staminal hairs were multicellular, glandular, differentiated into a single celled head containing ergastic substances and a multicellular, biseriate stalk.

Stomata were of anisocytic and paracytic type.

D/671, 1034.

#### 18. Ipomoea quamoclit Linn. Sp. Pl. (1753) p. 160.

A herbaceous twiner upto 3 m long. Leaves ovate, finely dissected, 10cm long. Inflorescence cymose clusters of flowers on long peduncle. Bracts acuminate. Sepals 5 aristate. Corolla salverform, orange red. Stamens 5, exserted. Style 1. Ovary superior, 4-locular, 4-seeded. Placentation axile. Stigma globose tuberculate-papillose. Capsule subglobose. Seeds pyriform, glabrous. (Fig. 353)

Vernacular name: Ganesh vel. Flowers: September-January **Micromorphology** (Fig. 353)

Whole plant was glabrous except inner walls of corolla which showed multicellular, glandular trichome which had an indistinct single celled head and a multicellular, multiseriate stalk.

Stomata were of paracytic type.

D/1249-1251.

#### 19. Merremia dissecta (Jacquin) H. Hallier, Bot. Jahrb. Syst. 16: 552. 1893.

A semi-woody twiners with woody basally, tuberculate stems. Leaves palmate divided into 5-7 lanceolate lobes. Inflorescences 1- to several flowered; peduncle 5-

10 cm. Pedicel thicker distally, minutely tuberculate, glabrous. Sepals ovate-lanceolate, subequal, 2-2.5 cm, enlarged and leathery in fruit, glabrous, margin narrowly scarious, apex acute, mucronulate. Corolla white, with purple-red throat, funnelform, midpetaline bands distinct. Anthers spirally twisted. Ovary glabrous. Capsule globose, glabrous, 2-loculed. Seeds black, glabrous. (Fig. 354)

Flowers: August-October.

#### Micromorphology (Fig. 354)

The leaves contained multicellular, sessile gland having radially arranged cells. Stomata were paracytic.

D/254.

### 20. Meremia emarginata Hallier f. in Engl. Bot. Jahrb. V. 16 (1893) p. 552.

A creeping filiform herb rooting at the nodes. Leaves reniform or ovate-cordate, upto 3 cm broad, crenate. Flowers yellow, axillary, solitary or few together on a short peduncle;

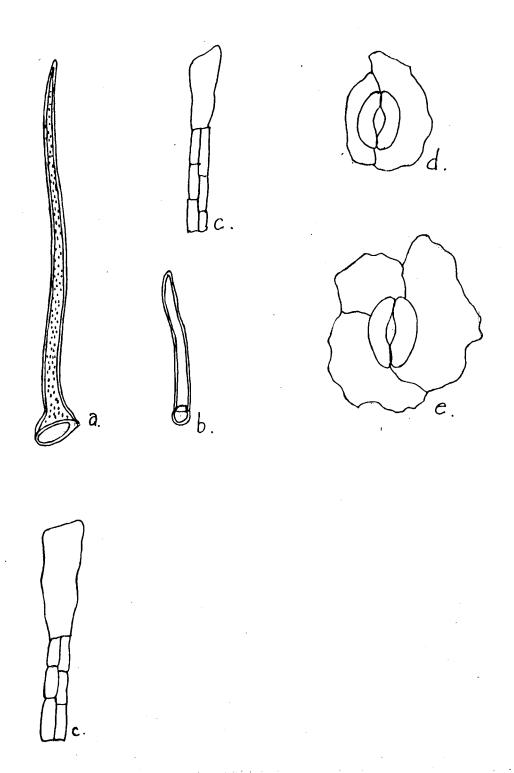


Fig. 352. Ipomoea pes-tigridis L., a. unicellular trichome with thick and warty wall, b. unicellular trichome, c. gland with a single celled head and multiseriate stalk, d. paracytic stomata, e. anisocytic stomata.

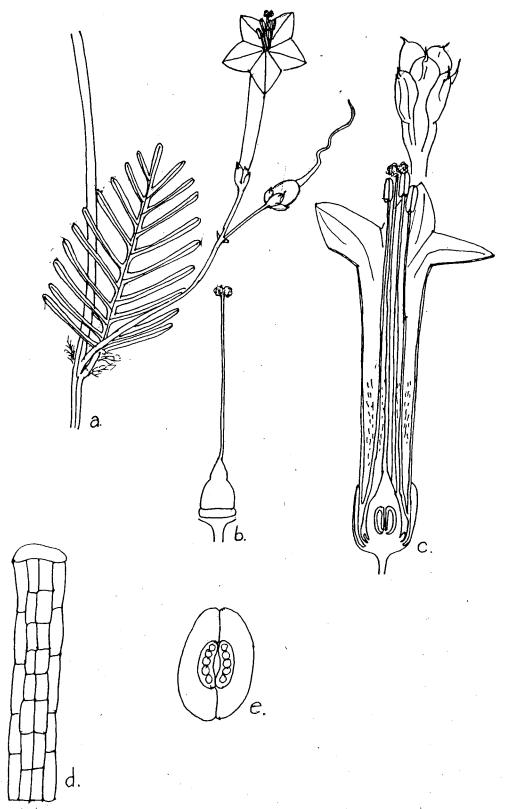


Fig. 353. Ipomoea quamoclit L., a. habit, b. gynoecium, c. L.S. of flower, d. gland with a single celled small head and multiseriate stalk, e. paracytic stomata.

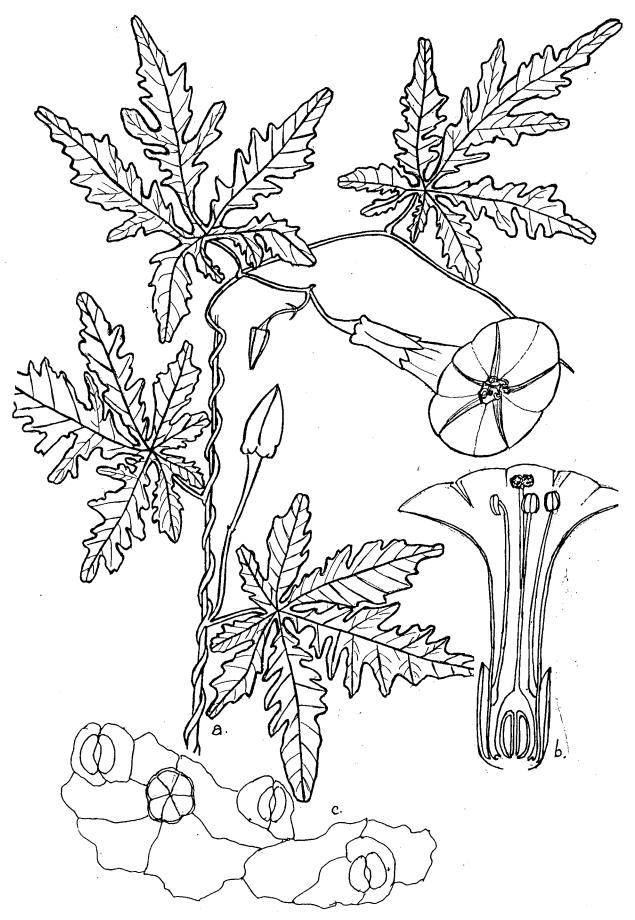


Fig. 354 Merremia dissecta Hall., a. habit, b. L.S. of flower, c. paracytic stomata and sessile multicellular gland.

bracts small, ovate. Sepals 5, 2 outer ovate, mucronate, the 3 inner with 2 truncate divaricate lobes. Corolla campanulate lined with 5 dark violet lines. Stamens 5, anthers twisted. Ovary 4 celled; ovules 4; style filiform; stigma 2-globose. Capsules subglobose. Seeds glabrous, dark chestnut-colored. (Fig. 355)

Vernacular name: Undari. Flowers: September-October. **Micromorphology** (Fig. 355)

Unicellular acicular trichomes were present.

Stomata were paracytic.

D/667.

#### 21. Merremia hederacea (Burm. f.) Hallier f., Bot. Jahrb. Syst. 18(1-2): 118. 1893.

A twinner or prostrate with ofter tuberculated stem, sometimes rooting at the nodes. Leaves ovate, shallowly to deeply 3-lobed, upto 5 cm long, mucronulate. Flowers solitary or several in lax inflorescences. Sepals obovate to spathulate, dissimilar, notched at the mucronulate apex. Corolla yellow or white, campanulate. Capsule globose or conic, somewhat 4-angled. (Fig. 356)

Flowers: September-October.

#### Micromorphology (Fig. 356)

Leaf showed presence of two celled, filamentous, non-glandular trichome; the upper cell was conical, elongated with pointed tip and the basal cell was swollen and short. Along with the above mentioned trichome, leaf also showed presence of multicellular, glandular, and differentiated into multicellular head in which the cells are radially arranged and a single celled stalk.

Staminal hairs were multicellular, glandular, distinctly differentiated into a triangular single celled head with lot of ergastic substances, and multicellular, multiseriate stalk. Stomata were of paracytic type.

D/1128.

#### 22. Merremia tridentata Hallier f. in Engl. Bot. Jahrb. V. 16 (1893) p. 552.

A perennial herb with a small woody rootstock and elongate, prostrate stems. Leaves linear-hastate, upto 3 cm long, often deeply emarginated and 3-toothed at the apex, dilated at the base into toothed auricles. Flowers axillary, solitary, with lanceolate bracts. Sepals 5, strongly mucronate. Corolla pale-yellow, campanulate. Stamens 5; anthers usually twisted. Ovary 4 celled; ovules 4. Capsules globose. Seeds trigonous. (Fig. 357) Vernacular name: Bhinigario.

Flowers: August- October.

#### Micromorphology (Fig. 357)

The leaves contained multicellular, sessile gland having radially arranged cells. Stomata were paracytic.

D/242.

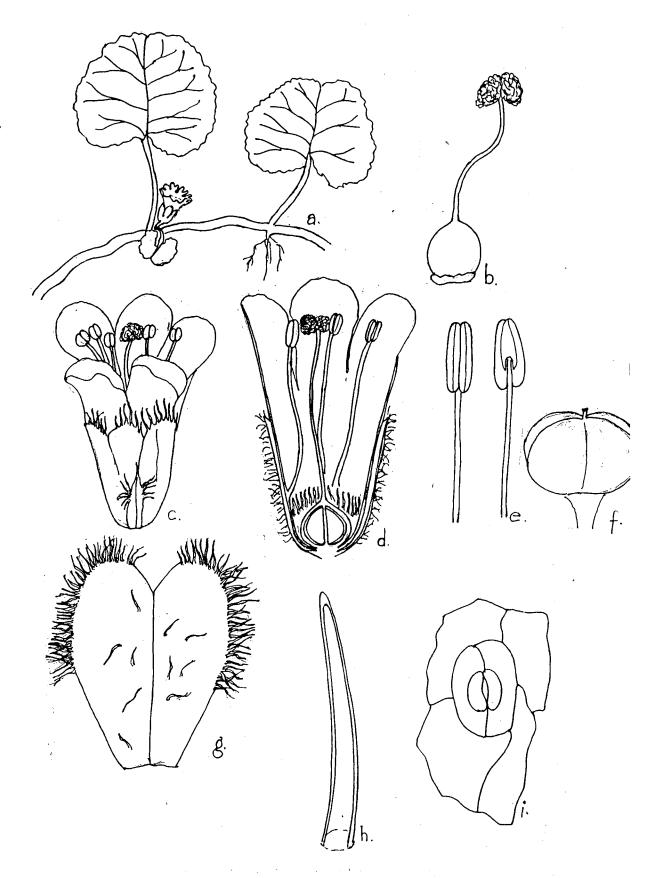


Fig 355 Merremia emarginata Hall., a. habit, b. gynoecium, c. flower, d. L.S. of flower, e. stamen, f. capsule, g. sepal, h. unicellular trichome, i. paracytic stomata.

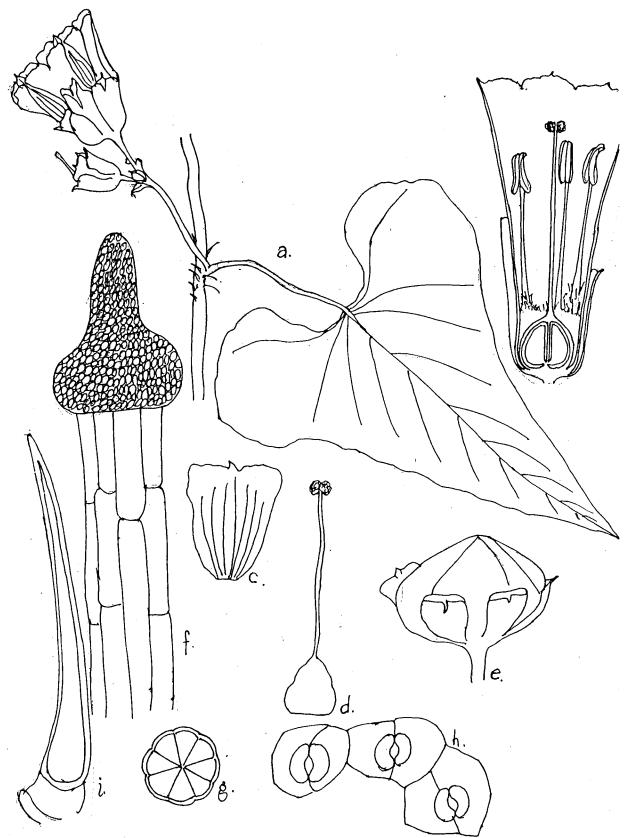


Fig. 356 Merremia hederacea (Burm. f.) Hall. f., a. habit, b. L.S. of flower, c. sepal, d. gynoecium, e. capsule, f. gland with a single celled head and multiseriate stalk, g. sessile multicellular gland, h. paracytic stomata, i. two celled trihcome.

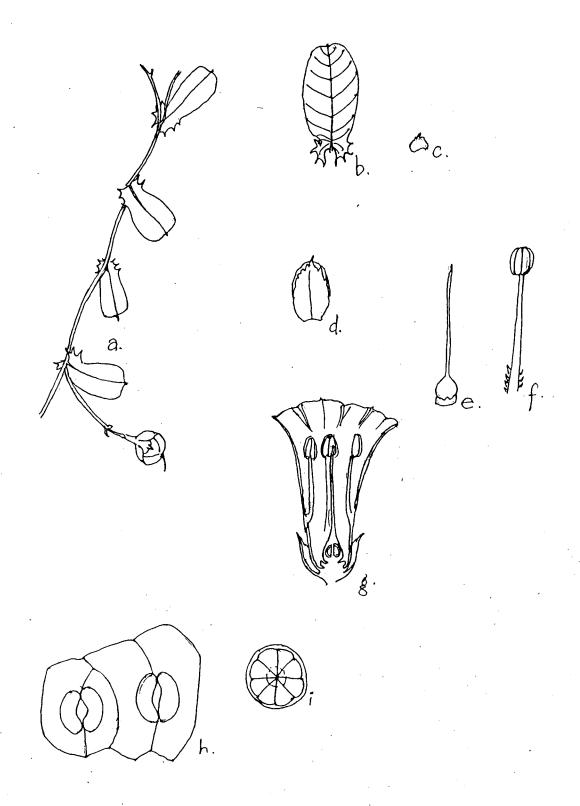


Fig. 357. Merremia tridentata Hall. f., a. habit, b. leaf, c. bract, d. sepal, e. gynoecium, f. stamen, g. L.S. of flower, h. paracytic stomata, i. glandular multicellular sessile trichome.

# Solanaceae

#### 1. Datura stramonium L., Sp. Pl. (1753) p. 179.

A shrub of 1 m in height with purplish stems and large broadly ovate leaves reaching upto 17 cm, ovate, sinuately dentate. Flowers in axillary or terminal cmes. Calyx 5.5 cm long, tubular; lobes 5, dentate. Corolla infundibuliform, white or purplish suffused, upto 10 cm long, shallowy 5-lobed. Anthers long, oblong, white. Ovary 2-celled; with many ovules on swollen placenta. Capsule ovoid, spiny and splitting by 4 valves. Seeds reniform, black. (Fig. 358)

Vernacular name: Dhaturo.

Flowers: June-July.

Micromorphology (Fig. 358)

Multicellular uniseriate smooth trichomes were seen on the leaves.

Stomata were of anomocytic and diacytic types.

D/202.

#### 2. Nicotiana tabacum L., Sp. Pl. 180. 1753.

A branched viscid-pubescent undershrub up to 1 m tall. Leaves cauline, broadly elliptic-ovate, upto 40 cm long. Flowers pink, in axillary and terminal compact corymboid panicles. Calyx oblong; lobes unequal. Corolla tube upto 4.6 cm long; limb up to 15 cm broad, lobes apiculate. Anthers oblong. Ovary 2-celled. Capsule oblong-ovoid. Seeds angled, minutely ruminate, brown. (Fig. 359)

Vernacular name: Tambaku.

Flowers: April-May.

#### Micromorphology (Fig. 360)

Leaf contained two types of glandular trichomes; 1) two celled 2) many celled having a two celled head and three celled elongated stalk.

Bract and calyx contain glandular trichomes with 3-4 celled stalk and 4-5 celled head containing a lot of ergastic substances.

Corolla contained glandular trichomes having 1 single celled head, and 3-4 celled elongated stalk; and 2-4 celled head with a similar stalk.

Stomata were of anomocytic type.

D/145.

#### 3. Physalis minima Linn. Sp. Pl. (1753) p. 183.

An annual herb with dichotomous branches and stem reaching to a height of 30 cm. Leaves ovate, upto 6 cm long, shallowly toothed or lobed. Flowers solitary. Calyx teeth triangular. Corolla yellow; lobes of limb short. Filaments glabrous. Anthers oblong, clustered around the stigma. Ovary ovoid, seated on a large disk. Berry ovoid or subglobose, entirely enveloped in the enlarged membranous 5-ribbed calyx. Seeds discoid or subreniform. (Fig. 361)

Variation observed: in flora the filaments are said to be glabrous, but my specimen had hairy filaments.

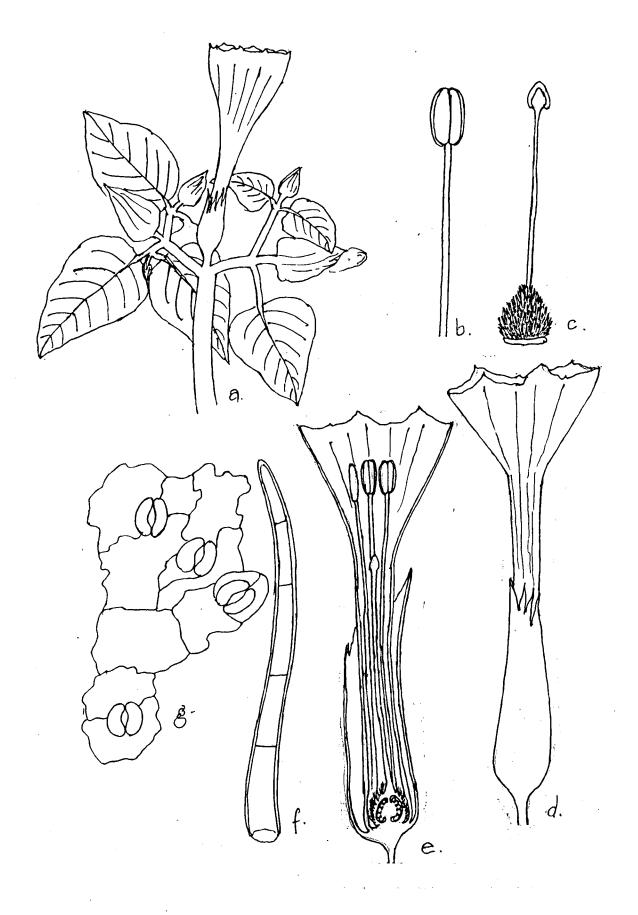


Fig. 358. Datura stramonium L., a. habit, b. stamen, c. gynoecium, d. flower, e. L.S. of flower, f. uniseriate trichome, g. anomocytic and diacytic stomata.

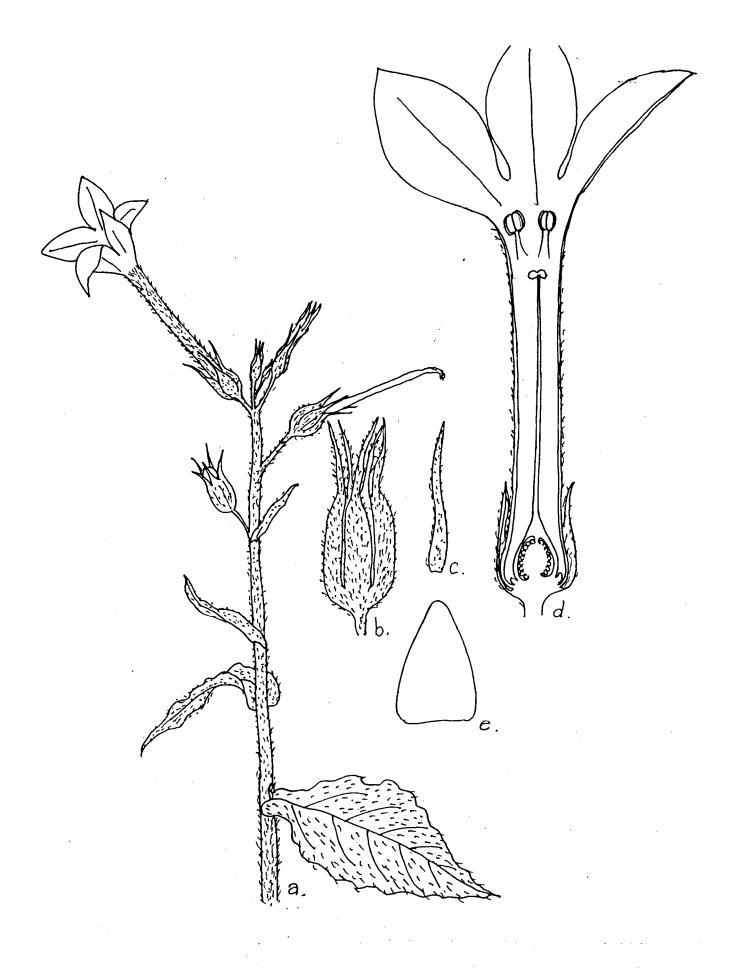


Fig. 359 Nicotiana tabacum L., a. habit, b. calyx with capsule, c. bract, d. L.S. of flower, e. capsule.

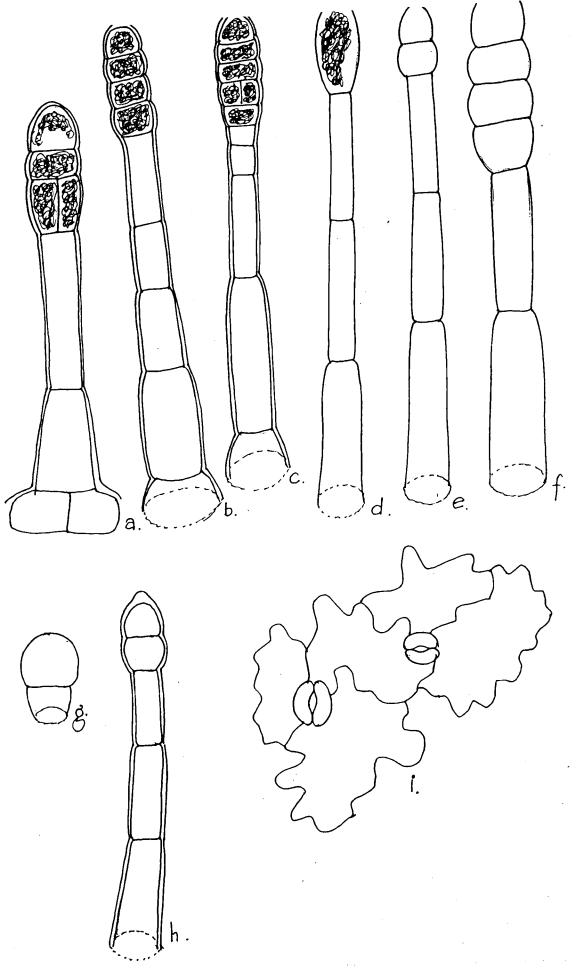


Fig. 360 Nicotiana tabacum L., a-h. glands with multicellular head (single celled to many celled head) and multicellular uniseriate as well as single celled stalk in some tricehomes is anomorphic status.

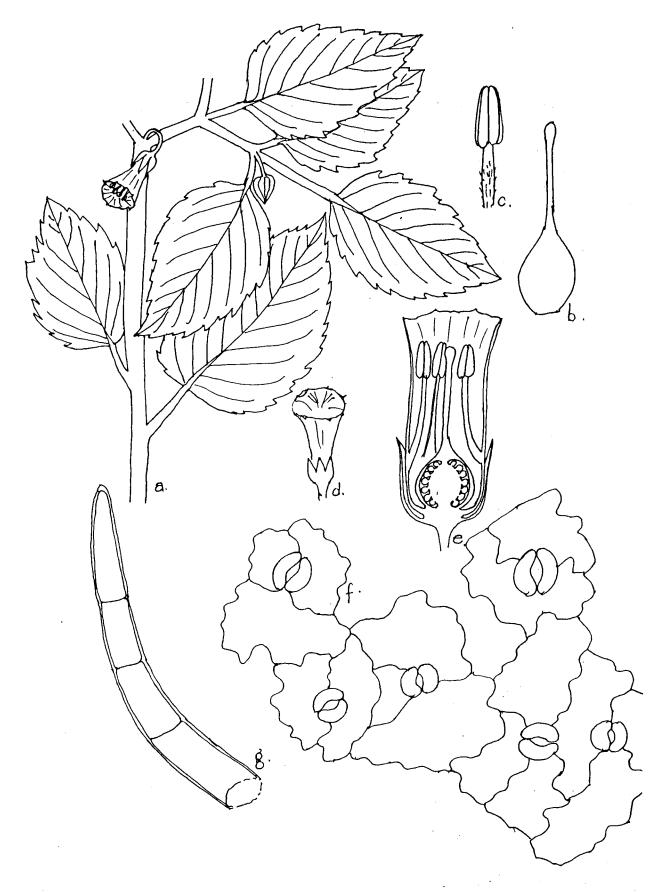


Fig. 361 Phyasalis minima L., a. habit, b. gynoecium, c. stamen, d. flower, e. L.S. of flower, f. anisocytic, diaytic and anomocytic stomata, g. uniseriate trichome.

Vernacular name: Popati. Flowers: August-October. Micromorphology (Fig. 361)

The plant showed presence of multicellular, uniseriate, non-glandular trichome. The cells of the trichome were broad at the base and continuously narrowing to the top, and all the cells were thin walled.

Stomata were of anomocytic, anisocytic and diacytic types. D/311.

# 4. Solanum americanum Miller. Gard. Dict. ed. 8: 5. 1768. (Solanum nigrum L.)

A divaricately branched annual with ovate-lanceolate, sinuateotoothed leaves, upto 9 cm long and tapering into the petiole. 2 cm long, slender; pedicels upto 1 cm long, very slender. Flowers extra axillary in cymes. Calyx 5-lobed, oblong, hairy and enlarged in fruit. Corolla white divided into 5 oblong subacute lobes. Stamens 5 connate into a short cone around the stigma; anthers yellow, oblong, filaments glabrous. Ovary globose, 2-celled. Berry small, purplish-black, but sometimes red or yellow. Seeds discoid. (Fig. 362)

Variations observed: In standard description of this plant, calyx is said to be glabrous and not enlarged in fruit, filaments are hairy but in my specimen calyx was found to be hairy and enlarged in fruit. Filaments were glabrous.

Vernacular name: Kamperu. Flowers: September-January. **Micromorphology** (Fig.362) Whole plant was glabrous.

The stomata were of anomocytic type.

D/372.

# 5. Solanum virginianum L. Sp. Pl. 187, 1753 (Solanum xanthocarpum Schrad. & Wendl.)

A very prickly diffuse bright-green perennial herb completely covered with long narrow, straight, yellow prickles often exceeding 1.5 cm long. Leaves ovate or elliptic, upto 10 cm, sinuate or subpinnatifid, stellately hairy on both sides, armed on the midrib with long yellow sharp prickles. Flowers in extra-axillary few-flowered cymes. Calyx 5-10 lobed, nearly 1.5 cm long, densely hairy and prickly; tube short; lobes linear-lanceolate, prickly outside. Corolla rotate, purple, 2 cm long; lobes deltoid, acute, hairy outside. Anthers oblong-lanceolate, opening by small pores. Ovary ovoid, 2-celled. Berry upto 2 cm in diameter, yellow, or white with green veins, surrounded by the enlarged calyx. Seeds numerous. (Fig. 363)

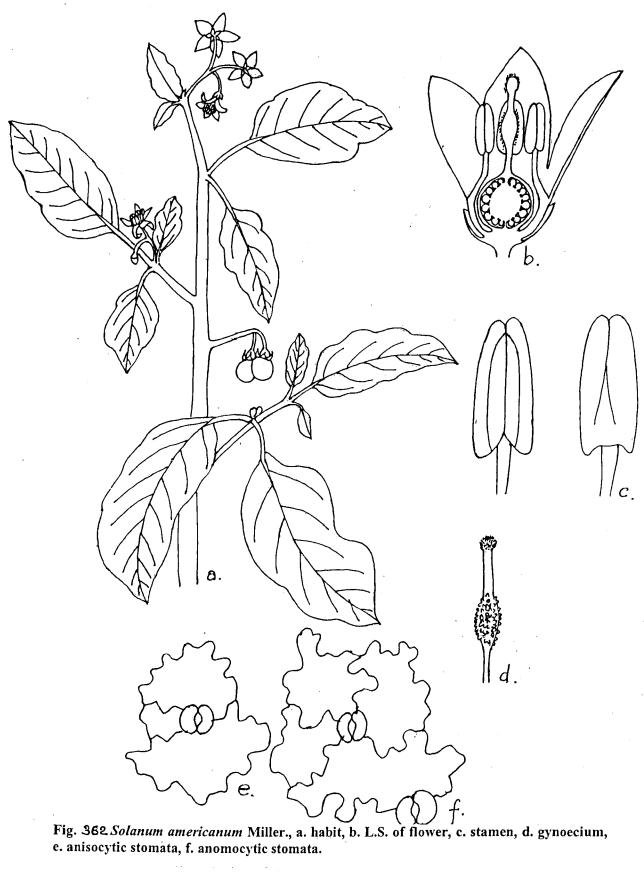
Vernacular name: Bhoringi.

Flowers: Throughout the year but less during the monsoon.

Micromorphology (Fig. 363)

The plant showed presence of stellate hairs with 4-5 thick walled arms.

Stomata were anisocytic and diacytic. D/209.



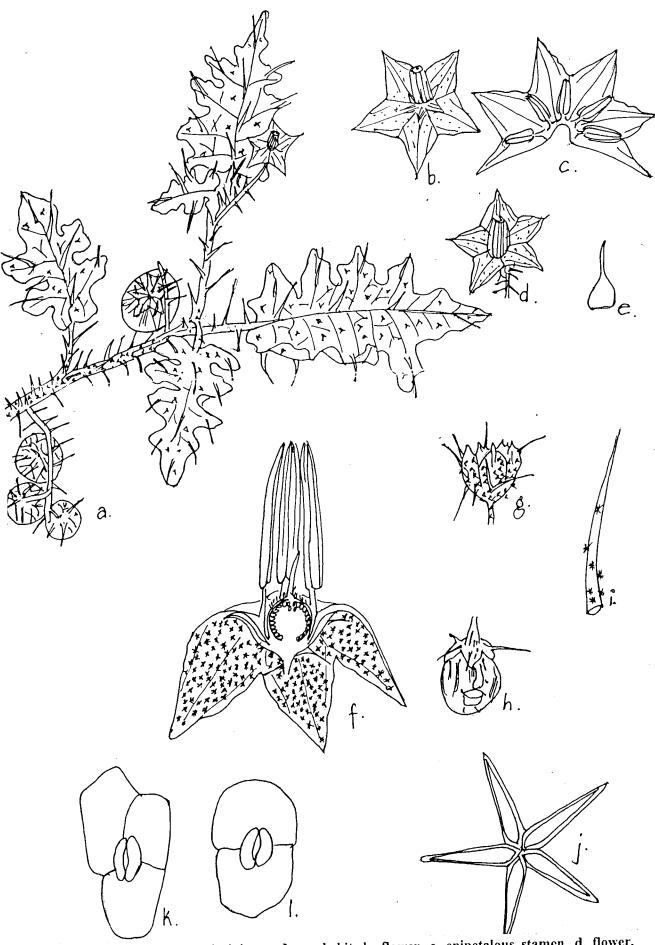


Fig. 363 Solanum virginianum L., a. habit, b. flower, c. epipetalous stamen, d. flower, e. gynoecium, f. L.S. of flower, g. calyx, h. fruit, i. spine, j. stellate hair with 5-arms, k. anisocytic stomata, l. diacytic stomata.

#### 6. Withania somnifera Dunal. in DC. Prodr. V. 13, part 1 (1852) p. 453.

A branched erect undershrub upto 2 m high clothed with mealy stellate hoary tomentum. Leaves ovate, 4 cm long. Flowers small, greenish, about 5 together in sessile umbellate cyme. Calyx teeth long, linear. Corolla lobes lanceolate. Anthers broadly elliptic. Ovary2-celled. Berry red, slightly 5-angled, pointed with the connivent calyx-teeth and scurfy-pubescent outside. Seeds yellow. (Fig. 364)

Vernacular name: Ashwagandha. Flowers: Throughout the year. **Micromorphology** (Fig. 364)

The plant showed presence of dendritic trichomes.

Stomata were of anomocytic type.

D/1072.

### Scrophulariaceae

#### 1. Bacopa monnieri (L.) Wettst. Nat. Pflanzenfam. 4(3b): 77. 1891.

A glabrous succulent branched creeping herb reaching a length of 30 cm. Leaves spathulateec, sessile, upto 2.5 cm long. Flowers axillary, solitary; bracteoles linear. Calyx lobes unequal. Corolla pale-blue; lobes nearly equal, rounded. Stamens didynamous, included; anthers bluish-purple. Ovary 2-celled; ovules many in each cell; style dilated at the top; stigma 2-lobed. Capsules ovoid, acute, pointed with the stylebase. Seeds oblong, striate, pale. (Fig. 365)

Vernacular name: Jal nevri.

Flowers: January-May.

Micromorphology (Fig. 365)

The leaf possessed 6-7 celled glandular trichomes which were sessile and cells were radiating from the head.

Stomata were of anomocytic, anisocytic and diacytic type.

D/302.

## 2. Elatinoides ramosissima (Wall.) Wettat. Pfam. 4(3b);58, 1891. (Kickxia ramosissima (Wall.) Janchan)

A slender, much branched herb hanging down from the walls. Leaves ovate to triangular, hastate. Flowers yellow, solitary, axillary, spurred. Calyx 5-lobed, lobes subequal. Petals 5, 2-lipped, lower lip with a spur. Stamens 4, didynamous, anthers divaricate. Ovary subglobose, stigma minute. Capsules globose, pale brown; seeds echinulate. (Fig. 366) Occurs in the cracks and crevices of the walls of old dilapidated buildings of Machhi area of Pavagadh, along with its frequent associate, *Lindenbergia indica* Kuntze; not common. Vernacular name: Bhini ghilodi.

Flowers: November-February.

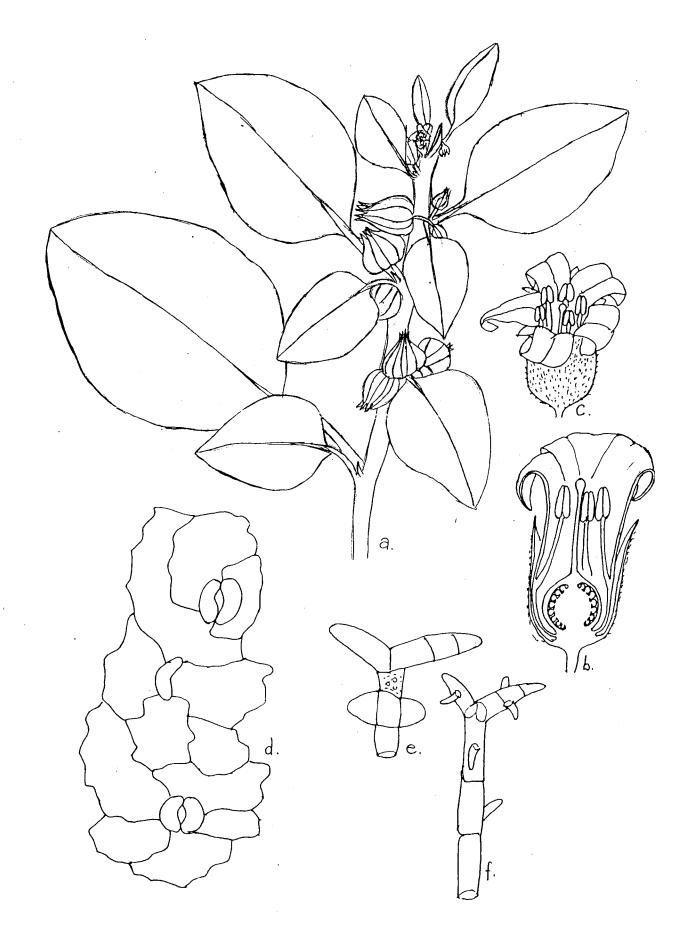


Fig. 364 Withania somnifera Dun., a. habit, b. L.S. of flower, c. flower, d. anomocytic stomatam, e-f. dendritic trichome.

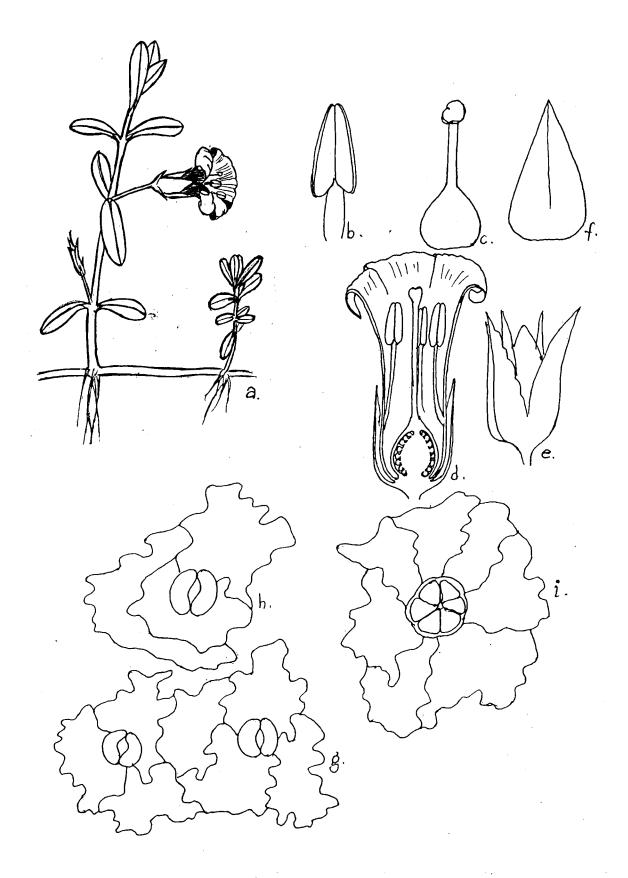


Fig. 365 Bacopa monnieri Wettst., a. Habit, b. stamen, c. gynoecium, d. L.S.of flower, e. calyx f. capsule, g. anisocytic and anomocytic stomata, h. diacytic stomata, i. glandular multicellular sessile trichome.

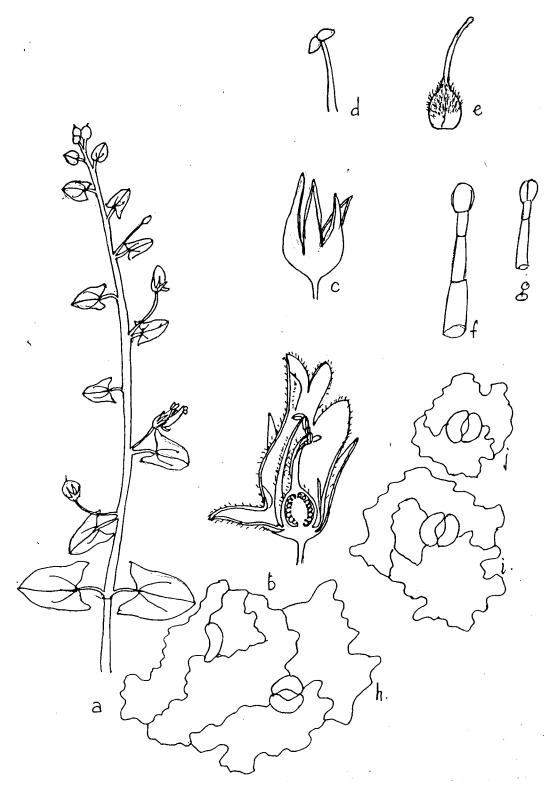


Fig. 366 Elatinoides ramosissima (Wall.) Wettat. a. habit, b. L.S. of flower, c. calyx, d. stamen, e. gynoecium, f. gland with single celled head and multicellular uniseriate stalk on corolla, g. gland with two celled trichome with two celled uniseriate stalk, h. anomocytic stomata, i. anisocytic stomata, j. diacytic stomata.

#### Micromorphology (Fig. 366)

The trichomes were present on stamens, ovary, and petals. Trichomes were multicellular, glandular, differentiated into a unicellular head and a multicellular, uniseriate stalk of 3-4 cells; whereas another trichome showed presence of two celled head.

Stomata were of anomocytic type in majority along with anisocytic and diacytic. D/180.

#### 3. Limnophila indica (L.) Druce Bot. Exch. Club Soc. Brit. Isles 3: 420. 1914.

A submerged aquatic herb with stem reaching a length of 60 cm or more. Leaves dimorphic, upper leaves oblong-lanceolate, sessile, upto 6 cm long, 3-nately whorled, serrate-dentate, glabrous, strongly 3-5 nerved; lower leaves submerged, finely segmented, often deflexed and root-like. Flowers in long erect leafy racemes upto 24 cm long; bracteoles linear-subulate. Calyx membranous; segments deltoid-ovate. Corolla paleviolet, 2-lipped; lobes of the upper lip short, rounded, those of the lower lip ovate, acute. Stamens 4, didynamous; anther-cells separate and stalked. Ovary 2-celled; ovules numerous in each cell; style deflexed; stigma 2-lamellate. Capsules subglobose. Seeds small, truncate at both ends. (Fig. 367)

Vernacular name: Tarati Flowers: November-January. **Micromorphology** (Fig. 367)

Three non-glandular trichomes were observed; two were unicellular and third was uniseriate. Unicellular trichomes were 1) elongated filamentous and 2) triangular with a broad base.

Stomata were paracytic and anomocytic.

D/714-715, 1031.

#### 4. Lindenbergia urticaefolia Link & Otto, Icon. Pl. Rar. Hort. Berol. 1828 t. 48.

An annual glandular-villous herb, reaching a height of 50 cm. Leaves ovate, upto 5 cm long, serrate, glandular-villous on both sides. Flowers solitary or 2-nate in the axils of large leaves, sometimes running out into axillary or terminal leafy racemes. Calyx lobes triangular-oblong. Corolla yellow 2-lipped; upper lip shortly 2-lobed; lower lip with 3 rounded veined lobes. Stamens didynamous; anthers with separate stalked cells. Capsules oblong, hairy in the upper part. Seeds minute, ellipsoid-oblong. (Fig. 368)

Vernacular name: Pirasdedi.

Flowers: September-November.

#### Micromorphology (Fig. 368)

Two types of trichomes were seen one was glandular with two-celled head and uniseriate stalk, second was multicellular uniseriate trichome.

Stomata were anomocytic.

D/1242.

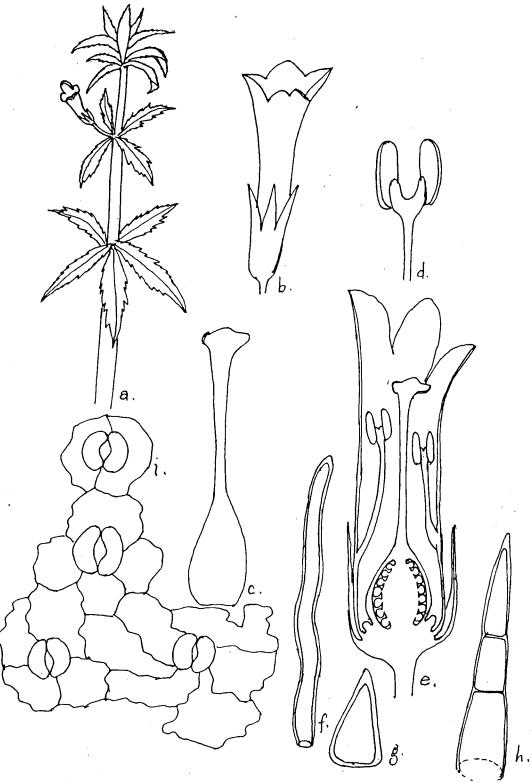


Fig. 367 Limnophila indica Druce., a. habit, b. flower, c. gynoecium, d. stamen, e. L.S. of flower, f. unicellular acicular trichome, g. unicellular conical trichome, h. multicellular uniseriate trichome, i. paracytic and anomocytic stomata.

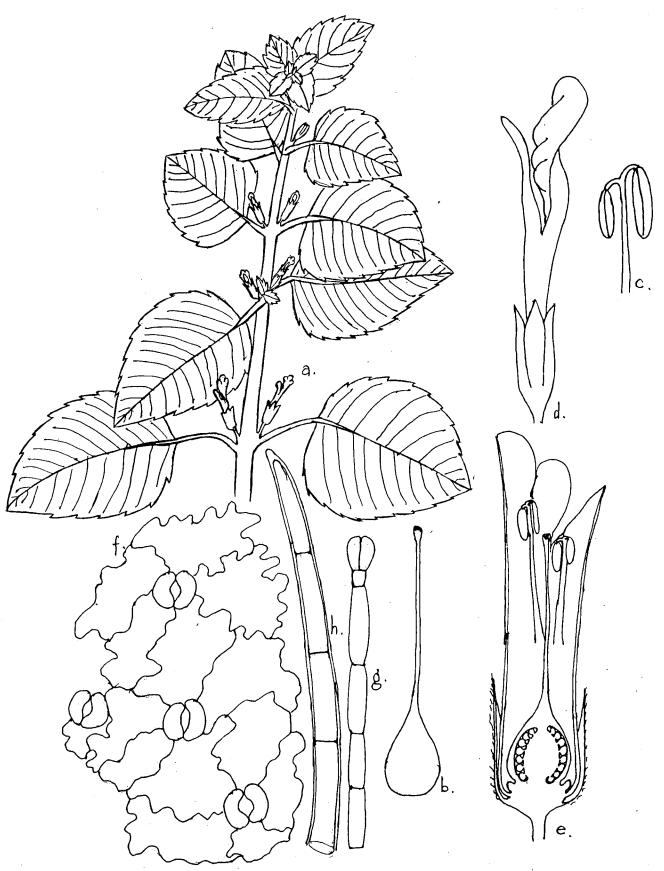


Fig. 368 Lindenbergia urticaefolia Link., a. habit, b. gynoccium, c. stamen, d. flower, e. L.S. of flower, f. anomocytic stomata, g. gland with two celled head and uniscriate stalk, h. uniscriate trichome.

## 5. Lindernia ciliata (Colsm.) Pennel, Brittonia, 2:182 (Bonnaya brachiata)

A glabrous diffusely branched erect annual reaching upto 25 cm high. Leaves oblong, upto 3 cm long, spinous-serrate. Flowers in lax terminal racemes; bracts linear-subulate. Calyx 5-partite; segments linear-subulate, finely aristate. Corolla 2-lipped, pink; upper lip erect, broad, concave or 2-fid; lower lip larger, 3-lobed, spreading. Stamens: the 2 upper perfect; the 2 lower reduced to glabrous staminodes; anther cells divaricate. Ovary 2-celled; ovules many in each cell. Capsules oblong. Seeds small, truncate at both ends. (Fig. 369)

Variation observed: in my specimen the staminodes were glabrous but in the standard description they were said to be pubescent.

Vernacular name: Gadag vel. Flowers: September-November.

Micromorphology (Fig. 369)

The vegetative part contain one two celled non-glandular and another glandular trichome having a two celled globular head and a 1 celled stalk. Within the corolla therewere glandular trichomes with 1-4 celled head and a single cell stalk.

Stomata were of diacytic and anomocytic type.

D/561-562, 1109-1110, 1248.

## 6. Lindernia crustacea (L.) F. Muell. in Syst. Census. Austral. Pl. 97, 1882 (Vandelia crustacea)

A much-branched, sparsely hairy annual upto 50 cm high, with angular stems. Leaves opposite, ovate, serrate. Flowers axillary and subracemose at the ends of the branches. Calyx-segments 5, teeth triangular, acute. Corolla 2-lipped, purplish; upper lip outermost, concave, notched or 2-fid; lower lip spreading, 3-lobed. Stamens 4, didynamous, filaments with subulate appendages at or towards the base; anthers cohering in pairs under the upper lip, the cells divaricate. Ovary 2-celled; ovules many in each cell. Capsules ellipsoid-oblong, obtuse. Seeds ellipsoid. (Fig. 370)

Flowers: July-December.

#### Micromorphology (Fig. 370)

The leaves contain both glandular and non-glandular trichomes. The glandular one is 4-celled, disc shaped and sessile. The non-glandular trichome is two celled, long pointed with a warty cells.

Stomata were of anisocytic type.

D/552-553, 1070.

## 7. Russelia equisetiformis Schl. & Cham. in Linnaea 6: 377. 1831 (Russelia juncea Zucc.)

A handsome bush, upto 120 cm high, with long rush-like ribbed leafless green stems (Phylloclades). The small branches are thin, and on them numerous flowers are produced. Leaves small, seen towards the tip of the stems. Flowers are about 3-cm long, tubular with five-petals. Calyx cupular, sepals 5, acuminate. Corolla mouth subequal; 5-lobed.

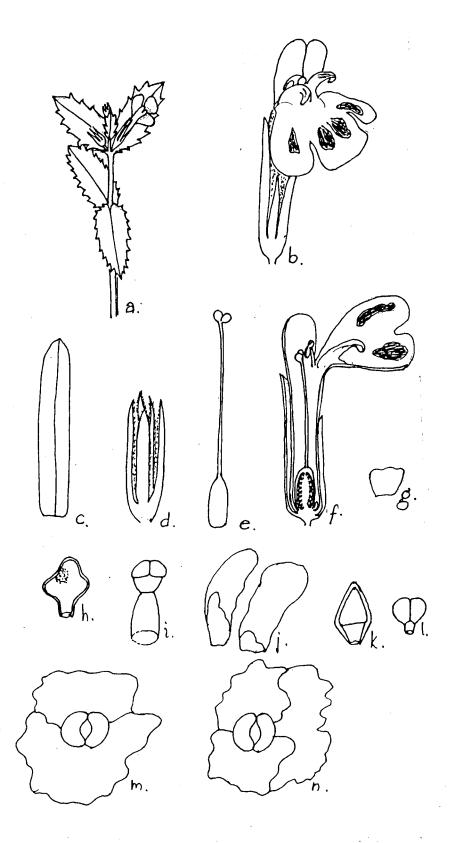


Fig. 369 Lindernia ciliata Pennel., a. habit, b. flower, c. sepal, d. calyx, e. gynoecium, f. L.S. of flower, g. Disc, h. unicellular gland, i. gland with three-celled head and a single celled stalk, j. unicellular club shaped gland, k. two celled uniseriate gland, l. gland with two celled head and a single celled stalk, m. diacytic stomata, n. anisocytic stomata.

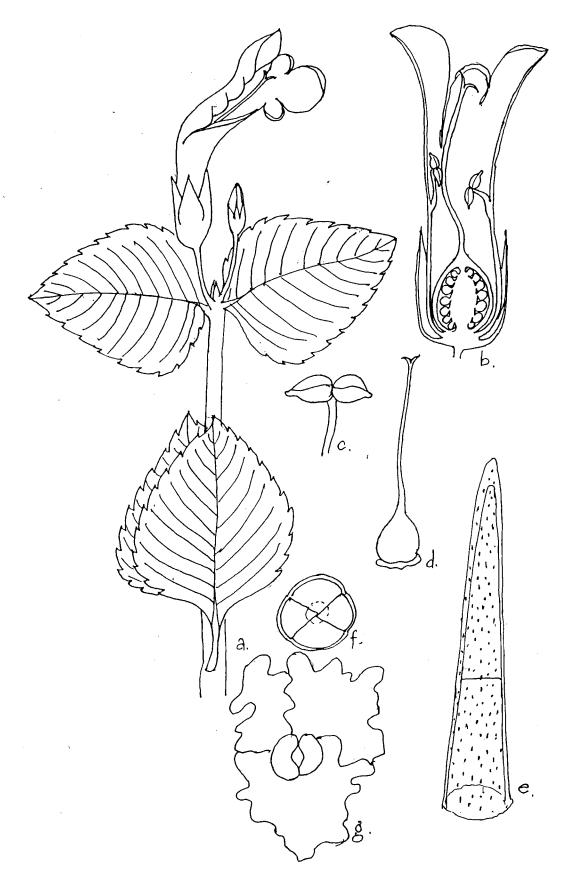


Fig. 870. Lindernia crustacea f. Muell., a. habit, b. L.S. of flower, c. stamen, d. gynoecium, e. two-celled uniseriate trichome, f. four-celled sessile gland, g. anisocytic stomata.

Stamens 4; didynamous, anthers divaricate. Ovary ovoid, 2-celled; ovules numerous; style long; stigma minute. (Fig. 371)

Flowers: throughout the year.

### Micromorphology (Fig. 372)

Leaf showed presence of multicellular, glandular trichome differentiated into a multicellular, 8-12 celled head and a single celled stalk. Along with it a multicellular cup shaped scale was also present.

Corolla showed presence of two types of trichomes: 1) the same as that of the leaf, a multicellular, 8-12 celled head and a single celled stalk. 2) multicellular, glandular trichome differentiated into a multicellular, 8-12 celled head and multicellular, uniseriate stalk.

Stomata were of anisocytic type.

D/236.

#### 8. Russelia rotundifolia Cav. Icon. V. 5. P. 9, t. 415. 1799

This is a leafy bush of about 1 m in height. Stem and branches 6- many angled. The leaves are suborbicular- cordate and sessile. Flowers red, borne in groups of 2-5 from the axils of leaves or in terminal racemes. Corolla tube long upto 2 cm and petal lobes very small, triangular. Stamens 4; didynamous, anthers divaricate. Ovary ovoid, 2-celled; ovules numerous; style long; stigma minute. (Fig. 373)

Flowers: throughout the year.

#### Micromorphology (Fig. 374)

The plant showed the presence of a number of multicellular glands along with non-glandular trichomes. The glands were with many celled head and single celled stalk. A cup-shaped multicellular gland was also observed. The non-glandular trichomes were unicellular as well as multicellular uniseriate with pitted wall.

Stomata were anisocytic.

D/228.

#### 9. Scoparia dulcis Linn. Sp. Pl. (1753) p. 116

An erect branched herb with 4-6 angled stems reaching a height of 1 m. Leaves rhomboid or elliptic, 3.5 cm long, narrowed into a petiole at base, serrate. Flowers 3-6 in axillary whorls. Calyx-segments 4, oblong. Corolla white. Stamens 4, subequal; anthers subsagitatte, cells divergent. Style clavate; stigma truncate or notched. Capsules subglobose. Seeds ovoid. (Fig. 375)

Vernacular name: Bhitchati ni jat.

Flowers: Throughout the year.

#### Micromorphology (Fig. 375)

There were both glandular and non-glandular trichomes. The glands were multicellular disc shaped, as well as with a single celled head and multicellular uniseriate stalk. The non-glandular was unicellular with striated wall.

Stomata were diacytic.

D/119, 791.

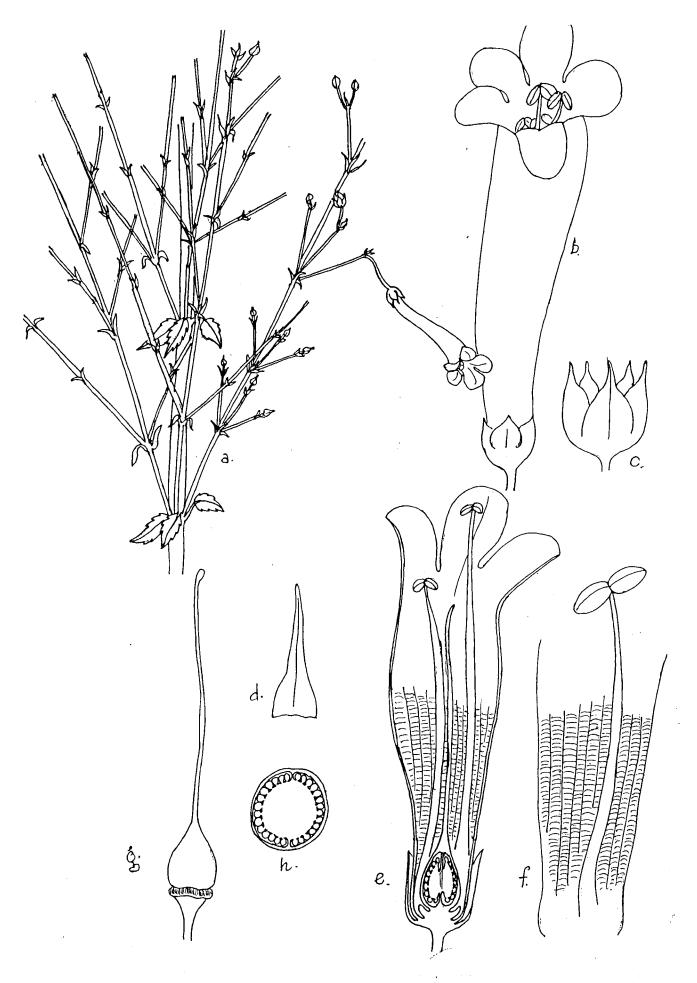


Fig. 37) Russelia equisetiformis Schl. & Cham., a. habit, b. flower, c. calyx, d. bract, e. L.S. of flower, f. epipetalous stamen, g. gynoecium, h. T.S. of ovary.

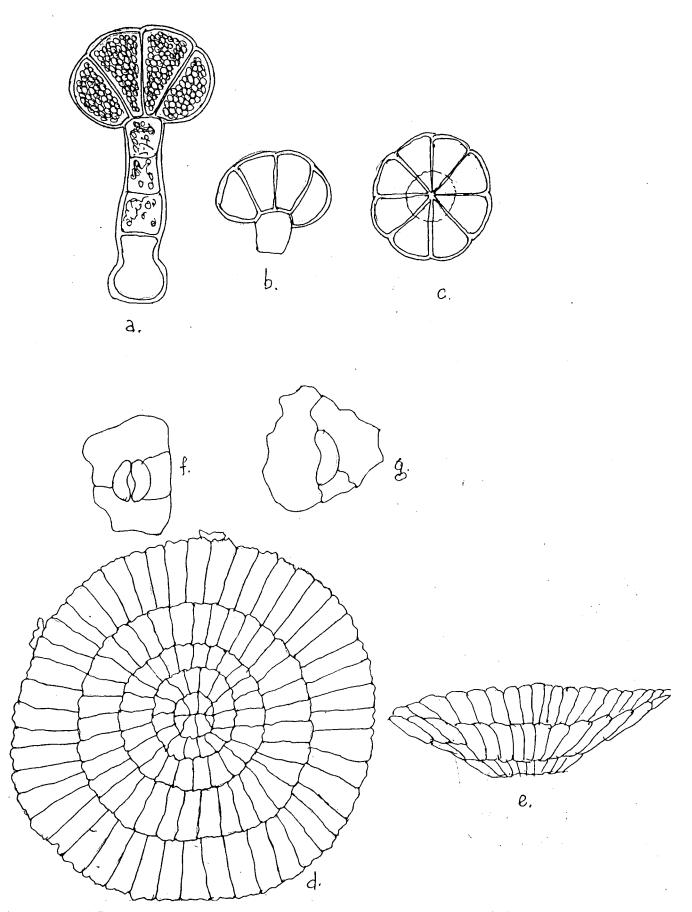


Fig. 372 Russelia equisetiformis Schl. & Cham., a. gland with many celled head and multicellular uniseriate stalk, b. gland with many celled head and single celled stalk, c. glandular multicellular sessile trichome, d-e. peltate scale, f. anisocytic stomata, g. anisocytic stomata with single guard cell.

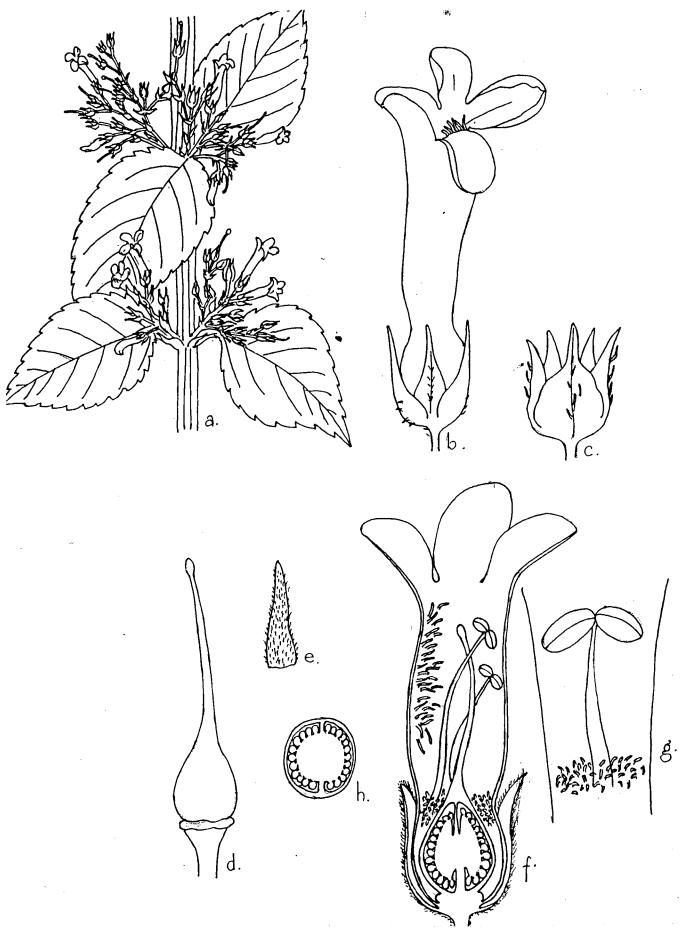


Fig. 373. Russelia rotundifolia Cav., a. habit, b. flower, c. calyx, d. gynoecium, e. bract, f. L.S. of flower, g. epipetalous stamen.

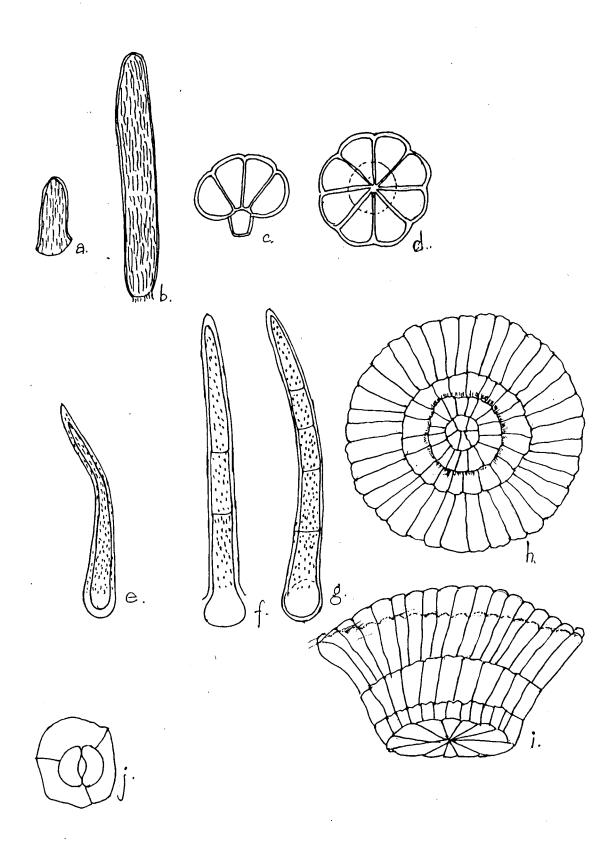


Fig. 374. Russelia rotundifolia Cav.. a-b. glandular unicellular trichome with thick wall and striations on the wall, c & d. glandular multicellular trichome with many celled head and single celled stalk, e. unicellular trichome, f-g. uniseriate trichome, h-i. peltate scale, j. anisocytic stomata.

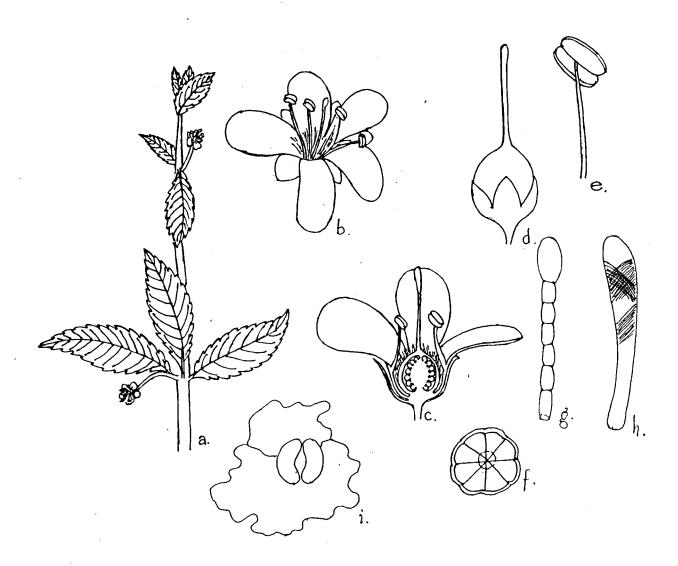


Fig. 375. Scoparia dulcis L., a. habit, b. flower, c. L.S. of flower, d. capsule, e. stamen, f. glandular multicellular sessile trichome, g. gland with a single celled head and multicellular uniseriate stalk, h. glandular unicellular thick walled trichome, i. diacytic stomata.

#### 10. Stemodia viscosa Roxb. Cor. Pl. V. 2 (1798) p. 33, t. 163.

An erect, aromatic, viscidly pubescent herb with quadrangular stem reaching upto 60 cm high. Leaves upto 4 cm, sessile, oblong, and amplexicaul. Flowers axillary, solitary or in terminal racemes; bracteoles 2, linear-subulate. Calyx 5-partite; sepals lanceolate. Corolla violet; upper lip broad 2-lobed; lower lip with 3 rounded or emarginated. Anther cells suborbicular, with one cell aborted. Capsules ovoid-oblong, 4-valved. Seeds oblong-ellipsoid. (Fig. 376)

Variation observed: here in this material, one of the anther cells was aborted, whereas, in standard descriptions, both the cells of the stamens were said to be fertile.

Vernacular name: Nukchani. Flowers: November-December. **Micromorphology** (Fig. 376)

Both glandular and non-glandular trichomes were seen in the plant, glandular trichomes were multicellular with 2-3 celled stalk and 1-2 celled heads. The non-glandular trichomes were multicellular, uniseriate with long rectangular cells. In some the terminal cell was swollen at the tip.

Stomata were of anomocytic and anisocytic type.

D/814-816.

#### 11. Stemodia serrata Benth. in DC. Prodr. V. 10 (1846) p. 381.

A robust leafy erect viscidly-pubescent annual with 4-angled stem. Leaves obovateoblong, upto 3 cm, serrulate above the middle, amplexicaul. Flowers subsessile, axillary, solitary; bracteoles 2 beneath the calyx, linear-subulate. Calyx 5-partite, segments linearlanceolate. Corolla 2-lipped; upper lip bifid; lower lip with 3 subequal, oblong-obtuse lobes. Stamens 4, didynamous; anther-cells stalked. Ovary 2-celled; ovules numerous in each cell; stigma 2-lobed. Capsules linear-oblong. Seeds minute, oblong-ellipsoid. (Fig. 377)

Flowers: December-February. **Micromorphology** (Fig. 377)

The plant contained glands with single to many celled head and multicellular uniscriate stalk.

Stomata were anisocytic and anomocytic.

D/117.

#### 12. Striga euphrasioides Benth. in Comp. Bot. Mag. V. 1 (1835) p. 364.

A partial parasite growing on the roots of grasses. It has a very variable habit, ranging from 15 cm high, with filiform simple stem to a much-branched stout herb reaching 60 cm high. Leaves linear, upto 5 cm long, 1 or 2 toothed on margins, sessile, scabrous. Flowers sessile or shortly pedicellate, in long, often interrupted, lax erect spikes. Calyx 1 cm long, tube campanulate, ribbed, calyx-teeth nearly equaling the tube, linear-subulate.. Corolla white; tube exserted,upper lip much shorter than the lower. Capsules oblong-ellipsoid, the top of the valves reflexed after dehiscence. Seeds cuneate-oblong, usually truncate at one end. (Fig. 378)

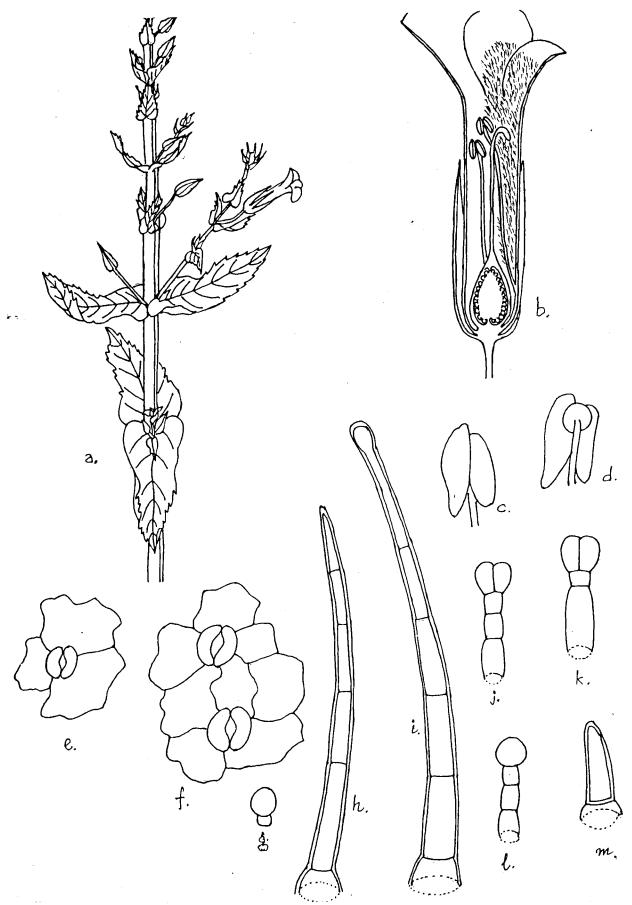


Fig. 376 Stemodia viscosa Roxb., a. habit, b. L.S. of flower, c-d. stamen, e. anisocytic stomata, f. anomocytic stomata, g. glandular trichome with a single celled head and a single celled stalk, h-i. uniseriate trichome, j-l. gland with single to many celled head and uniseriate two-three celled stalk. m. two celled uniseriate trichome.

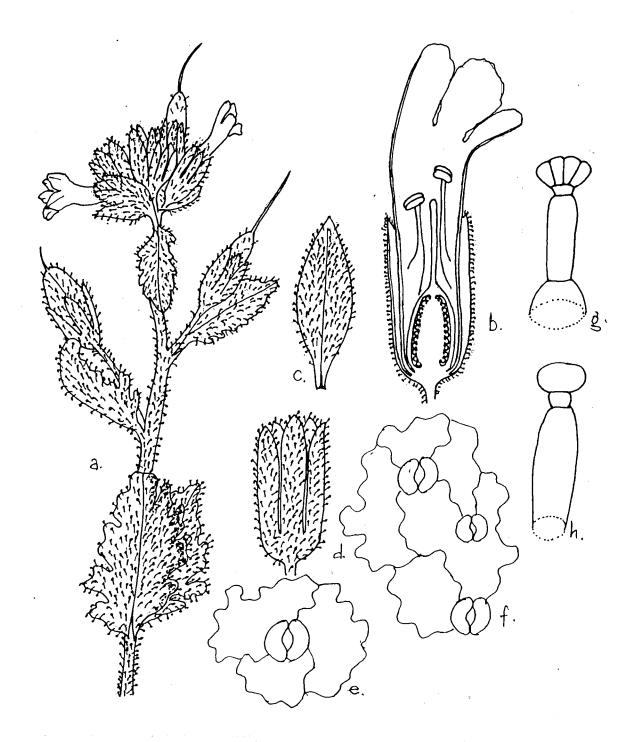


Fig. 377 Stemodia serrata Bth., a. habit, b. L.S. of flower, c. bract, d. calyx, e. anisocytic stomata, f. anomocytic stomata, g-h. gland with single to many celled head and multicellular uniseriate stalk.

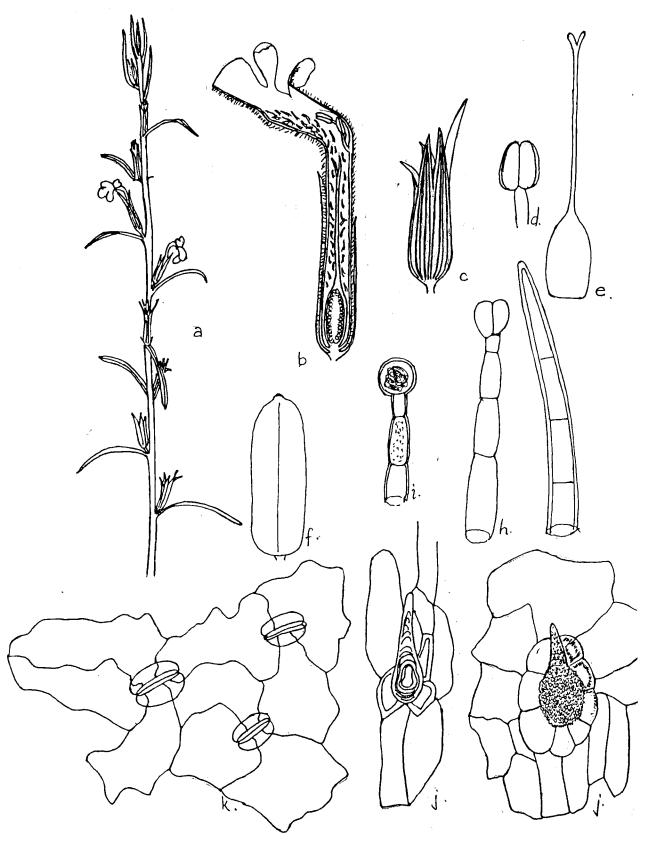


Fig. 378. Striga euphrasioides Bth., a. habit, b. L.S. of flower, c. calyx, d. stamen, e. gynoecium, f. capsule, g. gland with single celled head and multicellular uniseriate three celled stalk, h. multicellular gland differentiated into two celled head and multicellular uniseriate many celled stalk, i multicellular uniseriate trichome, j. unicellular trichome, k. Anomocyfic stomata

Vernacular name: Dholo agio. Flowers: August-December. **Micromorphology** (Fig. 378)

The leaf showed presence of unicellular, non-glandular trichome which was pointed upward and appressed and had a swollen base with a warty wall.

The corolla showed presence of three types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular trichome with thick and warty walls. 2) multicellular, glandular trichome differentiated into a two celled head and a multicellular, uniseriate stalk. 3) multicellular, glandular trichome differentiated into a single celled head filled with lot of substances and a multicellular, uniseriate stalk.

Stomata were of anomocytic type and sunken.

D/637, 761.

## 13. Verbascum chinense (L.) Santapau, Fl. Purandhar 90. 1958. (Celsia coromandeliana Vahl.)

A branched hairy annual herb reaching a height of 1 m. Radical leaves lyrate upto 10 cm; cauline leaves are smaller gradually becoming smaller and sessile at the top, passing into bracts. Flowers yellow in simple or branched terminal racemes upto 60 cm long. Calyx glandular-pubescent; lobes linear-oblong. Corolla rotate; lobes 5, rounded. Filaments densely bearded with purple hairs. Ovary globose. Capsules subglobose. Seeds oblong, truncate, warted. (Fig. 379)

Vernacular name: Kalhar. Flowers: Throughout the year. **Micromorphology** (Fig. 379)

There were two types of trichomes; one glandular and another non-glandular. The glandular trichome had a two celled spherical head and a stalk of two cells of which lower cell was elongated rectangular and the upper cell was short and square. The non-glandular trichome was upto 4-cells in length, uniseriate and joints were broad.

Stomata were of diacytic and anomocytic type.

D/1195.

### Lentibulariaceae

#### 1. Utricularia stellaris Linn. f. Suppl. (1781) p. 86.

An aquatic herb, the peduncles suspended in water by means of a whorl of oblong, vesicles about their middle; stolons submerged, slender, branched. Leaves all submerged, often in whorls of 4, pinnately cut into numerous capillary slender pectinate segments, each pinna usually provided near the base with a small globular-ovoid bladder with a truncate mouth. Flowers in slender erect few flowered racemes with floats in whorls of 4-8 attached below the lowest flower. Pedicels thickened, usually deflexed in fruit. Calyx 2-partite, sepals subequal, enlarged in fruit. Corolla yellow, 2-lipped, tube with a spur. Stamens 2. Ovary 1-celled, ovules many on free-central placentation. Capsules globose. (Fig. 380)

Vernacular name: Arkzver.

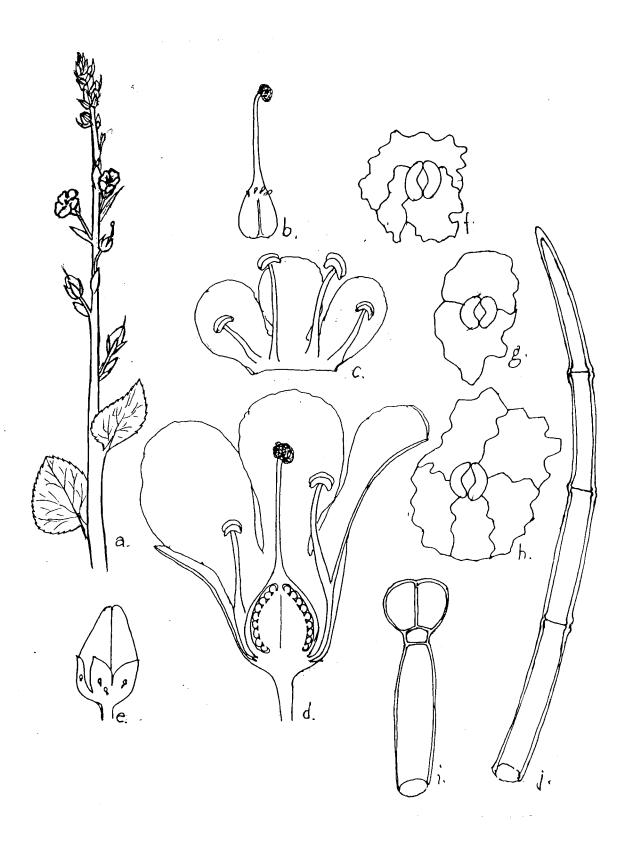


Fig. 379. Verbascum chinense (L.) Santapau, a. habit, b. gynoecium, c. epipetalous stamen, d. L.S. of flower, e. capsule, f. anisocytic stomata, g. diacytic stomata, h. anomocytic stomata, i. gland with two celled head and two celled uniseriate stalk, j. uniseriate trichome.

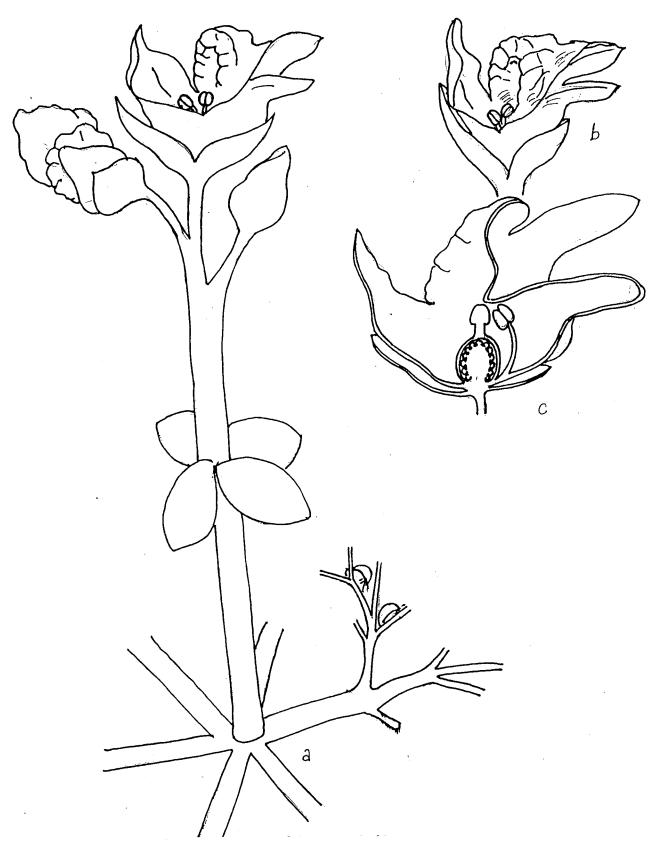


Fig. 380. Utricularia stellaris L., a. habit, b. flower, c. L.S. of flower.

Flowers: August-December.

D/277.

### Gesneriaceae

#### 1. Didymocarpous pygmaea Clarke. in A. DC., Monogr. Phan. 5: 82. 1883.

A very small herbs with a slender, curved stem bearing one leaf at the apex. Leaf ovate-elliptic, upto 3 cm long. Flowers 3-5 fascicled in axils. Sepals lobes 5, linear, enlarged in fruit. Corolla, tubular, mouth oblique; lobes 5, rounded. Stamens 2 cofluent at apex. Staminodes 2. Ovary unilocular with twoparietal placentae. Style long; stigma small, subcapitate, scarcely 2-lobed. Capsule nearly straight, linear; 2-valved. Seeds ellipsoid, small, smooth, minutely reticulate. (Fig. 381)

Flowers: July-November.

#### Micromorphology (Fig. 381)

The plant showed presence of two celled, uniseriate, unbranched and glandular trichome with a broad lower cell containing a lot of ergastic substance in it and an apical long pointed cell.

Stomata were of anomocytic and paracytic type. D/729, 730, 1205.

### Bignoniaceae

#### 1. Crescentia cujete Linn. Sp. Pl. (1753) p. 626.

A small tree of 4 m with arching branches and simple oblanceolate leaves fascicled at nodes. Flowers cauliflorous, foetid, borne singly or in pairs on the trunk and older branches in the evening time. Calyx large, bilabiate. Corolla usually with transverse folds in throat; lobes acuminate. Stamens 4, exserted. Ovary 1-locular; ovules multiseriate on 4 parietal placentae. Fruit a large globose berry with a hard woody shell. Seeds small, flat, embedded in pulp. (Fig. 382)

Vernacular name: Bilayati bel.

Flowers: March-July.

#### Micromorphology (Fig. 382)

The plant showed presence of unicellular trichome.

Stomata were anomocytic.

D/305.

#### 2. Heterophragma roxburghii DC. Prodr. V. 9 (1845) p. 210.

A tall tree with dark-brown bark exfoliating in scales. Leaves large, imparipinnate, upto 60 cm long with 3-5 pairs and an odd elliptic-oblong tomentose unequal-sided leaflets. Flowers fragrant, pale-rose colored in large, terminal, many-flowered tomentose panicles. Calyx lobes 5, densely tomentose outside, clothed inside with long silky hairs, 2-lipped. Corolla reaching 5 cm long, lobes 5, often with a pink and crisped margins. Stamens 4,

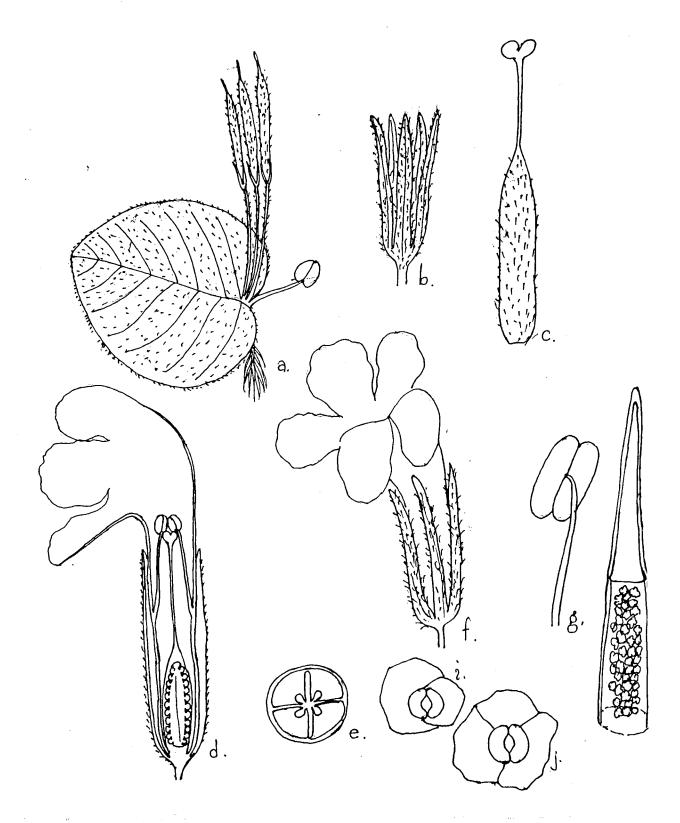


Fig. 381 Didymocarpus pgymaea Cl. a. habit, b. calyx, c. gynoecium, d. L.S. of flower, e. T.S. of ovary, f. flower, g. stamen, h. two-celled uniseriate trichome with inclusions in lower cell, i. paracytic stomata, j. anisocytic stomata

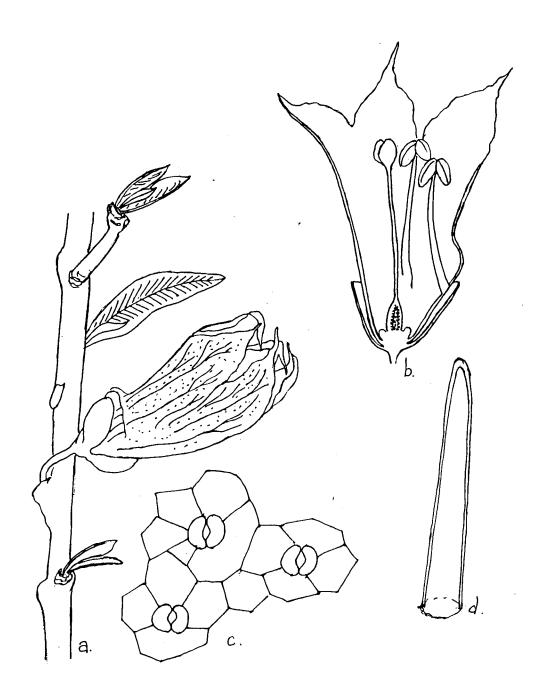


Fig. 382 Crescentia cujete L., a. habit, b. L.S. of flower, c. anomocytic stomata, d. unicellular trichome.

didynamous. Ovary 2-celled with numerous ovules. Capsules 30 cm long 4-celled. Seeds

winged. (Fig. 383)

Vernacular name: Waras. Flowers: February-Apr. Micromorphology (Fig. 383)

The plant contained unicellular acicular trichomes with a bulbous base.

Stomata were anomocytic, and anisocytic.

D/322.

### 3. Kigelia pinnata Jacq. Rev. Bign. (Bibi. Univ. Geneve). 24. 1838.

A tree up to 10 m tall. Leaves 9-20 cm long, rachis ribbed, tomentose or sparsely so; leaflets 5-9, ovate-oblong to elliptic-ovate upto 11 cm, coriaceous, scabrid, entire, acute or retuse, mucronate, base often oblique, midrib and veins prominent on undersurface, strigose. Panicles lax, pendulous. Flowers 6-7 cm broad. Calyx campanulate, glabrous. Corolla throat wide. (Fig. 384)

Vernacular name: Topgolo.

Flowers: May-August.

Micromorphology (Fig. 384)

Only multicellular sessile glands were present.

Stomata were diacytic and anisocytic.

D/230.

#### 4. Millingtonia hortensis L. f. Suppl. Pl. 291. 1782

An evergreen tree with corky bark reaching upto a height of 10 m. Leaves upto 50 cm long; imperfectly 2-3 pinnate, leaflets ovate-elliptic, upto 7 cm, acuminate sinuate-dentate. Flowers in terminal, many-flowered panicles opening in night. Flower buds doooping. Calyx 5-lobed. Corolla nicely fragrant, hypocrateriform, white, tube long, 5-lobed, 2-lipped. Stamens 4, didynamous, exserted; anthers with one fertile cell, other rudimentary. Disk cupular, crenate. Ovary linear-oblong; stigma 2-lobed. Fruit a capsule, 2-celled, seeds winged. (Fig. 385)

Vernacular name: Deshi Buch.

Flowers: December-May.

Micromorphology (Fig. 385)

Whole plant was glabrous.

Stomata were of anomocytic type.

D/289.

#### 5. Spathodea campanulata P. Beauv. Oware 1: 47. t. 27-28. 1805.

An ornamental tree of 25 m high with a crown of odd-pinnate leaves of a length of about 45 cm long. Leaflets 9-13, elliptic-oblong. Flowers in erect racemes, borne on stout peduncles. Calyx golden-brown, spathaceous. Corolla bright red or reddish orange, campanulate; lobes 5, deltoid. Stamens 4, subequal, unequally inserted near the base of swollen portion of tube; anthers large, 2-celled. Ovary 2-locular. Capsules fingerlike containing about 500 tissue papery seeds. (Fig. 386)

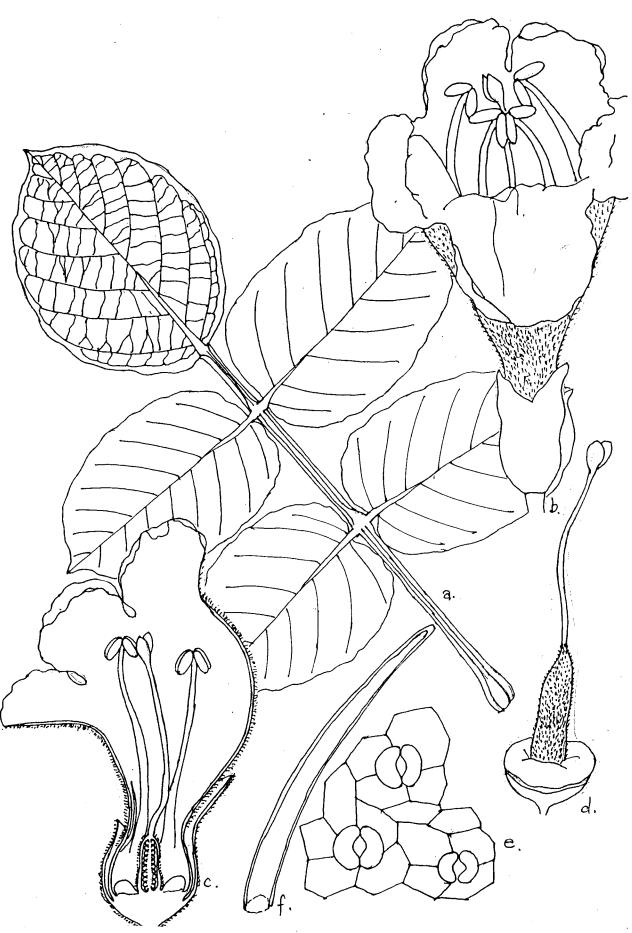


Fig. 383 *Heterophragma roxburghii* DC., a. habit, b. flower, c. L.S. of flower, d. gynoecium, e. anomocytic stomata, f. unicellular trichome.

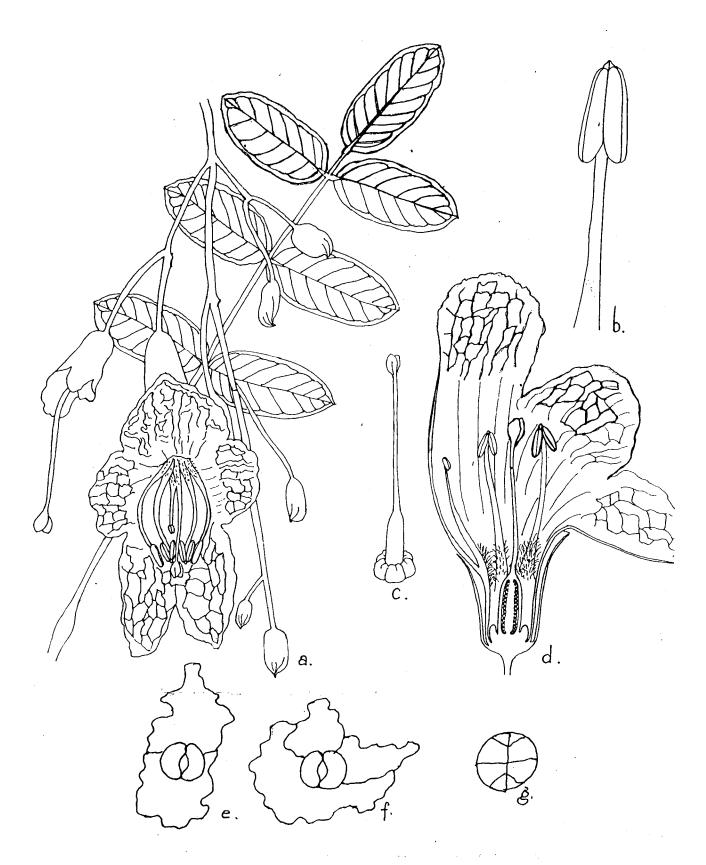


Fig 384 Kigelia pinnata Jacq. a. habit, b. Stamen, c. gynoecium, d. L.S. of flower, e. diacytic stomata, f. anisocytic sotmata, g. multicellular sessile gland.



Fig. 385 Millingtonia hortensis L. f., a. habit, b. L.S. of flower, c. anther cell, d. gynoecium, e. anomocytic stomata.

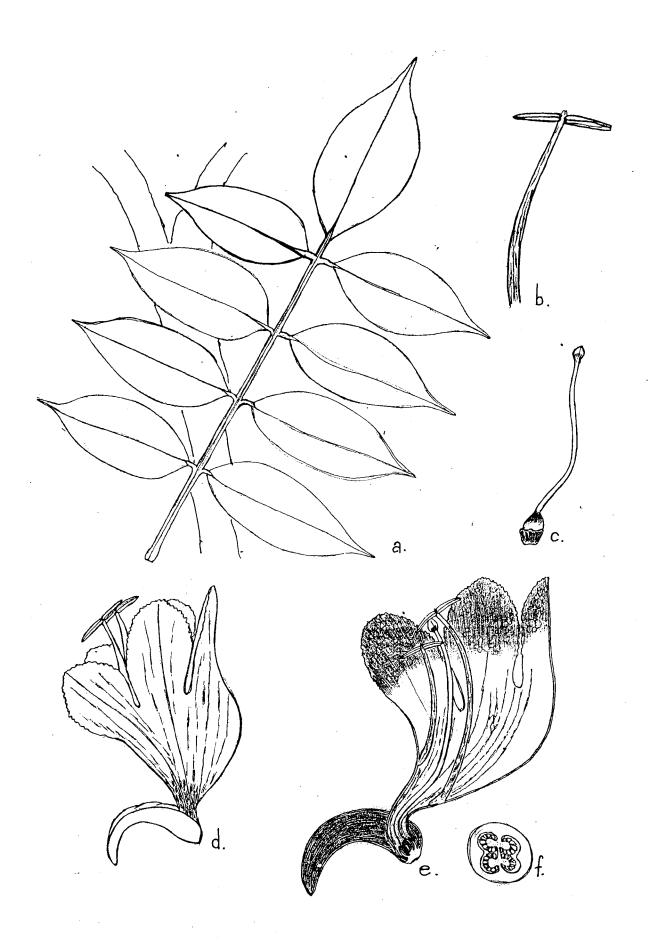


Fig. 386. Spathodea campanulata Beauv., a. habit, b. stamen, c. gynoccium, d. flower, e. L.S. of flower, f. T.S. of ovary.

Vernacular name: Rugtoora.

Flowers: July-Dec.

Micromorphology (Fig. 387)

The plant showed presence of multicellular, uniseriate, unbranched trichome with broad lumen and a thick wall.

Stomata were of anomocytic, diacytic, and anisocytic type.

D/265.

#### 6. Tabebuia rosea (Bertol) DC., Prodr. 9:215. 1845.

A tall tree of about 10 m with palmately penta- foliolate leaves. Leaflets elliptic oblong, varying in length. Terminal leaflets upto 15 cm long. Flowers yellow or rosy-pink borne in terminal panicles. Calyx bilabiate. Corolla infundibuliform having yellow throat, upto 8 cm long. Fruit a linear dehiscent capsule containing many winged seeds. (Fig. 388)

#### Micromorphology (Fig. 388)

The plant contained three types of glands: 1) three-celled uniseriate gland, 2) gland with multicellular head and two-celled uniseriate stalk, 3) multicellular sessile gland. Stomata were tetracytic and anomocytic. D/237.

### Pedaliaceae

#### 1. Pedalium murex Linn. Syst. Nat. ed. 10 (1759) p. 1123.

A branched herb with stem reaching upto 40 cm high. Leaves ovate-oblong, coarsely sublobate, fleshy, upto 5 cm, the lower side usually covered with minute scales. Flowers axillary, solitary. Calyx minutely scaly outside, divided rather more than ½- way down; lobes 5, linear-triangular, acute. Corolla yellow; lobes rounded. Filaments glandular-hairy at the base. Fruit pyramidal bluntly 4-angled, with stout sharp conical horizontal spines from the angles. (Fig. 389)

Vernacular name: Ubhu gokharu.

Flowers: July-January.

#### Micromorphology (Fig. 389)

The plant showed presence of multicellular, glandular trichome differentiated into a 2-4 celled head and a single celled stalk.

Stomata were of anomocytic and anisocytic type. D/323.

## 2. Sesamum orientale L. Sp. Pl. 2: 634. 1753. (Sesamum indicum L.)

An erect branched, annual upto 65 cm tall. Leaves ovate- oblong, lobed or 3-partite, upto 18 cm long, petiole upto 12 cm long. Flowers with strong unpleasant odour, bracteate; pedicel with 2 glands on either side at the base. Calyx lobes linear to narrowly lanceolate,. Petals mauve colored, obtuse. Stamens didynamous. Ovary 2-celled, oblong. Fruit oblong, loculicidal, capsule. Seeds black, brown or white, smooth. (Fig. 390)

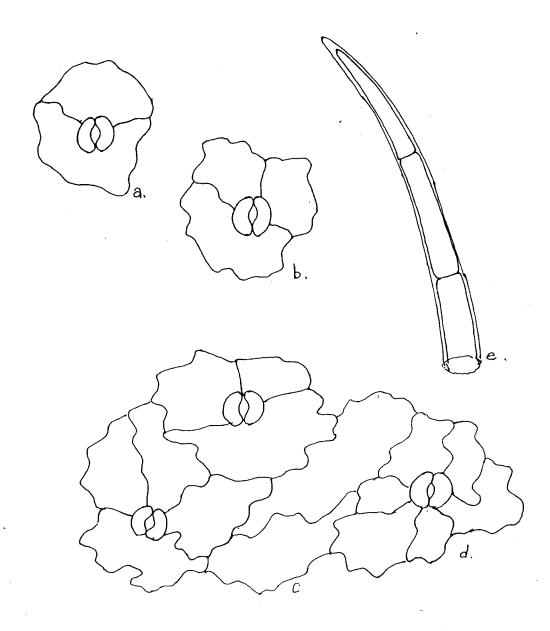


Fig. 387. Spathodea campanulata Beauv., a. diacytic stomata, b. anisocytic stomata, c-d. anomocytic stomata, & multicellular uniseriate trichome.



Fig. 388 Tabebuia rosea (Bertol) DC., a. habit, b. L.S. flower, c. calyx, d. stamen, e. gynoecium, f. three-celled uniseriate gland, g. gland with multicellular head and two-celled uniseriate stalk, h. tetracytic stomata, i. anomocytic stomata j. multicellular sessile gland.

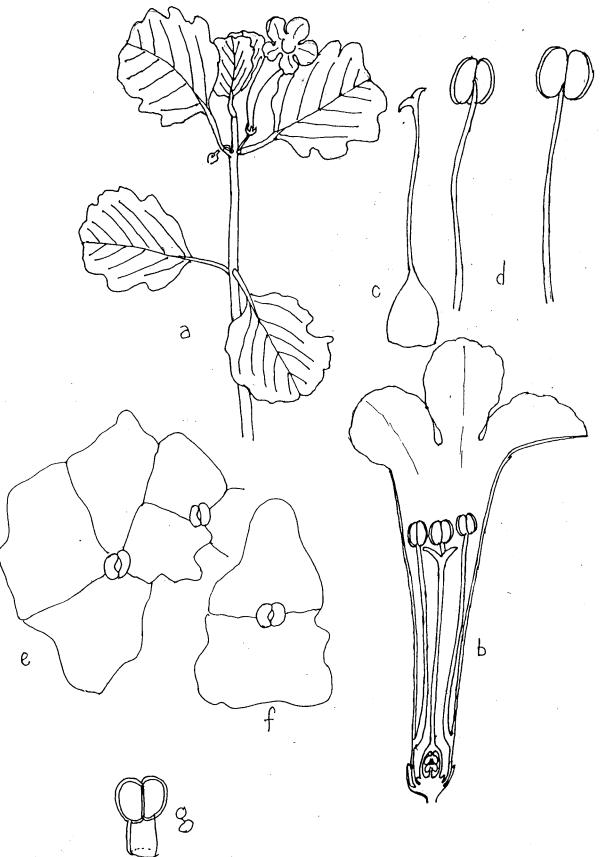


Fig. 389 Pedalium murex L., a. habit, b. L.S. of flower, c. gynoecium, d. stamen, e. anomocytic stomata, f. diacytic stomata, g. gland with two celled head and a single celled stalk.

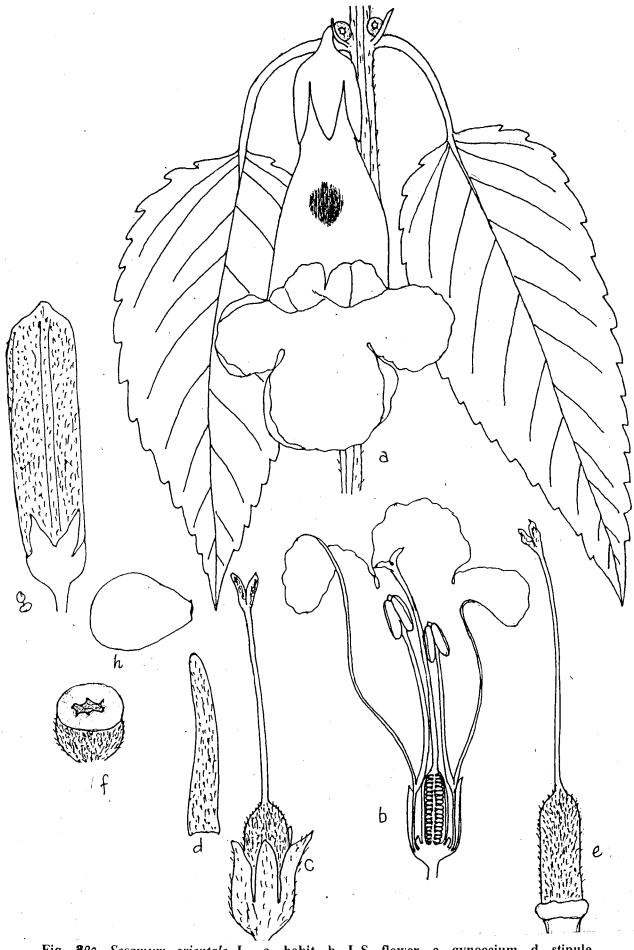


Fig. 390. Sesamum orientale L., a. habit, b. L.S. flower, c. gynoecium, d. stipule, e. gynoecium, f. extra floral gland, g. capsule, h. seed.

Vernacular name: Tal. Flowers: June-October.

Micromorphology (Fig. 391)

The plant showed presence of multicellular, non-glandular, uniseriate, unbranched trichome with broad cells and the apical cells was somewhat blunt at the tip. Stomata were of anomocytic and anisocytic type.

D/335.

## Martyniaceae

1. Martynia annua L. Sp. Pl. 2: 618. 1753. (Martynia diandra Gloxin.)

A branched herb with succulent, tomentose-glandular stem reaching to a height of 1.5 m tall. Leaves subcordate, upto 15 cm long, margin dentate. Flowers lilac, mottled red, blue or yellow inside; bracteoles 1-3, oblong, petaloid or lilac. Sepals

5, distinct, oblong-lanceolate. Corolla tube gibbous, 5-lobed; lobes tinged purple, obtuse. Fertile stamens 2; anther lobes divaricate, oblong; staminodes 2, slightly curved. Ovary globose, situated on the subglobose disc; stigmas 2, flat. Capsule more or less ovoid, 2 valved, with the style splitting into 2 curved, lignified and spiny processes. (Fig. 392)

Variation observed: in classical texts the anthers cells are reported to be confluent, like specimens available here, all had divaricate anthers.

Vernacular name: Vinchhudo. Flowers: August-November. **Micromorphology** (Fig. 393)

Whole plant showed presence of multicellular, glandular trichome differentiated into multicellular 6-8 celled head and a multicellular, uniseriate stalk.

Stomata were of anomocytic and anisocytic type.

D/308.

#### Acanthaceae

1. Adhatoda zeylanica Medic., Hist. & Comment. Acad. Elect. Sci. Theod,-Palat. 6: 393. 1790.

(Adhatoda vasica Nees.)

A densely branched shrub reaching 3 m high. Leaves elliptic-lanceolate, upto 20 cm long, acuminate. Flowers in long dense axillary spikes; bracts elliptic; bracteoles oblong-lanceolate. Calyx segments imbricate, oblong-lanceolate, 3-nerved. Corolla white, 3 cm long; upper lip ovate-oblong, curved, notched; lower lip as long as the upper, rounded, the middle lobe the broadest. Anther-cells apiculate at the base. Ovary 2-celled, slightly stalked. Seeds orbicular-oblong. (Fig. 394)

Vernacular name: Ardusi.

Flowers: August-November.

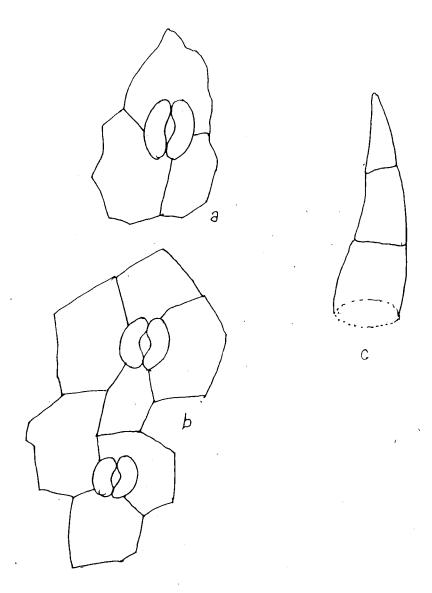


Fig. 391. Sesamum orientale L., a. anisocytic stomata, b. anomocytic stomata, c. multicellular uniseriate three-celled trichome

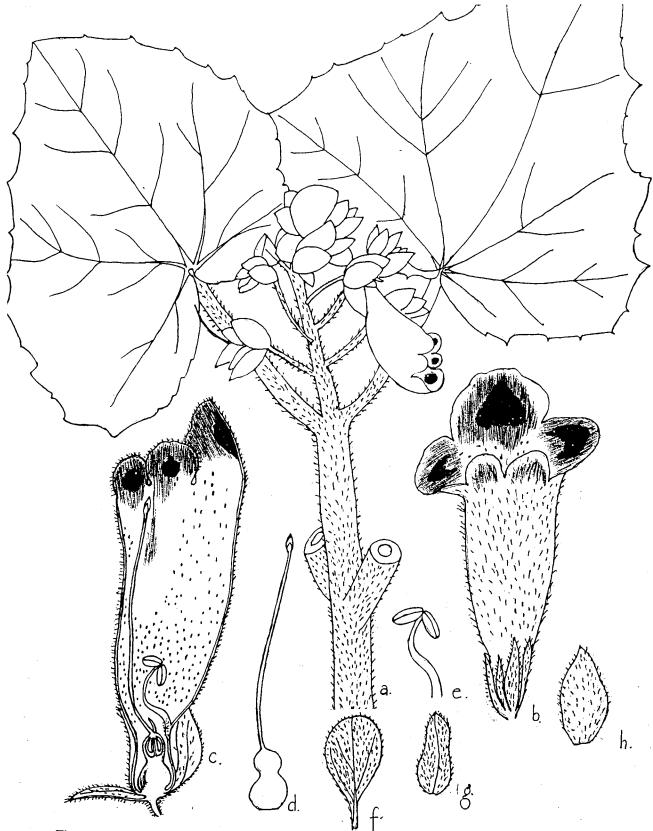


Fig. 392. Martynia annua L., a. habit, b. flower, c. L.S. flower, d. gynoecium, f. bract, g. bracteole, h. sepal.

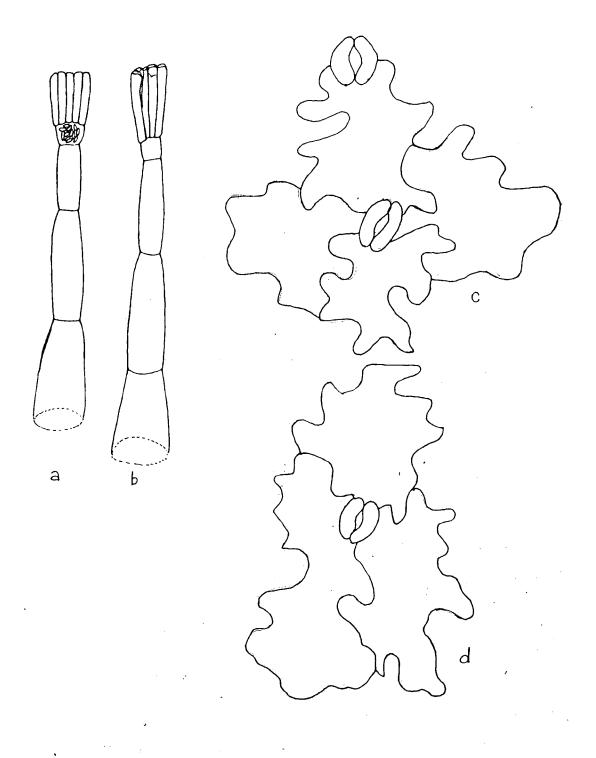


Fig. 393. Martynia annua L., a-b. gland with many-celled head and uniscriate stalk, c. anomocytic stomata, d. anisocytic stomata.

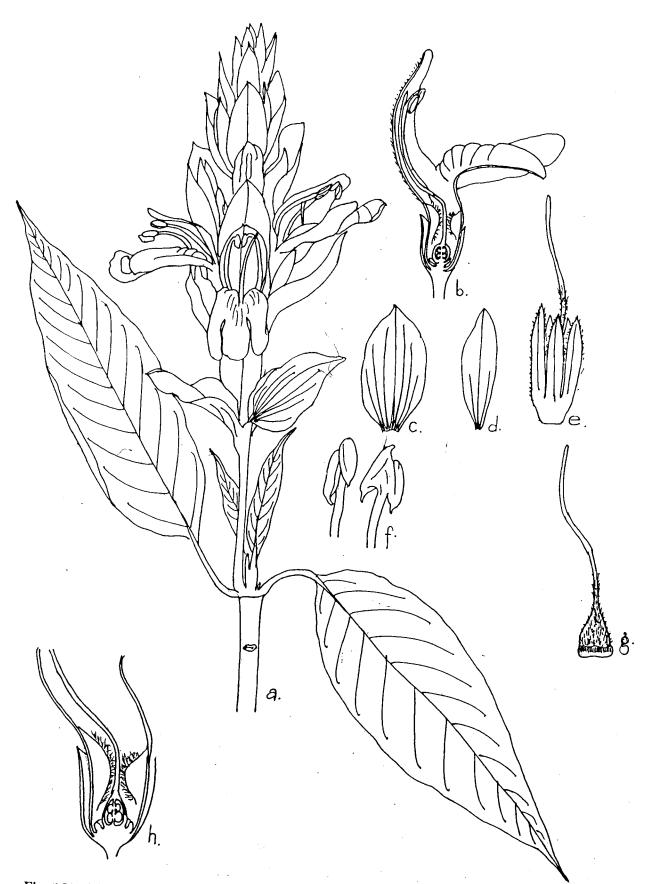


Fig. 394 Adhatoda zeylanica Medic., a. habit, b. L.S. flower, c. bract, d. bracteole, e. calyx with gynoecium, f. stamen, g. gynoecium, h. L.S. of flower enlarged.

#### Micromorphology (Fig. 395)

The leaf showed presence of multicellular, uniscriate, unbranched, non-glandular trichome with warty surface.

The corolla showed presence of multicellular, uniscriate, unbranched, non-glandular trichome with cells having a broad distal portion in one type and another type had cells with broad basal part; the cells had intercellular connections in their cross walls. Stomata were of diacytic type.

D/135.

#### 2. Barleria prionitis Linn. Sp. Pl. (1753) p. 636.

A prickly branched shrub upto 2 m high. Leaves elliptic, acuminate, upto 18 cm long, bristle-tipped; petioles with 3 divaricate acicular spines. Flowers solitary; bracts foliaceous, lanceolate, bristle-tipped; bracteoles linear, bristle-tipped. Calyx segments uequal, lanceolate-oblong with a mucro. Corolla 2-lipped, upto 4 cm long, yellow; upper lip deeply 4-lobed, obovate; lower lip oblong-obovate. Stamens 2 fertile and 2 staminodes; filaments of the fertile stamens exserted beyond the corolla-tube. Ovary 2-celled. Capsules ovoid; seeds 2 from below the middle, tomentose. (Fig. 396) Vernacular name: Khadhaserio.

Flowers: October-January.

#### Micromorphology (Fig. 397)

The plant showed two types of trichomes 1) unicellular, non-glandular, thick walled acicular with round or elongated bottom. 2) multicellular, glandular trichome differentiated into a 4-5 celled head and a single celled stalk.

Stomata were of diacytic.

D/449, 556-557, 759.

#### 3. Blepharis boerhaviaefolia Pers. Syn. V. 2 (1807) p. 180.

A divaricately branched prostrate herb upto 60 cm long. Leaves elliptic, in a whorl of 4, unequal, upto 5 cm long, serrate. Flowers axillary, 2 or 3 together; bracteoles 8 in opposite pairs, 3 pairs spathulate, strongly 3-nerved, the fourth pair rather more long, linear, strongly 3-nerved. Calyx-segments lanceolate; 3-nerved from the base. Corolla bilipped; pale blue with a yellow spot on the lower lip, upper lip subobsolete; lower lip obovate, with 3-5 rounded lobes. Stamens 4, didynamous; anthers with 1 large cell with densely bearded margins, the other cell small or obsolete. Disk annular. Ovary 2-celled, ovules 2 in each cell; stigma shortly 2-fid. Capsules ovoid, 2-seeded. Seeds echinate with obtuse spines. (Fig. 398)

Flowers: October-December. Micromorphology (Fig. 398)

The plant contained multicellular uniseriate trichomes.

Stomata were diacytic.

D/170, 421, 841.

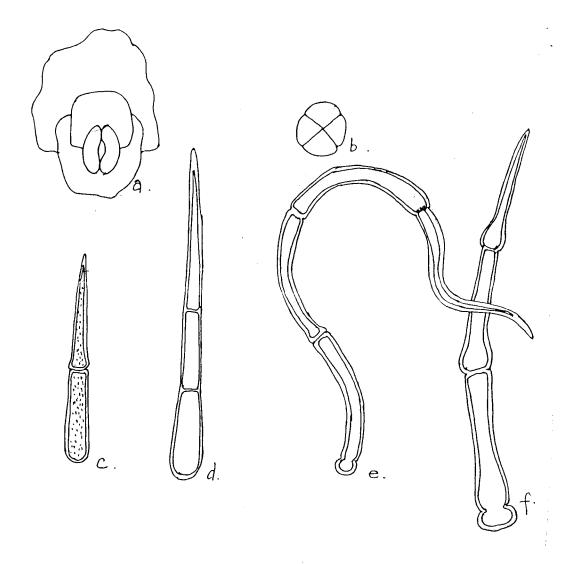


Fig. 395 Adhatoda zeylanica Medic., a. diacytic stomata, b. multicellular sessile gland, c-d. two-three celled uniseriate trichome with pitted wall, e-f. uniseriate three-four long celled trichome.

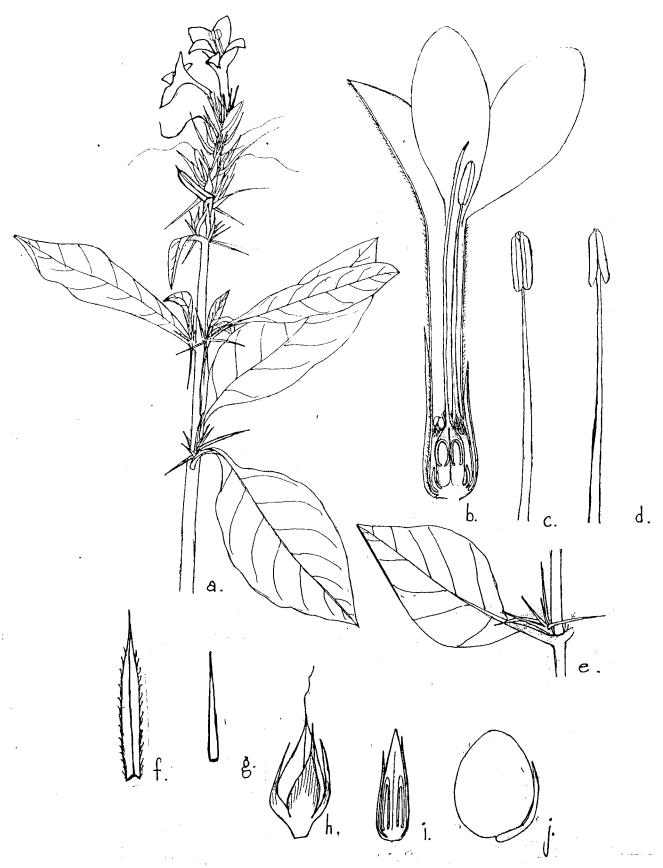


Fig. 396. Barleria prionitis L., a. habit, b. L.S flower, c-d. stamen, e. spines, f. bract, g. bracteole, h. capsule, i. L.S capsule, j. seed.

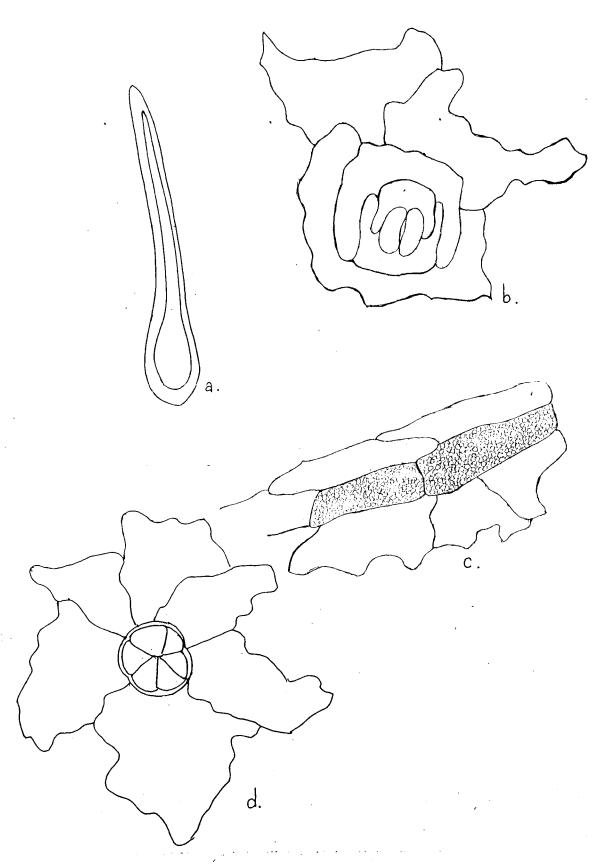


Fig. 397 Barleria prionitis L., a. unicellular trichome, b. diacytic stomata, c. cystolith, d. multicellular sessile gland.

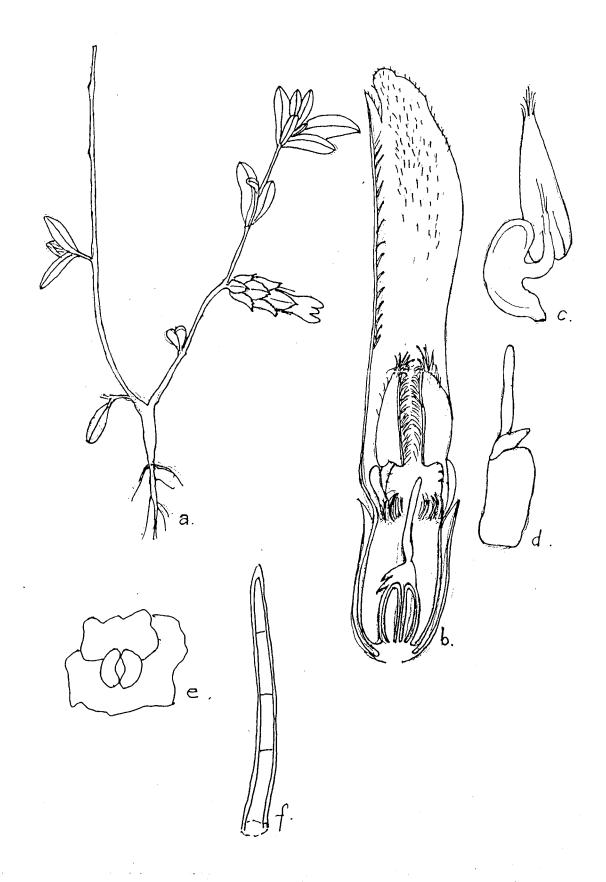


Fig 398. Blepharis boerhaviaefolia Pers., a. habit, b. L.S. flower, c. stamen, d. gynoecium, e. diacytic stomata, f. multicellular uniseriate trichome.

### 4. Daedalacanthus roseus T. Anders. in Journ. Linn. Soc. V. 9 (1867) p. 487.

A branched herb with stems upto 2 m high. Leaves oblong-lanceolate, upto 20 cm long, acuminate. Flowers in axillary and terminal spikes often 15 cm long; bracts obovate, with a reflexed mucro, white with very prominent raised green nerves. Bracteoles linear, acute. Calyx 5-lobed, white, lobes lanceolate with a strong midnerve. Corolla funnel-shaped, blue, fading to purple or red; tube slender, lobes oblong-obovate. Stamens 2. Ovary 2-celled; ovules 2 in each cell. Capsules clavate, pointed. Seeds hygroscopically hairy. (Fig. 399)

Vernacular name: Dashmuli. Flowers: November-January. **Micromorphology** (Fig. 399)

Whole plant was glabrous. Cystoliths were seen in leaves on surface view.

Stomata were of diacytic type.

D/273.

#### 5. Ecbolium ligustrinum (Vahl) Vollesen Kew Bull. 44: 651. 1989.

An erect branched low shrub with elliptic-lanceolate, acuminate, upto 18 cm long leaves. Flower in terminal spikes; bracts foliaceous, elliptic-lanceolate; bracteoles lanceolate. Calyx segments linear-lanceolate, acute. Corolla bluish-green, reaching 4 cm long; upper lip narrowly linear, notched at the apex; lower lip divided almost to the base into 3 lobes. Stamens 2; anther cells 2, linear. Ovary 2-celled; ovules 2 in each cell; stigma of 2 short divaricate lobes. Capsules battledore-shaped, pointed. (Fig. 400)

Flowers: October-January.

#### Micromorphology (Fig. 401)

The leaf showed presence of two types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular trichome with swollen joints and thick walls. 2) multicellular, glandular trichome differentiated into a 6-8 celled head and a single celled stalk.

The corolla showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with swollen joints and thick walls.

The sepal showed presence of multicellular, glandular trichome differentiated into a 4 celled head and 2 celled stalk with basal rounded cell.

The bract showed presence of multicellular, glandular trichome differentiated into a 4-8 celled club shaped head and a single celled stalk.

The bracteole showed two celled, non-glandular trichome in which the cells were arranged end to end.

The leaf surface also showed presence of cystolith.

Stomata were of diacytic type.

D/355.

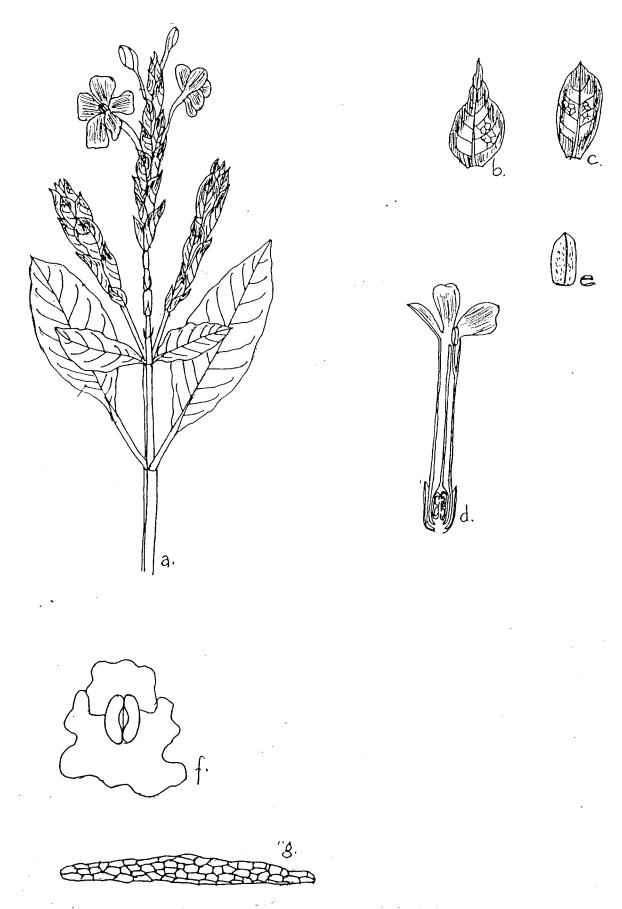


Fig. 399. Daedalacanthus roseus Anders., a. habit, b. bract, c. bracteole, d. L.S. of flower, e. capsule, f. diacytic stomata, g. cystolith.

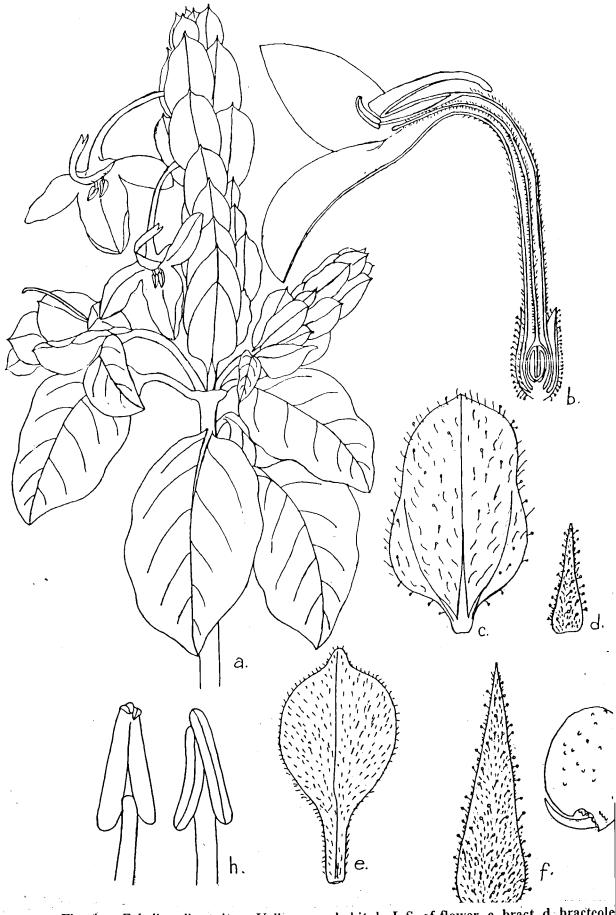


Fig. 400. Echolium ligustrinum Vollesen., a. habit, b. L.S. of flower, c. bract, d. bracteole h. stamen, e. capsule, f. sepal, g. seed.

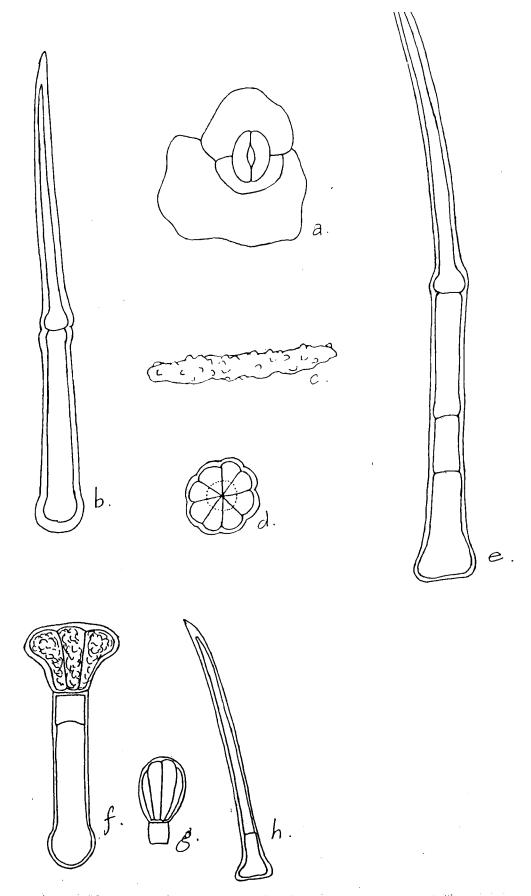


Fig. 401. Echolium ligustrinum Vollesen., a. diacytic stomata b, e, & h. two to many celled uniseriate trichome, c. cystolith, d. multicellular sessile gland, f. gland with multicellular head and 2-celled stalk, g. gland with multicellular head and single celled stalk.

# 6. Elytraria nodosa E. Hossain, Notes Roy. Bot. Gard. Edinburgh, 31: 379. 1972. (Tubiflora acaulis O. Kuntze.)

A stemless herb with radiating short-petioled radical, spathulate leaves about 20 cm long. Scapes, clothed spirally throughout their length with small rigid bracts, upto 30 cm long. Flowers borne in branched spikes. Bracts ovate, with ciliate margins; bractcoles linear, penicillate at the apex. Calyx 4-partite, lobes lanceolate. Corolla pale-blue or white, funnel shaped, 2-lipped. Stamens 2, perfect; anthers elliptic, cells 2. Disk small. Ovary 2-celled; ovules 6-10 in each cell; stigma shortly 2-lobed. Capsules ovoid; valves recurved. Seeds ovoid. (Fig. 402)

Flowers: October.

#### Micromorphology (Fig. 403)

Whole plant was glabrous except calyx and bract; which showed multicellular, uniscriate, unbranched, glandular trichome with thick walls and an uneven lumen. Along with it a multicellular, glandular, trichome was also present which was differentiated into two celled head and two celled stalk.

Stomata were of anisocytic and diacytic type. D/350.

#### 7. Haplanthus tentaculatus Nees. in DC. Prodr. V. 11 (1847) p. 513.

A branched slender herb with quadrangular, glandular-pubescent stems. Leaves ovate, acuminate, upto 10 cm long. Axillary spines (cladodes) slender, upto 2 cm long, densely and softly villous with long hairs, with 2 or 3 villous teeth at the apex. Flowers sessile in the midst of the cladodes; bracts and bracteoles absent. Calyx 5-partite; sepals linear-subulate. Corolla blue, 2-lipped, funnel-shaped. Stamens 2; anthers connivent, dorsifixed. Disk prominent. Ovary 2-celled; ovules 3-8 in each cell; style acute or obliquely truncate at the apex. Capsules oblong. (Fig. 404)

Variations observed: in standard descriptions, the bract and bracteoles are said to be smaller than calyx, but I have not found any bract or bracteole in any of the specimen I collected.

Vernacular name: Kala kirayat. Flowers: October-January. **Micromorphology** (Fig. 405)

The calyx showed presence of multicellular, uniseriate, unbranched non-glandular trichome; along with a multicellular, glandular trichome differentiated into a two celled head and a multicellular, uniseriate trichome with thick walls.

Stomata were of diacytic type.

D/427, 742.



Fig. 402. Elytraria nodosa E. Hossain, a. habit, b. flower, c. L.S. of flower, d. gynoecium, e. stamen, f. sepal united.

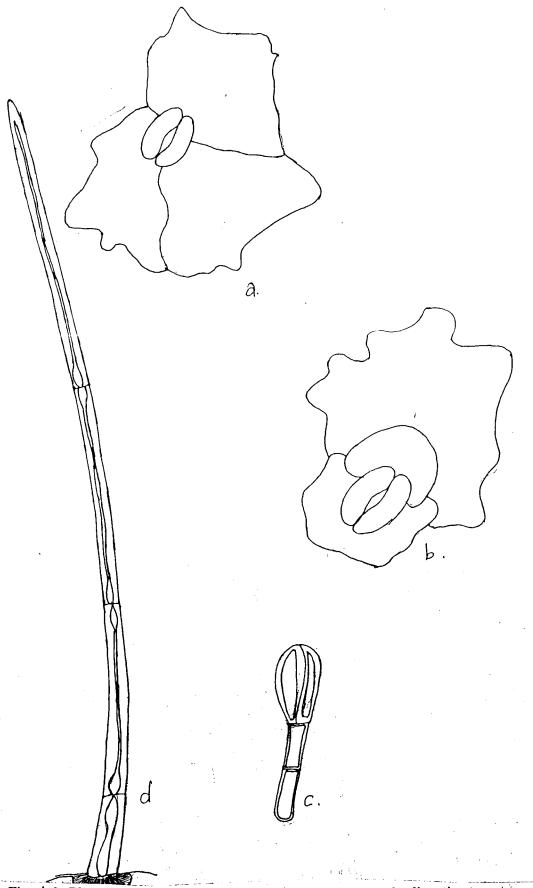


Fig. 403. Elytraria nodosa E. Hossain, a. anisocytic stomata, b. diacytic stomata, c. gland with two celled head and two celled stalk, d. uniseriate trichome.

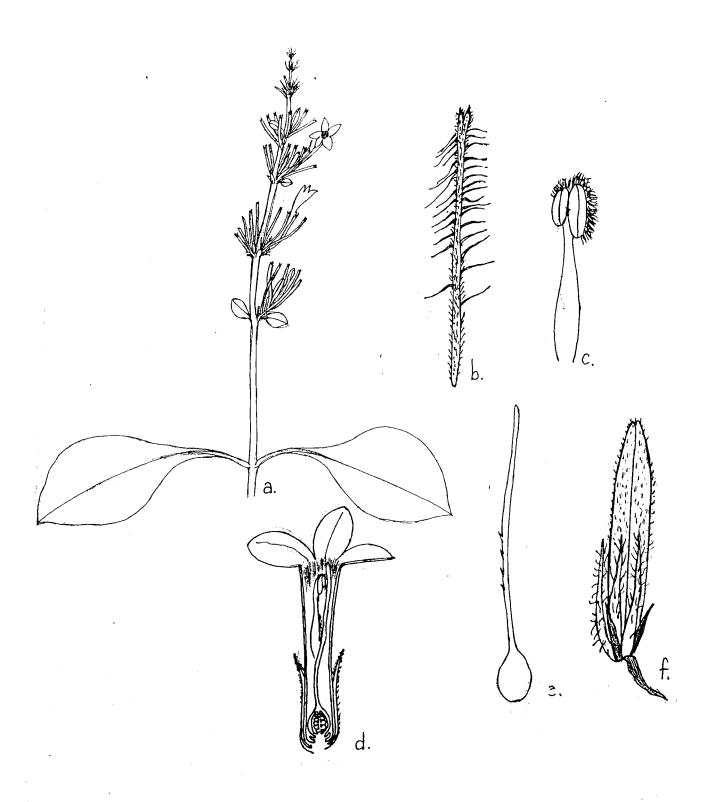


Fig. 404. Haplanthus tentaculatus Nees., a. habit, b. bracteole, c. stamen, d. L.S. flower, e. gynocium, f. capsule.

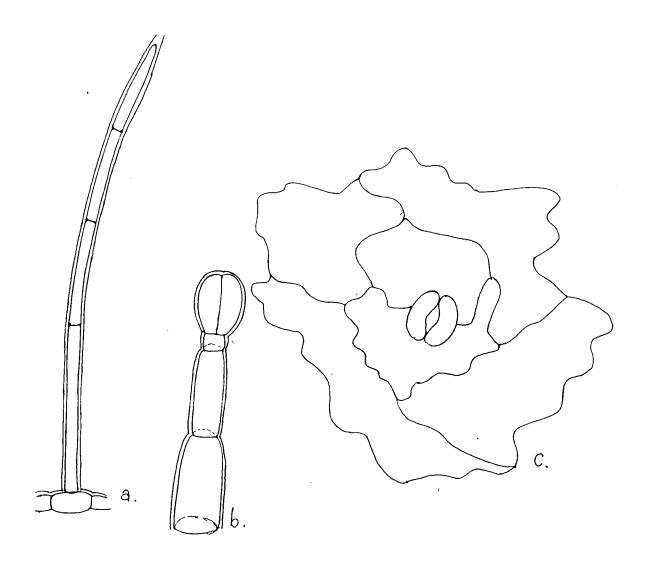


Fig. 405. Haplanthus tentaculatus Nees., a. multicellular uniscriate trichome, b. gland with two celled head and three celled stalk, c. diacytic stomata.

# 8. Hygrophila auriculata Heine, Kew Bull. 16: 172. 1962. (Asteracantha longifolia Nees.)

A branched herb with subquadrangular stem and branches reaching upto 2 m high. Leaves oblong-lanceolate, in verticels of 6 at node, the 2 outer leaves large, reaching 18 cm long, the 4 inner leaves reaching about 4 cm long, each leaf with a straight sharp yellow spine, upto 5 cm long, in its axil. Flowers in a whorl; bracteoles lanceolate, hairy. Calyx segments 4, lanceolate. Corolla purplish-blue, 2-lipped; the upper lip 2-fid with longitudinal folds or callosities on the palate, lower lip deeply 3-lobed, lobes obovate. Ovary oblong, 2-celled; style filiform; stigma 2. Capsules linear-oblong, 4-8 seeded. (Fig. 406)

Vernacular name: Kantashelio.

Flowers: June-January.

#### Micromorphology (Fig. 407)

The plant showed presence of 1) multicellular, non-glandular, uniseriate, and thick walled with a round bottom and 2) multicellular, glandular, sessile trichomes which had 6 celled head. Elongated cystoliths were also present on the surface

Stomata were of diacytic type.

D/586, 662, 1215-1216.

#### 9. Hygrophila serpyllum T. Anders. in Journ. Linn. Soc. V. 9 (1867) p. 456.

A procumbent, sparsely hairy herb upto 40 cm long. Leaves elliptic, upto 3 cm long, sessile. Flowers in axillary clusters of 2-3; bracts elliptic; bracteoles oblong-

lanceolate. Calyx sepals linear. Corolla 2-lipped, the upper lip shorter than the lower, with 2 oblong obtuse lobes, the lower 3-lobed, the mid-lobe larger than the lateral ones. Stamens 4, didynamous. Anthers of the lower stamens, larger. Ovary 2-celled; ovules 4-many in each cell; stigma simple, linear. Capsules linear-oblong; valves grooved on the back. Seeds 8-10, orbicular-ovoid. (Fig. 408)

Variations observed: In floras the flowers are said to be in spikes, but the specimens which I collected contained axillary clusters of 2-3 flowers.

Vernacular name: Sarpat.

Flowers: September-January. **Micromorphology** (Fig. 408)

The plant showed presence of four types of trichomes: 1) unicellular, non-glandular, thick walled trichome. 2) multicellular, uniseriate, unbranched, non-glandular trichome with thick walled with swollen joints. 3) multicellular, glandular trichome differentiated into 3-4 celled head and multicellular, uniseriate, stalk. 4) multicellular, glandular trichome with single celled head and a multicellular, uniseriate stalk.

Stomata were of diacytic type.

D/297, 454, 933.

#### 10. Justicia diffusa Willd. Sp. Pl. V. 1 p. 87. 1797

A much branched herb with subquadrangular stems reaching to a height of 60 cm. Leaves ovate-elliptic, acuminate, upto 4 cm. Flowers in long axillary and terminal spikes;



Fig. 466. Hygrophila auriculata Heine., a. habit, b. L.S. of flower, c. flower, d. stamen, e. flower showing ridges of corolla, f. gynoecium.

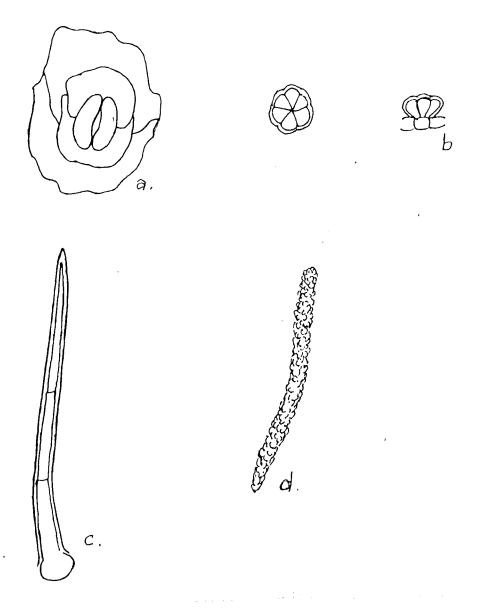


Fig. 407. Hygrophila auriculata Heine., a. diacytic stomata, b. multicellular sessile gland, c. multicellular uniseriate trichome, d. cystolith.

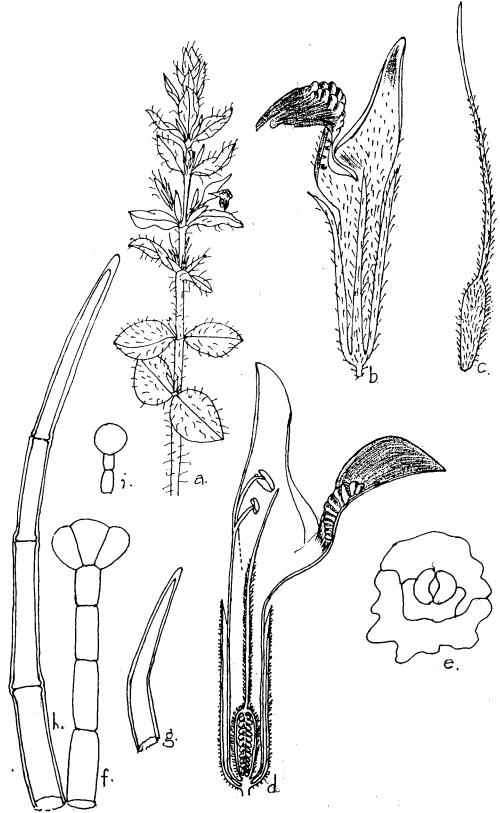


Fig. 408. Hygrophila serpyllum T. Anderson., a. habit, b. flower, c. gynoecium, d. L.S. of flower, e. diacytic stomata, f. gland with multicellular head and uniseriate stalk, g. unicellular trichome, h. multicellular uniseriate trichome, i. gland with single celled head and two celled stalk.

bracts and bracteoles ovate, acuminate. Calyx 4-partite; segments lanceolate, unequal. Corolla pale-purple; upper lip ovate, notched at the apex; lower lip very slightly 3-lobed at the rounded apex. Filaments glabrous except at their insertion. Ovary 2-celled; lower part of style pubescent. Capsules pointed, oblong, grooved on the back. Seeds subconcencentrically rugose. (Fig. 409)

Vernacular name: Khadsaliya ni jat.

Flowers: July-December.

#### Micromorphology (Fig. 409)

Leaf showed the presence of a multicellular, uniseriate, non-glandular thick walled trichome with the basal cell somewhat swollen.

Stomata were diacytic.

D/906-914.

## 11. Justicia japonica Thunb. Fl. Japan 20. 1784. (Justicia simplex, D. Don)

A branched herb with quadrangular stems reaching upto 50 cm high. Leaves ellipticoblong, upto 5 cm long. Flowers in dense terminal and axillary spikes about 10 cm long; bracts elliptic, margin scarious and ciliate; bracteoles lanceolate. Calyx segments subequal, or 1 sometimes a little longer than the others, linear. Corolla bi-lipped; upper lip ovate and concave, 2- fid; lower lip with 3 rounded lobes. Anther cells one higher up then the other and lower with a basal spur like appendage. Capsules oblong, obtuse, mucronate, constricted between the seeds. (Fig. 410)

Vernacular name: Parpata.

Flowers: November – December.

#### Micromorphology (Fig. 410)

Trichomes were absent on leaf, but cystoliths were very prominently observed.

Stomata were mostly diacytic except few anisocytic types.

D/251

#### 12. Lepidagathis cuspidata Nees. in Wall. Pl. As. Rar. V. 3 (1832) p. 97.

An branched undershrub with quadrangular stems reaching upto 1 m high. Leaves oblong-lanceolate, upto 10 cm long, mucronate; leaves of the branches elliptic-lanceolate, upto 3 cm long, subsessile, spinous-pointed. Flowers in terminal spikes upto 15 cm long; bracts elliptic-oblong, acute, spinous-pointed, 3-nerved; bracteoles linear-lanceolate, spinous-pointed, 1-nerved. Calyx segments unequal, oblong-lanceolate, spinous-pointed, 3-5 nerved. Corolla white; upper lip ovate, marked with dark transverse purplish lines; lower lip 3-lobed. Anther-cells bearded. Ovary 2-celled. Capsules ovoid-lanceolate, 2-valved. Seeds ovoid, hygroscopically hairy. (Fig. 411)

Vernacular name: Bhuyaterada.

Flowers: December-April.

#### Micromorphology (Fig. 412)

The plant showed presence of three types of trichomes: 1) two celled non-glandular trichome with thick walls. 2) unicellular, non-glandular trichome with narrow lumen and

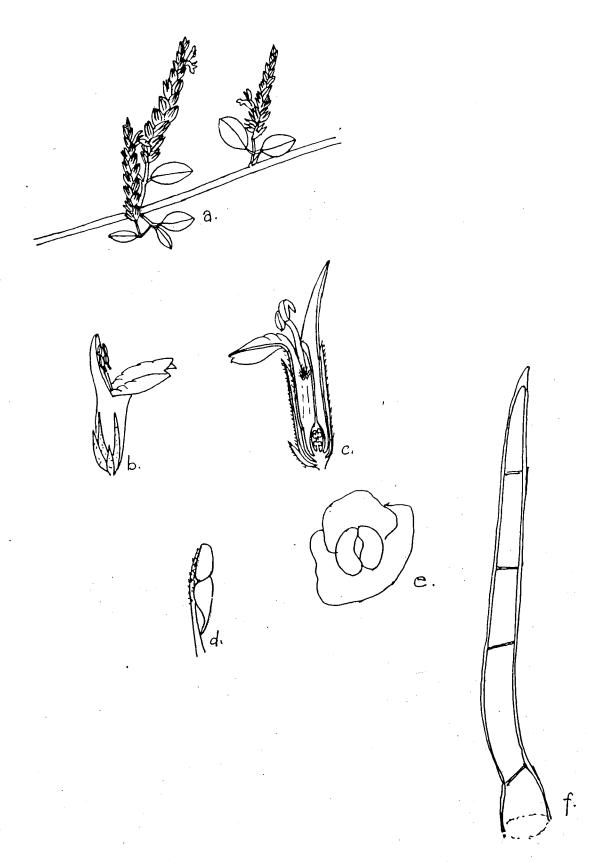


Fig. 409. Justicia diffusa Willd., a. habit, b. flower, c. L.S. of flower, d. stamen, e. diacytic stomata, f. multicellular uniseriate trichome.

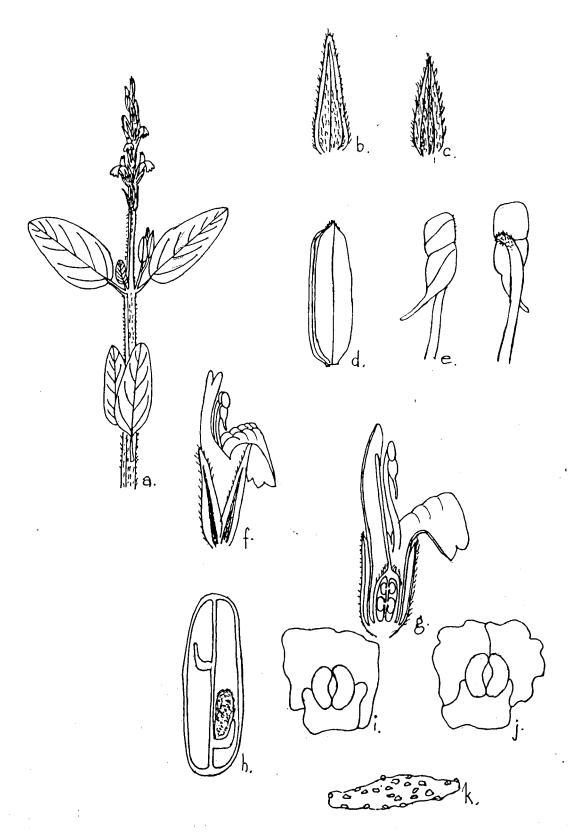


Fig. 410. Justicia japonica Thunb., a. habit, b. bract, c. bracteole, d. capsule, e. stamen, f. flower, g. L.S flower, h. L.S. capsule, i-j. diacytic stomata, k. cystolith.

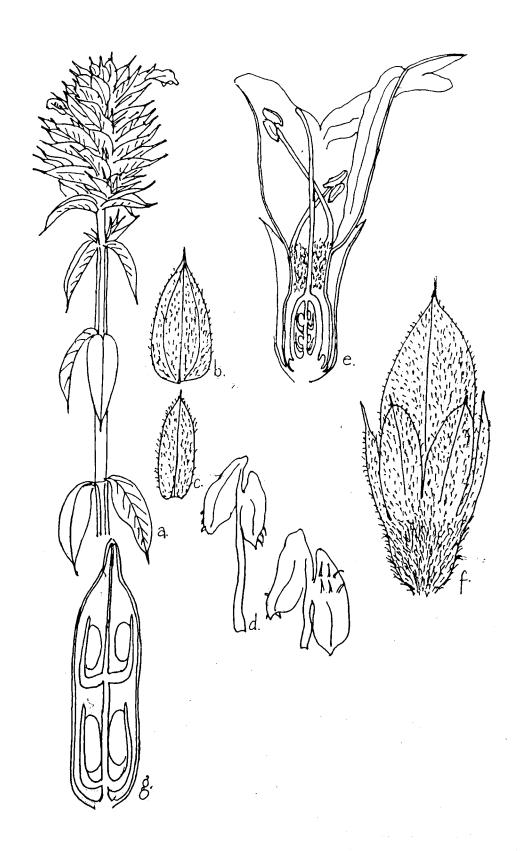


Fig. 411. Lepidagathis cuspidata Nees., a. habit, b. bract, c. bracteole, d. stamen, e. L.S. flower, f. capsule, g. L.S. capsule.

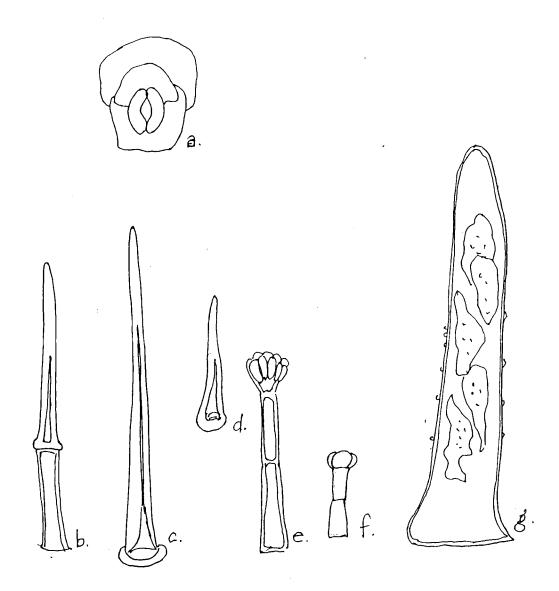


Fig. 412. Lepidagathis cuspidata Nees., a. diacytic stomata, b. two celled uniseriate trichome with thick wall, c-d unicellular thick walled trichome with small lumen, e-f. gland with multicellular head and two celled uniseriate stalk, g. unicellular gland.

thick wall. 3) multicellular, glandular trichome differentiated into a 6-12 radiating celled head or sometimes 3-4 celled head and a multicellular, uniseriate stalk.

Anther showed presence of unicellular, glandular trichome with broad lumen, thin walled with lot of content.

Stomata were of diacytic type.

D/320.

#### 13. Lepidagathis fasciculata Nees in wall. Pl. As. Rar. V. 3. (1832) p. 95.

A branched herb with quadrangular, hairy stem reaching upto 30 cm long. Leaves ovate or elliptic, in pairs, upto 6 cm long, crenate. Flowers in terminal spikes; bracts ovate, 3-nerved; bracteoles linear. Calyx 5-partite; outer upper segment longest, linear-lanceolate, 3-nerved; two lower segment linear, 1-nerved; the 2 inner lateral segments subulate. Corolla white; upper lip short, 2-fid, lower lip 3-lobed, spotted with the middle the longest; palate glabrous. Anther-cells bearded, one attached lower than the other. Ovary 2-celled. Capsules oblong-lanceolate. Seeds suborbicular, hygroscopically hairy. (Fig. 413)

Flowers: February.

#### Micromorphology (Fig. 414)

The leaf showed presence of unicellular, non-glandular, thick-walled trichome which was slightly curved at the tip. The petal showed presence of unicellular, non-glandular, trichome with somewhat blunt tip; along with a multicellular, glandular

trichome differentiated into a 3-4 celled or 1 celled head and a multicellular stalk. Moreover along with these trichomes leaves also showed presence of cystolith.

Stomata were of diacytic type.

D/382, 1057, 1087.

#### 14. Neuracanthus sphaerostachys Dalz. in Kew Journ. Bot. V. 2 (1850) p. 140.

A perennial herb with quadrangular pubescent, stems upto 60 cm high. Leaves ellipticoblong, subsessile, upto 10 cm long. Flowers in globose congested silky hairy sessile spikes in the opposite axils( appearing circular around the node); bracts purplish, suborbicular, strongly 5-7 nerved. Calyx 2-lipped; upper lip 3- lobed, lobes lanceolate; lower lip divided almost to the base, segments lanceolate. Corolla blue, infundibuliform; limb sub-bilabiate. Stamens 4, didynamous; anthers of the upper pair with one perfect and one imperfect cell. Ovary 2-celled; ovules 2 in each cell. Capsules ovoid. Seeds orbicular, densely silky. (Fig. 415)

Vernacular name: Ganthera.

Flowers: September-October.

#### Micromorphology (Fig. 415)

The plant showed presence of two types 1) multicellular, uniseriate, unbranched non-glandular trichome with somewhat cylindrical cells. 2) multicellular, glandular trichome with two celled head and a single celled stalk.

Stomata were of diacytic type.

D/596, 1192.

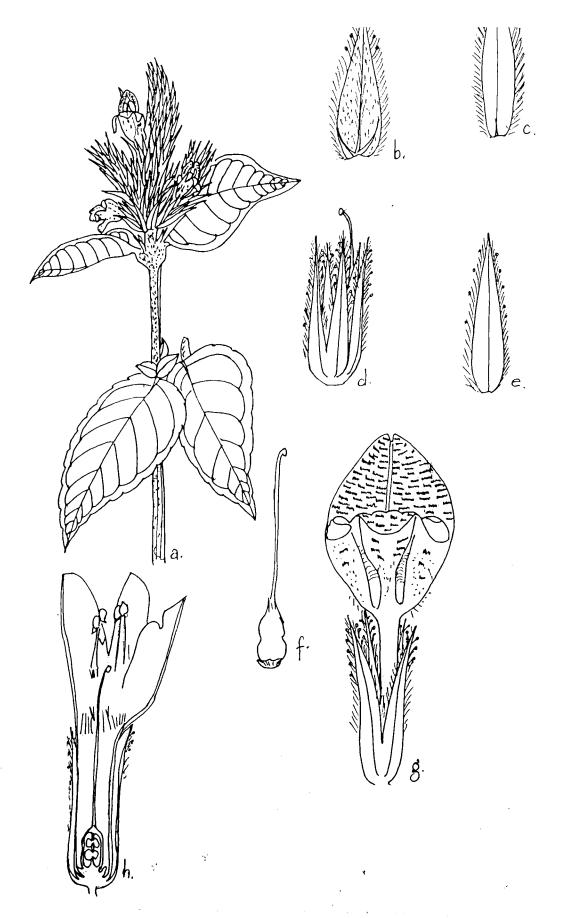


Fig. 413. Lepidagathis fasciculata Nees., a. habit, b. bract, c. bracteole, d. calyx, e. sepal, f. gynoecium, g. flower, h. L.S. of flower.

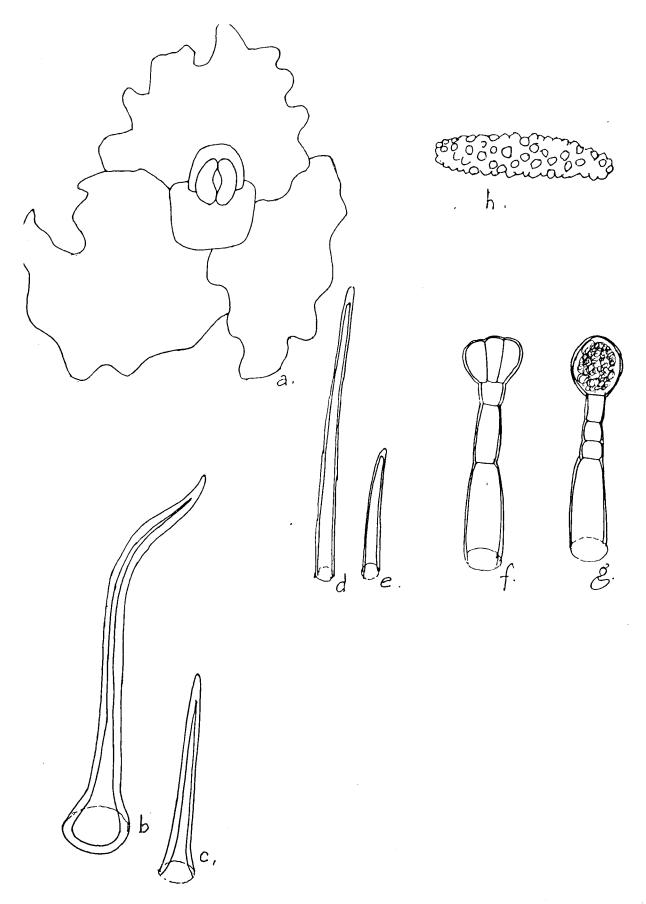


Fig. 4)4. Lepidagathis fasciculata Nees., a. diacytic stomata, b-e. unicellular trichome with thick wall and large lumen, f-g. gland with single to multicellular head and uniseriate four celled stalk.

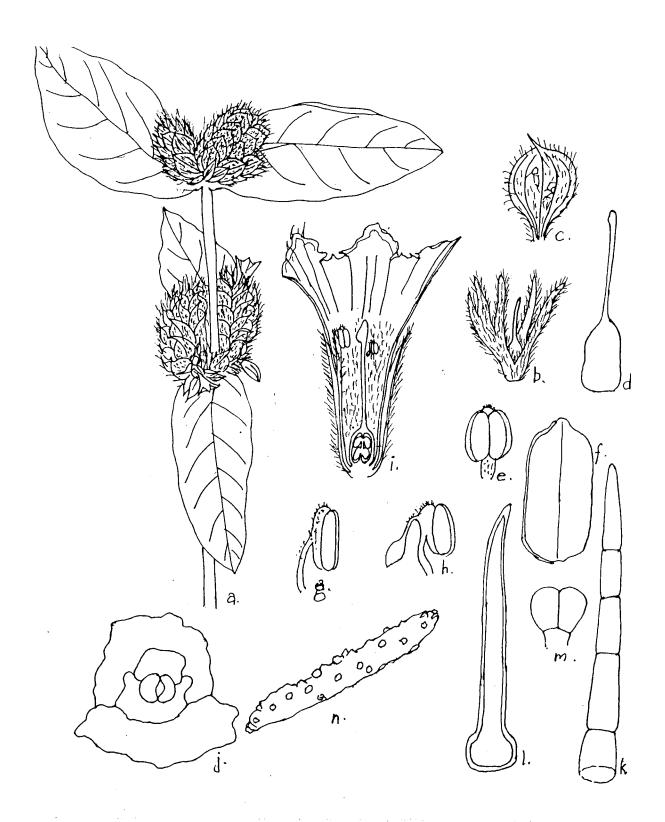


Fig. 415. Neuracanthus sphaerostachys Dalz., a. habit, b. calyx and gynoecium, c. bract, d. gynoecium, e. stamen, f. capsule, g-h. anther cell, i. L.S. flower, j. diacytic stomata, k. multicellular uniseriate trichome, l. unicellular trichome, m. gland with two celled head and a single celled stalk, n. cystolith.

### 15. Peristrophe bicalyculata Nees, in Wall. Pl. As. Rar. V. 3. (1832)

A much branched herb with 5-angled stem reaching a height of 1.5 m. Leaves ovate, acuminate, upto 8 cm long. Flowers in trichotomous cymes in large lax divaricate pubescent panicles; bracts linear, mucronate; bracteoles 4, similar to the bracts. Calyx segments lanceolate-subulate. Corolla rosy,; upper lip elliptic-oblong; lower lip oblong, 3-lobed. Filaments glabrous. Anther-cells one above other, muticous. Ovary 2-celled, oblong, glabrous. Capsules cylindric. Seeds orbicular, papillose and slightly rugose. (Fig. 416)

Variations observed: in the description available in floras, the plant is said to have 6-angled stem, filaments hairy, and ovary hairy at the tip, but here the stem was five-angled ovary and filaments were glabrous.

Vernacular name: Kali angedi. Flowers: November-March. **Micromorphology** (Fig. 416) Leaves were glabrous. Stomata were diacytic. D/172, 411, 570-571.

# 16. Ruellia cyanea (Nees.) T. Anderson, J. Proc. Linn. Soc., Bot. 7: 24. 1863. (Ruellia patula Jacq.)

A small usually pubescent shrub with long, straggling, much-branched stem. Leaves ovate or elliptic, upto 3 cm long. Flowers axillary, solitary or 2-3 together; bracteoles foliaceous, elliptic. Calyx lobes linear-lanceolate. Corolla purplish-blue 3 cm long, campanulate-infundibuliform; lobes of the limb broadly elliptic or suborbicular. Stamens 4, didynamous; anthers 2-celled, oblong. Ovary 2-celled. Capsules upto 2 cm long, clavate. Seeds suborbicular, margined with hygroscopic white hairs. (Fig. 417)

Flowers: June-November.

# Micromorphology (Fig. 417)

The plant showed presence of multicellular, uniseriate, unbranched trichome with apical cell having swollen joint. Cystoliths were common in leaves.

Stomata were of diacytic type.

D/583.

### 17. Ruellia tuberosa L., Sp. Pl. 635. 1753.

An erect, tall herb with stout 4-angled stems reaching a height of 60 cm. Leaves oblongobovate to oblanceolate, upto 9 cm long. Flowers blue-violet, solitary or in 1-3-flowered, terminal or axillary cymes; bracts and bracteoles linear-lanceolate. Calyx lobes linear. Corolla 5-lobed, subequal, ovate. Stamens with oblong-sagittate anthers. Ovary oblong, 2-celled. Capsule oblong, many-seeded, minutely beaked at tip. Seeds orbicular, hairy. (Fig. 418)

Vernacular name: Bandhukadi.

Flowers: Almost throughout the year.



Fig. 416. Peristrophe bicalyculata Nees., a. habit, b. flower, c. L.S. of flower, d. stamen, e. calyx with gynoecium, f. gynoecium, g. diacytic stomata.

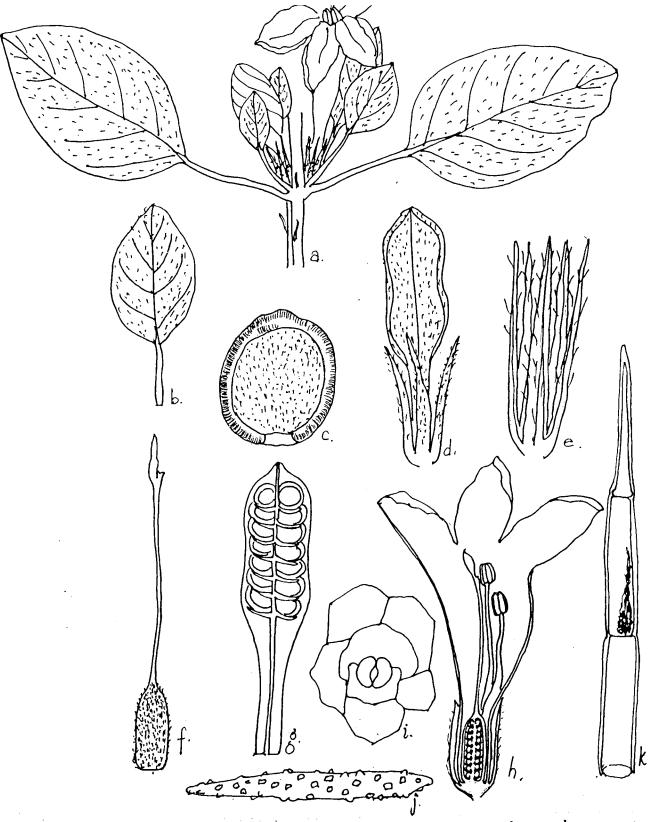


Fig. A|7. Ruellia cyanea T. Anderson., a. habit, b. leaf, c. seed, d. capsule, e. calyx, g. gynoecium, g. L.S. of Capsule, h. L.S. of flower, i. diacytic stomata, j cystolith, k. uniseriate trichome.

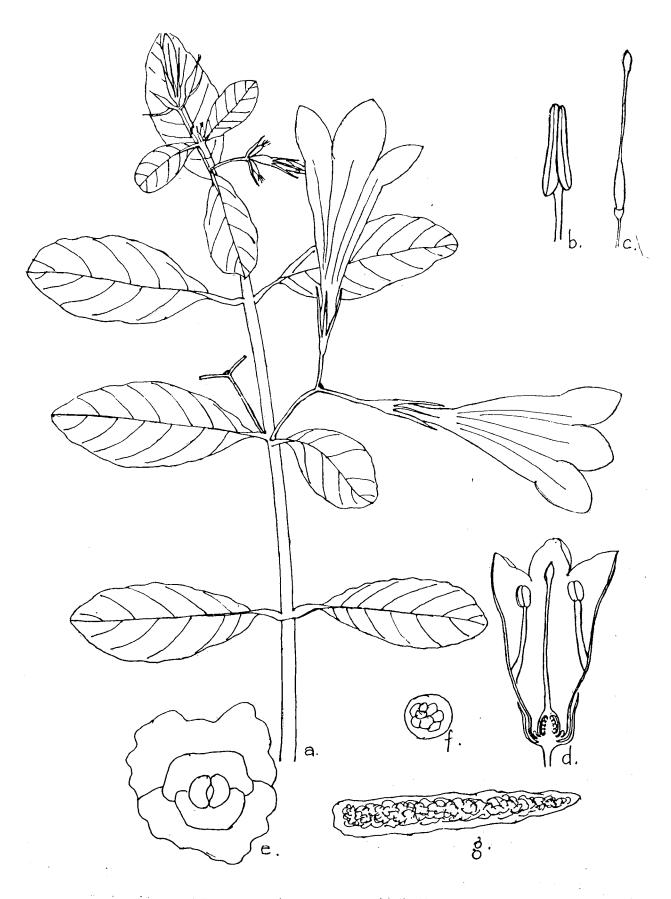


Fig. 418. Ruellia tuberosa L., a. habit, b. stamen, c. gynoecium, d. L.S. of flower, e. diacytic stomata, f. multicellular sessile gland, g. cystolith.

## Micromorphology (Fig. 418)

Whole plant was glabrous. Stomata were of diacytic type. D/ 463, 999, 1159.

## 18. Rungia parviflora Nees. in Wall. Pl. As Rar. V. 3 1832 p. 110, var. pectinata

A much-branched straggling annual herb. Leaves elliptic-lanceolate, very variable in size, upto 6 cm. Flowers in terminal and axillary 1-sided subsessile spikes upto 3 cm long; bracts dimorphic, the barren, in 2 rows, lanceolate, cuspidate, with scarious margined; fertile bracts smaller, orbicular. Corolla blue; upper lip, ovate, acutely acuminate; lower lip obovate, 3-lobed. Cells of the lower anthers with a long white appendage. Capsules ovoid, compressed, with 2- or 4-seeded. (Fig. 419)

Vernacular name: Khadsaliyo. Flowers: November-February. **Micromorphology** (Fig. 419)

The whole plant was glabrous; but the leaf surface showed presence of cystolith.

Stomata were of diacytic type.

D/459.

## 19. Rungia repens Nees. in Wall. Pl. As. Rar. V. 3 (1832) p. 110.

A decumbent herb often rooting near the base. Leaves oblong-lanccolate, upto 5 cm long, subsessile, unequal-sided. Flowers in erect terminal, imperfectly 1-sided spikes, upto 8 cm long; bracts elliptic, cuspidate, the margins scarious; bracteoles linear-lanceolate, with scarious margins. Calyx segments lanceolate-subulate. Corolla 2-lipped; upper lip oblong, emarginated; lower lip shortly 3-lobed. Stamens 2; anthers 2-celled, the cells often superposed, the lower cell often with a white basal appendage. Disk annular. Ovary 2-celled; ovules 2 in each cell; stigma minutely 2-fid. Capsules ovoid-oblong. Seeds suborbicular, rugose with concentric furrows, pale-brown. (Fig. 420)

Vernacular name: Khatsalio. Flowers: November-January. **Micromorphology** (Fig. 420)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with very broad basal cells.

Stomata were of diacytic type.

D/731, 1045-1046.

## 20. Thunbergia erecta T. Anders. in Journ. Linn. Soc. V. 7 (1864) p. 18.

A glabrous, upright, upto 1.25 m tall undershrub. Leaves elliptic-ovate, upto 8 cm long, apiculate. Flowers solitary axillary. Bracts deciduous. Calyx teeth subulate. Corolla tube curved yellowish-white, lobes subequal, obtuse. Staminal filaments glandular-hairy; anthers oblong, bearded, mucronate. Style long; stigma 2-lobed, upper lobe upright, lower patent. (Fig. 421)

Flowers: November-March.

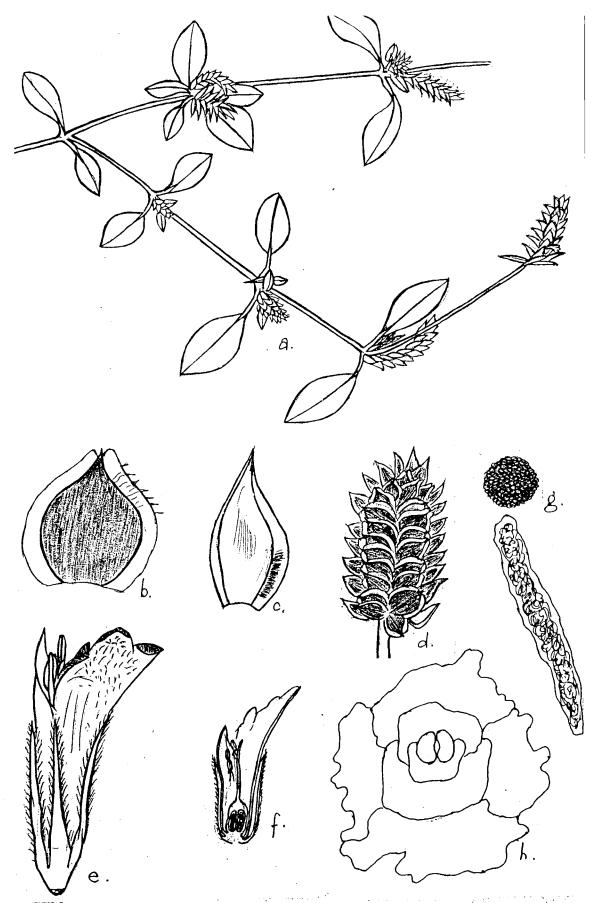


Fig. 419. Kungia parviflora Nees., a. habit, b. bract, c. bracteole, d. inflorescence, e. flower, f. L.S. of flower, g. seed, h. diacytic stomata, i. cystolith.

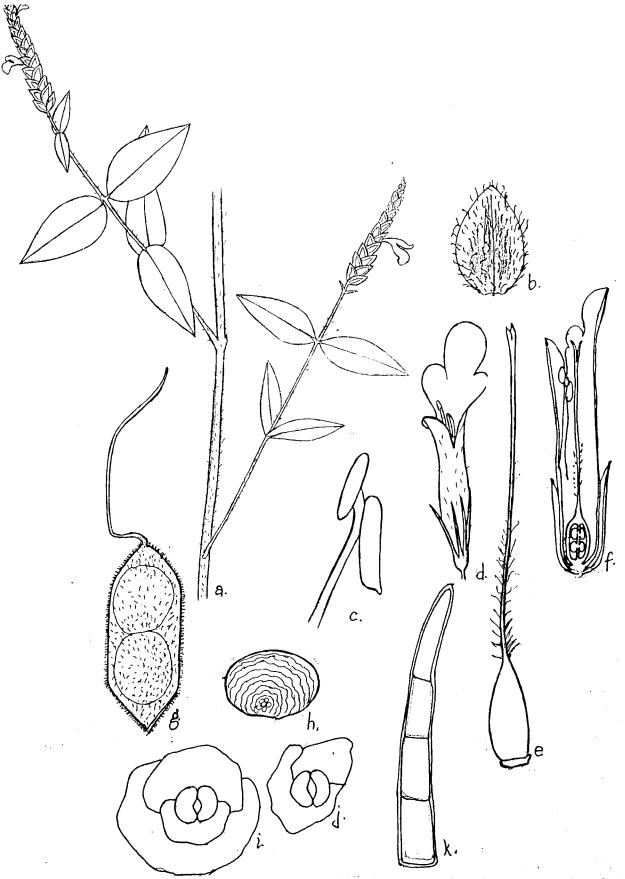


Fig. 420. Rungia repens a. habit, b. bract, c. stamen, d. flower, e. gynoecium, f. L.S. of flower, g. capsule, h. seed, i-j. diacytic stomata, k. multicellular uniseriate many celled trichome.

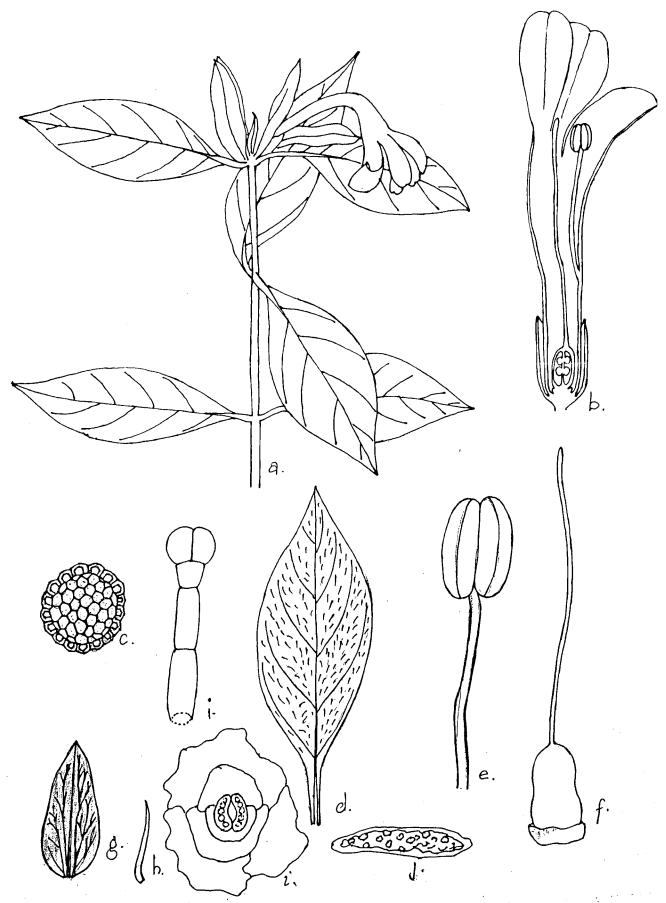


Fig. 421 Thunbergia erecta T. Anderson., a. habit, b. L.S. of flower, c. pollen-grain, d. leaf, e. gynoecium, g. bract, h. bracteole, i. gland with two celled head and three celled stalk, i. diacytic stomata, j. cystolith.

## Micromorphology (Fig. 421)

The leaf was glabrous though it showed presence of cystolith and the corolla showed presence of multicellular, glandular trichome differentiated into two celled head and a multicellular, uniseriate, trichome.

Stomata were of diacytic type.

D/233.

# Verbenaceae

# 1. Clerodendrum phlomidis Linn. f. Suppl. (1781) p. 292.

A small tree, reaching upto 10 m high, with more or less pubescent branches. Leaves ovate or subrhomboid, upto 6 cm long, dentate, undulate. Flowers in small dichotomous axillary cymes; bracts obovate-lanceolate. Calyx divided about ½-way down; segments ovate. acuminate. Corolla white; lobes nearly equal. elliptic. Stamens 4, didynamous. Ovary imperfectly 4-celled. Drupe broadly obovoid.

Flowers: August-February. (Fig. 422)

# Micromophology (Fig. 422)

The plant showed presence of three types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular trichome with elongated rectangular cells. 2) multicellular, glandular trichome differentiated into a 1-4 celled and sometimes two celled head or a single celled head and a single celled stalk. 3) multicellular, glandular trichome differentiated into a two celled head and a two celled stalk.

Stomata were of anomocytic type.

D/499.

## 2. Clerodendrum serratum (L.) Moon, Cat. Pl. Ceylon 1:46. 1824.

A shrub with 4-angled stem reaching a height of 3 m. Leaves ovate-elliptic, opposite, acutely serrate. Flowers in terminal long pyramidal panicles, each subtended by a pair of acute bracts and purplish blue in colour. Corolla bilabiate, upper lobe large. Stamens 4, didynamous. Ovary imperfectly four-celled with one ovule in each locule. Drupe subglobose, dark purple containing four pyrenes and enclosed in cupuliform calyx. (Fig. 423)

Vernacular name: Bharungi. Flowers: August-October.

Micromorphology (Fig. 423)

Leaves were glabrous.

Stomata were diacytic, anisocytic and anomocytic.

D/256.

### 3. Gmelina asiatica Linn. Sp. Pl. (1753) p. 626.

A much-branched more or less spinous shrub with horizontal, rigid, puberulous, often much shortened branchlets and spinous at the end. Leaves ovate or elliptic, upto 3 cm long, sometimes irregularly lobulate, glaucescent beneath from a coating of minute round

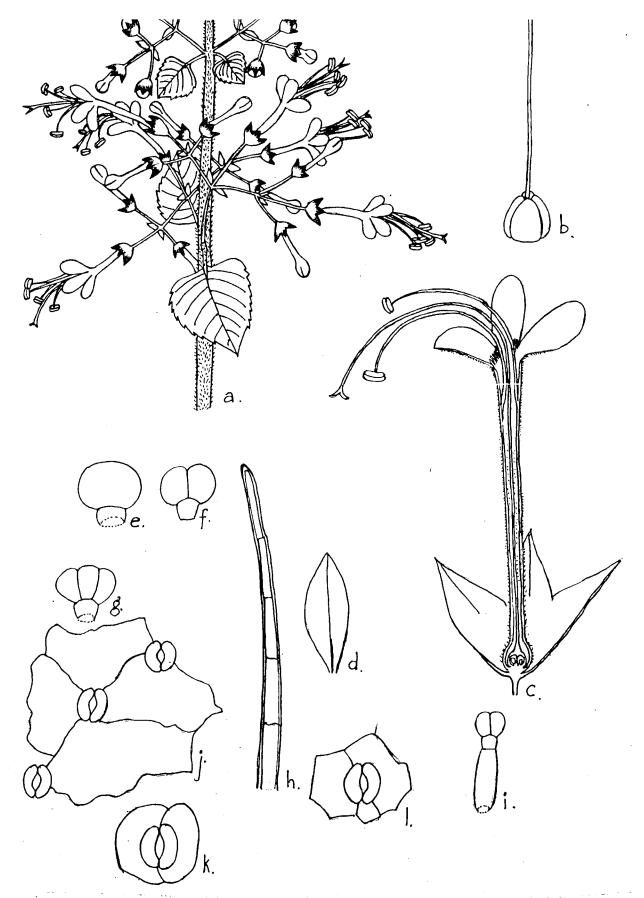


Fig. 422. Clerodendron phlomidis L. f., a. habit, b. gynoecium, c. L.S. flower, d. bract, e-g. gland with one to three celled head and a single celled stalk, h. uniseriate trichome, i. gland with two celled head and two celled stalk, j. anomocytic stomata, k. paracytic stomata, l. anisocytic stomata.



Fig. 423 Clerodendron serratum Moon., a. habit, b. flower, c. L.S. of flower, d. diacytic stomata, e. anisocytic stomata, f. anomocytic stomata.

glands. Flowers large, nodding, in terminal racemes or panicles; bracts small, caducous. Calyx cup-shaped, truncate, clothed with flattened round glands; lobes 4, small, triangular. Corolla 2-lipped, bright-yellow; tube narrow curved, inflated above; lobes 4, ovate, the lower one the largest. Drupes obovoid, yellow when ripe, containing 1 pyrene. (Fig. 424)

Vernacular name: Badhara.

Flowers: more or less throughout the year.

## Micromorphology (Fig. 424)

The plant showed presence of two types of trichomes: 1) unicellular, non-glandular trichome with thin walls and a broad lumen. 2) multicellular, glandular trichome differentiated into 3-4 celled head and a single celled stalk.

Stomata were of anomocytic type.

D/193

# 4. Phyla nodiflora (L.) Greene, Pittonia 4: 46, 1899. (Lippia nodiflora Michaux.)

A creeping perennial herb with subqudrangular stems rooting at the nodes, more or less clothed with appressed, medifixed, white hairs. Leaves spathulate, upto 4 cm long, aprressedly hairy on both sides with medifixed white hairs. Flowers sessile, densely packed in long-pedunculate axillary oblong heads; bracts elliptic-obovate, mucronate. Calyx deeply 2-lobed, mitre-shaped, the 2 acuminate lobes projecting beyond it. Corolla white or pale-pink, 2-lipped; upper lip erect, bifid; lower lip 3-lobed, the middle lobe the largest. Fruit globose-oblong, splitting into two 1-seeded plano-convex pyrenes. (Fig. 425)

Vernacular name: Ratveliyo.

Flowers: more or less all the year.

# Micromorphology (Fig. 425)

The plant showed presence of medifixed hairs with warty surface.

Stomata were of paracytic, diacytic and anomocytic type.

D/682, 683, 812.

## 5. Vitex negundo Linn. Sp. Pl. (1753) p. 638.

A large shrub with grey bark and quadrangular stem, whitish with a fine tomentum. Leaves 3-5 foliolate, leaflets lanceolate, acute, the terminal leaflet upto 10 cm long, lateral leaflets smaller, covered with a fine white tomentum beneath. Flowers in cymes; bracts lanceolate. Calyx teeth triangular. Corolla bluish-purple; upper lip divided to the base into 2 obtuse lobes; lower lip large, with 2 short oblong obtuse lateral lobes and a large broadly obovate terminal lobe. Stamens 4, didynamous; anther cells divaricate. Ovaries 2-4 celled; ovules 4; stigma 2-fid. Drupe black. (Fig. 426)

Vernacular name: Nagod.

Flowers: more or less throughout the year.

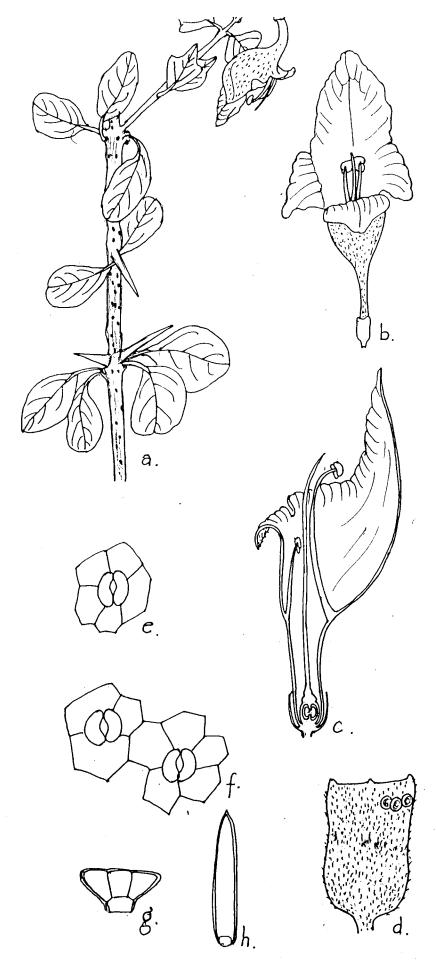


Fig. 424 Gmelina asiatica L., a. habit, b. flower, c. L.S. of flower d calve and anomacutic

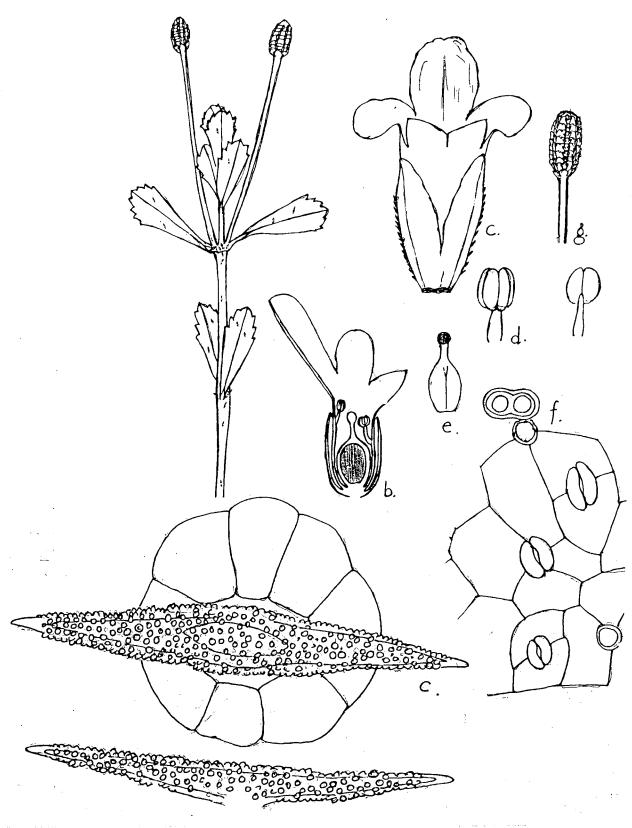


Fig. 425 Phyla nodiflora Greene., a. habit, b. L.S. of flower, c. flower, d. stamen, e. gynoecium, f. T.S. of ovary, g. inflorescence, g. diacytic stomata h. medifixed hair with thick warty wall.



Fig. 426 Vitex negundo L., a. habit, b. L.S. of flower.

## Micromorphology (Fig. 427)

There were three types of trichomes: 1) unicellular, non-glandular, elongated trichome with warty wall. 2) multicellular, uniscriate, non-glandular, unbranched trichome. 3) two -four celled glandular trichome which was sessile.

Stomata were can not observed because of numerous trichomes on the surface. D/ 744.

## 6. Tectona grandis Linn. f. Suppl.(1781) p. 151.

A large deciduous tree, tomentose with stellate hairs reaching a height of 30 m or more. Leaves elliptic or obovate, upto 60 cm, lower surface clothed with dense stellate grey tomentum. Flowers in large terminal cymose panicles upto 1 m long, with lanceolate bracts. Calyx 5-6 lobed, stellately tomentose, semiglobose-campanulate; in fruit enlarged, bladder like, enclosing the fruit, ovoid. Corolla white, 5-6 lobed; limb with spreading subequal lobes. Stamens 5-6, equal; anther

lobes parallel. Ovary 4-celled; ovule solitary; style linear; stigma shortly 2-fid. Fruit subglobose, 4-lobed. (Fig. 428)

Vernacular name: Sag. Flowers: June-September. Micromorphology (Fig. 428)

Plant showed presence of stellate hairs of 3 long arms.

D/462, 665, 996-998.

# Lamiaceae

# 1. Anisochilus carnosus Wall . Pl. As. Rar. V. 2 (1831) p. 18.

A finely pubescent, erect, annual, with stem quadrangular reaching upto 60 cm high. Leaves broadly ovate, upto 6 cm long, crenate. Flowers sessile, in dense spikes upto 4 cm long; bracts broadly ovate, acuminate. Calyx bilipped; upper lip ovate-lanceolate, decurved over the lower lip and closing the calyx-mouth; lower-lip truncate. Corolla pale-purple, 2-lipped; upper lip with very shallow rounded lobes; lower lip concave. Stamens 4, didynamous. Disk lobed. Ovary 4 partite; style 2-fid at the apex. Nutlets suborbicular, brown. (Fig. 429)

Vernacular name: Ubhoratvelio. Flowers: September-October. Micromorphology (Fig. 429)

The plant showed presence of two types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular trichome. 2) multicellular, glandular trichome differentiated into a two celled head and a one celled stalk.

Stomata were of anisocytic and anomocytic type.

D/332.

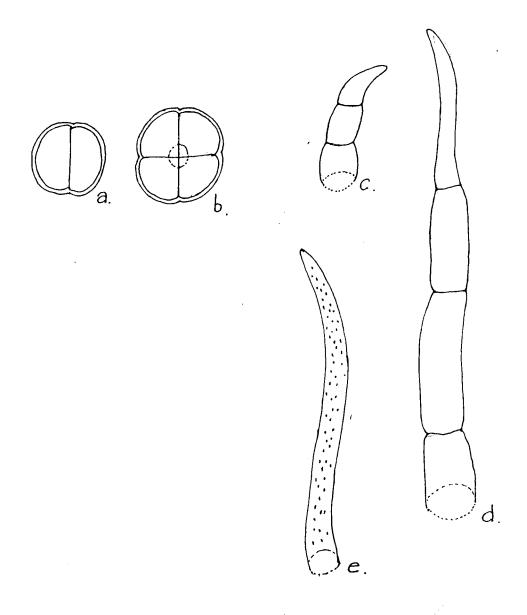


Fig. 427 Vitex negundo L., a & b. two to four celled sessile gland, c-d. multicellular uniseriate trichome, e. glandular unicellular trichome with warty wall.

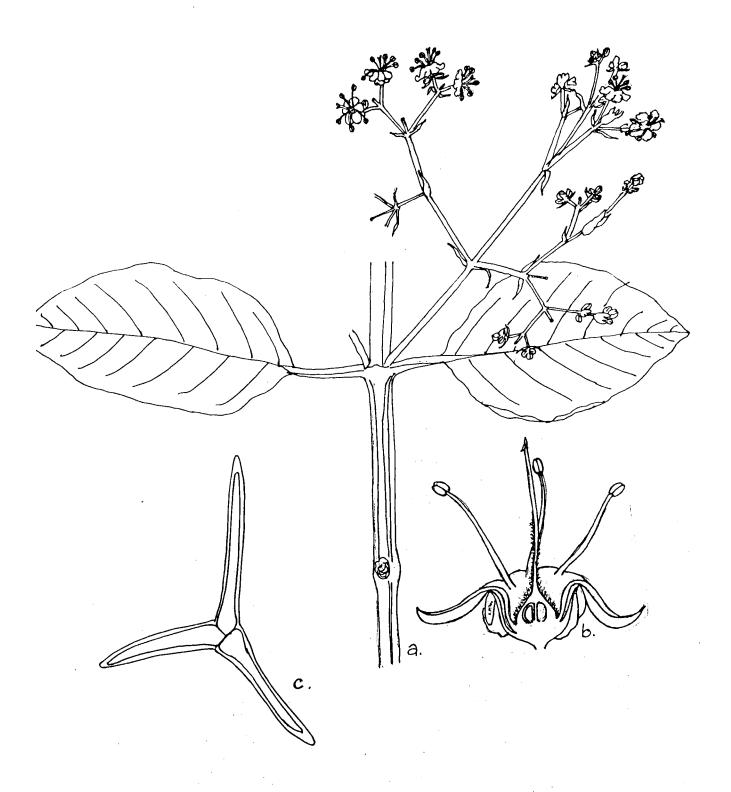


Fig. 428 Tectona grandis L., a. habit, b. L.S. of flower, c. three celled stellate hair.

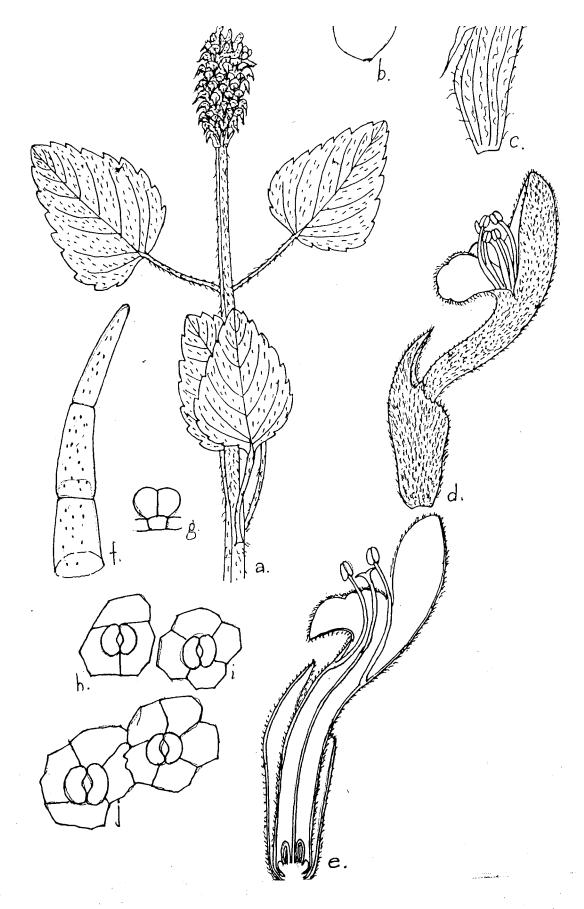


Fig. 429. Anisochilus carnosus Wall., a. habit, b. seed, c. calyx, d. flower, e. L.S. of flower, f. multicellular uniseriate trichome, g. multicellular sessile gland, h. anisocytic stomata, i. tetracytic stomata, j. anomocytic stomata.

# 2. Anisomeles indica (L.) Kuntze. Revis. Gen. Pl.2: 512. 1891.

A suffruticose, hirsute herb reaching a height of 1 m. Leaves ovate, upto 12 cm long, serrate. Flowers sessile in dense whorls to form a dense spicate inflorescence; bracts linear. Calyx teeth lanceolate. Corolla purple; upper lip oblong, rounded, the middle lobe, deeply divided into 2 oblong lobes. Filaments bearded. Nutlets broadly ovoid with rounded ends. (Fig. 430)

Vernacular name: Chodharo.

Flowers: August-October.

# Micromorphology (Fig. 430)

There were multicellular uniseriate trichomes and glands with single celled head and two celled uniseriate stalk.

Stomata were diacytic, anisocytic and anomocytic.

D/287, 489, 564, 1091, 1246.

# 3. Basilicum polystachyon L. Suppl. Meth. 143. 1802. (Moschosma polystachyon Benth.)

This is an annual with an erect much branched, sharply quadrangular, glabrous stem reaching upto 1 m in height. Leaves ovate-elliptic, upto 5 cm, serrate. Flowers in numerous whorls of spicate racemes. Calyx 2-lipped; upper lip broad, suborbicular, reflexed; lower lip with 4 lanceolate acute teeth, longer than the upper lip. Corolla pale pink; bi-lipped; upper lip 4-lobed, the lobes subequal; lower lip entire. Stamens 4, didynamous. Ovary 4-partite; style clavate. Nutlets ellipsoid, smooth, brown. (Fig. 431) Vernacular name: Abchi-baychi.

Flowers: September-January.

## Micromorphology (Fig. 432)

Almost the whole plant was glabrous, except for leaves. The trichome on the leaf was glandular, unicellular and thin walled.

The corolla and calyx showed presence of multicellular non-glandular uniseriate trichomes of differing nature, all of them had a pointed apex and broad basal cell. In some the walls were protruded out like teeth giving them a dendritic appearance. All the cells were thick walled with a broad lumen.

Stomata are anisocytic and diacytic.

D/575, 745.

# 4. Blandinia biflora (Vahl) Raf. Flora Telluriana 3: 88. 1837. (Leucas biflora R. Br.)

A procumbent, pubescent, herb with quadrangular stems and branches. Leaves ovate-elliptic, variable, upto 5 cm long, serrate. Flowers in distant axillary whorls of 1-4; bracts small, subulate. Calyx teeth subequal, lanceolate, ciliate. Corolla white, 2-lipped; upper lip extremely villous, corolla tube annulate within; the middle lobe of the lower lip emarginated. Nutlets oblong, trigonous, truncate, enclosed in the persistent calyx. (Fig. 433)

Flowers: September-February.

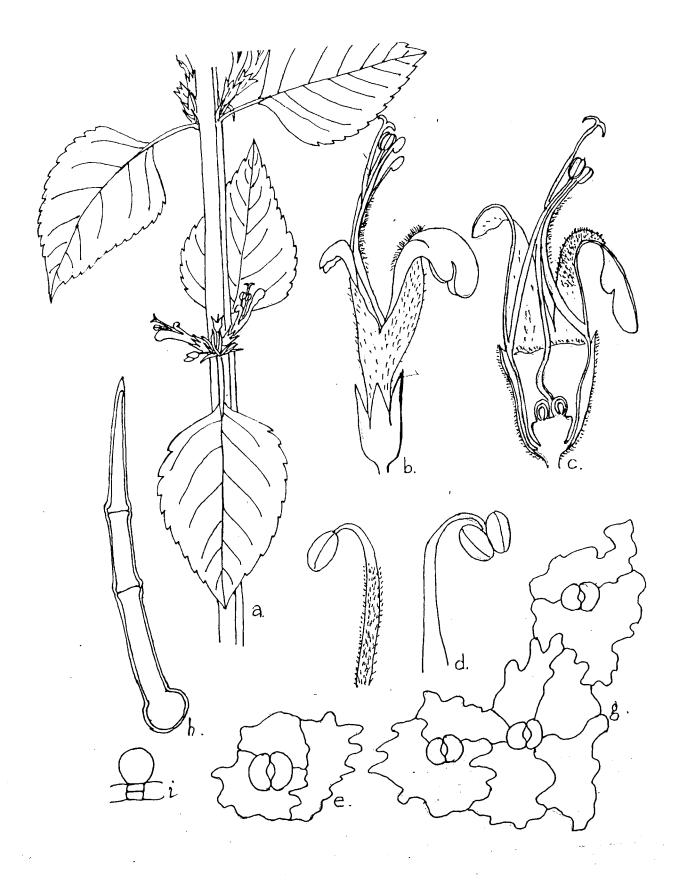


Fig. 430. Anisomelos ovata R. Br., a. habit, b. flower, c. L.S. of flower, d. stamen, e. diacytic stomata, f. anisocytic stomata, g. anomocytic stomata, h. multicellulr uniseriate trichome, i. gland with single celled head and two celled uniseriate stalk.

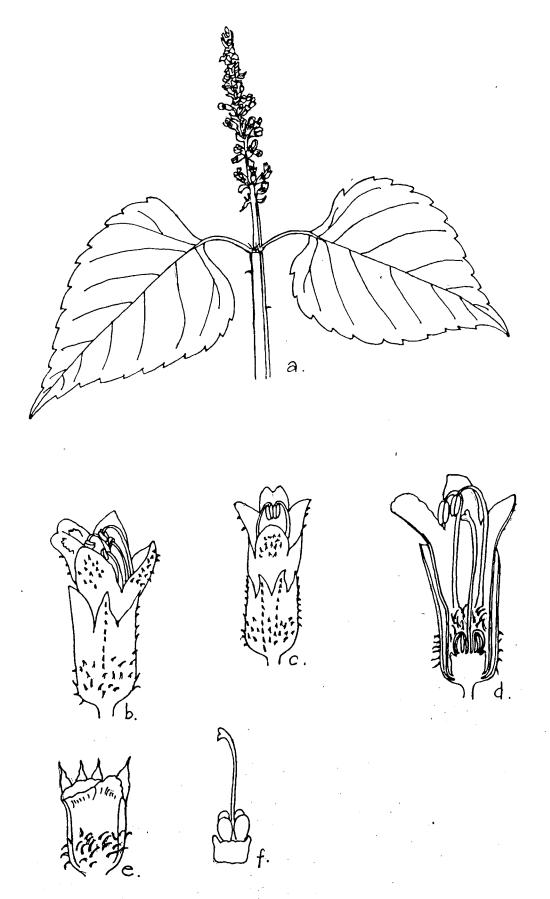


Fig. 431. Basilicum polystachyon (L.) a. habit, b-c. flower, d. L.S. of flower, e. calyx, f. gynoecium.

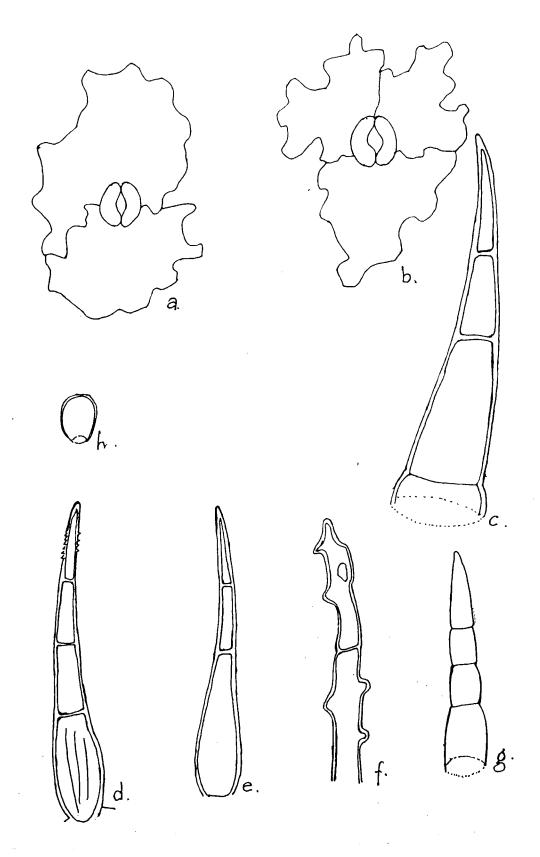


Fig. 432 Basilicum polystachyon (L.)., a. diacytic stomata, b. anisocytic stomata, c. multicellular uniseriate trichome with broad cells d-e. multicellular uniseriate trichome, f. two celled uniseriate, slightly branched trichome g. multicellular uniseriate trichome.

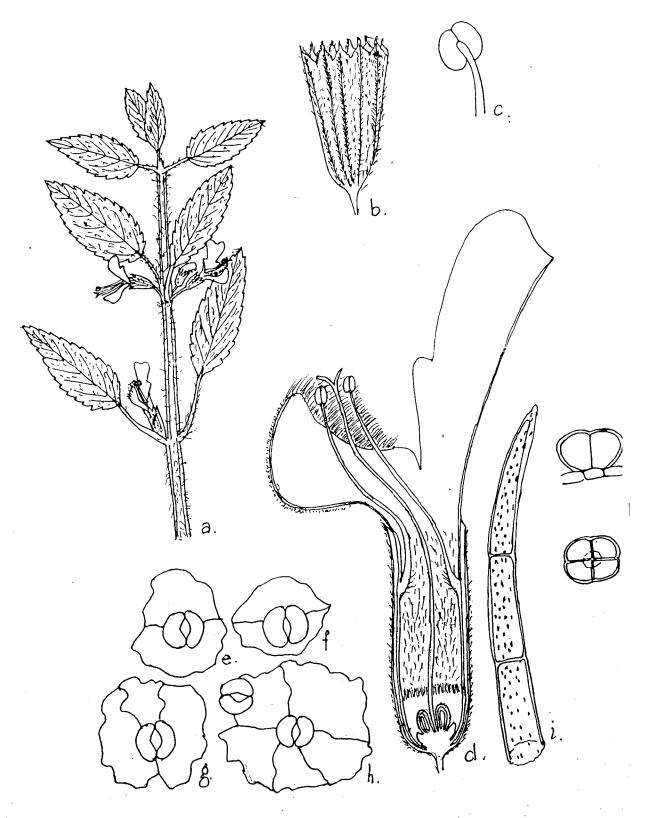


Fig. 433 Blandinia biflora (Vahl) Raf.., a. habit, b. calyx, c. stamen, d. L.S. of flower, e-f. diacytic stomata, g. anisocytic stomata, h. anomocytic stomata, i. multicellular uniseriate trichome, j. two-four celled sessile gland.

## Micromorphology (Fig. 433)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with warty thick wall. Along with it a multicellular, glandular trichome was present differentiated into a four celled sessile head.

Stomata were of diacytic, anomocytic and anisocytic type.

D/746, 1047, 1217.

# 5. Glechoma bombaiensis (Dalzell) Kuntze Revis. Gen. Pl. 2: 518. 1891. (Nepeta bombaiensis Dalz.)

A branched herb reaching upto 30 cm high with stem obtusely quadrangular, clothed with soft white hairs. Leaves rounded-ovate, upto 5 cm long, crenate. Flowers in axillary 6-8 flowered cymes; bracts elliptic-lanceolate, acuminate. Calyx

2-lipped. Corolla pale-blue with purple spots; bi-lipped; upper lip 2-fid; lower lip 3-lobed, the middle lobe broadest. Stamens 4, didynamous; anther-cells diverging.

Disk uniform. Ovary 4-partite; style shortly 2-fid; lobes subequal. Nutlets ellipsoid, darkbrown, dotted with white dots. (Fig. 434)

Flowers: July-August.

## Micromorphology (Fig. 434)

The plant showed presence of multicellular, uniseriate, unbranched non-glandular trichome.

Stomata were of diacytic, anisocytic and anomocytic type. D/1200-1204.

### 6. Hyptis suaveolens (L.) Poit. in Ann. Mus. Hist. Nat. 7: 472. t. 29. f. 2. (1806)

An annual, hirsute, herb with stems and branches reaching to a height of 1 m. Leaves broadly ovate or suborbicular, upto 7 cm long, crenate-serrulate. Flowers axillary or terminal in short umbels; bracts minute, setaceous. Calyx tubular, 10-nerved; limb subequally 5-lobed. Corolla blue; bilabiate, lobes-5, lowest lobe shorter, abruptly deflexed, saccate, contracted at base. Stamens 4, declinate; anthers 2-celled; cells confluent; disk symmetrical. Ovary 2-celled; style shortly 2-fid. Nutlets usually 2, ovoid, flat, blackish brown. (Fig. 435)

Vernacular name: Vilayati tulsi.

Flowers throughout the year.

## Micromorphology (Fig. 436)

There were trichomes and glands. The trichomes were: 1) multicellular uniseriate trichome,2) two celled uniseriate trichome. The glands were: 1) gland with single celled head and two celled uniseriate stalk, 2) unicellular gland, 3) gland with two celled head and a single celled stalk, 4) gland with single celled head and a single celled stalk.

Stomata were diacytic.

D/030, 213, 817-821.

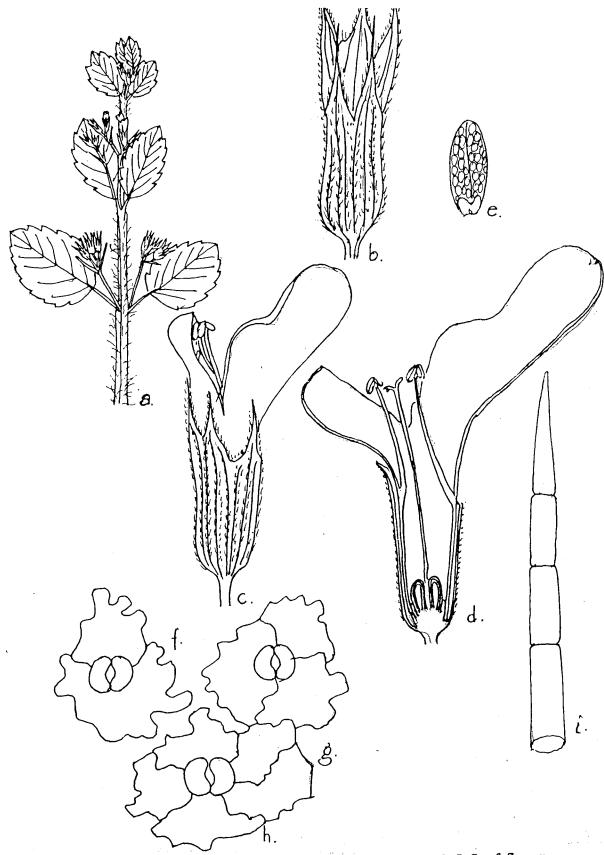


Fig. 434. Glechoma bombaiensis Kuntze., a. habit, b. calyx c. flower, d. L.S. of flower, e. seed, f. diacytic stomata, g. anisocytic stomata, h. anomocytic stomata i. multicellular uniseriate trichome.

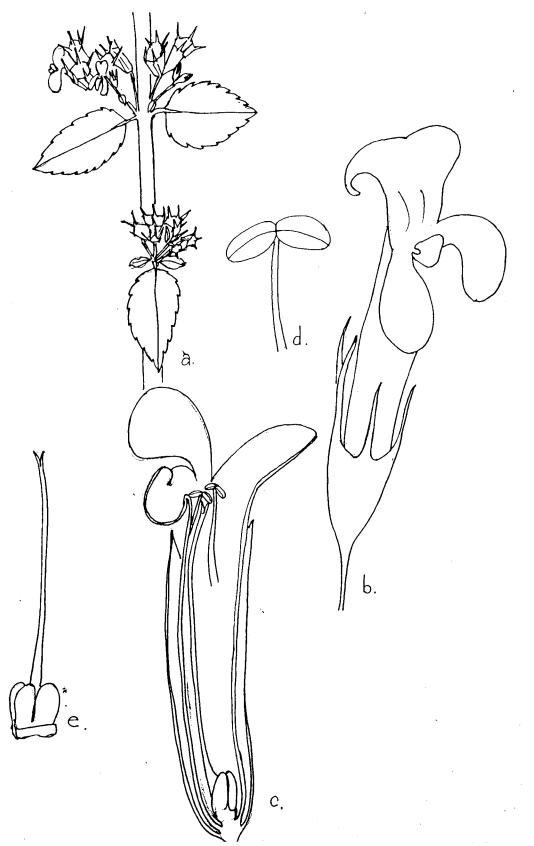


Fig. 435. Hyptis suaveolens Poit., a. habit, b. flower, c. L.S. of flower, d. stamen, e. gynoecium.

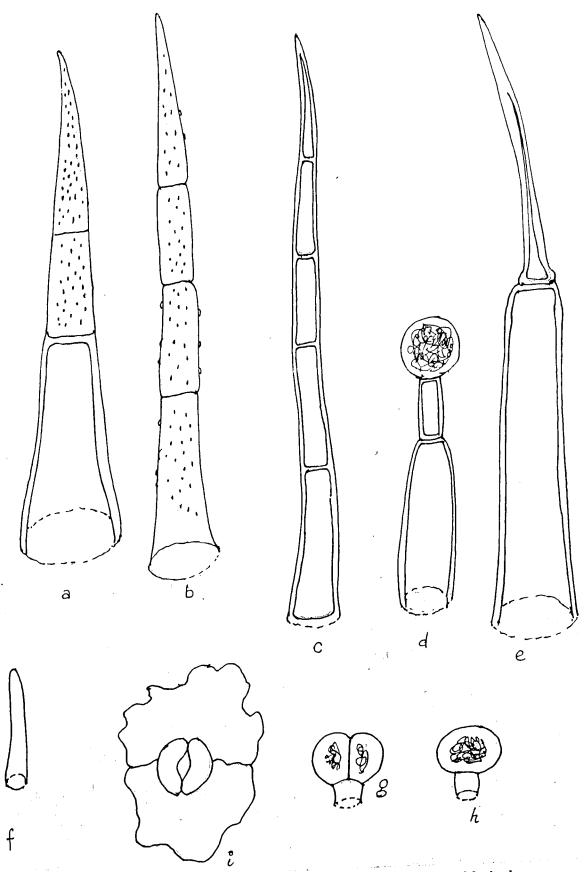


Fig. 436 Hyptis suaveolens Poit., a-c. multicellular uniseriate trichome, d. gland with single celled head and two celled uniseriate stalk, e. two celled uniseriate trichome, f. unicellular gland, i. diacytic stomata, g. gland with two celled head and a single celled stalk, h. gland with single celled head and a single celled stalk.

## 7. Leonotis nepetifolia R. Br. in. Ait. Hort. Kew. ed. 2 (1811) V. 3, p. 400.

A tall erect plant upto 2 m high with stem obtusely quadrangular. Leaves ovate, upto 15 cm long, serrate. Flowers in axillary and terminal dense globose many-flowered clusters; bracts linear, spinous-pointed, deflexed. Calyx ribbed, teeth 8-9, the upper largest, all with strong sharp spinous points. Corolla orange-scarlet; densely clothed orange-scarlet hairs, annulate inside with 3 transverse parallel rings of white hairs; upper lip densely woolly with orange-scarlet hairs; lower lip deeply 3-lobed, the lobes oblong, obtuse, the middle lobe longest. Stamens 4, didynamous;

anthers connivent, the cells divaricate. Disk equal. Ovary 4-partite. Nutlets oblong-obovoid. (Fig. 437)

Vernacular name: Hejurchei. Flowers: September-October. **Micromorphology**(Fig. 437)

The leaf showed presence of two types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular, trichome with basal broad cells. 2) multicellular, glandular trichome differentiated into 1-4 celled head, and a single celled stalk.

The trichomes on stamens were multicellular, glandular, with 2-celled head and a multicellular-uniseriate stalk.

The corolla showed presence of three types of trichomes: 1) multicellular, uniseriate, unbranched, non-glandular trichome with warty surface. 2) multicellular, uniseriate, unbranched, non-glandular trichome with smooth wall. 3) three celled non-glandular trichome with cells arranged end to end and with a swollen middle cell.

The stomata were of diacytic, anisocytic and anomocytic.

D/591-592, 1186-1187.

## 8. Leucas urticaefolia R. Br. Prodr. (1810) p. 504.

An annual with quadrangular finely tomentose, stem. Leaves ovate, upto 10 cm long. Flowers in many-flowered globose whorls; bracts linear-lanceolate, aristate. Calyx cylindric; mouth very oblique, about 10-toothed, somewhat 2-lipped, the upper lip very small with minute spinescent teeth, the lower much prolonged, the 3 lowest teeth the largest, spinescent from a triangular base. Corolla white; upper lip obovate, concave; lower lip 3-lobed. Stamens 4, didynamous; anthers conniving, the cells divaricate. Disk entire. Ovary 4-partite. Nutlets obovoid-oblong. (Fig. 438)

Vernacular name: Kubo. Flowers: August-November.

# Micromorphology(Fig. 439)

The glands present were multicellular sessile gland, and gland with single celled head and two celled stalk. The trichomes were multicellular uniseriate and two celled uniseriate trichome.

Stomata were diacytic and anomocytic.

D/282.

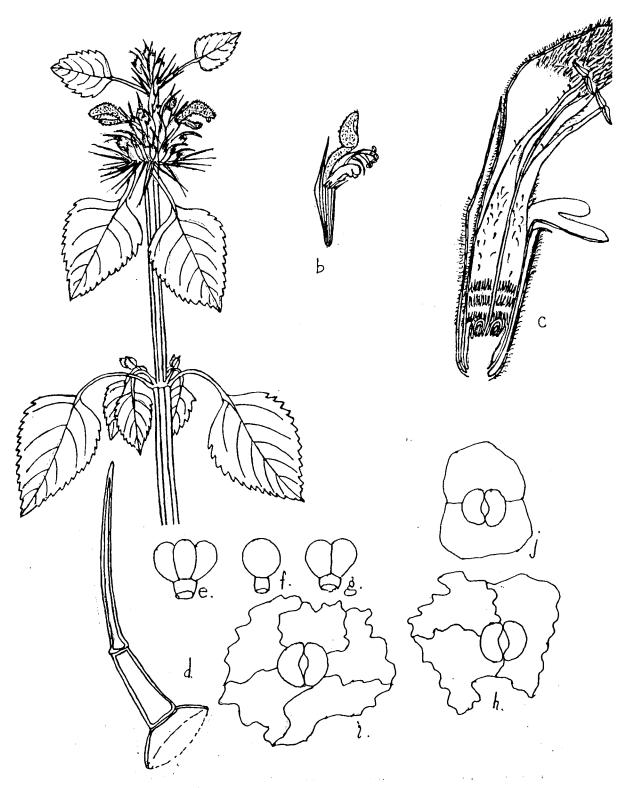


Fig. 437 Leonotis nepetifolia R. Br., a. habit, b. flower, c. L.S. of flower, d. multicellular trichome with basal cell broad, e-g. gland with single to three celled head and single celled stalk, h. anisocytic stomata, i. anomocytic stomata, j. diacytic stomata.

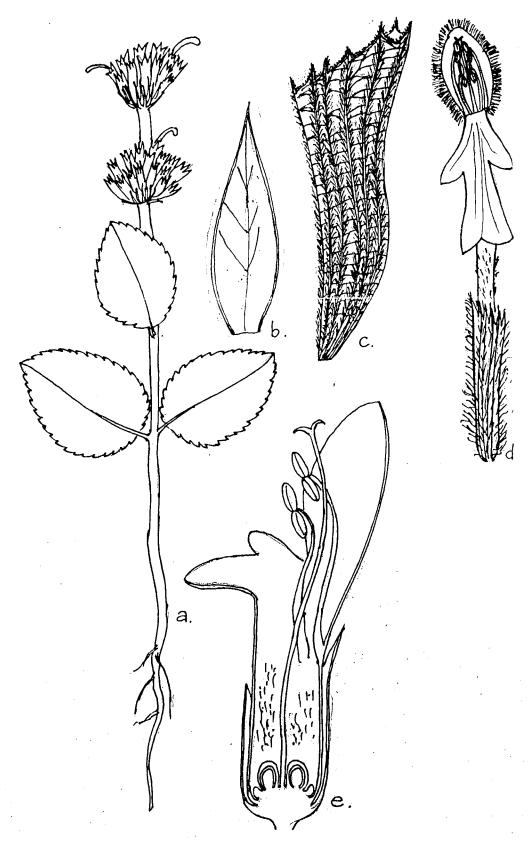


Fig. 438. Leucas urticaefolia R. Br., a. habit, b. bract, c. calyx, d. flower, e. L.S. of flower.

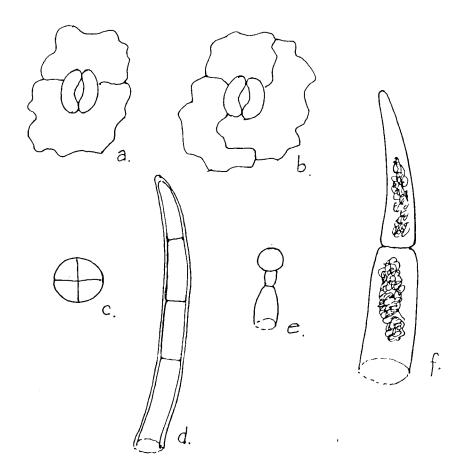


Fig. 439. Leucas urticaefolia R. Br., a. diacytic stomata, b. anomocytic stomata, c. multicellular sessile gland, d. multicellular uniseriate trichome, e. gland with single celled head and two celled stalk f. two celled uniseriate trichome.

#### 9. Leucas zeylanica R. Br. Prodr. (1810) p. 504.

A much-branched, hispid annual with quadrangular stems upto 45 cm high. Leaves linear-lanceolate, upto 8 cm long, serrulate. Flowers sessile, usually in terminal whorls; bracts linear. Calyx curved, mouth broad, oblique; upper tooth of calyx longer than the others, triangular, acute, the other teeth subequal. Corolla white, 2 cm long; upper lip densely white woolly, lower lip 3-lobed, the middle lobe broadly obovate, rounded, the lateral lobes very small. Nutlets obovoid-oblong. (Fig. 440)

Vernacular name: Kuba ni jat.

Flowers: November-January.

## Micromorphology (Fig. 440)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome.

Stomata were of diacytic and anisocytic type.

D/957.

## 10. Ocimum canum Sims. in Bot. Mag. (1824) t. 2452.

A much-branched pubescent herb, upto 60 cm high with subqudarangular stems. Leaves elliptic-lanceolate, upto 4 cm long, serrate, gland-dotted. Flowers about 6 in a whorl, in racemes upto 20 cm long; bracts elliptic-lanceolate. Calyx bi-lipped; upper lip suborbicular, mucronate; lower lip with 4 lanceolate teeth, the 2 central teeth longer than the lateral. Corolla white; upper lip broadly oblong, 4-toothed; subtruncate apex; lower lip oblong, obtuse. Stamens much exserted; the 2 upper with a tooth at the base. Style exserted beyond the filaments. Nutlets ellipsoid, black. (Fig.441)

Vernacular name: Jangali tulsi.

Flowers: July-December.

## Micromorphology (Fig. 441)

The plant showed presence of four types of trichomes: 1) multicellular, uniseriate, unbranched trichome with thick wall and a round bottom cells. 2) multicellular, uniseriate, unbranched trichome with thick and warty wall and a round bottom cells. 3) multicellular, glandular trichome differentiated into a single celled head and a single celled stalk. 4) multicellular, two celled head and a single celled stalk.

The plant showed presence of diacytic type.

D/652.

# 11. Ociumum tenuiflorum L. Sp. Pl. 597. 1753. (Ocimum sanctum L.)

A branched pubescent annual, with subquadrangular stem reaching upto 30 cm high. Leaves elliptic-oblong, upto 5 cm long, serrate, minutely gland-dotted. Flowers in racemes upto 15 cm long in close whorls; bracts ovate. Calyx 2-lipped; upper lip suborbicular, apiculate; lower lip with 2 central long slender awns which project beyond the upper lip. Corolla 2-lipped; purplish; upper lip broadly 4-lobed, lower lip entire. Stamens 4, didynamous, declinate, the upper pair with a small bearded appendage at the base. Ovary 4-partite. Nutlets 4, ellipsoid, yellow with small black markings. (Fig. 442)

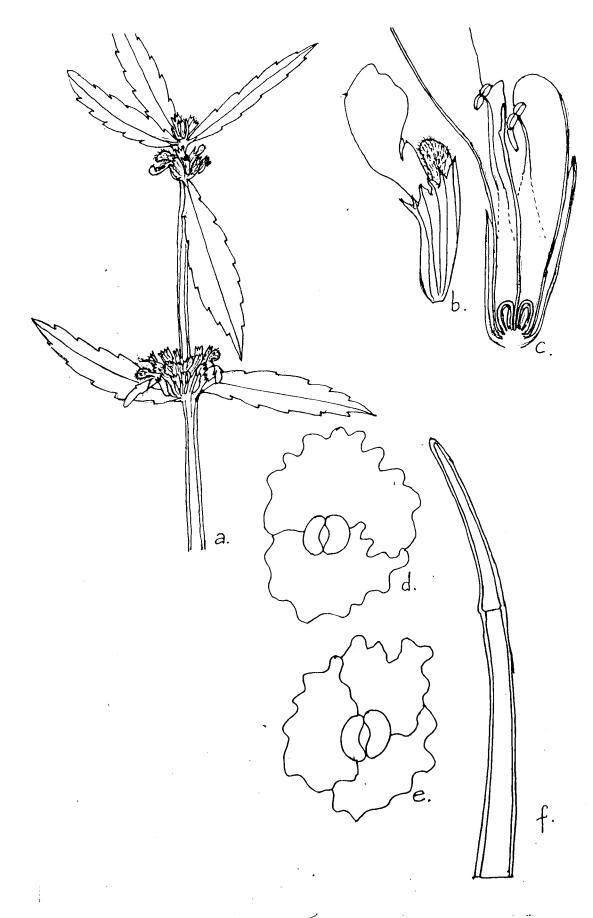


Fig. 440. Leucas zeylanica R. Br., a. habit, b. flower, c. L.S. of flower, d. diacytic stomata, e. anisocytic stomata, f. two celled uniseriate trichome.

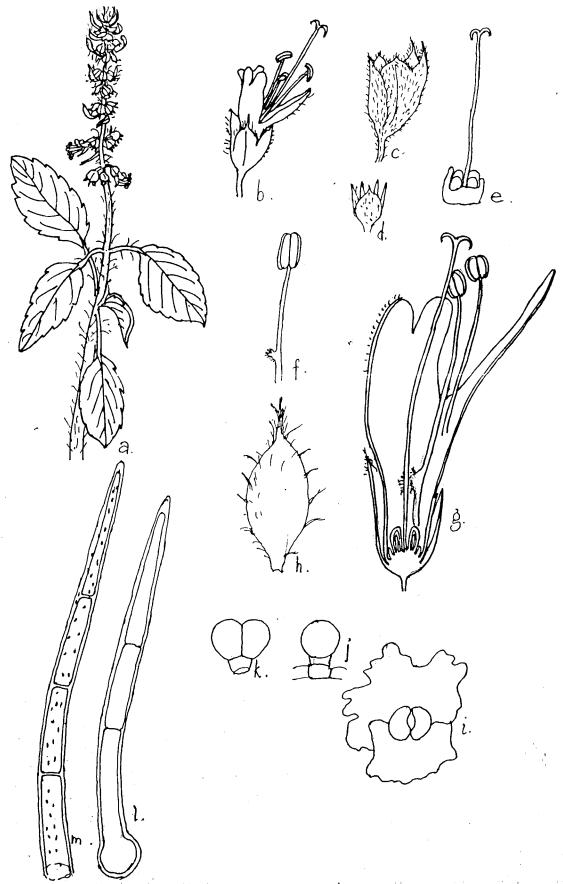


Fig. 441. Ocimum canum Sims., a. habit, b. flower, c-d. calyx, e. gynoecium, f. stamen, g. L.S. of flower, h. bract, i. diacytic stomata, j. gland with single celled head and single celled stalk, k. gland with two celled head and single celled stalk, h. multicellular uniseriate trichome with smooth wall, m. multicellular uniseriate trichome with smooth wall with warty wall.

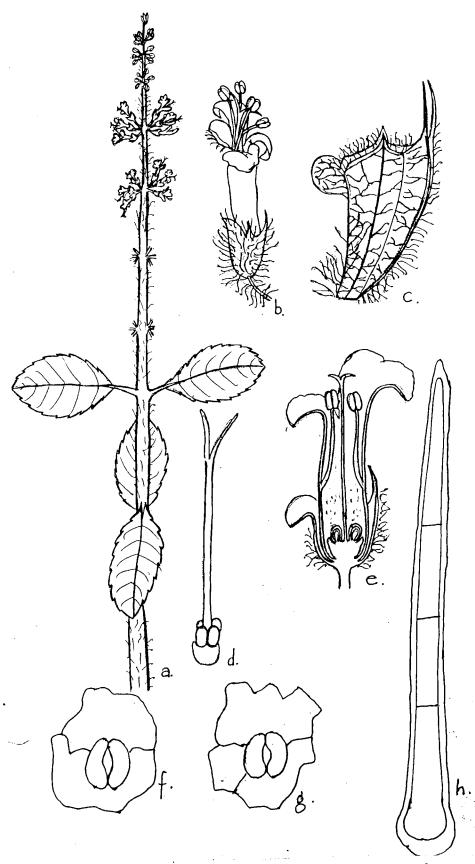


Fig. 442. Ocimum tenuiflorum L., a. habit, b. flower, c. calyx, d. gynoecium, e. L.S. of flower, f. diacytic stomata, g. anisocytic stomata, h. multicellular uniseriate trichome.

Vernacular name: Tulsi.

Flowers: Throughout the year. **Micromorphology**(Fig. 442)

The plant showed presence of a multicellular, uniseriate, non-glandular trichome with thick wall and the lower cell with a round base.

Stomata were of anisocytic, diacytic and anomocytic type. Among these, anisocytic and anomocytic type of stomata were in majority.

D/700-701.

# Nyctaginaceae

## 1. Boerhaavia diffusa Linn. Sp. Pl. (1753) p. 3

A glabrous prostrate or ascending divaricately branched herb with stem reaching upto 1 m long. Leaves broadly ovate or sub-orbicular, in unequal pairs at each node, the larger upto 3 cm, rounded. Flowers small, in umbels of 4-10 flowers arranged in axillary or terminal corymbose panicles; bracteoles lanceolate. Perianth petaloid, gamotepalous, limb funnel shaped, 5-lobed, plicate. Stamens 2 or 3. Ovary oblique; ovule erect; stigma peltate. Fruit broadly and bluntly 5-ribbed, glandular. (Fig. 443)

Vernacular name: Punarava.

Flowers: More or less throughout the year.

Micromorphology (Fig. 443)

Whole plant was glabrous.

Stomata were cyclocytic, tetracytic and anisocytic.

D/430, 485.

#### 2. Boerhavia repanda Willd., Sp. Pl. 1: 22, 1797

A diffuse decumbent branched herb with long internodes and branches upto 15 cm long. Leaves deltoid-ovate, upto 7 cm long, acuminate, repand-sinuate. Flowers in 3-8 flowered umbels; bracteoles beneath the umbels lanceolate. Perinath petaloid, pink, limb funnel shaped with 5-lobed margin, the lobes plicate. Stamens 5. Ovary oblique; ovule erect; stigma peltate. Fruit clavate, ribbed, rough with glandular knobs (Fig. 444).

Flowers: October-December.

#### Micromorphology (Fig. 445)

The plant showed presence of multicellular, non-glandular, uniseriate, unbranched trichome with a broad basal cell.

Stomata were of anomocytic type.

D/ 441-442, 473.

# 4. Commicarpus verticillatus (Poir.) Standl. Contr. U. S. Natl. Herb. 18(3): 101. 1916. (Boerhaavia verticillata Poir.)

A glabrous branched climber. Leaves thick, broadly ovate or suborbicular, upto 6 cm long, obtuse, mucronate, sinuate margins. Flowers in long-pedunculate racemes arranged

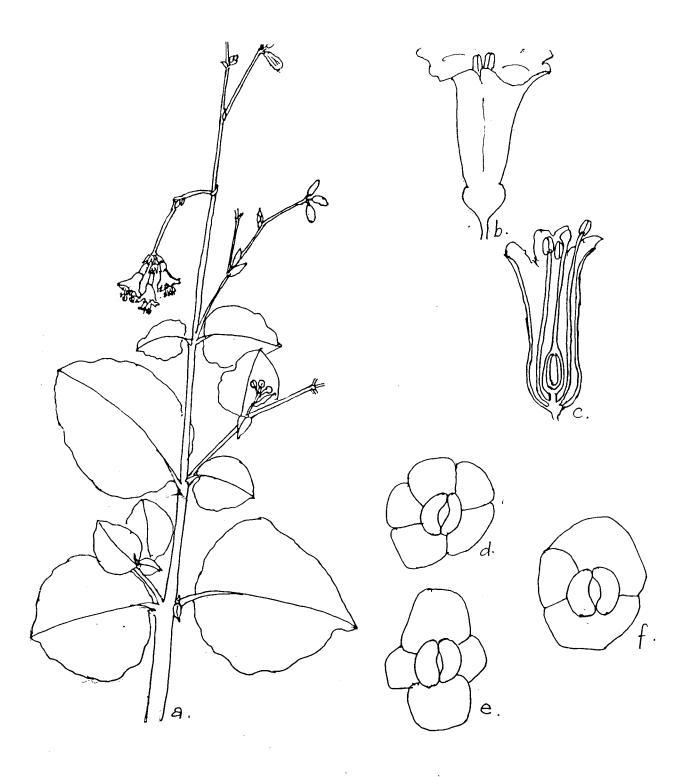


Fig. 443 Boerhaavia diffusa L., a. habit, b. flower, c. L.S. of flower, d. anomocytic stomata, e. tetracytic stomata, f. anisocytic stomata,

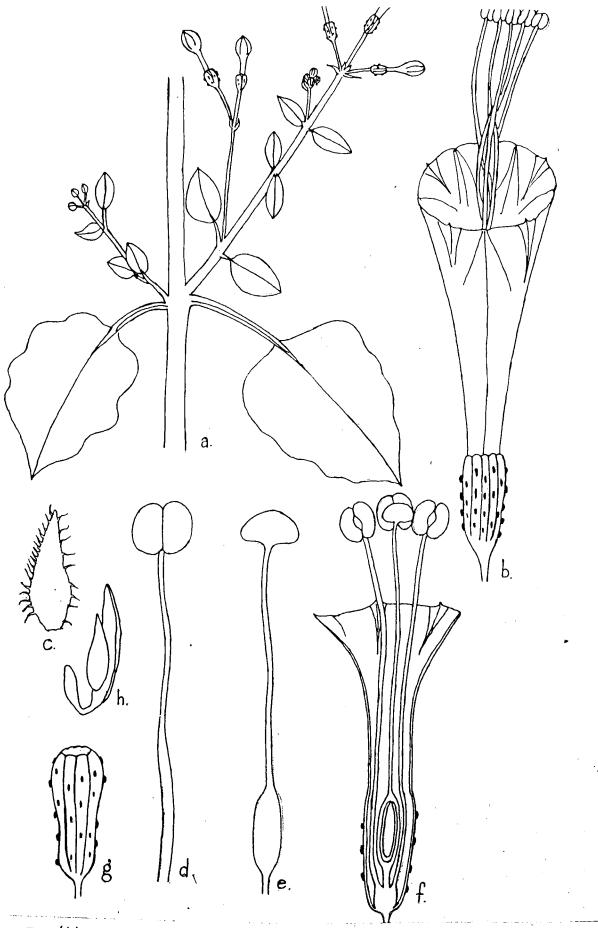


Fig. 444. Boerhaavia repanda Willd., a. habit, b. flower, c. bract, d. stamen, e. gynoecium, f. L.S. of flower, g. capsule, h. seed.

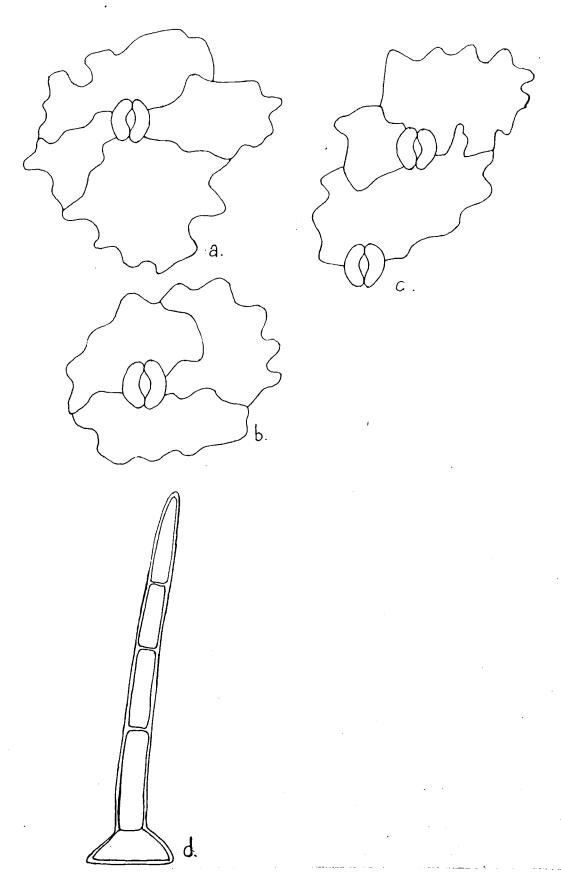


Fig. 445. Boerhaavia repanda Willd., a-b. anomocytic stomata, c. anisocytic stomata, d. multicellular uniseriate trichome.

in few-flowered whorls; bracteoles ovate-oblong, acute, deciduous. Perianth white, gamotepalous; tube constricted above the ovary, upper portion funnel-shaped; lobes of the limb 2-fid. Stamens 5, connate below. Ovary oblique, ovule erect; stigma peltate. Fruit furnished with large semi-globose glands round the crown (Fig. 446).

Vernacular name: Zeri Satodo. Flowers: August-December.

Micromorphology (Fig. 446)

The leaves were covered by multicellular, glandular, trichomes having a large globose one celled head filled with ergastic substances and 3 celled stalk, the glands of the bracts were similar but the terminal cell was long rectangular.

Stomata were of anisocytic and tetracytic type.

D/362-364, 990, 1037.

#### 4. Bougainvillea specatabilis Willd., Sp. Pl. V. 2 (1799) p. 348

An armed branched, evergreen, pubescent climber. Leaves orbicular-ovate, acuminate at apex. Spines upto 3 cm long. Flowers usually in clusters of 3, bracts obtuse, ternate at the ends of every branchlet and forming immense panicles of a deep magenta colour. Perianth greenish-yellow, tubular with a spreading, 5-lobed limb. Stamens 5, unequal, scarcely exserted. Ovary stipitate; style lateral; stigma linear (Fig. 447).

Vernacular name: Boganvel.

Flowers: More or less throughout the year.

Micromorphology(Fig. 447).

There were non-glandular and glandular trichomes. The non-glandular wasmulticellular uniscriate trichome with thick wall and glandular was multicellular uniscriate trichome. Stomata were anomocytic, tetracytic and anomocytic.

D/78.

#### Amaranthaceae

### 1. Achyranthes aspera Linn. sp. Pl. (1753) p. 204.

An erect, herb with quadrangular branches reaching upto 1m high. Leaves elliptic or obovate, thick, pubescent on both sides. Flowers greenish-white, stiffy deflexed against the woolly-pubescent rhachis, in elongate terminal spikes reaching as much as 50 cm long. Bracts broadly ovate, aristate, bracteoles with a spine as long as the blade which hardens in fruit and falling off tepals ovate-oblong and finely pointed with narrow white membranous margins. Stamens 5 connate at base, with equal number of toothed staminodes. Ovary oblong; 1-celled; ovule solitary, pendulous from a long basal funicle; stigma capitellate. Utricle oblong-cylindric, enclosed in the hardened perianth enclosing a brown subcylindric seed. (Fig. 448)

Vernacular name: Sonar. Flowers: November-January.

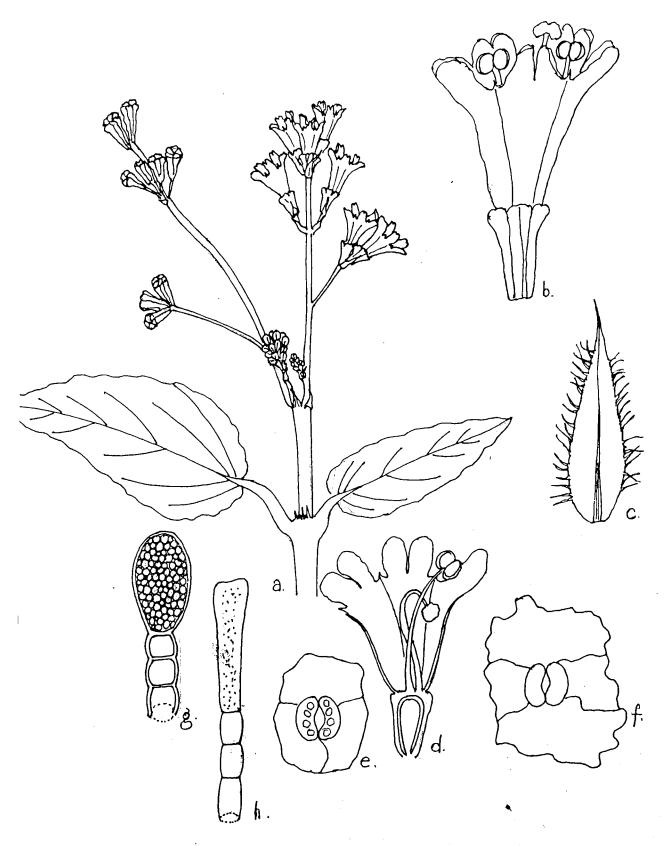


Fig. 446. Commicarpus verticillatus Standl, a. habit, b. flower, c. bract, d. L.S. of flower, e. anisocytic stomata, f. tetracytic stomata, g-h. glandular with single celled head and multicellular uniseriate stalk.

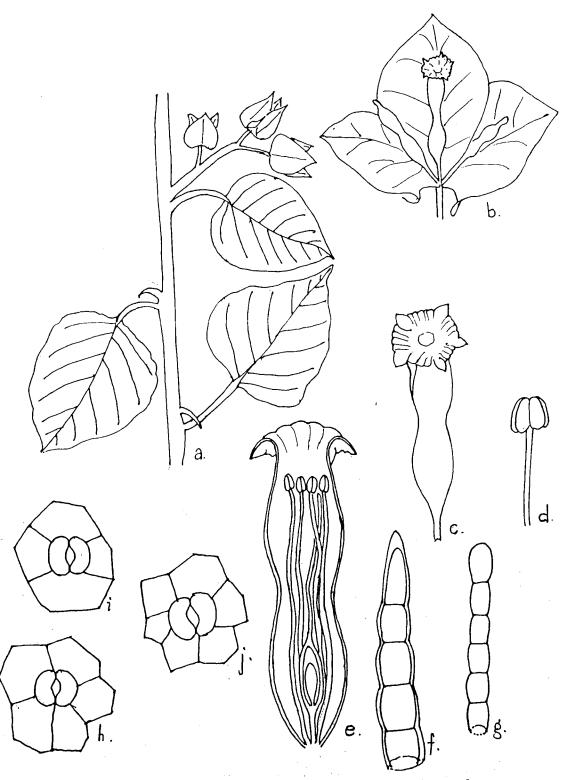


Fig. 447. Bougainvillea spectabilis Willd., a. habit, b. inflorescence, c. flower, d. stamen, e. L.S. of Stamen, f. multicellular uniseriate trichome with thick wall, g. glandular multicellular uniseriate trichome, h. anomocytic stomata, i. tetracytic stomata, j. anomocytic stomata.

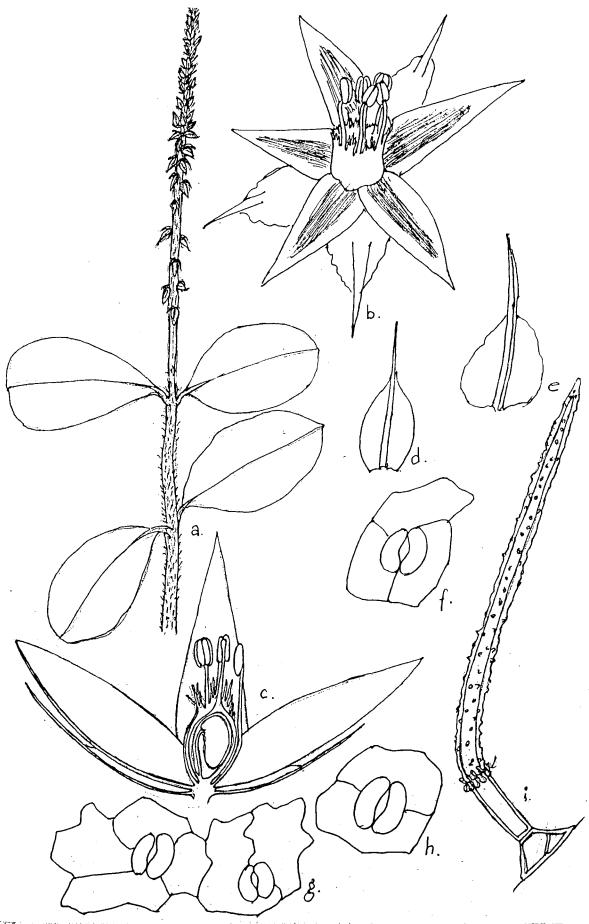


Fig. 446. Achyranthes aspera L., a. habit, b. flower, c. L.S. of flower, d. bract, e. bracteole, f. anisocytic stomata, g. anomocytic stomata, h. diacytic stomata, i. multicellular uniseriate trichome with upper cell long. warty and thick walled.

#### Micromorphology (Fig. 448)

There were three-celled uniseriate trichomes with thick papillate wall in upper long cell and projections at the septa.

Stomata anisocytic, diacytic, and anomocytic.

D/381.

### 2. Aerua lanata Juss. in Ann. Mus. Par. V. 2 (1803) p. 131.

An erect or prostrate pubescent, branched herb with a long tap-root. Leaves elliptic or obovate, acute, more or less white with cottony hairs beneath. Flowers greenish-white, bisexual, in small dense subsessile axillary heads or spikes often closely crowded; bracteoles membranous, broadly ovate, concave, apiculate. Tepals oblong, obtuse, sometimes apiculate, silky-hairy on the back. Utricle ovoid; stigmas 2. Seeds small, smooth and polished, black. (Fig. 449)

Vernacular name: Gorak ganjo.

Flowers: August-October.

### Micromorphology (Fig. 449)

There were multicellular uniseriate trichomes with thick papillate wall and projections at the septa.

Stomata anisocytic and anomocytic.

D/951.

#### 3. Alternanthera bettzickiana (Regel) Nicholson, III Dict. Gard. ed. 1. 59. 1884.

A migrant perennial erect or decumbent, herb with many branches reaching a length of 50 cm. Stem tinged with purple on nodes. Leaves oblong-obovate or spathulate, upto 6 cm, in subequal pairs, clothed with fine denticulate hairs. Heads axillary, sessile, usually globose or ovoid, solitary, white. Tepals lanceolate, acute, mucronate. Utricles falling off with the tepals. (Fig. 450)

Flowers: throughout the year.

#### Micromorphology (Fig. 450)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with walls with projects or warty walls and the joints had finger like projections.

Stomata were of diacytic and paracytic type.

D/320.

## 4. Alternanthera sessilis (Linn.) DC. Cat. Hort. Monsp. 77. 1813.

A prostrate or decumbent herb, often rooting at lower nodes. Leaves elliptic-obovate, narrowed into a long petiole. Inflorescence of white globose or oblong heads, sessile in the axil. Bracts and bracteoles subequal, scarious, white. Perianth lobes acuminate, with a few hairs on back, ovate, acute, scarious, one-nerved. Filaments 5, but only 3 antheriferous, united below into a short tube; staminodia subulate, filiform. Ovary obovoid; style 1; stigma capitate. Utricle, obreniform, deeply emarginated, dark-brown. Seed discoid. (Fig. 451)

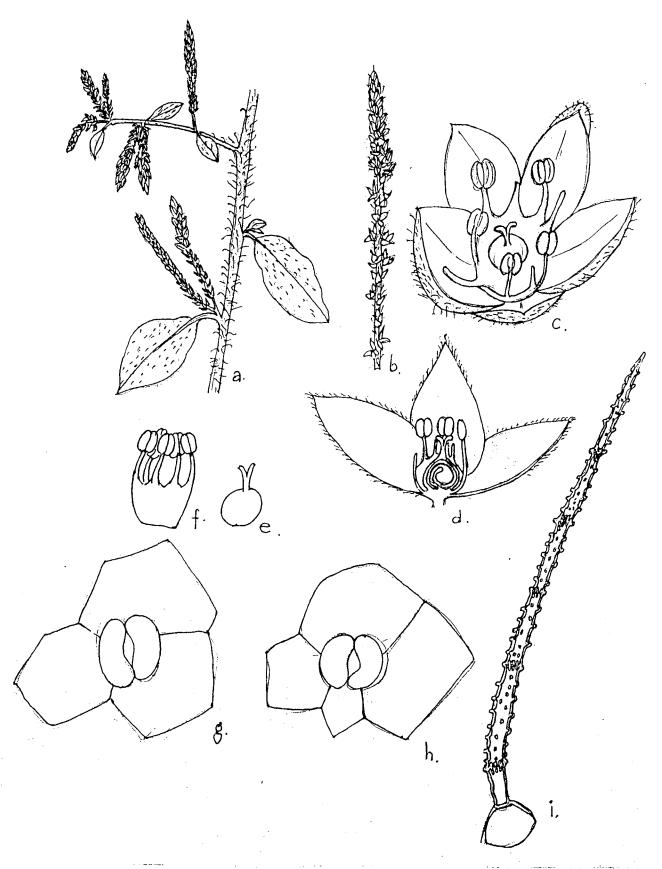


Fig. 449. Aerua lanata Juss., a. habit, b. inflorescence, c. flower, d. L.S. of flower, e. gynoecium, f. stamens connate, g. anisocytic stomata, h. anomocytic stomata, i. multicellular uniseriate trichome with thick papillate wall and projections at the septa.

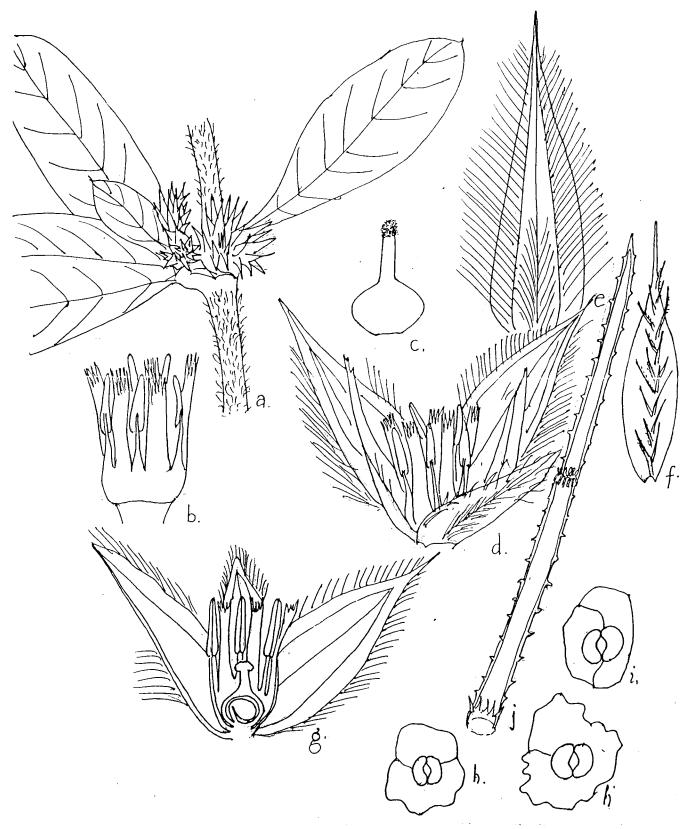


Fig. 450. Alternanthera bettzickiana (Regel) Nicholson., a. habit, b. staminal tube with staminodes, c. synoecium, d. flower, e. bract, f. bracteole, g. L.S. of flower, h. diacytic stomata, i. paracytic stomata, j. two to many celled uniseriate trichome with thick warty wall.

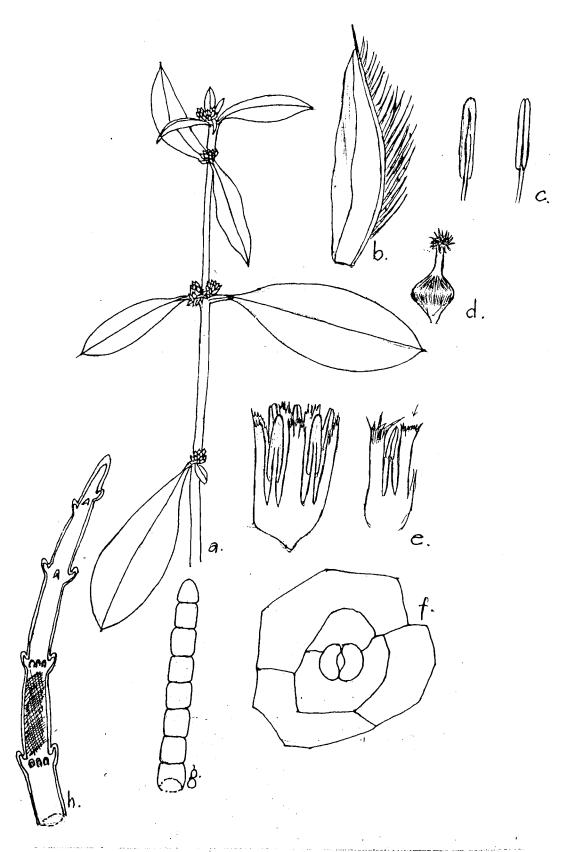


Fig. 451. Alternanthera sessilis DC., a. habit, b. bract, c. stamen, d. gynoecium, e. staminal tube with staminodes, f. diacytic stomata, g. multicellular uniseriate trihcome with small cuboidal cells, h. multicellular uniseriate trichome with finger-like projections at the septa.

Vernancular name: Pani ni Bhaj. Flowers: throughout the year. **Micromorphology** (Fig. 451)

There was a uniseriate gland with small cuboidal cells in addition to multicellular uniseriate trichome with finger-like projections at the septa and striated wall.

Stomata diacytic. D/342.

#### 5. Amaranthus spinosus Linn. Sp. Pl. (1753) p. 991.

An erect glabrous herb upto 30 cm high with often reddish, many grooved branches and with sharp divaricate spines. Leaves ovate or lanceolate, upto 7 cm long, spinous-apiculate. Flowers numerous, in dense axillary clusters and in terminal and axillary dense or interrupted spikes; bracteoles 2, linear, bristle-pointed. Male flowers with 5 ovate, acute, bristle-pointed tepals. Stamens 5, free; anthers 2-celled; staminodes 0. Female flowers: Perianth of female flowers scarcely long with 5 oblong tepals. Ovary ovoid, compressed, 1-celled; ovule solitary, erect; styles 2, divaricate. Capsules ovoid, circumsessile about the middle. (Fig. 452)

Vernacular name: Bhaji ni jat.

Flowers: September.

Micromorphology (Fig. 452)

Whole plant was glabrous.

Stomata were of anomocytic and anisocytic types.

D/417.

#### 6. Amaranthus viridis Linn. Sp. Pl. ed. 2 (1763) p. 1405.

An erect glabrous herb upto 30 cm high with often purplish, many grooved branches. Leaves ovate or deltoid, upto 8 cm long, usually notched at the apex. Flowers pale green, in small axillary clusters and in slender tapering terminal and axillary spike- like racemes; bracteoles ovate-oblong, with a green keel. Sepals 3, ovate-oblong, with a strong green keel. Stamens 5, connate at the base, anthers basifixed. Ovary ovoid, 1-celled, ovule solitary, styles 3, each style branching to give distinct stigma. Utricle indehiscent. Seed very small, shining black. (Fig. 453)

**Variations observed:** *Amaranthus viridis* is said to have 2-3 styles, but in my specimen, styles were 3, each style branching to give distinct stigma.

Vernacular name: Dhhimdo. Micromorphology (Fig. 453)

Whole plant was glabrous.

Stomata present were anisocytic and anomocytic, the latter more common. D/152.

#### 7. Celosia argentia Linn. Sp. Pl. 205. (1753)

An erect branched annual reaching a height of 1 m with strongly ribbed stems. Leaves oblong-lanceolate, upto 13 cm long, acuminate. Spikes terminal, solitary, straw-coloured, sometimes tinged reddish, upto 10 cm long. The uppermost flowers sterile, sessile; bracts

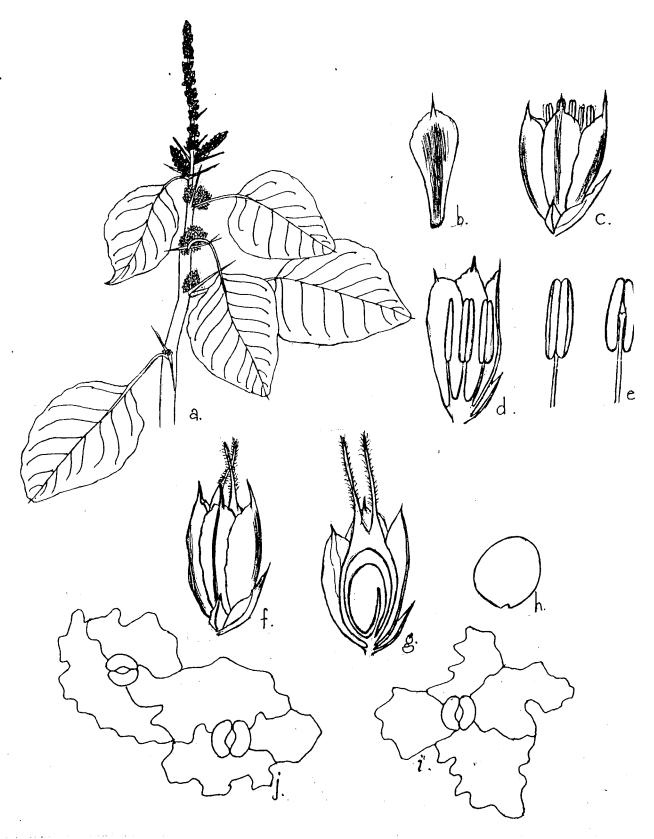


Fig. 452. Amaranthus spinosus L., a. habit, b. bract, c. male flower, d. L.S. of male flower, f. female flower, g. L.S. of female flower, h. seed, i-j. anomocytic stomata.

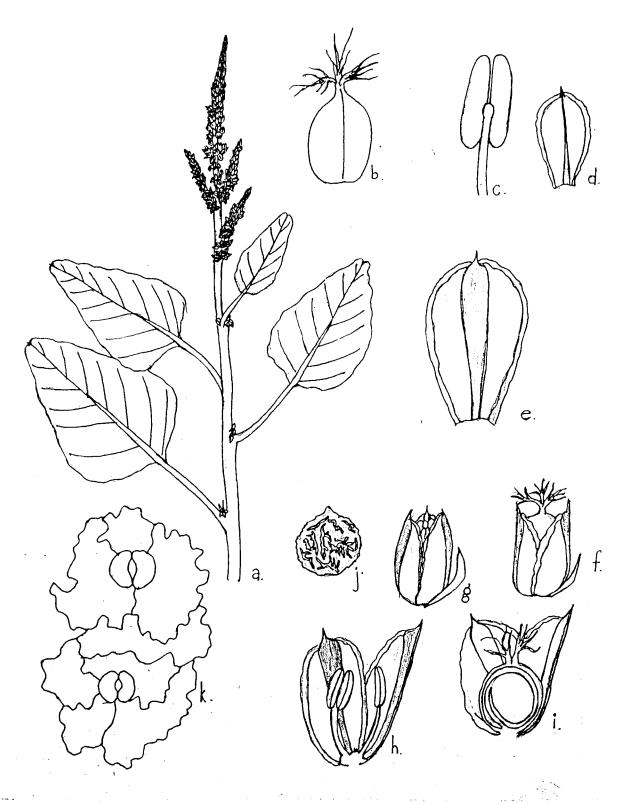


Fig. 453. Amaranthus viridis L., a. habit, b. gynoecium, c. stamen, d. bract, e. perianth, f. female flower, g. male flower, h. L.S. of male flower, i. L.S. of female flower, j. seed, k. anomocytic stomata.

and bracteoles subequal, ovate, mucronate, pellucid, 1-nerved, persistent. Perianth lobes subequal, ovate, concave, mucronate, white or white with pink tip. Stamens 5, united to form a high cup, and the cup shows infoldings. Pseudo-staminodes minute. Ovary ellipsoid; stigma 2, minute. Fruit an obovoid utricle. Seed reddish-brown. (Fig. 454)

Additional characters: the staminal cup showing infolding are not reported earlier.

Vernacular name: Lamdi.

Flowers: August-November.

### Micromorphology (Fig. 455)

There were glands with a biseriate head and uniseriate stalk.

Stomata were anisocytic and anomocytic.

D/568, 686, 839, 840, 1043.

# 8. Celosia trigyna L. Mantissa Plantarum 2: 212–213. 1771. (Digera arvensis Forsk.)

An annual weed of about 60 cm in height with glabrous spreading branchlets. Leaves ovate or elliptic, upto 7 cm long, acute, sometimes with reddish margins. Flowers sessile, in lax axillary peducunclate spikes upto 12 cm long. Bracts and bractcoles ovatelanceolate, submembranous, persistent. Tepals 5, slightly connate below, oblong, rosecolored. Stamens 5; free, anthers 2-celled; staminodes 0. Ovary 1-celled; ovule solitary, erect; stigmas, recurved. Utricle globose with a green fleshy outgrowth. Seed single, yellowish-brown. (Fig. 456)

Additional characters: The globose utricle shows presence of fleshy green branched outgrowth which is branched like a pair of horns on either sides. This was not recorded earlier

Vernacular name: Kanjro lolar.

Flowers: September-November.

### Micromorphology (Fig. 456)

The plant was glabrous.

Stomata were anomocytic sometimes with sister stomata.

D/100.

#### 9. Gomphrena celosioides Mart. Beitr. Amar. 93. 1825

A densely white-hairy prostrate annual with branches having swollen nodes. Leaves oblanceolate, subsessile upto 5 cm long. Flowers white in terminal subglobose or elongate-cylindric spikes. Tepals 5, white; usually smaller towards the apex of the raceme, absent in the highest flower. Style exserted; stigma 2, recurved. Utricle compressed, globose, margined, muriculate with a persistent style base. Seeds yellowish-brown. (Fig. 457)

Flowers: August-December.

#### Micromorphology (Fig. 457)

There were multicellular uniseriate trichomes characterized by broad basal cells and elongated upper cells.

Stomata anomocytic.

D/253.

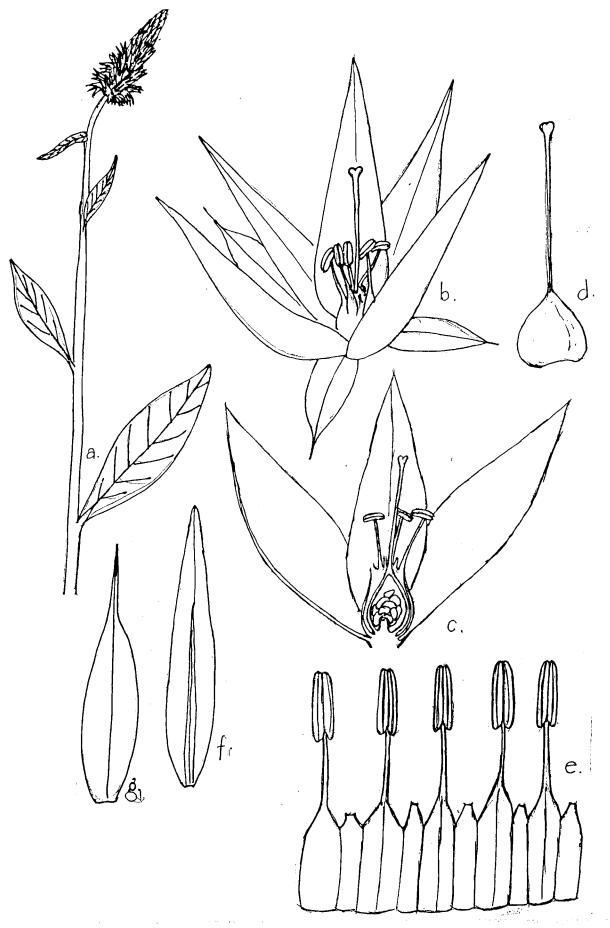


Fig. 454. Celosia argentia L., a. habit, b. flower, c. L.S. of flowe, d. gynoecium, e. staminal filaments connate and alternate with staminodes, f. bract, g. bracteole.

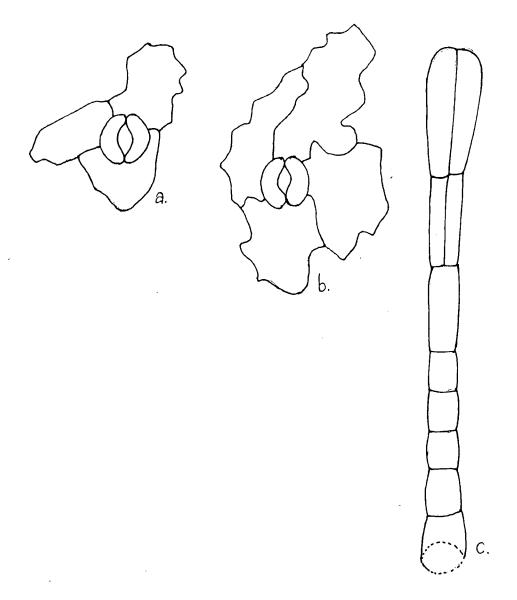


Fig. 455. Celosia argentia L., a. anisocytic stomata, b. anomocytic stomata, c. gland with biseriate head and uniseriate stalk.

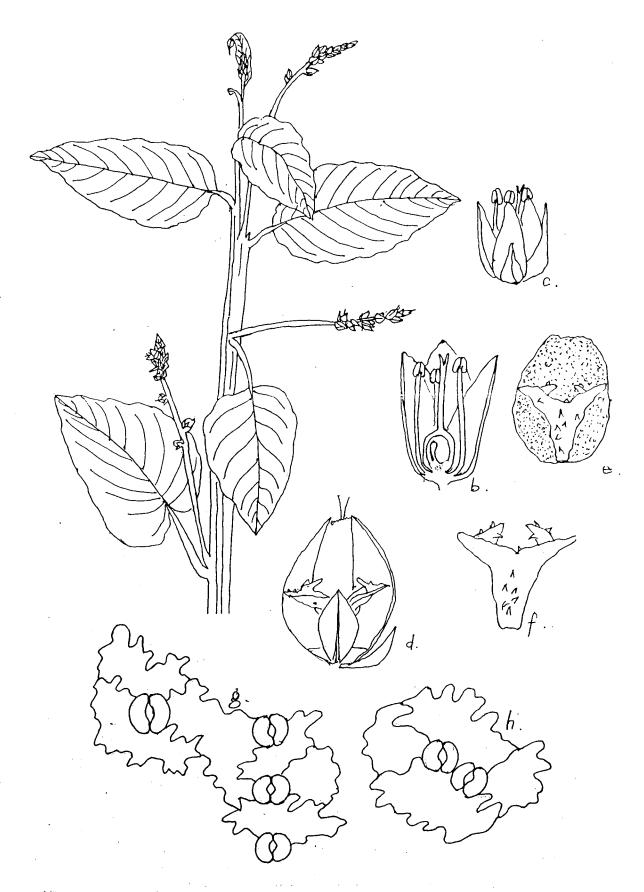


Fig. A56 Celosia trigyna L., a. habit, b. L.S. of flower, c. flower, d. fruit, e. fruit with bract, bracteole, tepals removed, f. fleshy outgrowth on fruit, g. anomocytic stomata, h. anomocytic stomata showing sister stomata.

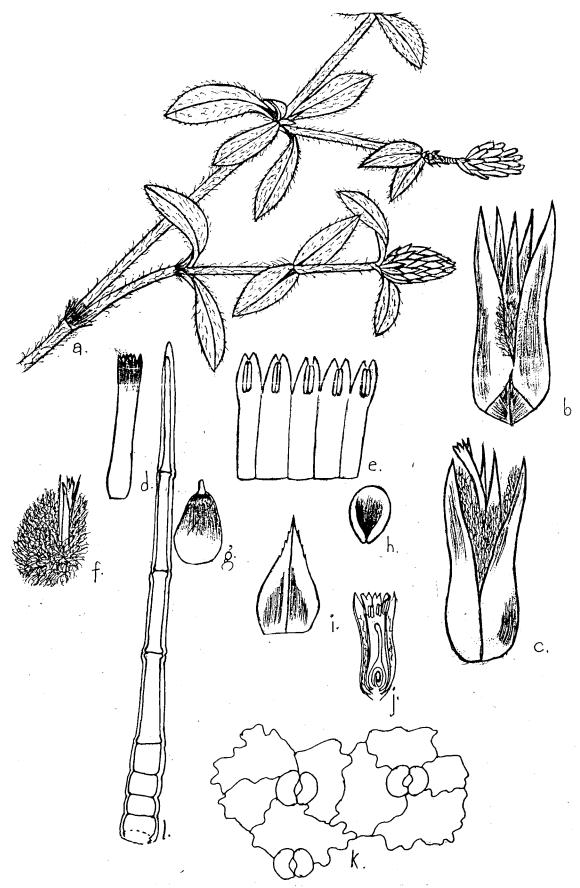


Fig. 457. Gomphrena celosioides Mart., a. habit, b-c. flower d. staminal column, e. staminal column showing anther cells, f. fruit with persistent pubescent perianth, g. fruit, h. seed, i. bract, j. L.S. of flower, k. anomocytic stomata, l. multicellular uniseriate trichome.

#### 10. Nothosaerua brachiata Wight Icon. V. 6 (1853) p. 1.

An erect slender branched herb upto 50 cm. high. Leaves elliptic-lanceolate, opposite, thinly membranous, reddish green, base tapering into a short often

obscure petiole. Flowers sessile, borne in small dense axillary white cylindric spikes; bracts and bracteoles hyaline, acute, persistent. Tepals 3-5, hyaline. Stamens 1-2, hypogynous; filaments free; anthers 2-celled, staminodes 0. Ovary oblong; ovule solitary, pendulous from a long funicle; Fruit a membranous oblong compressed utricle enclosed in the perianth. Seeds minute, shining black. (Fig. 458)

Flowers: June-November.

### Micromorphology (Fig. 458)

The plant was glabrous.

Stomata were anisocytic, anomocytic and tetracytic types.

D/576, 1054-1055, 1185.

# 11. Pupalia lappacea (L.) Juss. Ann. Mus. Hist. Nat. 2:132. 1803. (Pupalia atropurpurea Moq.)

This is a biennial reaching a height of 2 m. with straggling branches which are often tinged with purple. Leaves ovate or elliptic-lanceolate, upto 10 cm long, mucronate. Flowers in sessile clusters in lax pedunculate terminal spikes upto 30 cm long. The sterile flowers reduced to hooked purple awns; bracts broadly ovate, persistent; bracteoles as the bracts. Perianth segments of perfect flowers ovate-lanceolate, aristate, clothed with cottony wool, 3-nerved. Stamens 5 with subulate, shortly connate filaments; anthers 2-celled; staminodes 0. Ovary 1-celled; ovule solitary, pendulous; stigma capitate. Utricle membranous. Seed oblong-ellipsoid. (Fig. 459)

#### Micromorphology (Fig. 459)

The plant showed presence of two celled, non-glandular trichome having a broad basal cell and long narrow acicular apical cell.

Stomata were of anomocytic type.

D/739,747.

# Chenopodiaceae

# 1. Basella alba Linn., Sp. Pl. 272. 1753.

A perennial twining herb with stem stout at the base, upper branches slender, fleshy and climbing. Leaves dark green, broadly ovate, 5-13 cm long and 2.5-8 cm broad, acute or acuminate, basally cordate, cuneate or truncate; petiole 0.5-3 cm long. Inflorescence an axillary or terminal spike, 8-14 cm long; rachis stout. Flowers white, pinkish or red, subsessile, remaining closed at anthesis. Bracts scaly, small; bracteoles similar to calyx, acute, bracts and bracteoles free from perianth. Perianth united up to the middle, cup shaped, lobes short, cucullate. Stamens included; filament short. Anther cordate. Ovary 1-locular. Fruit black or dark purple enclosed within the persistent fleshy calyx, 1.0 cm long. Seed globose, indehiscent. (Fig. 460)

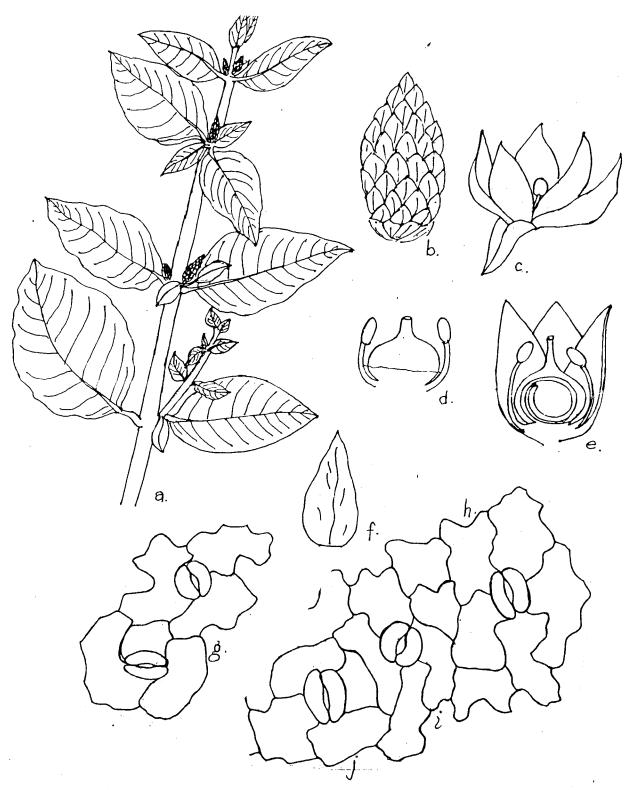


Fig. 458. Nothosaerua brachiata Wt., a. habit, b. inflorescence, c. flower, d. gynoecium and stamen, e. L.S. of flower, f. bract, g. anisocytic and anomocytic stomata, h-i. anomocytic and tetracytic stomata, j. anomocytic stomata.

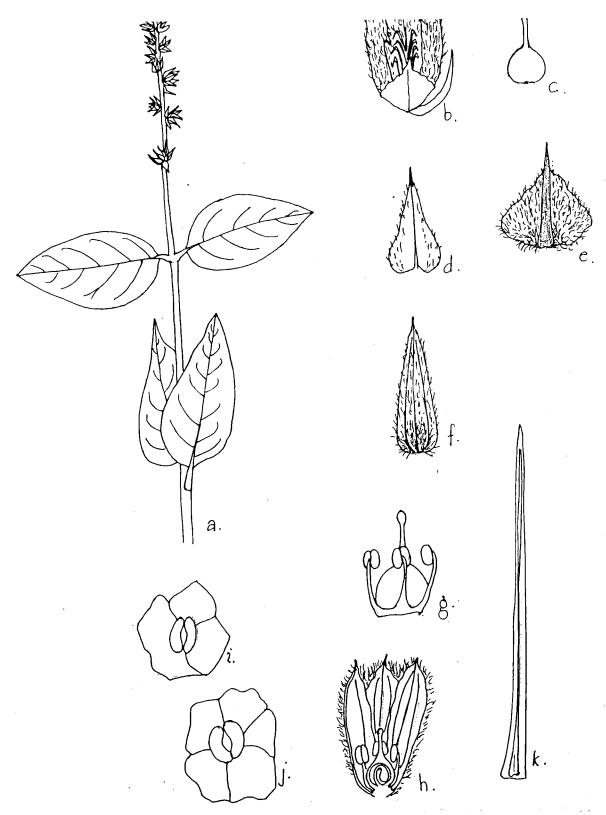


Fig. 459. Pupalia lappacea (L.) Juss., a. habit, b. flower, c. gynoecium, d. bract, d. bacteole, f. perianth, g. stamens connate at the base and gynoecium, h. L.S. of flower, i. anisocytic stomata, j. anomocytic stomata, k. unicellular trichome with thick wall and narrow lumen.

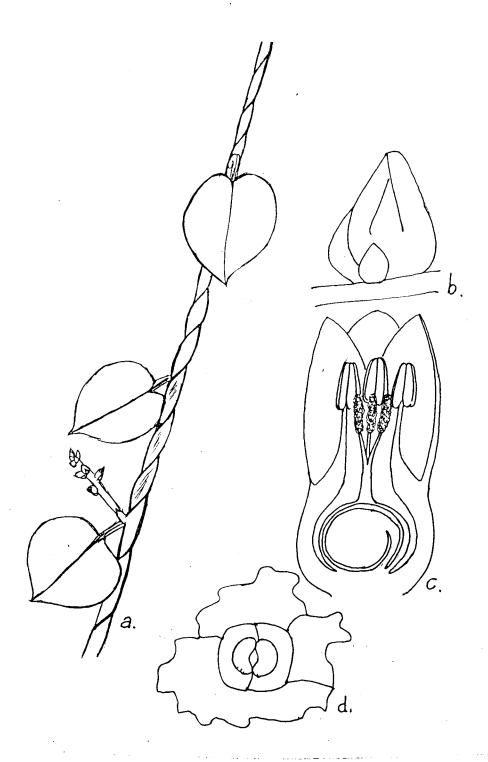


Fig. 460. Basella alba Linn., a. habit, b. flower, c. L.S. of flower, d. paracytic stomata.

Variations observed: In floras, bracteoles are said to be adnate to the bi-lipped perianth, but in my specimen bracteoles were found to be free from perianth and perianth was cupshaped.

Vernacular name: Poi. Flowers: February-March. **Micromorphology** (Fig. 460)

The plant showed paracytic type of stomata, and trichomes were absent.

D/103

#### 2. Chenopodium album Linn. Sp. Pl. (1753) p. 219.

An erect succulent herb reaching a height of 30 cm. Stems often reddish, striped. Leaves oblong/rhombic, alternate, very variable in size and shape. Flowers in clusters forming lax paniculate often mealy spikes. Bracts and bracteoles 0. Tepals 5, oblong-lanceolate, fleshy. Stamens 5, anthers 2-celled; filaments connate at the base. Ovary depressed-globose; ovules solitary; style absent. stigmas 2. Fruit utricle, enclosed in the perianth. Seed orbicular, shining. (Fig. 461)

Additional characters: Cohesion of filaments at the base is not reported earlier.

Vernacular name: Chil ni bhaji. Flowers: August-November. **Micromorphology** (Fig. 461) Whole plant was glabrous. Stomata were of anomocytic two

Stomata were of anomocytic type.

D/678.

# Phytolaccaceae

#### 1. Rivina humilis L. Sp. Pl. 121 . 1753.

A handsome erect perennial branched herb of 1 m high. Leaves ovate-oblong, upto 12 cm long, acuminate, Flowers in axillary, rarely terminal racemes, bisexual; bracts small, subulate; bracteoles 2, caducous. Flowers cream-coloured with 4 obovate-oblong tepals. Stamens 4; filaments filiform; anthers oblong, erect. Ovary subglobose, 1-locular; ovule solitary; style short; stigma capitellate. Berries crimson red on maturity, 1-seeded.(Fig. 462)

Flowers: August-November.

Micromorphology (Fig. 462)

Whole plant was glabrous.

Stomata were of anomocytic types.

D/464.

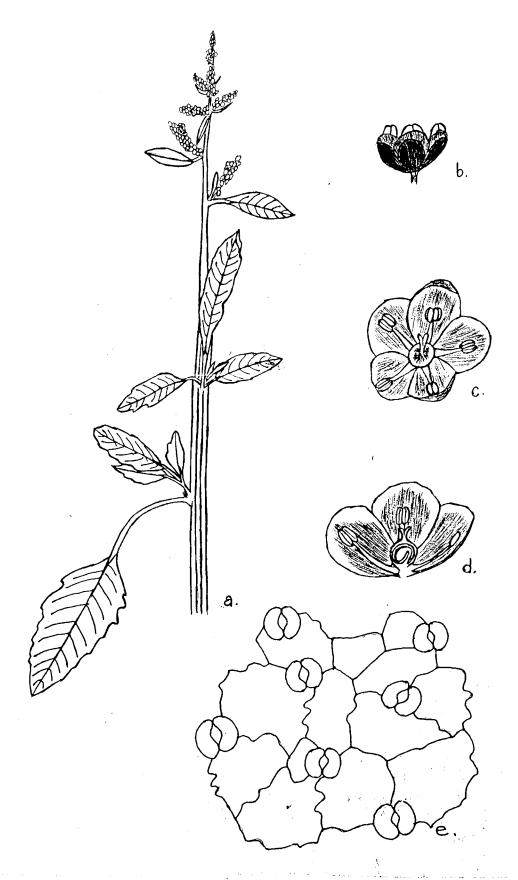


Fig. 461. Chenopodium album L., a. habit, b-c. flower, d. L.S. of flower, e. anomocytic stomata.

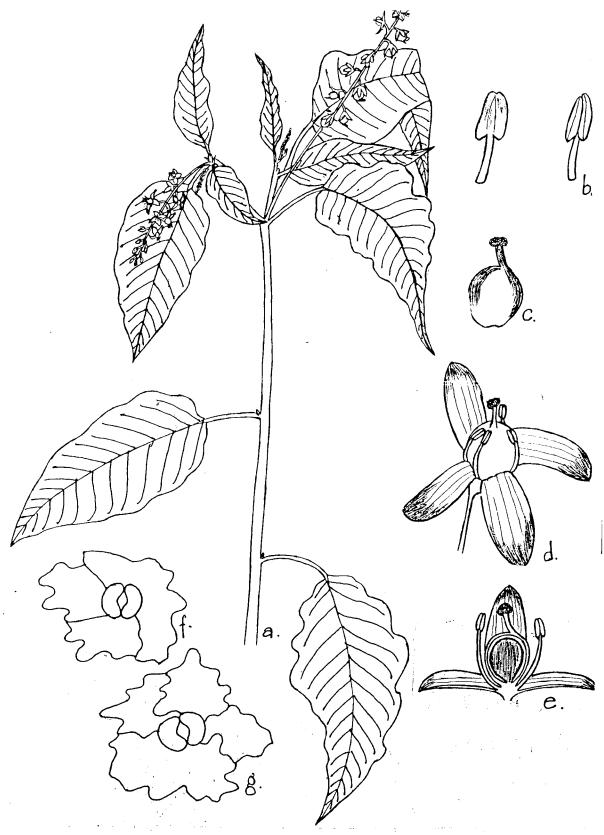


Fig. 462. Rivina humilis L., a. habit, b. stamen, c. gynoecium, d. flower, e. L.S. of flower, f. anisocytic stomata, g. anomocytic stomata.

# Polygonaceae

#### 1. Antigonon leptopus Hook. & Arnott, Bot. Beechey Voy. 308. t. 69. 1838.

A slender climbing shrub with branchlets and rhachis of the inflorescence often terminating in tendrils. Leaves amplexicaul at base, ovate-deltoid, upto 10 cm long, undulate; petiolate, ochrea membraneous. Flowers in fascicles arranged in axillary racemes; rhachis of racemes frequently terminated by branched tendrils. Perianth 5-6 merous, pink-red, cyclic; 3 outer tepals in fruit dry, accrescent, forming wings.

Stamens 8, connate at base into a ring, with short teeth between the filaments. Ovary 3-angled; ovules pendulous; styles 2-3, free; stigmas capitate, papillose. Nuts ovoid-conical. Seeds deeply grooved. (Fig. 463)

Vernacular name: Antigonon.

Flowers: July-November.

#### Micromorphology (Fig. 464)

There were glandular and non-glandular trichomes. The glands were four-celled sessile, and trichomes were unicellular and small.

Stomata were paracytic, anisocytic, diacytic and anomocytic types.

D/693, 694.

# 2. Persicaria decipiens (R. Br.) K.L. Wilson, Telopea 3: 178. 1988. (Polygonum serrulatum Lagasca)

An erect glabrous herb with often reddish stem reaching a height of 1 m or more. Leaves linear, upto 12 cm long; stipules connate into a tubular ochrea, reaching upto 4 cm high, strigose, the mouth truncate and ciliate with long stiff bristles which are nearly as long as the tube. Flowers in paniculate slender erect racemes; bracts membranous, strongly ciliate with long hairs, the margins somewhat rose-colored. Perianth white, segments ovate. Stamens 5-8, perigynous; filaments filiform; anthers 2-celled, joined by a small connective. Ovary trigonous; ovule solitary; styles 3, connate at the base, stigma capitate. Nutlets trigonous, smooth. (Fig. 465)

Flowers: November-March.

## Micromorphology (Fig. 465)

The stem, leaf and stipules showed presence of unicellular, non-glandular, trichome with thick wall and tip slightly curved. The lumen was very narrow. The base of the trichome was raised on the 2-3 swollen epidermal cells.

Stomata were of anomocytic, anisocytic and paracytic type. D/935.

#### 3. Polygonum plebejum R. Br. Prodr. (1810) p. 420

A diffusely-branched, prostrate herb, often with a woody rootsock. Leaves oblong, alternate, 2 cm long, sessile or shortly petiolate; stipules connate into a tubular ochrea lacerate to the middle, fimbriate. Flowers pink, axillary, solitary or 2-3 together; pedicels short or 0. Bracts and bracteoles membranous, ochreate. Perianth green or colored, 4-5 cleft, divided nearly to the base. Stamens 5-8; filaments filiform, often dilated at the base;

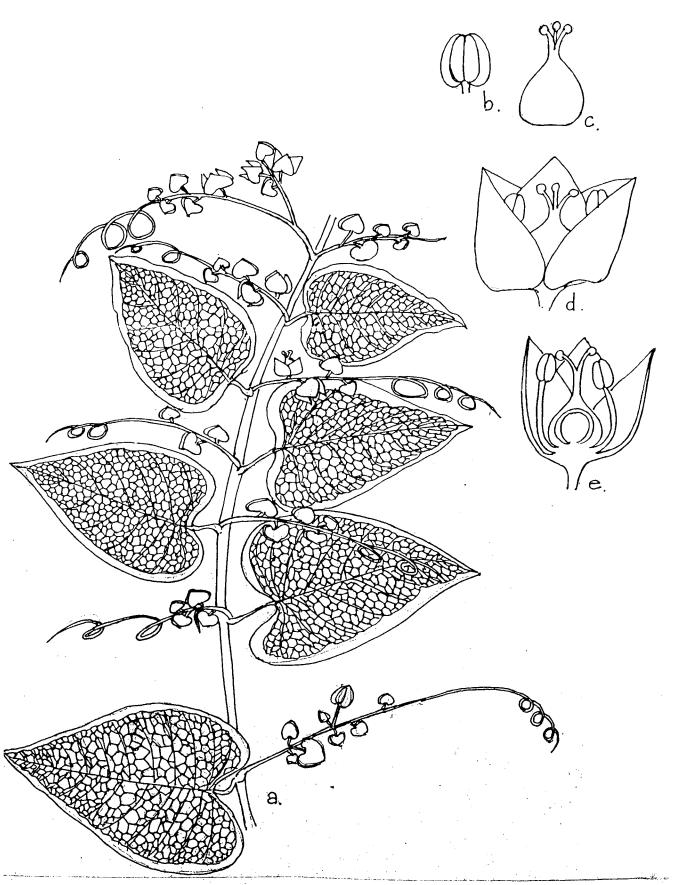


Fig. 463. Antigonon leptopus Hook. & Arnott., a. habit, b. stamen, c. gynoecium, d. flower, e. L.S. of flower.

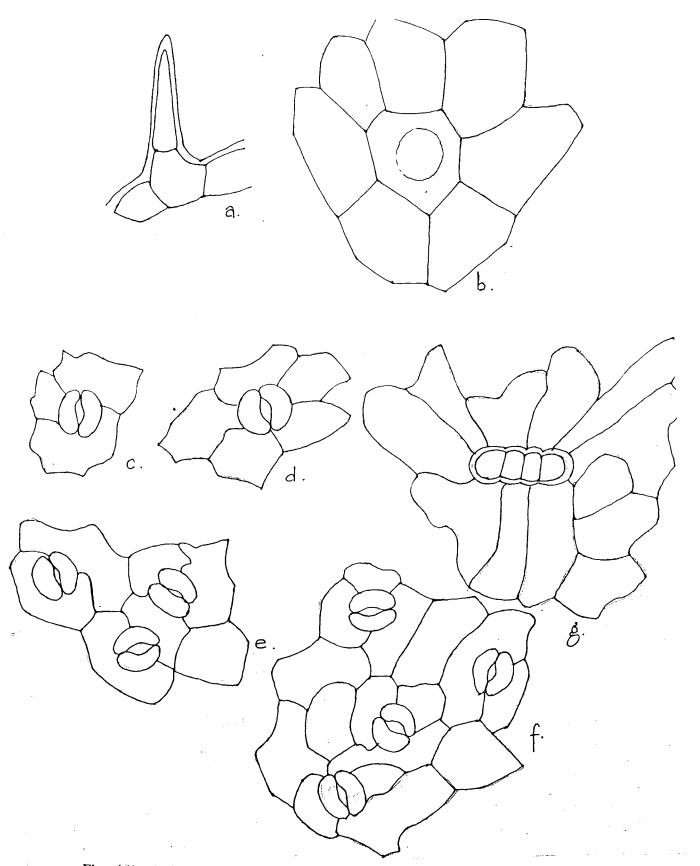


Fig. 464. Antigonon leptopus Hook. & Arnott., a. unicellular trichome, b. epidermal papillae, c. anisocytic stomata, d. anomocytic stomata, e. paracytic and diacytic stomata, f. paracytic, anisocytic and anomocytic stomata, g. four celled sessile gland.

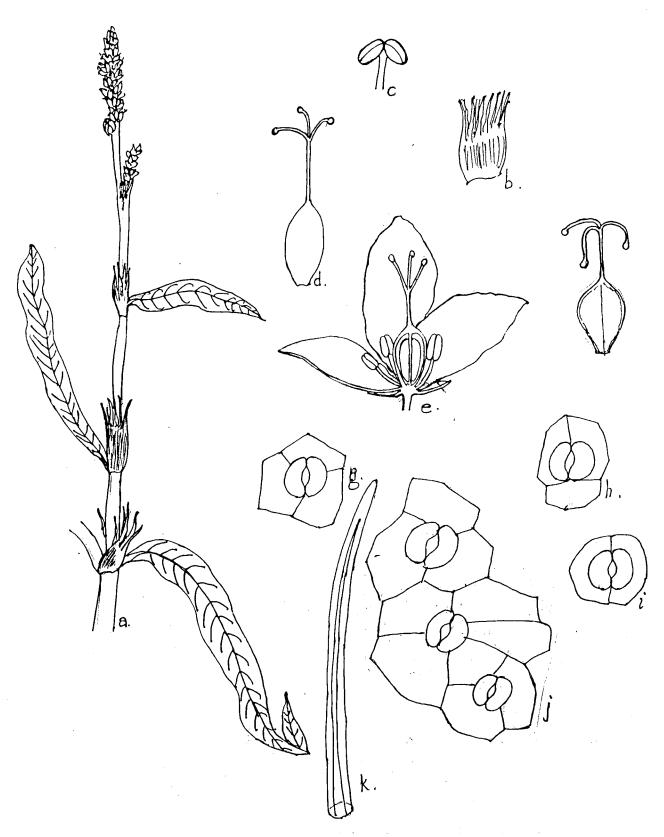


Fig. 465. Persicaria decipiens (R. Br.) K.L. Wilson., a. habit, b. ochreate stipule, c. stamen, d. gynoecium, e. L.S. of flower, f. nut, g-h. anisocytic stomata, i. paracytic stomata, j. anomocytic and anisocytic stomata, k. unicellular acicular trichome.

anthers 2-celled. Ovary 3-gonous. Nutlet angled; pericarp usually hard, shining. (Fig.

Vernacular name: Zinko okhrad.

Flowers: December-May.

Micromorphology (Fig. 466)

Whole plant was glabrous.

Stomata were of anomocytic.

D/094.

## Aristolochiaceae

#### 1. Aristolochia bracteolata Lam.. Encycl. 1:258. 1783

A slender prostrate branched perennial upto 2 m long with reniform or broadly ovate leaves having cordate base and a wide shallow sinus. Flowers solitary; pedicels with a large sessile orbicular or subreniform bract at the base. Perianth base subglobose, tube cylindric with a trumpet-shaped mouth, dark-purple, with revolute margins. Stamens 6, adnate 1-seriately above the ovary forming a gynostegium. Ovary inferior, more or less 6-celled; ovules many, 2-seriate. Capsules oblong-ellipsoid, 12-ribbed. Seeds deltoid with a slightly cordate base (Fig. 467).

Vernacular name: Kidamari. Flowers: August-November.

Variations observed: I could observed a number of differences, from the standard descriptions found in the flora, where in the leaf is said to be obtusely acuminate, flowers, in axillary racemes and bracts small, ovate. But in our specimens, the leaves were obtuse with a slight notch, flower axillary solitary and bract small, obtuse, rounded, and acuminate.

Vernacular name: Batak vel. Flowers: September-November. **Micromorphology** (Fig. 468) Whole plant was glabrous Stomata were of anomocytic type. D/1096-1097

# 2. Aristolochia littoralis D. Parodi Anales Soc. Ci. Argent. 5: 155. 1878. (Aristolochia elegans Masters)

A slender climber, with pendulous branches and foliage, Leaves upto 5 cm long broadly ovate-cordate, obtuse at the apex, glabrous on both surfaces; petiole 3-5 cm long. Inflorescence solitary, axillary. Flowers on long pedicels, up to 7 cm long. Perianth limb inflated, pale yellowish green, swollen, contracted at the mouth, funnel-shaped at top, rich purple with creamy white markings. Stamens 6. Gynostegium short, cylindrical. Capsule 4 cm long. (Fig. 469)

Flowers: June-July.

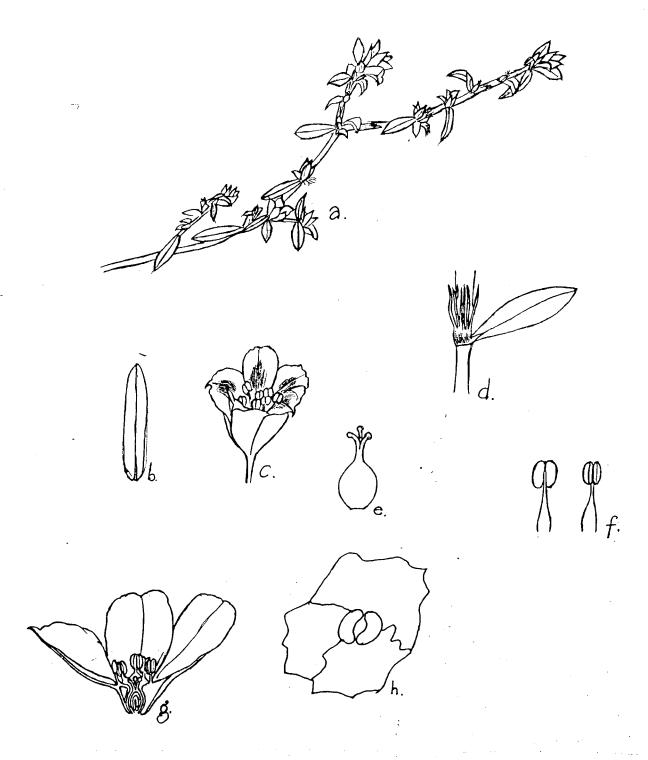


Fig. 466 Polygonum plebejum R. Br., a. habit, b. leaf, c. flower, d. leaf with ochreate stipule, e. gynoccium, f. stamen, g. L.S. of flower, h. anisocytic stomata.

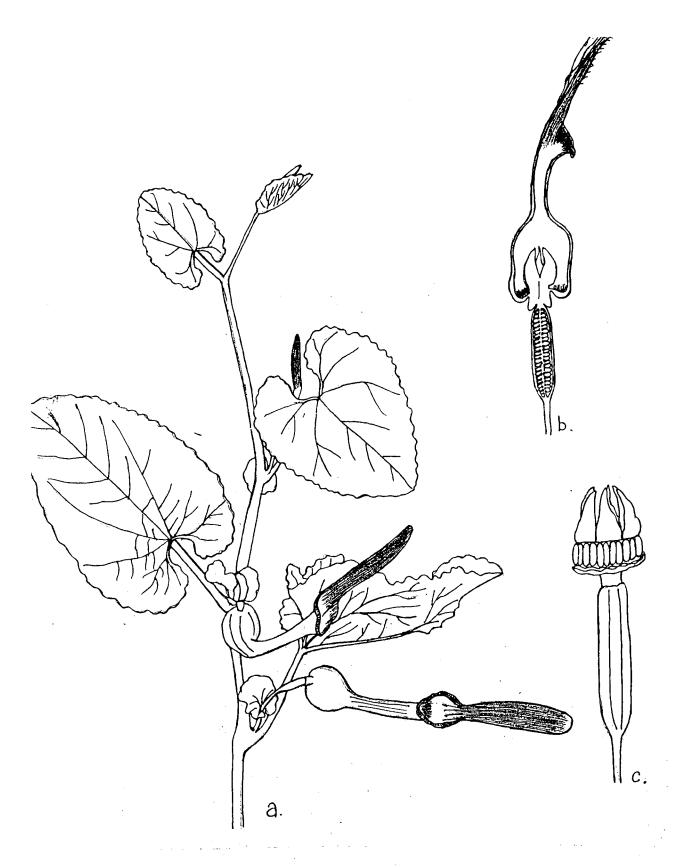


Fig. 467 Aristolochia bracteolata Lam., a. habit, b. L.S. of flower.

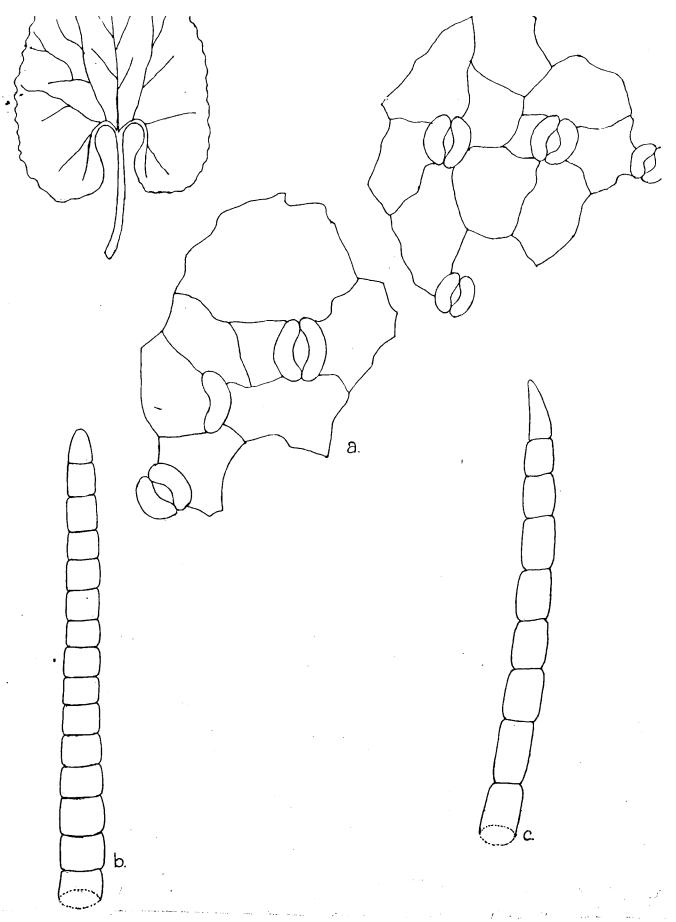


Fig. 468. Aristolochia bracteolata Lam., a. leaf, b. anomocytic stomata, c. multicellular uniseriate trichome having cuboidal cells.

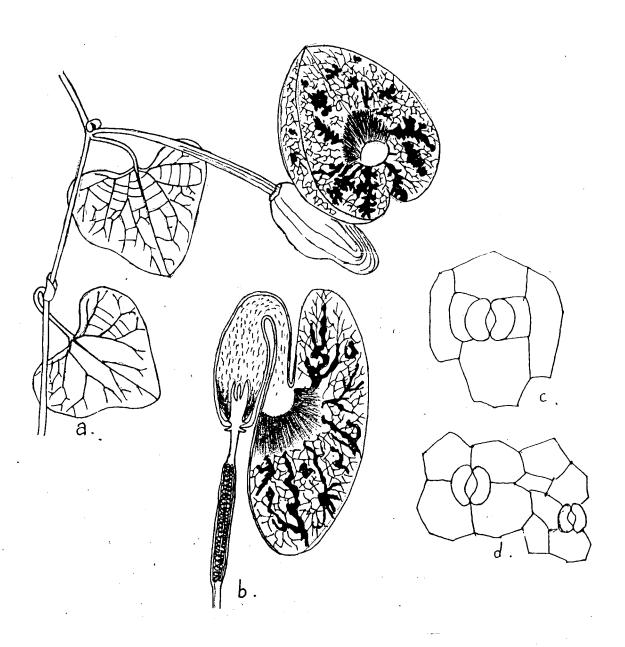


Fig. 469 Aristolochia littoralis D. Parodi., a. habit, b. L.S. of flower, c tetracytic stomata, d anomocytic stomata.

#### Micromorphology(Fig. 469).

Leaf was glabrous, whereas perianth showed presence of multicellular, uniscriate, trichome with short cells arranged end to end.

Stomata were of anomocytic, tetracytic and anisocytic type. D/244.

### Loranthaceae

#### 1. Loranthus longiflorus Desrouss. in Lam. Encyc. Method. V 3 (1789) p. 598.

A large bushy glabrous partial-parasite with grey bark and opposite, thick, coriaceous, linear-oblong leaves, upto 20 cm long. Flowers in axillary unilateral racemes often 2 from the axil; bract ovate, subacute, concave; bractcoles 2, free or connate with the bract. Calyx tube copular, adnate to the ovary; limb short, truncate or 4-6 toothed. Corolla split at the back; tube curved, slightly widened upwards, scarlet or orange or pink or white; lobes 5, linear, reflexed. Stamens 4, adnate to the petals. Ovary inferior, 1-celled; ovule solitary; style quadrangular. Berry ovoid-oblong, pink. (Fig. 470)

Flowers: February-March. **Micromorphology** (Fig. 470) Whole plant was glabrous. Stomata were of tetracytic type. D/200.

## Euphorbiaceae

#### 1. Acalypha indica Linn. Sp. Pl. (1753) p. 1003.

A pubescent branched annual, herb upto 1 m high. Leaves rhomboid-ovate, alternate, upto 8 cm long, crenate-serrate, glabrous, thin, somewhat 3-nerved; petioles usually longer than the blade; stipules minute. Flowers in numerous axillary spikes, the males minute, clustered near the summit of the spike, the females scattered, 3-5 surrounded by a shortly pedunculate large leafy cuneiform many-nerved bract. Male flowers: tepals 4. Stamens usually 8; filaments short, free; anther cells distinct, divaricate, often at length twisted or flexuous. Pistillode 0. Female flowers: tepals 3-4, minute imbricate. Ovary 3-celled; ovules solitary in each cell; styles filiform, fimbriate. Capsules concealed by the bract, only 1-seeded. Seeds ovoid, smooth, pale-brown. (Fig. 471)

Vernacular name: Dadri. Flowers: June-September. **Micromorphology** (Fig. 471)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with pitted walls.

Stomata were of paracytic type.

D/450, 506.

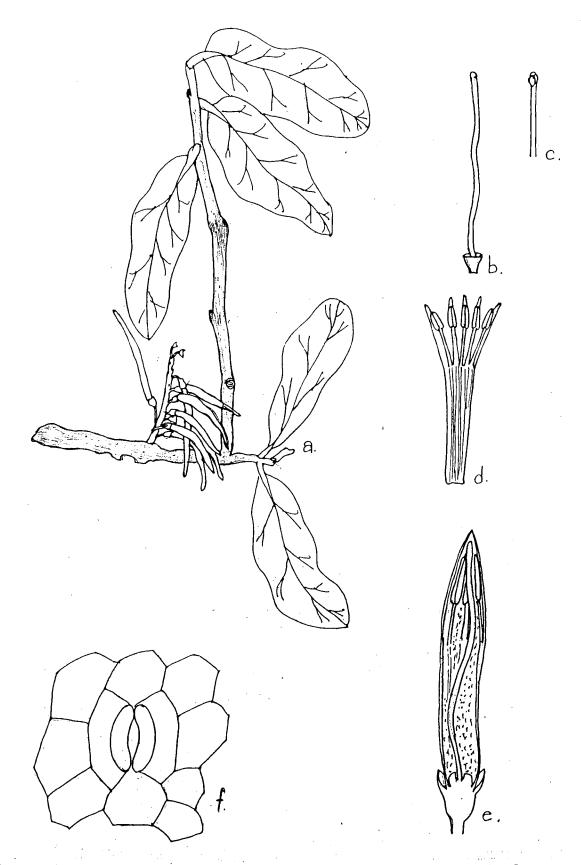


Fig. 470. Loranthus longiflorus Desr., a. habit, b. gynoecium, c. stigma and style, d. epipetalous stamen, e. L.S. of flower, f. tetracytic stomata.

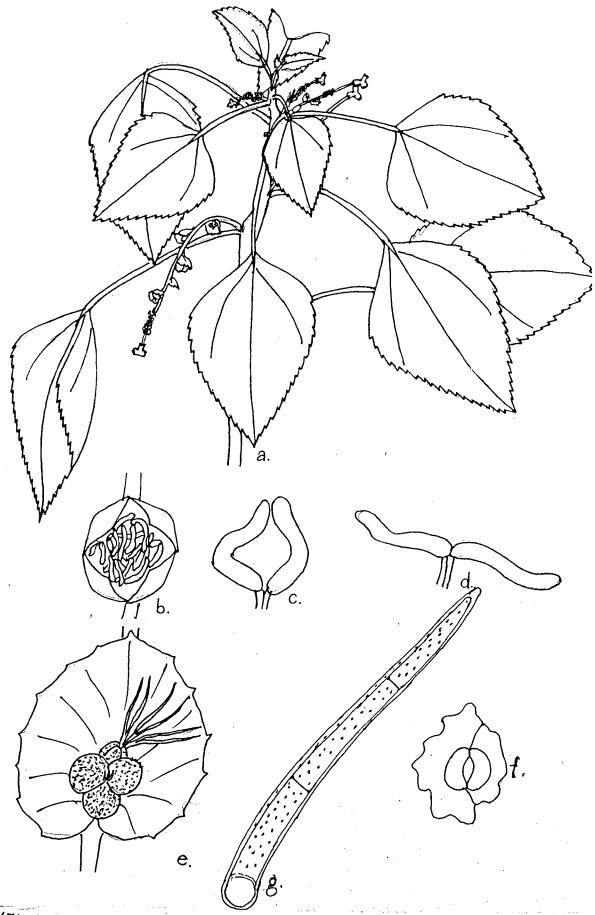


Fig. 471. Acalypha indica L., a. habit, b. male flower, c-d. stamen, e. female flower, f. paracytic stomata, g. multicellular uniseriate trichome with pitted wall.

# 2. Chamaesyce pycnostegia (Boiss.) Soják, as. Nár. Mus., Odd. PYír. 140: 170. 1972. (Euphorbia pycnostegia Boiss.)

An annual, slender, erect, glabrous, dichotomously branched herb upto 60 cm high. Stems often tinged with purple, with swollen nodes. Leaves oblong, upto 4 cm, serrulate; floral leaves reaching 1.5 cm long, distichously imbricating, ovate-cordate, often apiculate; stipules minute, fimbriate. Involucres stalked, glabrous outside, hairy inside; lobes fimbriate; gland transversely oblong; limb white, obliquely obovate, rounded at the apex. Capsules glabrous; cocci obtusely keeled; styles short, divaricate, each deeply 2-lobed. Seeds oblong, obtusely 4-angled, tuberculate. (Fig. 472)

Flowers: October-December.

### Micromorphology (Fig. 472)

Whole plant was glabrous.

Stomata were of anomocytic type.

D/324.

#### 3. Chrozophora prostrata Dalzell in Dalzell & Gibson, Bombay Fl. 233. 1861.

A stellately hairy prostrate annual about 25 cm long with both radical and cauline leaves. Leaves broadly ovate-suborbiucular upto 3.5 cm long, cordate at base, crenate, stellately woolly below. Flowers in axillary few-flowered racemes. Male flowers; outer tepals ovate, inner tepals reddish elliptic-lanceolate. Stamens 15 in 2 whorls. Female flowers; tepals linear. Capsules subglobose, stellately woolly. Seeds globose. (Fig. 473)

Vernacular name: Betho okharad.

Flowers: November-April.

#### Micromorphology (Fig. 473)

Stellate hairs with five-arms were present all over the plant.

Stomata were of anomocytic and anisocytic types.

D/190.

#### 4. Croton bonplandianus Baill. in Adansonia 4: 339. 1863.

A much branched perennial herb, perennial reaching upto 60 cm high. Leaves ovate-lanceolate, serrate, upto 7 cm, acute at apex. Flowers in racemes, greenish; male flowers above, female flowers fascicled in the axil of minute bracts. Male outer tepals obovate, minute; inner tepals linear-oblong. Stamens 10-15. female tepals lanceolate. Ovary densely stellate-hairy; stigmas 2-fid. Capsules 3-angled, stellately-hairy. seeds oblong, shining, with white caruncle. (Fig. 474)

Vernacular name: Croton.

Flowers: March-April.

### Micromorphology (Fig. 475)

Stellate hairs with many arms were present all over the plant. Stomata were of paracytic, cyclocytic and anomocytic types. D/695, 1361.

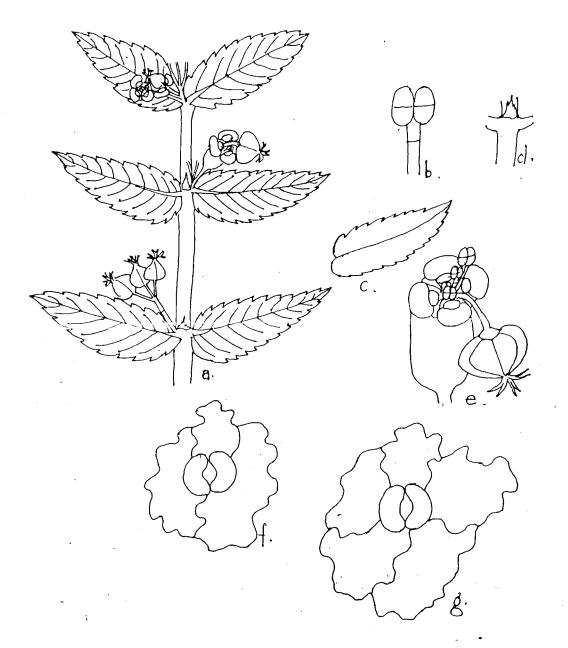


Fig. 471. Chamaesyce pycnostegia Boiss., a. habit, b. stamen, c. leaf, d. stipule, e. cyathium, f. anisocytic stomata, g. anomocytic stomata.

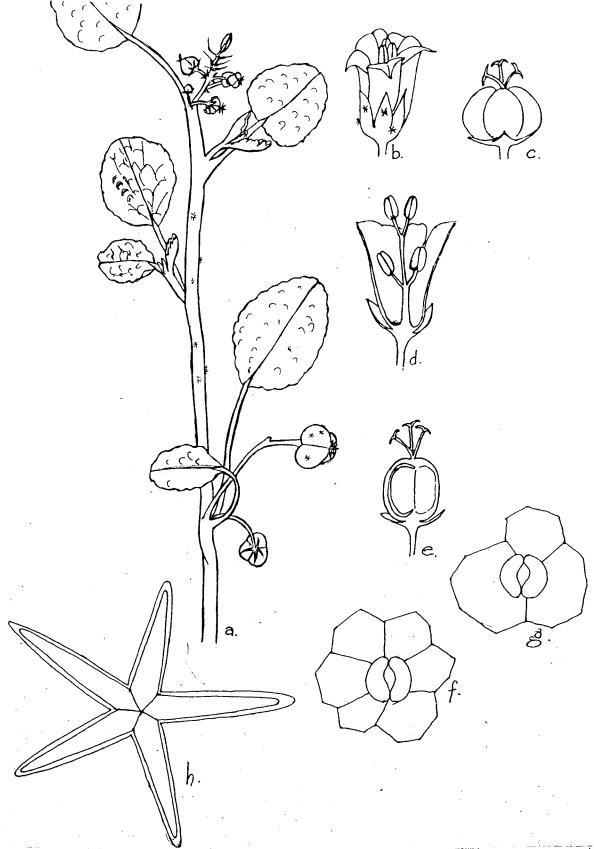


Fig. 473 Chrozophora prostrata Dalz., a. habit, b. male flower, c. female flower, d. L.S. of male flower, e. L.S. of female flower, f. anomocytic stomata, g. anisocytic stomata, h. stellate hair with five-arms.

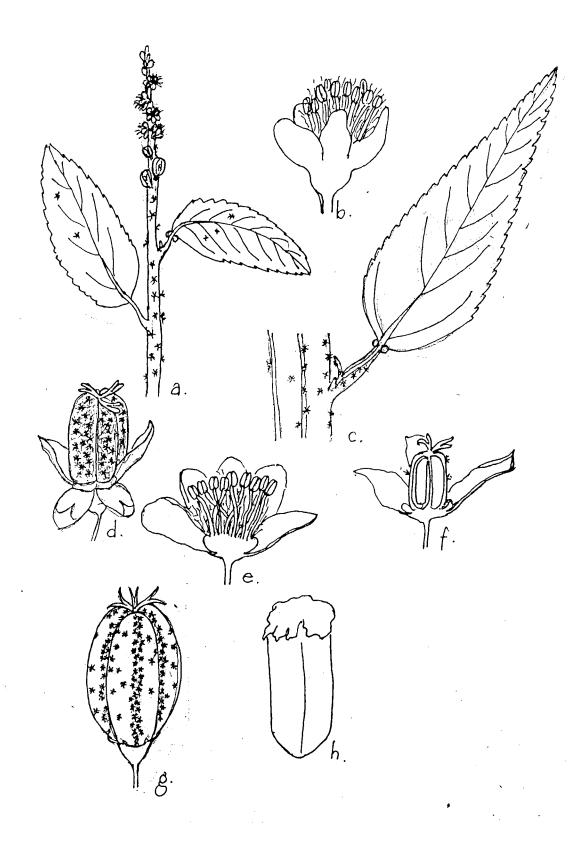


Fig. 474 Croton bonplandianum Baill., a. habit, b. male flower, c. leaf, d. female flower, f. L.S. of female flower, g. fruit, h. seed.

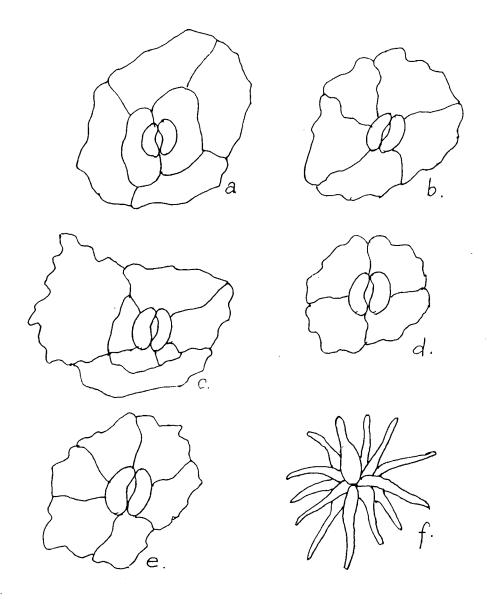


Fig. 475. Croton bonplandianus Baill., a. paracytic stomata, b. cyclocytic stomata, c-e. anomocytic stomata, f. stellate hair with many arm.

## 5. Dalechampia scandens var. cordofana (Hochst. ex Webb) Muell. Arg. in DC. Prodr. 15(2): 1245, 1866.

A puberulous slender twiner. Leaves tripartite, the median lobe elliptic-lanceolate, the laterals slightly smaller, asymmetrically lanceolate. Stipules lanceolate. The inflorescence usually axillary and is a bilaterally symmetrical pseudanthium of 2 large creamy-white, 3-lobed bracts positioned at different levels. The lower one subtend the pistillate inflorescence and the upper one the staminate inflorescence. Male flowers: sepals elliptic-ovate, becoming reflexed, greenish-yellow; staminal column; anthers minute, yellow. Female bracts ciliate. Female flowers: pedicels extending in fruit; sepals 6(-10), pinnatifid, elliptic with 4 pairs of linear gland-tipped lateral lobes, strigose-hirsute, the hairs urticating; disc 0; ovary densely pubescent; styles dilated and excavated at the apex. Fruits trilobate, pubescent, brown. Seeds spherical, grey, brown-mottled and streaked. (Fig. 476)

Vernacular name: Ekpani-panda.

Flowers: August-October. **Micromorphology** (Fig. 477)

Both glandular and non-glandular types of trichomes were present, 1) non-glandular unicellular trichome with broad lumen, 2) non-glandular two-celled trichome with basal cell small and 3) glandular four celled biseriate trichome. D/101.

## 6. Euphorbia heterophylla L. Sp. Pl. 453. 1753. (Euphorbia geniculata Ort.)

An annual, erect herb of 60 cm height with fistular, glabrous, and green, branched stems. Leaves variable, linear-lanceolate, oblong, narrowed at base, subentire, dentate to serrate, glabrous above, hairy and whitish beneath. Involucres in cymes, densely corymbose; lobes 5, ovate, fimbriate. Capsules globose, glabrous. Seeds ovoid-subglobose, ash-colored, tuberculate. (Fig. 478)

Flowers: Throughout the year.

#### Micromorphology (Fig. 478)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with thick and warty walls and a swollen basal cell.

Stomata were of anomocytic type.

D/465, 1235-1237.

#### 7. Euphorbia hirta L. Sp. Pl. 454. 1753.

An annual, erect-decumbent herb upto 35 cm high. Leaves ovate-oblong, utp 3 cm long, oblique, serrulate; stipules subulate. Cyathia in axillary, capituliform cymes. Involucres campanulate; lobes acute, hairy; glands orbicular, truncate at apex, with an obsolete appendage. Capsules depressed globose, 3-lobed, appressed pubescent. Seeds globose, 4-angled, slightly transversely rugose, reddish. (Fig. 479)

Vernacular name: Vadi dudhi. Flowers: Throughout the year.

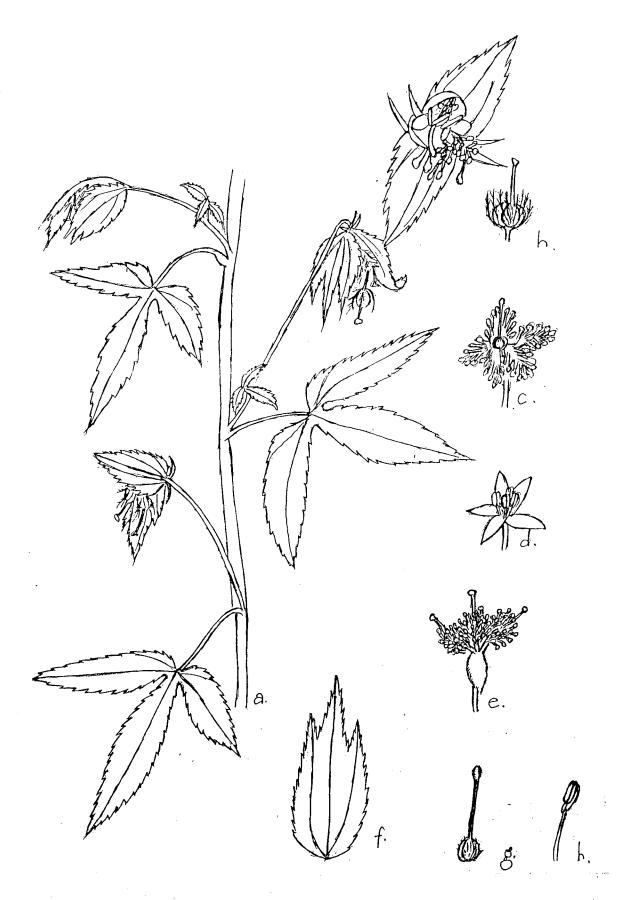


Fig. 476. Dalechampia scandens L., a. habit b. inflorescence b. female flower c. male flower g. gynoecium h. stamen.

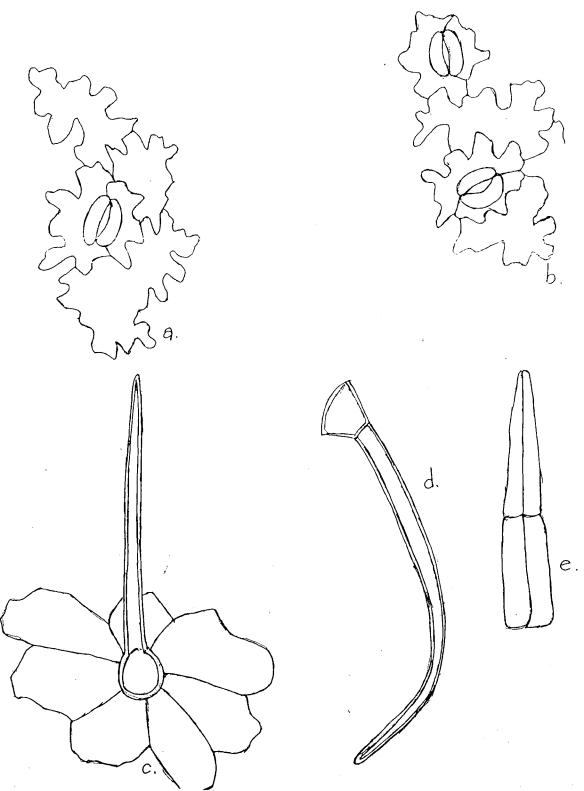


Fig. 477. Dalechampia scandens L., a-b. paracytic stomata, c. unicellular trichome with broad lumen, d. two-celled trichome with basal cell small, e. four celled biseriate trichome.

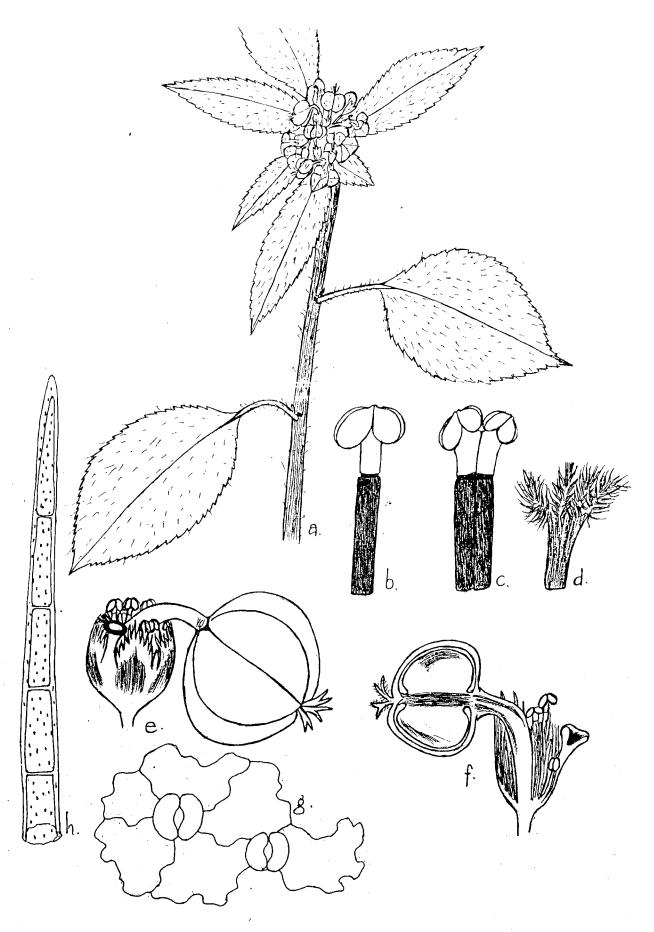


Fig. 478. Euphorbia heterophylla L., a. habit, b-c. stamen, d. bract, e. cyathium, f. L.S. of cyathium, g. anomocytic stomata, h. multicellular uniseriate trichome with warty wall.

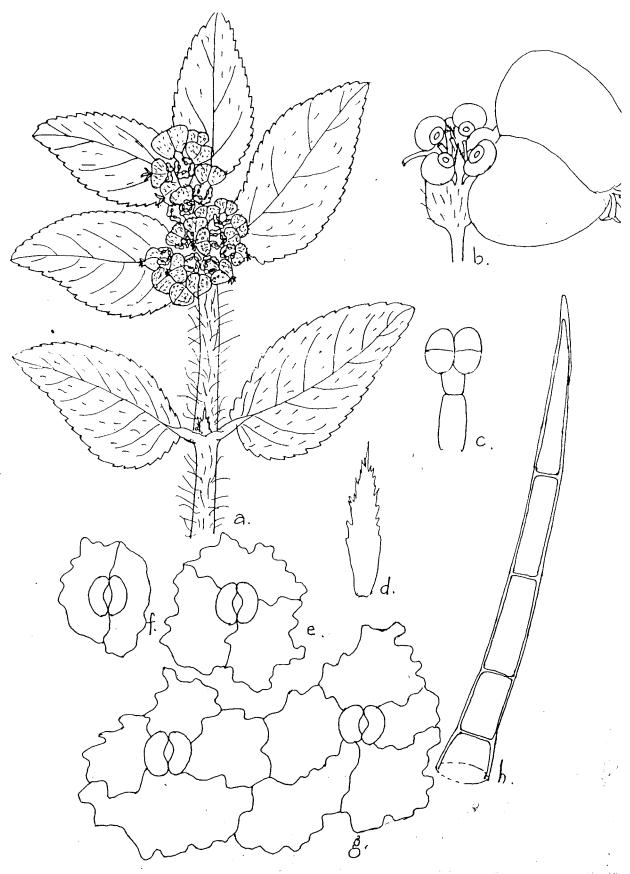


Fig. 479. Euphorbia hirta L., a. habit, b. cyathium, c. stamen, d. bract, e. anisocytic stomata, f. paracytic stomata, g. anomocytic stomata, h. multicellular uniseriate trichome with basal cell small.

#### Micromorphology (Fig. 479)

Multicellular uniseriate trichome with basal cell small and thin walled were present all over the plant.

Stomata were anisocytic, paracytic and anomocytic.

D/330.

#### 8. Euphorbia hypericifolia Linn. Sp. Pl. (1753) p. 454.

An erect streading annual, upto 50 cm high having elliptic-oblong, upto 3 cm long, serrulate, unequal-sided leaves. Cyathia, in many-flowered cymes, possesses 4-5 lobed perianth-like involucre with thick glands at the mouth, each gland often bearing a petaloid spreading white or colored limb. Male flowers consists of a stalked stamen without floral envelope. Female flowers: ovary 3-celled on an ultimately exserted stalk in the centre of the involucre; ovule solitary in each cell; styles 3, free. Capsules subglobose, hairy; styles short 2-fid. Seeds smooth (Fig. 480).

Flowers: Throughout the year.

### Micromorphology (Fig. 481).

The plant showed presence of multicellular, uniseriate, unbranched non-glandular trichome.

Stomata were of anomocytic, and anisocytic type.

D/832-834.

#### 9. Euphorbia microphylla Heyne, in Roth, Nov. Pl. Sp. P. 229. 1821.

A glabrous annual with numerous spreading branches reaching to a length of 24 cm. leaves obliquely oblong with pink margins. Cyathia axillary, numerous. Gland shortly stipitate with a small conspicuous limb. Capsules keeled. Seeds quadrangular. (Fig. 482).

Variation observed: in all the floras, the limb of cyathia are said to be inconspicuous but in my specimen, they were comparatively large and conspicuous.

Flowers: November-April.

#### Micromorphology (Fig. 482)

Leaves were glabrous.

Stomata were anisocytic, anomocytic and paracytic.

D/299.

#### 10. Euphorbia prostrata Aiton, Hortus, Kew. 2: 139. 1789.

An annual, prostrate herb with several, spreading stems reaching upto 30 cm in length long. Leaves ovate-oblong, slightly oblique, obtuse, cordate-rounded at base. Involucres axillary, solitary, hairy outside; lobes lanceolate, ciliate; glands red, suborbicular. Capsules subglobose. Seeds narrowly ovoid, 1 mm long, 4-angled, obtuse at apex, truncate at base, transversely rugose. (Fig. 483)

Vernacular name: Lal dudheli. Flowers: Throughout the year.



Fig. 480. Euphorbia hypericifolia L., a. habit, b. L.S. of cyathium, d. stamen, c. bract, e. seed.

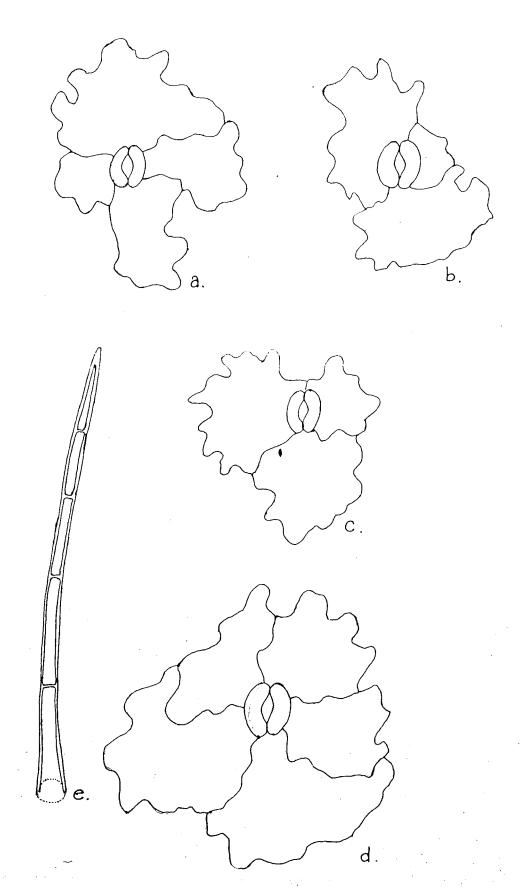


Fig. 481. Euphorbia hypericifolia L., a. tetracytic stomata, b-c. anisocytic stomata, d. anomocytic stomata, e. multicellular uniseritae trichome with thin wall.

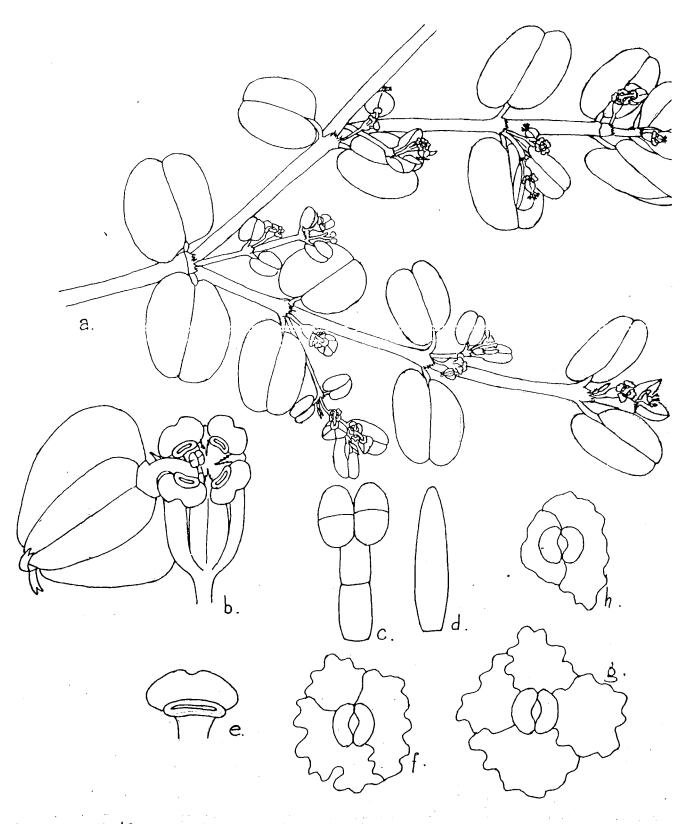


Fig. 482. Euphorbia microphylla Heyne., a. habit, b. cyathium, c. stamen, d. bract, e. gland, f. anisocytic stomata, g. anomocytic stomata, h. paracytic stomata.

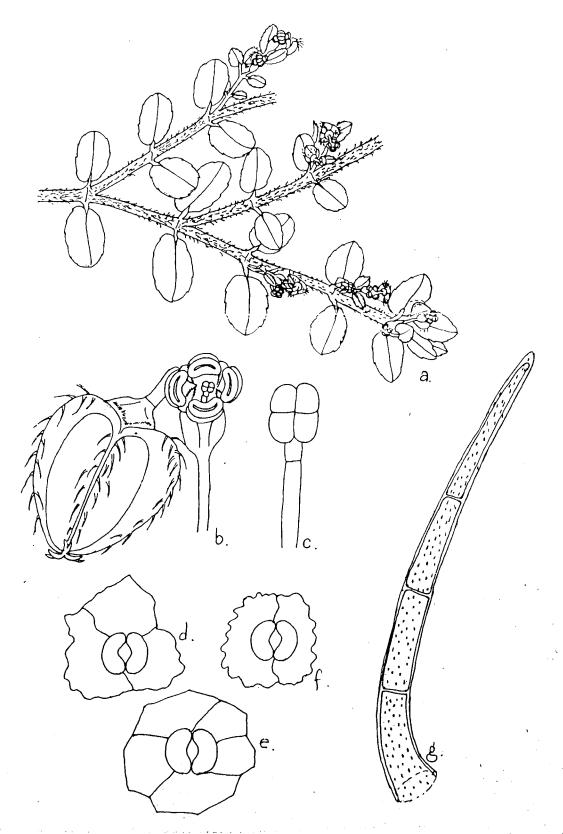


Fig. 483. Euphorbia prostrata Aiton., a. habit b. cyathium c. stamen, d. anisocytic stomata, e. anomocytic stomata, f. paracytic stomata, g. multicellular uniseriate trichome with pitted wall.

#### Micromorphology (Fig. 483)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome with thick warty walls.

Stomata were of anomocytic, anisocytic, and paracytic type. D/337.

#### 11. Jatropha curcas Linn., Sp. Pl. 1006. 1753.

A shrub of 4 m high with broadly ovate leaves, cordiform upto 15 cm long, shallowly 5-lobed; stipules caduceus. Flowers unisexual, in terminal, cymose panicles; central flowers usually femal. Male flowers small, yellowish. Perianth bi-seriate; outer tepal sepaloid, ovate-obovate, sericeous at base inside; inner petaloid. Stamens 10, 2-seriate; inner 5 stamens are connate into a central column. Female flowers: perianth single whorled, sepaline. Ovary 3-celled; styles long, 3. Capsules globose, rugose when dry. (Fig. 484)

Vernacular name: Vilayti arandi.

Flowers: Throughout the year. **Micromorphology** (Fig. 484)

Two types of non-glandular trichomes were present; 1) unicellular hair with thick wall and broad lumen and 2) multicellular uniseriate trichome.

Stomata were anisocytic, paracytic, and anomocytic.

D/498.

#### 12. Jatropha gossypifolia Linn. Sp. Pl. (1753) 1006.

A glandular hairy shrub reaching a height of 2 m. Leaves palmately lobed, upto 15 cm long, subcordate; lobes obovate, acute, glandular hairy on margin; stipules ciliate, glandular. Flowers in glandular, corymbosa cymes, small, red. Outer tepals glandular, hairy, acuminate; inner tepals ovate, ciliate. Stamens 8, 5+3; filaments basally connate; inner 3 longer; anther cells parallel, contiguous. Ovary3-celled; with single ovule in each locule. Capsules broadly oblong, 3-lobed. Seeds oblong, 3-angled, grayish brown. (Fig. 485)

Flowers: Throughout the year.

#### Micromorphology (Fig. 486)

Two types of trichomes were present; 1) non-glandular multicellular uniseriate trichome with two basal small cell, and 2) glandular with multicellular head and multicellular, multiseriate stalk.

Stomata were tetracytic and paracytic.

D/673.

#### 13. Phyllanthus maderaspatensis Linn. Sp. Pl. (1753) p. 982.

A woody annual with stems reaching a height of 1m. Leaves obovate-cuneate, upto 2cm long, mucronate; stipules peltate, lanceolate, very acute. Flowers axillary, the male flowers minute in small clusters, the female larger, solitary, shortly pedicellate. Sepals 6, obovate, obtuse, green with white margins. Stamens 3; filaments connate. Styles 3,

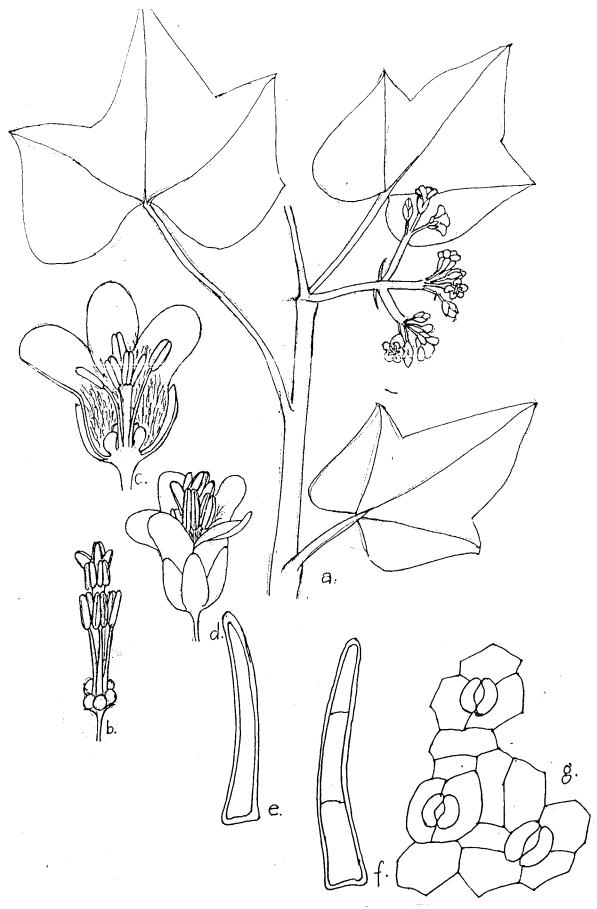


Fig. 484. Jatropha curcas L., a. habit, b. stamen, c. L.S. of Male flower, d. male flower, e. unicellular hair, f. multicellular uniseriate trichome, g. anisocytic, paracytic and anomocytic stomata.



Fig. 485. Jatropha gossypifolia L., a. habit, b. bract, c. female flower, d. L.S. of female flower, e. male flower, f. L.S. of male flower, g. stamen, h. fruit.

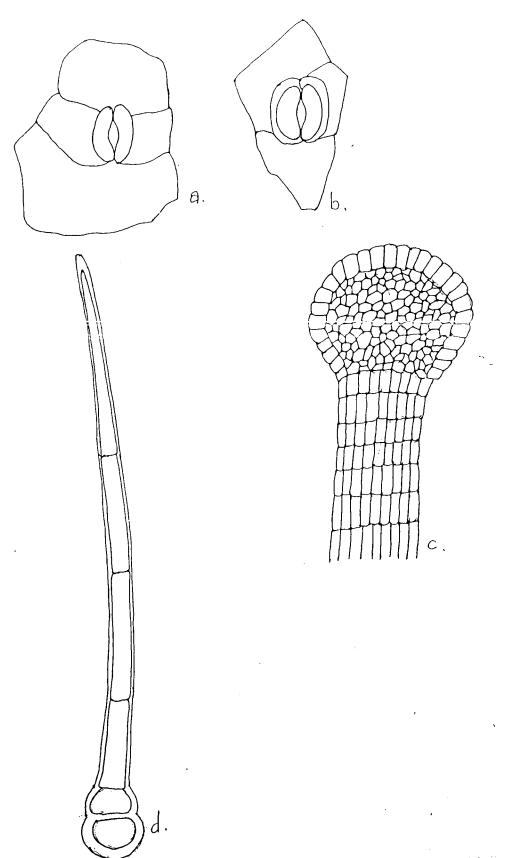


Fig. 486. Jatropha gossypifolia L., a. tetracytic stomata, b. paracytic stomata, d. multicellular uniseriate trichome with two basal small cell, c. gland with multicellular head and multicellular, multiseriate stalk.

distinct, very small, 2-lobed. Capsules depressed-globose, 3-lobed. Capsules 3-gonous, muriculate in fine lines, brown. (Fig. 487)

Vernacular name: Kanochha.

Flowers: July-August.

Micromorphology (Fig. 487)

Whole plant was glabrous.

Stomata were of anisocytic, and paracytic type.

D/175.

#### 14. Phyllanthus reticulatus Poir. Encyc. Method. V. 5 (1804) p. 298.

A large pubescent straggling shrub with oblong or elliptic leaves upto 3 cm lon. Flowers axillary, the males in fascicles of 2-6, the females solitary. Calyx segments oblong, alternating with the glands of the disk. Male flowers: stamens 5, the 3 inner connate into a column, the 2 outer free, shorter. Female flowers: ovary 5-10 celled; ovules 2 in each cell, superposed; styles 3, minute, 2-lobed. Fruit a purple fleshy globose berry. Seeds 8-16, irregularly 3-gonous, finely granulate. (Fig. 488)

Vernacular name: Datwan,

Flowers: throughout the year.

Micromorphology (Fig. 488)

The plant showed presence of multicellular, uniseriate, unbranched, non-glandular trichome.

Stomata were of tetracytic type.

D/102.

## 15. Phyllanthus virgatus G.Forst. Fl. Ins. Austr. 65. 1786. (Phyllanthus simplex Retz.)

A perennial glabrous undershrub with a long tap root and compressed branches. Leaves distichous, numerous, oblong, upto 2 cm long; stipules peltate. Flowers solitary. Male flowers. Perianth sepaline. Stamens 3 distinct. Female flowers. Perianth similar to male flowers. Ovary triangular, trigonous. Capsule globose, rough with minute prominences. Seeds trigonous, covered with minute tubercules. (Fig. 489)

Vernacular name: Moti bhoiamli.

Flowers: August-April.

Micromorphology (Fig. 489)

Leaves were glabrous.

Stomata were paracytic, anomocytic, and anisocytic.

D/486.

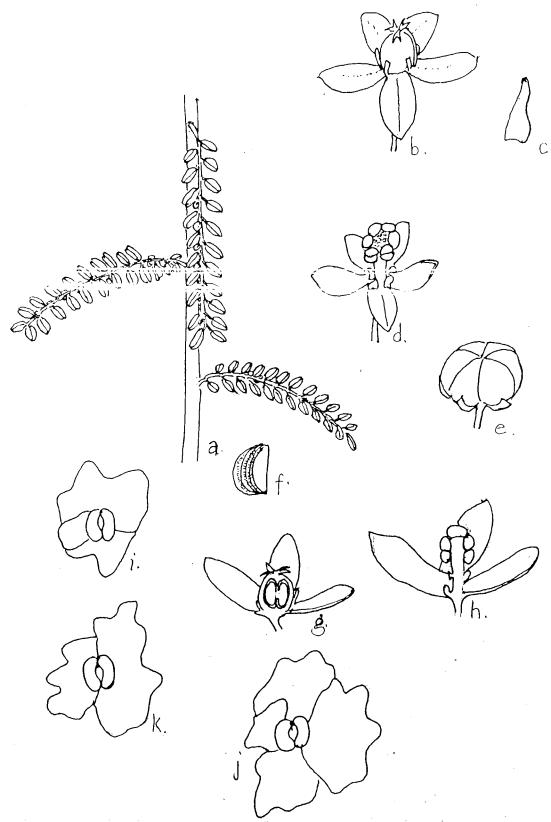


Fig. 487. Phyllanthus maderaspatensis L., a. habit, b. female flower, c. bract, d. male flower, e. fruit, f. seed, g. L.S. of female flower, h. L.S. of male flower, i-j. anisocytic stomata, k. paracytic stomata.

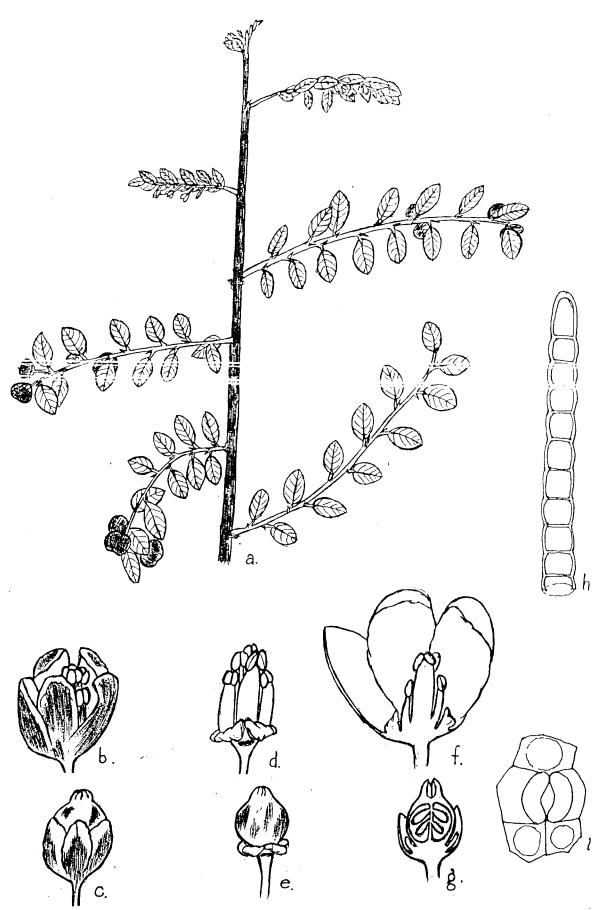


Fig. 488. Phyllanthus reticulatus Poir., a. habit, b. male flower, c. female flower, d. stamens with disc gland, e. gynoecium with disc gland, f. L.S. of male flower, g. L.S. of female flower, h. multicellular uniseriate trichome with small cells, i. tetracytic stomata.

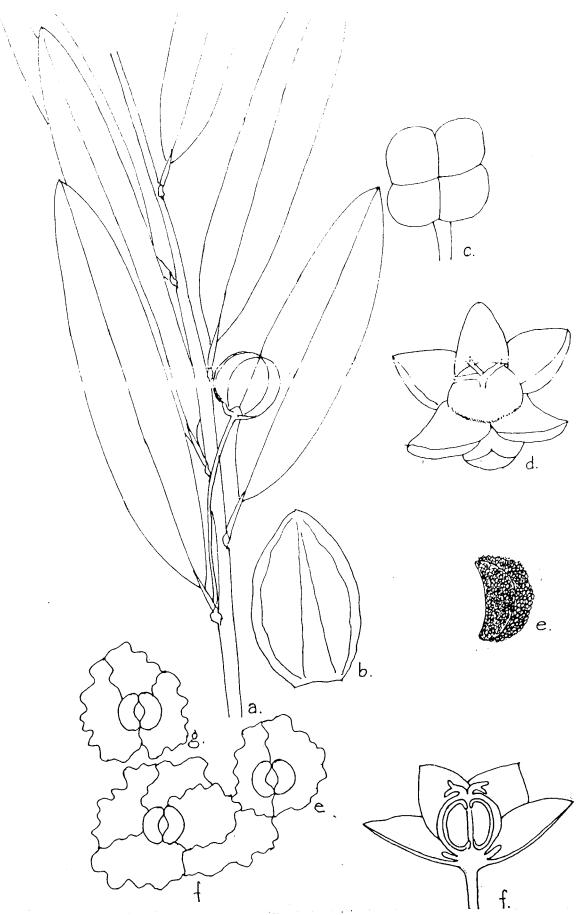


Fig. 489. Phyllanthus virgatus G.Forst., a. habit b. bract c. stamen d. female flower, e. seed, f. L.S. of female flower, e. paracytic stomata, f. tetracytic stomata, g. anisocytic stomata.

## 16. Ricinocarpus ciliatus (Forssk.) Kuntze, Revis. Gen. Pl. 2: 617. 1891. (Acalypha ciliata Forsk.)

A stout herb upto 1 m high. Leaves ovate, often acuminate, upto 8 cm long, thin, finely serrate, 5-nerved; petioles longer than blade. Flowers in axillary androgynous spikes, males few, at the top of the spike, the females several, crowded at its base;

bracts of female flowers large, 1-2 flowered, pale green, exceeding the capsules, with many nerves ending in long subulate hispid teeth. Male flowers: tepals 4, valvate. Stamens usually 8; filaments short, free; anther cells divaricate, often at length twisted or flexuous. Pistillode 0. Female flowers: tepals 3-4, minute imbricate. Ovary 3-celled; ovules solitary in each cell; styles filiform, and fimbriate. Capsules concealed by the bracts, white. Seeds globosely ovoid. (Fig. 490)

Vernacular name: Dadari.
Flowers: July-December.
Micromorphology (Fig. 490)
Whele plant was glabrous.
Stomata were of anisocytic and paracytic type.
D/366, 752- 754.

#### Ulmaceae

#### 1. Trema orientalis Blume, Mus. Bot. V. 2 (1856) p. 62.

A fast-growing short-lived tree about 10 m in height. Leaves obliquely ovate, upto 13 cm, acuminate, crenate-serrulate, chartaceous, clothed beneath with soft often white pubescent. Flowers dioecious, in axillary pubescent cymes, the male cymes compact than the female. Male flowers with 4-5 slightly incurved, induplicate-valvate sepals. Pistillode small or 0. Female flowers with sepals as in the male. Petals 0. Ovary sessile; ovulcs pendulous; style central with 2 linear arms, style-arms slightly incurved. Drupe black when ripe. (Fig. 491)

Vernacular name: Kargol.

Flowers: more or less throughout the year.

#### Micromorphology (Fig. 491)

The plant showed presence of three types of trichomes: 1) multicellular, glandular trichome differentiated into a single celled head and a multiseriate stalk. 2) multicellular, glandular trichome differentiated into a multicellular 3-4 celled head and a multiseriate stalk. 3) two celled trichome differentiated into a single celled head and a single cell stalk.

Stomata were of anomocytic type.

D/1084-1086.

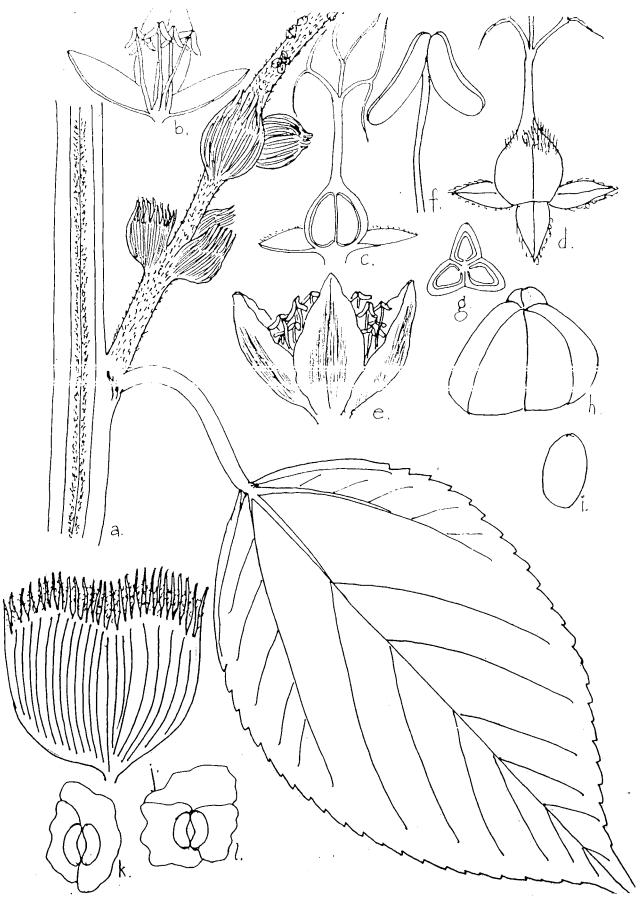


Fig. 490 Ricinocarpus ciliatus (Forssk.) Kuntze, a. habit, b. L. S. of Male flower, c. L.S. of female flower, d. female flower, e. male flower, f. stamen, g. T.S. of ovary, h. capsule, i. seed, j. calyx, k. paracytic stomata, l. anisocytic stomata.

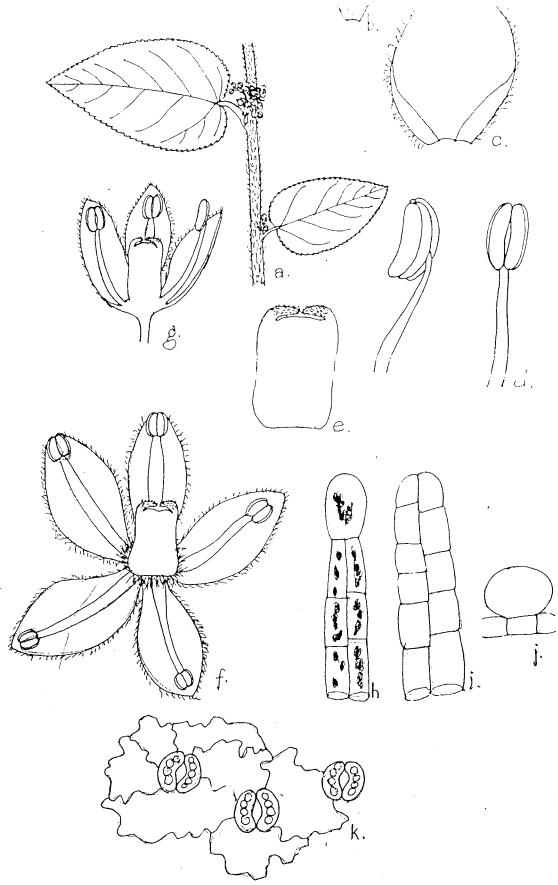


Fig. 491. Trema orientalis Blume., a. habit, b. bract, c. tepal, d. stamen, e. pistillode, f. flower, g. L.S. of male flower, h. gland with single celled head and biseriate stalk, i. gland with two celled head and biseriate stalk, j. unicellular sessile gland, k. anomocytic stomata.

### Urticaceae

### 1. Ficus hispida Linn. f. Suppl. (1781) p. 442.

A small hispidly-pubescent tree. Leaves ovate-oblong, upto 30 cm long, abruptly acuminate, toothed, the lower surface hispid-pubescent; stipules 2 to each leaf, ovate-lanceolate. Hypanthodia obovoid, upto 3 cm across, yellowish when ripe, slightly umbonate, hispid and sometimes with bracts scattered along the sides, borne on leafless hanging twigs; basal bracts 3. Male flowers numerous with two

bracts, near the apex of the hypanthodium containing the galls, sepals 3, stamen one. Gall flowers pedicellate, perianth present. Perianth scaly, five lobed and gamophyllous. Female flowers with perianth 0. Ovary globose, one celled, ovule pendulous. Achenes ovoid. (Fig. 492; Fig. 493))

Variations observed: In standard descriptions, perianth in gall and female flowers were reported to be absent and the male flowers without bracts, but in our specimens, both gall and female flowers were with scaly, five lobed and gamophyllous perianth and male flowers possessed two bracts.

Vernacular name: Dhedh umaro.

Flowers: April-July.

#### Micromorphology (Fig. 494)

The plant showed presence on unicellular, non-glandular trichome with thick wall and a very broad lumen. The wall was warty. It also showed presence of multicellular, glandular trichome differentiated into a 1-2 celled head and a single celled stalk.

Stomata were anomocytic.

D/154.

## 2. Ficus racemosa L. Sp. Pl. 1060 1753. (Ficus glomerata Roxb.)

An evergreen tree reaching to a height of 20 m. Leaves ovate-oblong, upto 15 cm; stipules ovate-lanceolate, scarious. Hypanthodium on short leafless warted branches often only a few inches long, from the stem and larger branches, sub-globose, 3 cm across, red when ripe, with depressed umbilicus; basal bracts 3, ovate-triangular; male flowers near the mouth are sessile; perianth 3-4, membranous, inflated, enveloping the 2 clongate ovate anthers; filaments connate. The female flowers forming a zone near the walls of the receptacle has a gamophyllous, irregularly toothed perianth covering only the base of the rough ovoid ovary, stigma minute, entire and indistinct. Achene small, minutely tuberculate. (Fig. 495; Fig. 496)

Variation observed: this plant is said to have a clavate stigma in female flowers, but in my plants, the stigmas of female flowers, were minute entire and indistinct.

Vernacular name: Umaro.

Flowers: Throughout the year.

#### Micromorphology (Fig. 497)

Leaf showed presence of three types of trichomes one was unicellular, non-glandular, elongated, curved trichome with thick wall and a round bottom. The second type of trichome was multicellular, glandular differentiated into a head and a stalk. The head was

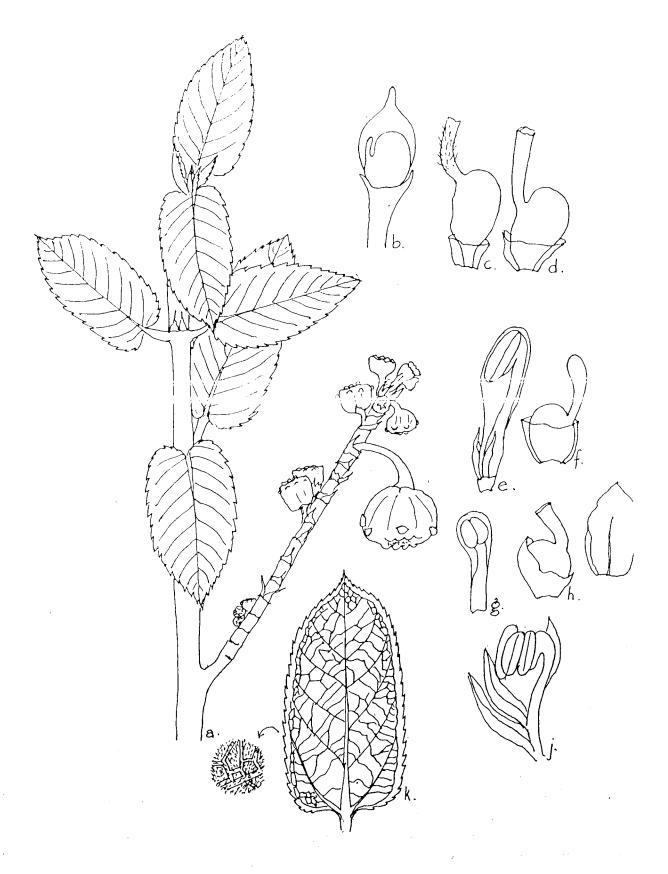


Fig. 492. Ficus hispida L., a. habit, b. sterile flower, c-d, f & h. female flower, e, g & j. male flower, i. bract.

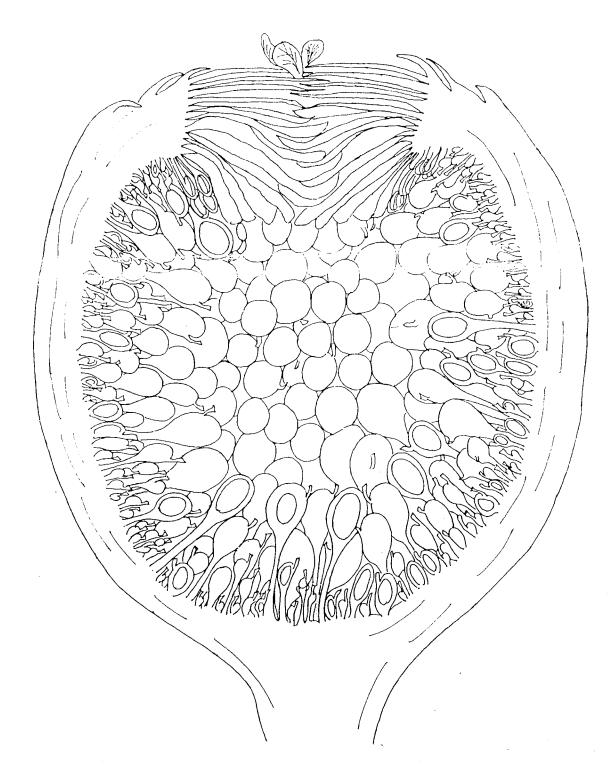


Fig. 493. Ficus hispida L., L.S. of inflorescence.

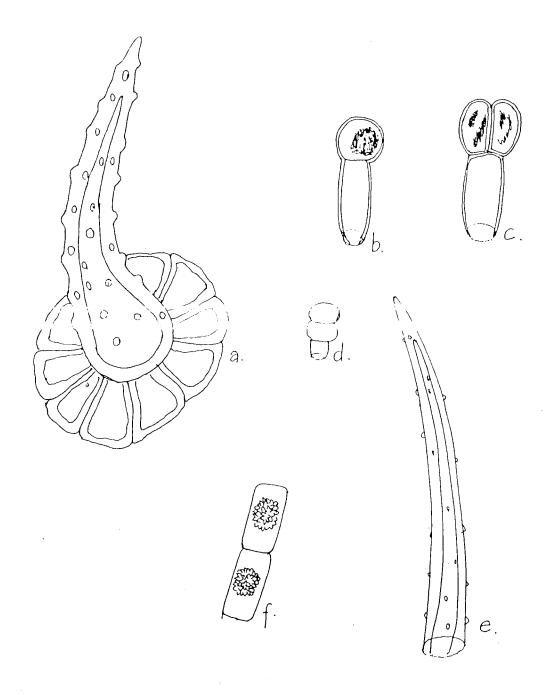


Fig. 494. Ficus hispida L., a. unicellular thick walled papillate trichome with broad lumen, b-c. gland with single to two celled head and unicelled stalk, d. gland with head having two cells in two tiers and unicelled stalk, e. unicellular trichome with thick warty wall and broad lumen, f. crystals.



Fig. 495. Ficus racemosa L., a. habit, b-c. female flower, d. scale, e-f. male flower with perianth, g-h. sterile flower, j. bract, k. bracteole, l. perianth.

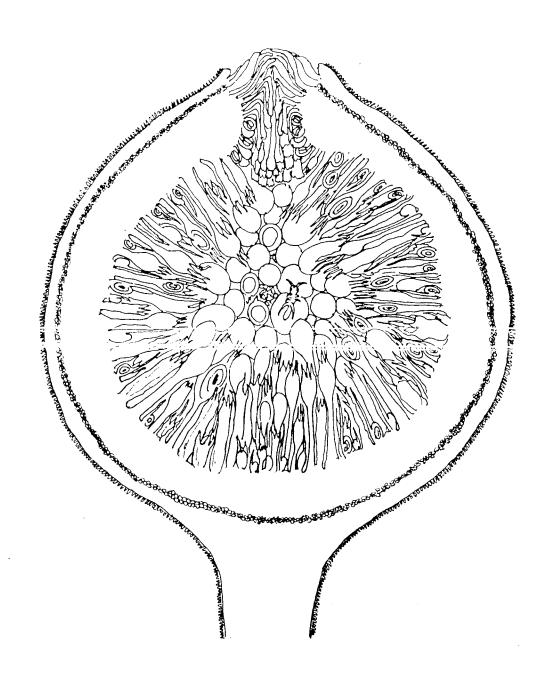


Fig. 496. Ficus racemosa L., L.S. of inflorescence.

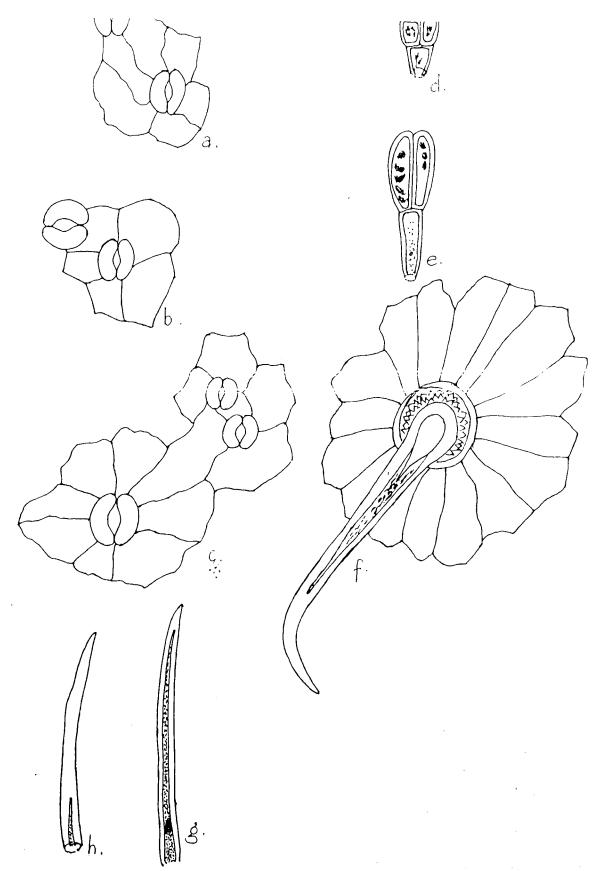


Fig. 497. Ficus racemosa L., a-c. anomocytic stomata, d. gland with four celled head and single celled stalk, e. gland with two celled head and a single celled stalk, f. unicellular trichome with thick wall and a crystal at the base of the trichome, g. unicellular trichome with thick wall and narrow lumen filled with ergastic substances, h. unicellular trichome with small lumen.

two celled and stalk was unicellular; the third trichome was similar to the second one except the four celled head in which cells was arranged in two tiers. Stipule showed presence of unicellular, non-glandular, elongated trichome with thick wall.

Stomata were of anomocytic and cyclocytic type; anomocytic type was present in majority.

D/1219-1220.

### Hydrocharitaceae

### 1. Hydrilla verticillata Presl, Bot. Bemerk. P. 112. 1844.

An aquatic fresh water plant, occurring as large masses in water with slender much branched stems reaching 30 cm or long and often rooting at nodes. Leaves linear, upto 1 cm long, sessile. Flowers minute dioecious, solitary in a subglobose, muricate spathe. Sepals and petals 3 each. Stamens 3 with reniform anthers. Female flowers sessile, in a tubular 2-toothed spathe. Sepals and petals as in male flowers. Ovary one-celled; ovules numerous. Fruit subulate, smooth or muricate. Seeds 2-3, oblong. (Fig. 498) Vernacular name: Kureli.

D/252.

### Musaceae

### 1. Musa paradisiaca Linn. Sp. Pl. (1753) p. 1043.

A large coarse, often tree like, perennial herb rising from a massive sympodial corm with the sheathing leaf bases closely overlapping and appressed to each other forming a hollow false trunk (pseudostem). Lamina oblong, with pinnate parallel venation and reaches a length of 3 m. Axis of the inflorescence arising from the corm growing up through the tube formed by the leaf sheaths, commonly turned towards one side or drooping. At the end of axis is a large cone shaped structure bearing a close succession of large leathery-firm form boat shaped spirally arranged branches each of which subtends a compact few flowered bractless monochasial cyme. Flowers epigynous, irregular, and strongly nectariferous, tepals 6. the 3 outer tepals and 2 inner tepals join together into a usually 5 toothed or 5 lobed initially tubular structure that soon splits on one side. The odd tepal or inner tepal free, boat shaped and contains nectar. Stamens mostly 5. gynoecium tricarpellary, syncarpous, trilocular, ovary inferior with many ovules in axile placentation, Fruit cylindric, fleshy, up to 20 cm long, yellowish when ripe, the pulp sweet, edible. (Fig. 499)

Vernacular name: Kela.

Flowers: Throughout the year.

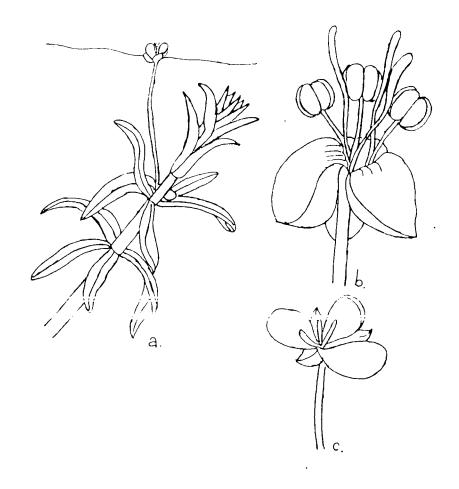


Fig. 498 Hydrilla verticillata Presl., a. habit, b. male flower, c. female flower.

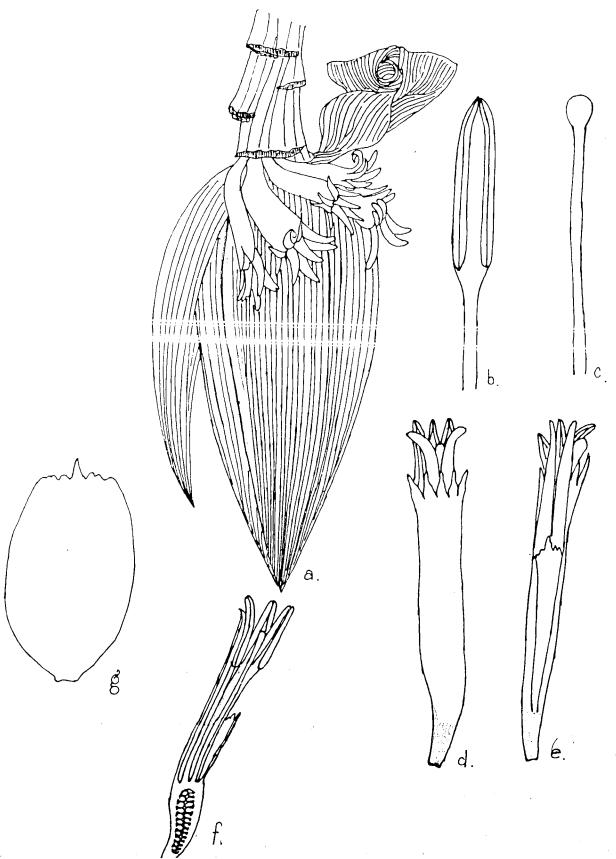


Fig. 499. Musa paradisiaca L. a. habit, b. stamen, c. stigma and style, d-e. flower, g. bract.

### Zingiberaceae

### 1. Alpinia nutans Roscoe, in Smith, Exot. Bot. V. 2 (1805) p. 93.

A handsome ornamental herb with stem reaching upto 3 m in height. Leaves oblong lanceolate having a length upto 60 cm. Flowers white, borne in panieles reaching 30 cm long. Rachis hairy, and bracts large concave, ivory white with pink tips. Corolla with a tinge of pink. The labella variegated with red and yellow. Stamen 1, perfect. Lips spreading, with incurved margins. Ovary 3-celled. Fruit

globose, containing many seeds. (Fig. 500)

Vernacular name: Nag-champa Micromorphology (Fig. 500)

Three types of unicellular trichomes were obeserved, with different thickness of the walls

Stomata were tetracytic.

D/105.

### 2. Curcuma pseudomontana Grah. Cat. Pl. Bomb. (1839) p. 210.

A stemless herb with small tuberous rootstock, bearing small almond-like or subglobose tubers at the ends of the fibres. Leaves lanceolate-oblong, acuminate, reaching 60 cm or more long. Flowers in dense compound spikes, crowned by a coma of enlarged mauvepurple colored bracts, 2 or 3 flowers in each bract; lower bracts ovate, enclosing bracteolate fugacious flowers. Calyx cylindric, minutely toothed. Corolla-tube funnel shaped; corolla-lobes oblong, the upper longer and somewhat concave. Stamen 1 perfect; anthers cells spurred at the base; staminodes oblong, petaloid, connate with the filament. Ovary 3-celled; ovules numerous on axile plancentas. Fruit globose 3-valved capsule. Seeds obovoid; usually arillate. (Fig. 501)

Vernacular name: Haldar ni jat.

Flowers: July-September. Micromorphology (Fig. 501) Whole plant was glabrous. Stomata were of tetracytic type.

D/272.

## Amaryllidaceae

### 1. Curculigo orchioides Goerin. Fruct. V. 1 (1788) p. 63, t. 13.

A herb with a tuberous stout rootstock and copious fleshy tuberous root. Leaves linearlanceolate, upto 3 cm long, plicate, base sheathing. Scape short, clavate, flattened; bracts, and ovary hidden among the leaf-sheaths. Flowers bright-yellow, distichous, the lowest in the raceme 2-sexual, the upper male; bracts lanceolate, membranous. Perianth 6-partite, separated from the ovary by a solid stipe bearing the rotate limb, segments elliptic-

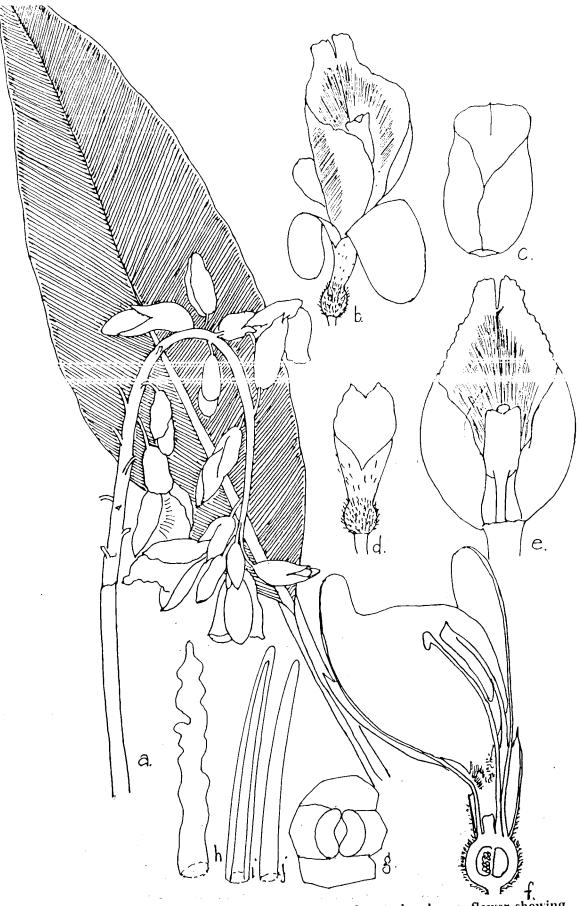


Fig. 500. Alpinia nutans Roscoe., a. habit, b. flower, c. bract, d. calyx, e. flower showing stamen, f. L.S. of flower, g. tetracytic stomata, h. gland unicellular trichome, i. unicellular trichome, j. unicellular trichome with thick wall and narrow lumen.

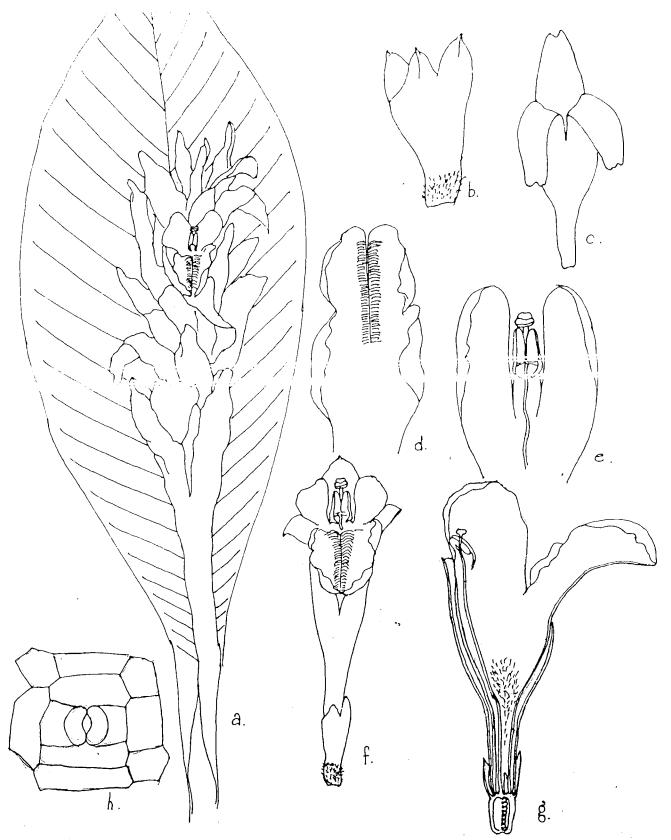


Fig. 501. Curcuma pseudomontana Grah., a. habit, b. calyx, c. corolla, d. upper lip of the corolla, e. lower lip of the corolla showing epipetalous stamen enclosing style and stigma, f. flower, g. L.S. of flower, h. tetracytic stomata.

oblong, the stipes slender. Stamens 6, adnate to the base of the perianth-lobes; anthers linear. Ovary inferior, 3-celled, lanceolate, the cells 6-8-ovulate; stigma 3-cleft. Capsules 1-4 seeded; septa spongy. Seeds oblong, black, shining. (Fig. 502)

Vernacular name: Kali musli. Flowers: July-September. **Micromorphology** (Fig. 502) Whole plant was glabrous. Stomata were of tetracytic type D/296.

### Liliaceae

### 1. Asparagus racemosus Willd, Sp. Pl. V. 2 (1799) p. 152.

An extensive scandent spinous much-branched undershrub with a number of tuberous fusiform roots. Leaves reduced to minute spinescent structure subtending the leaf like falcate cladodes, borne in axillary clusters of 2-6. Flowers white, strong scented in solitary or fasciled racemes; bracts scarious. Perianth six-partite, segments, oblong, reflexed and connivent below; stamens 6, filaments free, opposite to the perianth segments, anthers 2-celled; ovary trigonous, three chambered, style short, columnar, ending in three recurved stigmatic lobes; fruits are globose berries. (Fig. 503)

Vernacular name: Shatavari. Flowers: June-September. **Micromorphology** (Fig. 503) Whole plant was glabrous. Stomata were of tetracytic type. D/326.

# 2. Asphodelus fistulosus var. tenuifolius (Cav.) Baker J. Linn. Soc., Bot. 15: 272 1876. (Asphodelus tenuifolius Cav.)

An annual herb upto 60 cm in height. Leaves radical, terete, fistular with a sheathing leaf base and upto 30 cm long. Scapes several from the root, much branched, upto 60 cm high. Flowers white, solitary in each broadly ovate, scarious bract with a strong brownish keel. Perianth petaloid, segments 6, shortly connate below oblong, with a strong brownish costa. Stamens 6. Ovary 3-celled; ovules 2 in each cell; style fusiform; stigma sub-capitate, 3-lobed. Capsules globose. Seeds sharply 3-gonous and black. (Fig. 504)

Vernacular name: Dungaro. Flowers: December-March. **Micromorphology** (Fig. 504) Stomata were tetracytic D/374.



Fig. 502. Curculigo orchioidoes Gaetrn., a. habit b. epipetalous stamen, c. flower, d. fruit, e. stamen, f. seed, g. tetracytic stomata.

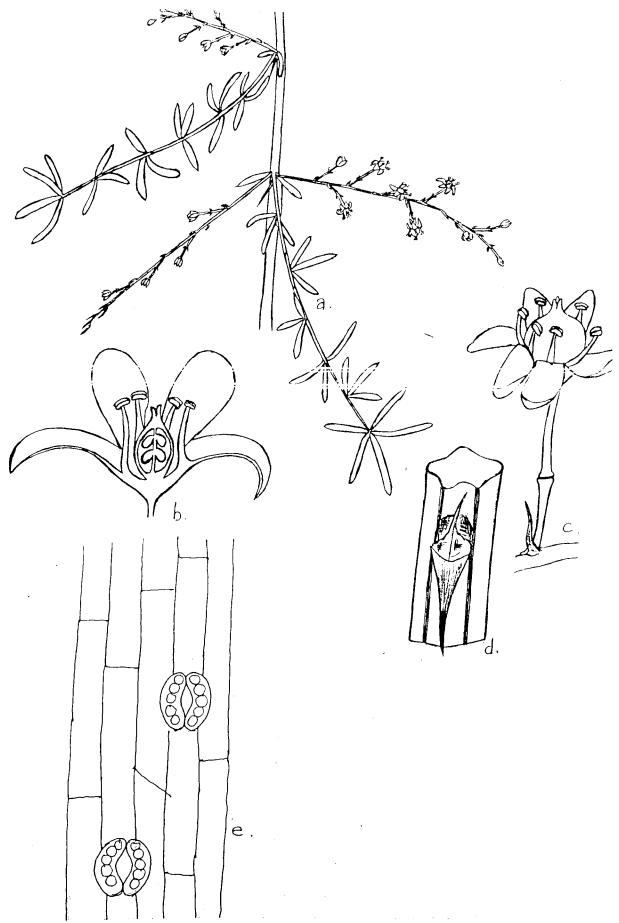


Fig. 503 Asparagus racemosus Willd. a. habit b. L.S. of flower c. flower d. scaly leaf with spiny spur e. tetracytic stomata.

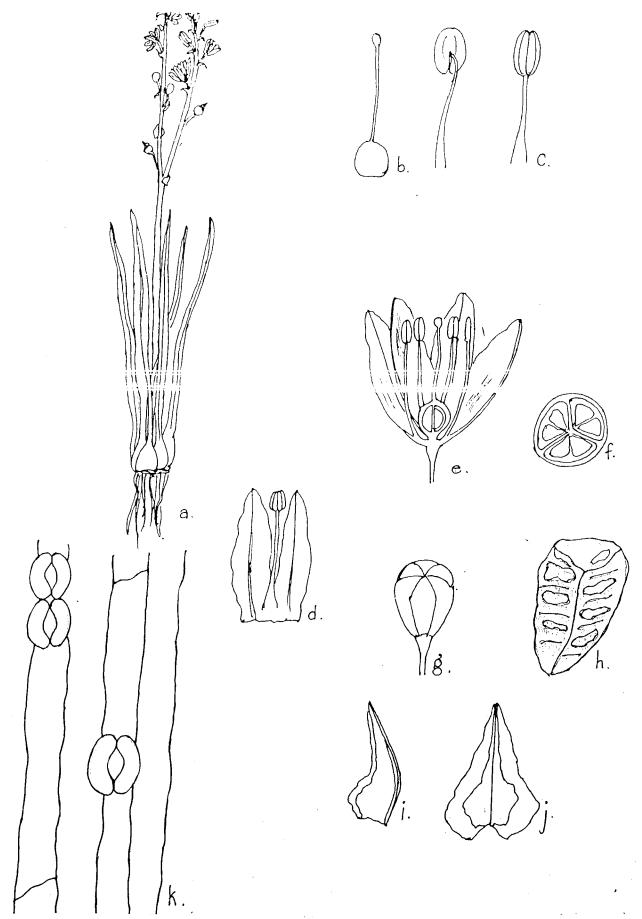


Fig. 504. Asphodelus fistulosus var. tenuifolius (Cav.) Baker, a. habit, b. gynoecium, c. stamen, d. epipetalous stamens, e. L.S. of flower, f. T.S. of ovary, g. fruit, h. seed, i-j. bract, k. tetracytic stomata.

## 3. Dracaena terniflora Roxb. Fl. Ind. V. 2 p. 159, 1832. (Dracaena spicata Baker)

A slightly branched straggling shrub. Leaves elliptic-lanceolate, upto 30 cm, acuminate, coriaceous; petioles with a widened subamplexicaul base. Flowers white, often 2-3 together on the rhachis of a usually simple scarious, ovate bract. Perianth coralline, tubular; lobes linear, obtuse. Stamens 6, adnate to the base of the perianth tube; anthers versatile. Ovary 3-celled; ovules solitary in each cell. Fruit a red globose berry, 1-seeded. (Fig. 505)

Micromorphology (Fig. 505) Stomata were of tetracytic type. D/227.

### 4. Gloriosa superba Linn, Sp. Pl. (1753) p. 305.

A herbaceous tail branching comber with solid, fleshy-white, cylindric tubers upto 30 cm long. Stems annual, reaching to a length of 6 m long, given off from the angles of the young tubers. Leaves ovate-lanceolate, about 15 cm, acuminate, tip ending in a tendril-like spiral, base cordate. Flowers axillary, solitary, or sub-corymbose towards the ends of the branches. Perianth-segments linear-lanceolate with crisply waved margins, basal half bright yellow, upper half red, reaching 7 cm, deflexed. Stamens 6; anthers versatile. Ovary 3-celled; style deflexed. Capsules linear-oblong. Seeds numerous, subglobose. (Fig. 506)

Vernacular name: Kankasni. Flowers: July-September. **Micromorphology** (Fig. 506) Whole plant was glabrous. Stomata were anomocytic. D/617, 659-661.

### Pontederiaceae

#### 1. Eichhornia crassipes (Mart.) Solma in DC., Phan. 4:527. (1883).

A free floating with stoloniferous aquatic herbs upto 50 cm high with short stem and many long firbrous roots having root pockets. Leaves broadly ovate to rhomboid, rosulate. Petiole glabrous and spongy with a fusiform bulbous portion about the middle, about 30 cm long. Inflorescence 3-35 flowered raceme. Flowers lilac, tinged blue, withering soon. Perianth 6-partite, tube green; segments obovate, posterior segment with a yellow spot. Stamens unequal in 2-series, filaments curved glandular hairy; anthers purple-blue. Ovary ovoid, 3-locular; style glandular; stigma 3-lobed, glandular. capsule trilocular. (Fig. 507)

Vernacular name: Kanphutti. Flowers: September-November.

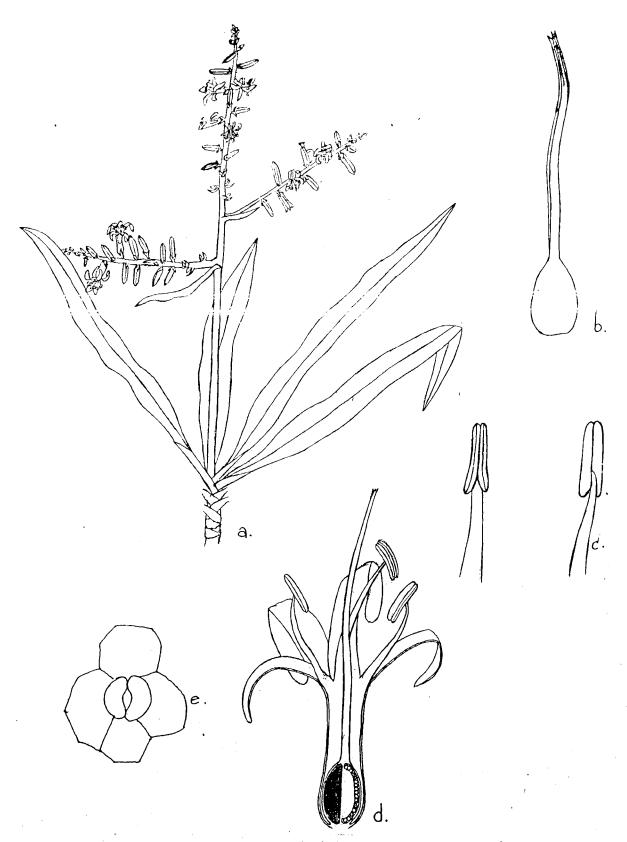


Fig. 505. Dracena terniflora Roxb., a. habit, b. gynoecium, c. stamen, d. L.S. of flower, c anomocytic stomata,



Fig. 506. Gloriosa superba L., a. habit, b. gynoecium, c. L.S. of flower, d. anomocytic stomata.



Fig. 507 Eichhornia crassipes (Mart.) Solma., a. habit, b. L.S. of Flower, c. stamen, d. gynoecium.

### Micromorphology (Fig. 508)

Whole plant was glabrous except the stamens which showed the presence of multicellular, glandular, unbranched trichome differentiated into a single celled head and a multicellular, uniscriate stalk.

Stomata were of tetracytic and actinocytic. Among which tetracytic was present in majority

D/190.

## 2. Monochoria vaginalis Prestl Reliq. Haenk. V. 1 (1830) p. 128. (Pontederia vaginalis Burm.)

Aquatic herb with—short, suberect, spongy rootstock, clothed with leafsheaths. Leaves radical and solitary at the top of the emerging stem, ovate-cordate, upto 10 cm, acuminate; the peduncles emerges from the channeled sheaths of the uppermost leaves. Inflorescence racemose; flowers blue, usually spotted with red. Perianth campanulate, 6-partite, 3 of them narrowly obovate. Stamens 6, adnate to the base of the perianth-lobes; filaments of the large anther with an acute horn at one side, the filaments of the smaller anthers filiform; anthers basifixed, linear-oblong. Ovary 3-celled, ellipsoid, ovules many in each cell; stigma 3-lobed. Fruit ellipsoid, membranous capsule. Seeds ellipsoid, with many brown ribs. (Fig. 509)

Vernacular name:Monochoria. Flowers: August-October. **Micromorphology** (Fig. 509) Stomata were tetracytic. D/855.

### Commelinaceae

### 1. Commelina benghalensis Linn. Sp. Pl. (1753) p. 41

A slender herb, dichotomously branched from the base upwards creeping and rooting below. Leaves ovate or oblong, upto 7 cm long, villous and unequal-sided.

Spathes 1-3 together, funnel-shaped, auricled on one side, pubescent; upper branch of cyme 2-3 flowered; the lower 1-2 flowered. Sepals 3, membranous, the 2 inner often connate. Petals 3, 2 larger clawed and third smaller. Stamens 6, adnate to the base of the perianth; anthers oblong; fertile stamens 3; 3 imperfect. Ovary 3-celled, 2 cells, 2-ovulate, 1 cell 1-ovulate. Capsules pyriform, 5-seeded. Seeds oblong. (Fig. 510)

Flowers: August-December.

Micromorphology (Fig. 510)

The whole plant was glabrous.

Stomata were of tetracytic type.

D/1240.

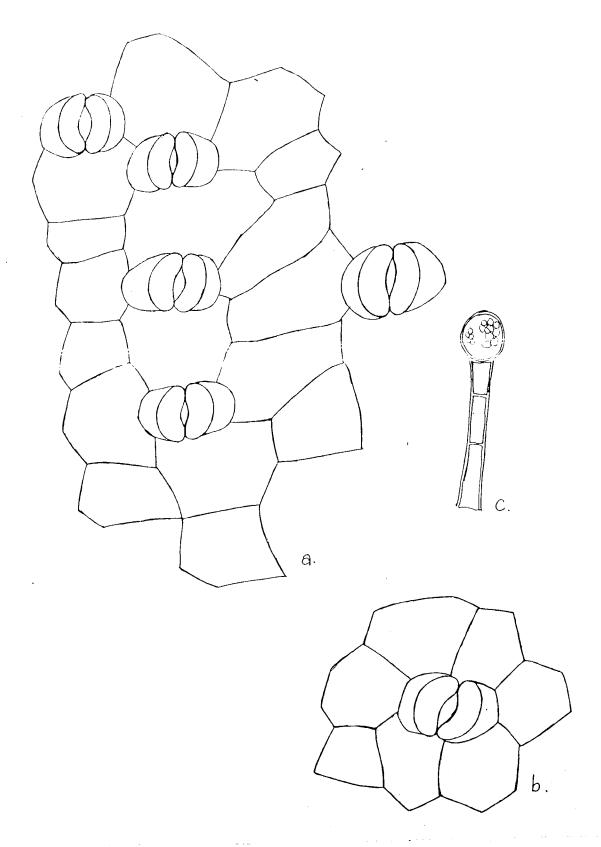


Fig. 508. Eichhornia crassipes (Mart.) Solma., a. anomocytic stomata, b. tetracytic stomata c. gland with one celled head and tri-celled stalk.

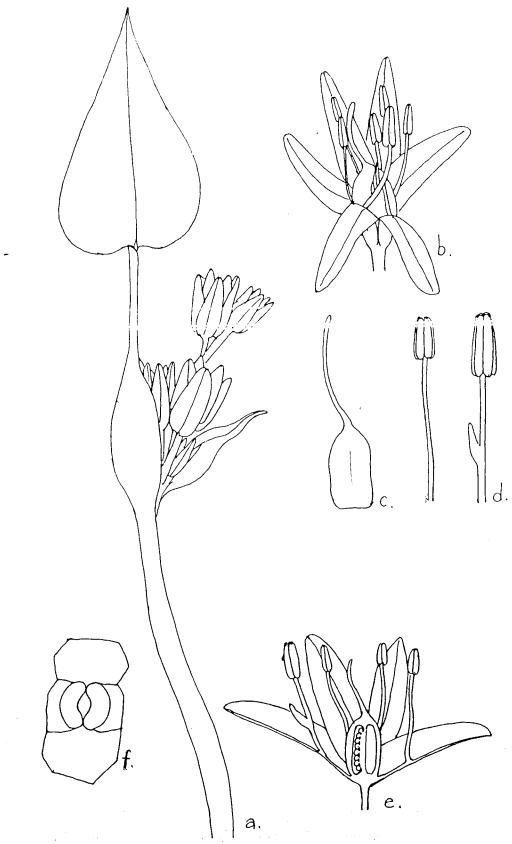


Fig. 509. Monocharia vaginalis (Burm. f.) Presl., a. habit b. flower, c. gynoecium, d. stamen, e. L.S. of flower, f. tetracytic stomata.

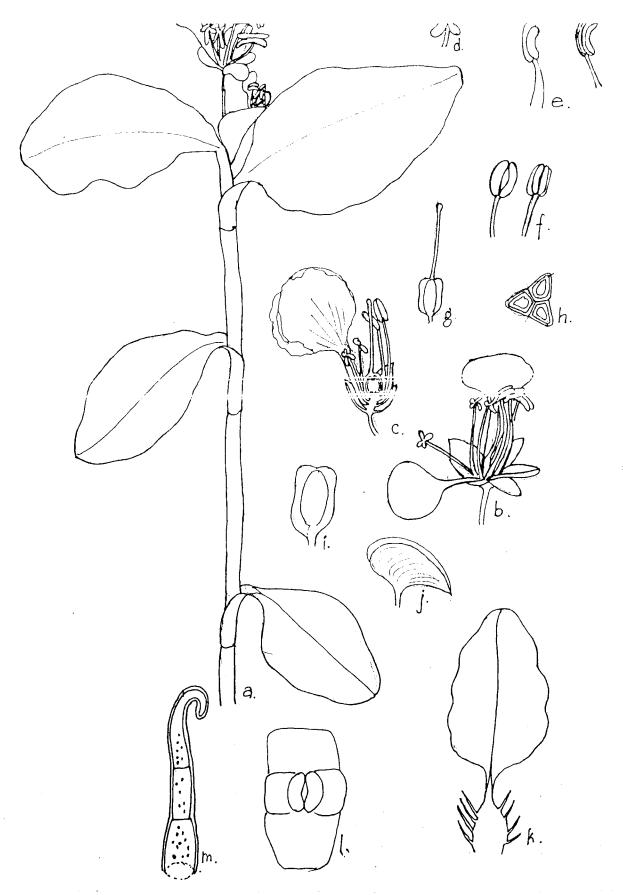


Fig. 510. Commelina benghalensis L., a. habit, b. flower, c. L.S. of flower, d-f. stamen, g. gynoecium, h. T.S. of ovary, i. capsule, j. spathe, k. leaf, l. tetracytic stomata, m. three-celled trichome with upper cell hook shaped.

### 2. Cyanotis cristata Schultes f. Syst. V. 7 (1830) p. 1150.

A slender herb branched from the base upwards, creeping and rooting below. Leaves upto 5 cm long, sessile, ovate-oblong, with villously ciliate margins. Flowers in scorpioidly recurved cymes upto 2 cm long, longer than the bracteoles; peduncles upto 10 cm long; bracts ciliate with long hairs. Sepals 3, free, lancelolate, acuminate. Corolla fused; lobes 3, ovate. Stamens 6, all perfect, subequal, epipetalous; filaments fusiform below the tip, bearded above; anthers oblong. Ovary 3-celled; ovules 2 in each cell, collateral, one erect, the other pendulous. Capsules oblong, 3-gonous. Seeds 3-gonous, striate and with 2 large pits on two of the faces, black. (Fig. 511)

Vernacular name: Shishmuliya ni jat.

Flowers: August-October.

### Micromorphology (Fig. 511)

Whole plant showed presence of multicellular, uniscriate, non-glandular, unbranched, elongated and thick walled trichome. The staminal hairs were also multicellular but they were beaded, uniscriate, unbranched, and the cells of the trichomes were globular, thin walled.

Stomata were of tetracytic type.

D/929, 954.

## 3. Phaeneilema scapiflorum (Roxb.) G. Brückn. Notizbl. Bot. Gart. Berlin-Dahlem 10: 56. 1927.

(Aneilema scapiflorum Wight)

A tufted herb with root of elongate pisiform tubers. Leaves narrowly ensiform, upto 20 cm long, acuminate, glabrous. Flowers in erect elongate panicles on terminal leafless scapes; sheaths on the scape embracing the scape below, finely acuminate with an oblique mouth; upper bracts amplexicaul, ovate, acuminate, membranous, often sported with small spots. Sepals elliptic-oblong, purple-green. Petals blue, obovate. Stamens 3 and staminodes 3; filaments all bearded with blue hairs; anthers of fertile stamens blue, those of the staminodes yellow. Ovary sessile 3 celled; cells 1-ovulate. Capsules obovoid. Seeds 5 or 6 in a cell, superposed, sharply 3-gonous. (Fig. 512)

Flowers: May-June.

### Micromorphology (Fig. 512)

The plant showed presence of staminal hairs. The hairs were glandular, multicellular, uniseriate, elongated trichome whose wall was warty and thick. The cells of the trichome were at right angles to the previous or the preceding ones.

Stomata were of tetracytic type.

D/893-897, 1038.

### 4. Rhoeo discolor Hance, in Walp. Ann. V. 3 (1853) p. 659.

Tradescantia discolor L'Herit.

A prostate slender herb. Leaves large, lanceolate, and sheathed at the base, green above and purple beneath. Flowers blue or purple almost included within the bracts. Perianth oblong-ovate, clawed; white. Stamens 6; filaments long and hairy with staminal hairs;

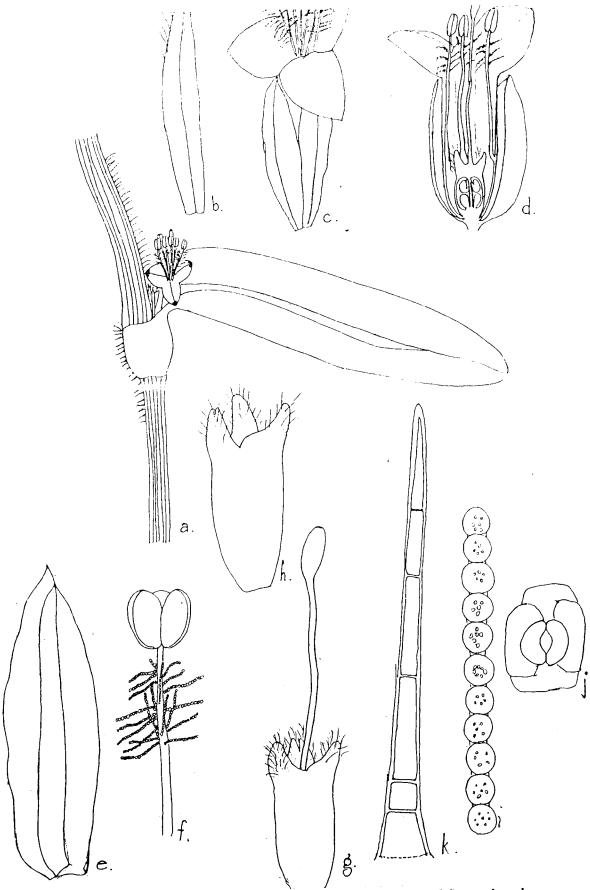


Fig. 511. Cyanotis cristata Schultes f., a. habit b. bract c. flower d. L.S. of flower h. calyx e. bracteole f. stamen g. calyx with gynoecium i. uniseriate staminal gland with small round cells having some inclusions, j. tetracytic stomata, k. multicellular uniseriate trichome with thin wall and large cells with narrow lumen.

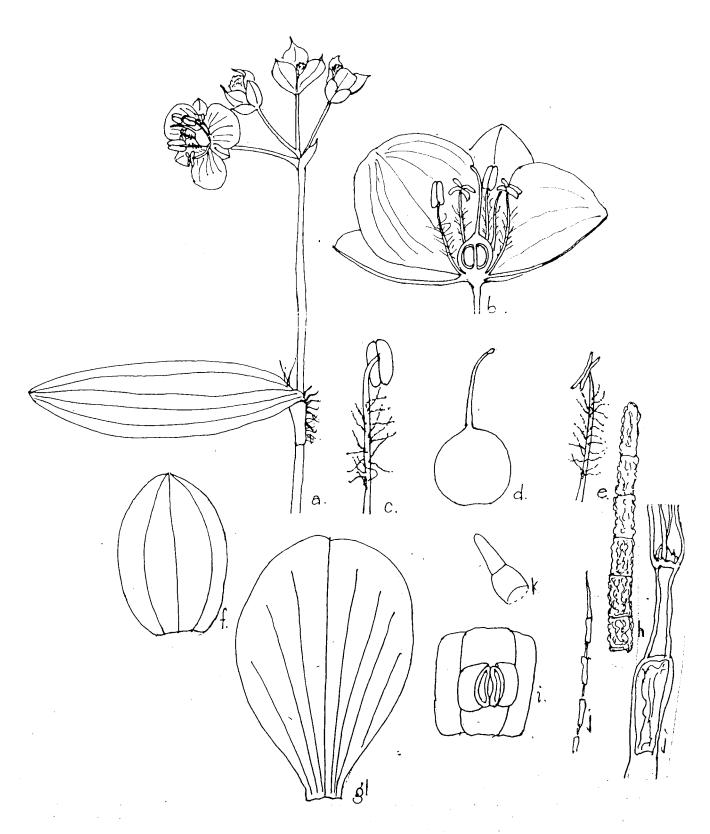


Fig. 512. Phaeneilema scapiflorum (Roxb.) G. Brückn., a. habit, b. L.S. of flower, c and e. stamen, d. gynoecium, f. sepal, g. petal, h. gland with thick and warty wall, i. tetracytic stomata, j. enlarged view of the glandular trichome, k. two-celled gland.

anthers separated at the tip by a broad connective; anther cells kidney shaped. Ovary globular; 3 celled; ovules 2 in each cell; style long; stigma capitate. (Fig. 513)

Micromorphology (Fig. 513)

Staminal hairs were multicellular, beaded, unbranched, uniscriate, and thick walled. Stomata were of tetracytic type. D/171.

### Arecaceae

### 1. Caryota urens Linn. Sp. Pl. (1753) p. 1189.

A tall palm having an unbranched trunk reaching a height of 20 m, cylindric, annulate. Leaves bipinnate, fasciculate or alternate, upto 7 m; arched and drooping; leaflets cunciform, obliquely truncate, upto 20 cm long, irreregularly serrate-toothed on the truncate margin; peticle with fibrous nexted margins at the base, sheath smooth. Spadix upto 4 m long; branched forming a dense tassel drooping from the stout short peduncle. Spathes 50 cm long, closely embracing the peduncle of the spadix. Flowers monoecious, solitary. Male flowers: sepals 3, short rounded. Petals 3 larger, linear, oblong, reddish. Stamens about 40; filaments short, white; anthers acuminate, as long as the petals. Female flowers subglobose, smaller than the male. Sepals and petals as in male flowers. Staminodes 3. Ovary obovoid, trigonous, 3-celled. Ovule solitary in each cell, erect. Fruit reddish; pericarp acrid, stinging. Seeds 1 or 2. (Fig. 514)

Vernacular name: Shivjata. Flowers during most of the year. D/104.

## **Typhaceae**

## 1. Typha australis K. Schum. & Thonner, Beskr. Guin. Pl. 401. 1827 (Typha angustata Bory & Chaub.)

A robust marshy herb of about 3 m in height. Leaves erect, spongy, exceeding the flowering stem, semicylindric above the sheath. Spikes cylindric, the male and female spikles often separated by a considerable interval. Flowers small, the female spikes pale brown. Perianth of capillary hairs or in the male flowers obsolete. Stamens 3; connective thickened at the tip. Female flowers mixed with clavate-tipped pistillodes; bracteoles subspathulate, equaling the linear stigmas, both longer than the hairs. Pollen simple. (Fig. 515)

Vernacular name: Gha bajriyo. Flowers: October-June.

D/848-849.

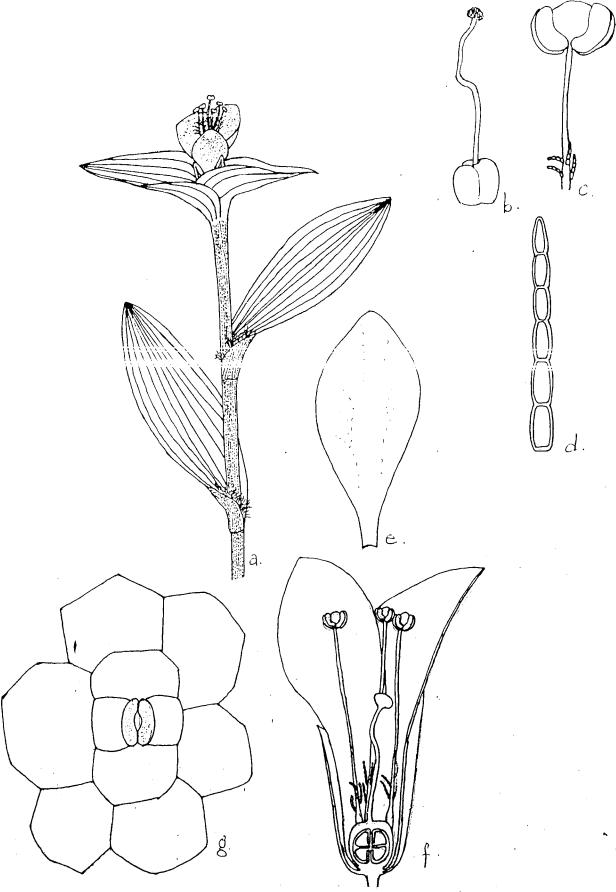


Fig. 513 Rhoeo discolor Hance., a. habit b. gynocium c. stamen d. uniseriate gland with thick wall and small cells, e. petal, f. L.S. of flower, g. tetracytic stomata.

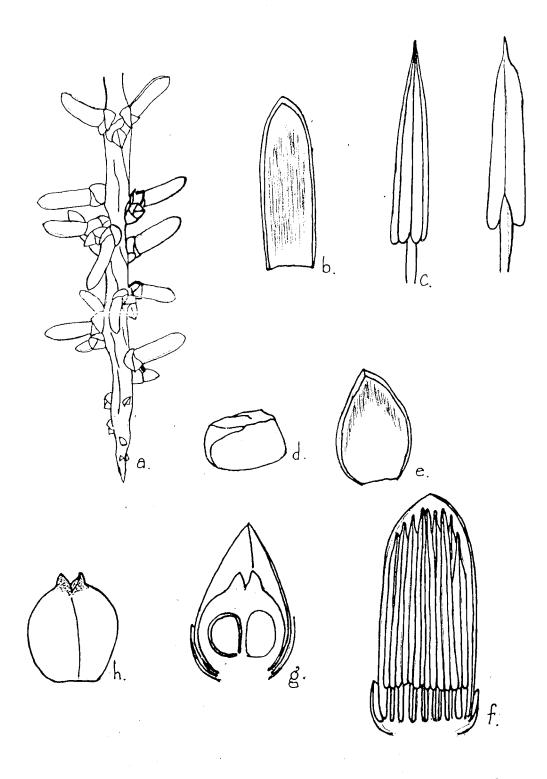


Fig. 514 Caryota urens L., a. habit, b. petals, c. stamen, d. flower bud, e. sepal, f. L.S. of male flower, g. L.S. of female flower, h. gynoecium.



Fig. 515. Typha australis K. Schum. & Thonner., a. habit, b. female flower, c. male flower, d. female flower.

### Araceae

### 1. Pothos scandens Linn. Sp. Pl. (1753) p. 968.

A climbing evergreen plant with much branched, tough, terete, smooth, leafy stem. Leaves elliptic or lanceolate, upto 10 cm long, acuminate; petiole broadly winged, upto 7 cm, the base semi-amplexicaul. Peduncles upto 1 cm long, axillary. Spathes cymbiform, cuspidate, green. Spadix yellow, as long as the spathe, globose, ovoid, the stipes as long as the inflorescence. Perianth of 6 segments with hooded tips. Stamens 6; filaments linear; anther cells divaricate. Ovary depressed, 3-celled, ovules solitary in each cell, truncate; stigma minute, sessile, lobulate. Berries 1-1.5 cm long, oblong, scarlet. (Fig. 516)

Flowers: May-July.

Micromorphology (Fig. 516)

Whole plant was glabrous but is showed the presence of crystals.

Stomata were of tetracytic type.

D/176.

### Alismataceae

### 1. Limnophyton obtusifolium Miq. Fl. Ind. Bat. V. 3. (1855)

A scapigerous perennial herb with short stout rootstock with numerous root fibres possessing radical leaves. The leaves are deltoidly sagittate upto 30 cm long. Petiole very long, striate channeled above. Flowers polygameous (male and bisexual) in paniculate whorls borne on a 1 m long stout angular scape. Flowers white, sepals 3, green. Orbicular ovate, petals 3, obovate, white. Stamens 6 with flattened filaments. Carpels upto 20, ovules solitary. Fruit hard achenes in globose head. (Fig. 517)

Vernacular name: Nalkut.

D/108.

### Cyperaceae

#### 1. Cyperus iria Linn. Sp. Pl. (1753) p. 45.

A glabrous annual with triquetrous, striate, tufted stems reaching 50 cm in length. Leaves linear, grass-like, 3-ranked, finely acuminate. Umbel decompound, of many primary rays upto 12 cm long, bearing irregularly fascicled umbellules formed of narrow interrupted spikes of 5-20 small few-flowered spikelet; bracts 3-5, the longest sometimes reaching 20 cm long. Spikelets small linear-oblong, obtuse, compressed, 6-20 flowered. Glumes apiculate, loosely or scarcely imbricate, 3-5 nerved, with broad hyaline margins. Stamens 2 or 3; anthers small, oblong, muticous, yellow. Ovary compressed. Nut obovoid, triqueterous, brown or black, slightly exserted from the glume. (Fig. 518) Flowers: Throughout the year.

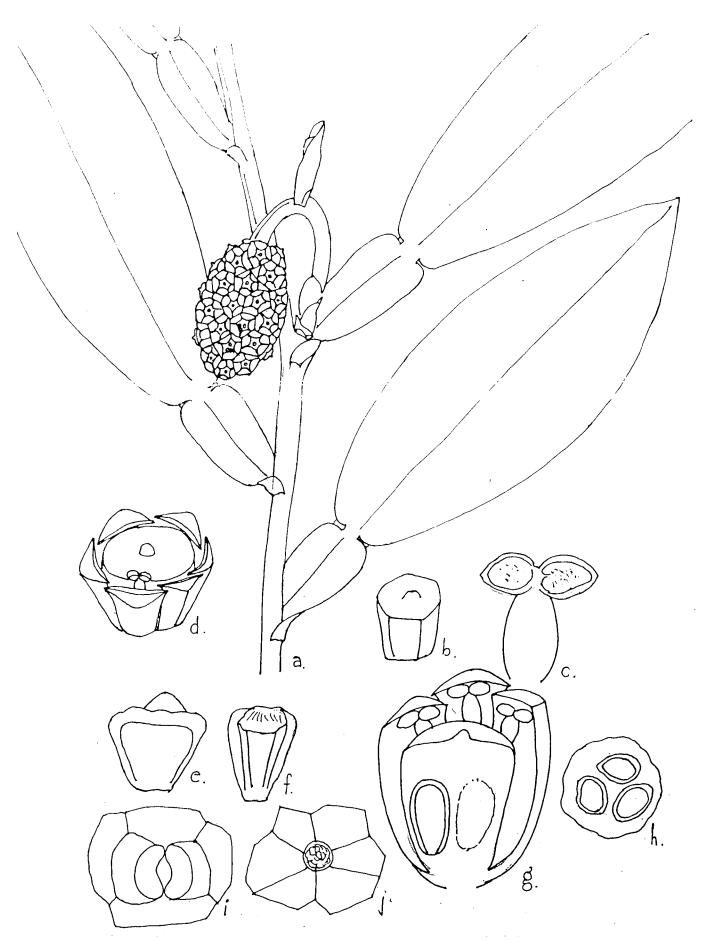


Fig 516. Pothos scandens L., a. habit, b. gynoecium, c. stamen, d. flower, e-f. tepal, g. L.S. of flower, h. T.S. of ovary, i. tetracytic stomata, j. crystals.

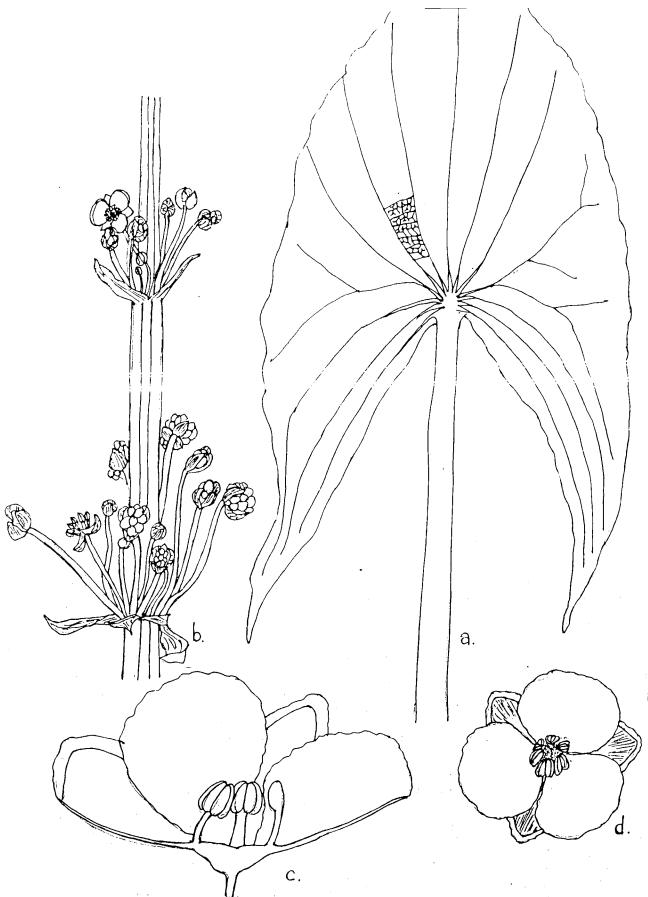


Fig. 517 Limnophyton obtusifolium Miq., a. habit, b. inflorescence, c. L.S. of male flower, d. male flower.

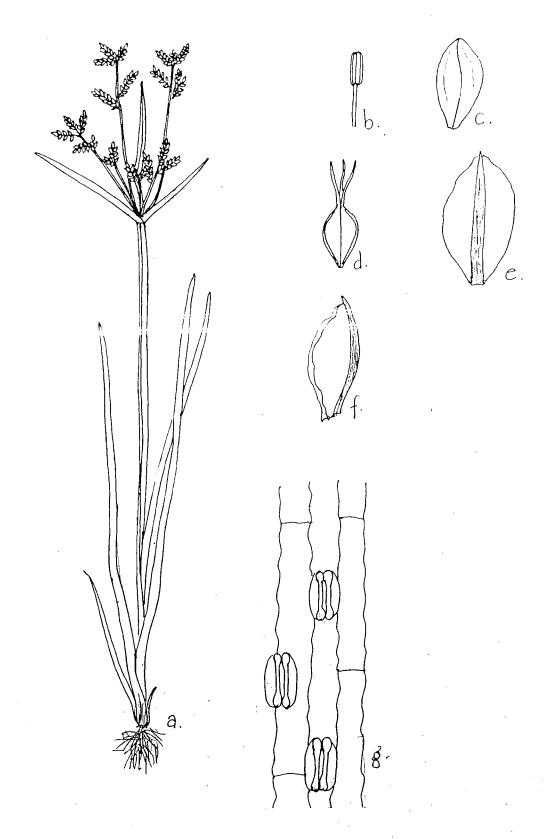


Fig. 518. Cyperus iria L., a. habit, b. stamen, c-d. floral glume, e. gynoccium, f. empty outermost glume, g. graminaceous stomata.

Micromorphology (Fig. 518) Stomata were graminaceous. D:921-924.

### 2. Cyperus leucocephalus Retz. Obs. Fasc. 5 (1789) p. 11.

A glabrous rhizomatous herb with caespitose, very slender stems. Leaves linear, shorter than the stem, many-nerved. Heads dense, globose, white, containing 8-50 spikelets; bracts 3, the longest reaching 7 cm long, narrowly linear, long-acuminate, many-nerved. Spikelets compressed, elliptic, 10-18 flowered. Glumes oblong-lanceolate, subobtuse, whitish or pale-brown, with hyaline margins. Stamen 1; anthers oblong, muticous. Nut oblong-ellipsoid, trigonous, shortly apiculate, granulate, black. (Fig. 519)

Flowers: August-October. **Micromorphology** (Fig. 519)

Stomata graminaceous.

D/240.

### 3. Cyperus rotundus Linn Sp.Pl. (1753) p. 45.

A stoloniferous herb with stolons bearing hard ovoid tunicate black fragrant tubers upto 2.5 cm in diameter; stems triquetrous, about 75 cm long. Leaves narrowly linear, finely acuminate, flat, 1-nerved. Umbel simple or compound; rays 2-8, the longest reaching 8 cm long, bearing short spikes of 3-10 slender spreading red brown; bracts 3, the longest reaching 15 cm long. Spikelets upto 4 cm long, linear, red-brown, 10-50 flowered, compressed; rhachilla with hyaline wings. Glumes oblong, slightly apiculate; back reddish-brown, 3-7- nerved. Stamens 3, anthers oblong. Nut obovoid, trigonous, grayish-black. (Fig. 520)

Vernacular name: Moth. Flowers: Throughout the year. **Micromorphology** (Fig. 520)

Stomata graminaceous and epidermal cell walls appeared pitted.

D/977-978.

# 4. Eleocharis acutangula (Roxb.) Schult. Mant. 2: 91, 1824 (Eleocharis fistulosa Link.)

A stoloniferous, herb with triquetrous, stems concave on one face and reaching upto 1 m height. Leaves represented by ovate, acute or lanceolate hyaline limb with obliquely truncate sheaths. Inflorescence a single solitary ovoid or cylindric many-flowered spiketlets. Spikelets upto 4 cm long, greenish; lowest glumes bract-like, ovate, coriaceous, with narrow membranous margins; rhachilla slender, angular. Glumes imbricate, membranous or coriaceous, the lowest usually empty, bract-like; the uppermost empty, the remainder 2-sexual. Fertile glumes ovate-oblong or subobovate, multistriate on the back, often with minute brown spots inside; bristles longer than the nut, brown, retrorsely scabrid. Stamens 3; anthers linear, muticous. Ovary orbicular-

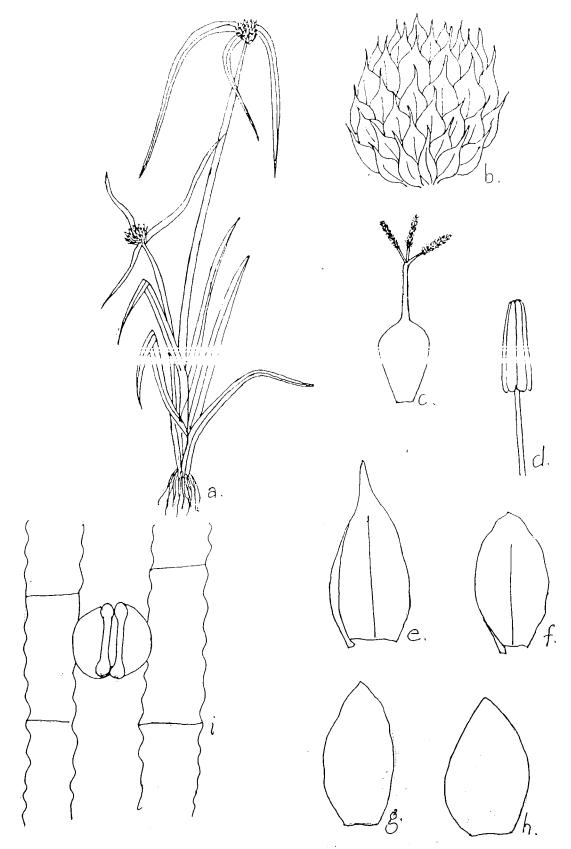


Fig. 519 Cyperus leucocephalus Retz., a. habit, b. inflorescence, c. gynoecium, d. stamen, e-f. involucral glume, g-h. floral glume, i ... graminaceous stomata.



Fig. 520. Cyperus rotundus L., a. habit, b. rhachilla, c. stamen, d. gynoecium, e. inflorescence, f. glume, g. nut, h. graminaceous stomata.

ovoid; style with a swollen base; stigmas 3, filiform. Nut obovoid, striate, pale, tipped with the annular somewhat saucer-shaped style-base. (Fig. 521)

Micromorphology (Fig. 521)

Whole plant was glabrous.

Stomata graminaceous.

D. 888-890.

### 5. Eleocharis atropurpurea Kunth, Enum. V. 2 (1837) p. 151.

An annual with densely tufted stems upto 15 cm long. Leaves represented by a membranous sheath. Inflorescence a single solitary ovoid or cylindric many-flowered spiketlets at the tip of the stem. Spikelets ovoid, obtuse, many-flowered; rhachilla pitted. Glumes broadly ovate-oblong, concave, loosely imbricate, easily detached; back green; sides membranous with a chestnut-brown band along each; bristles 4-7, slender, as long as the nut, white. Anthers small, oblong, alternate with bristles. Nut obovoid, biconvex, smooth, black, apiculate with the short stout white style-base. (Fig. 522)

Flowers: September-December.

Micromorphology (Fig. 522)

Stomata graminaceous.

D/971-973.

### 6. Eleocharis plantaginea R. Br. Prod. (1810) p. 224.

(Scirpus plantaginus Roxb.)

A stoloniferous densely tufted herb reaching 1 m high and upto 1 cm diameter, appearing transversely septate when dry; sheaths 5-20 cm long, very thin, soon torn, bright redbrown, shining. Inflorescence a single solitary ovoid or cylindric many-flowered spiketlets. Spikelets upto 4 cm long, straw-colored; rhachilla stout, angled. Glumes closely imbricate, broadly ovate, 1-nerved, coriaceous, persistent. Bristles 7, equaling or exceeding the nut, retrorsely scabrid, yellow. Stamens 3; anthers narrowly linear, with a long setaceous tip. Ovary orbicular-ovoid; style with a swollen base; stigmas 2, filiform. Nut orbicular-obovoid, smooth, yellowish. (Fig. 523)

Flowers: Throughout the year.

Micromorphology (Fig. 523)

Whole plant was glabrous.

Stomata graminaceous.

D/892.

### 7. Fimbristylis dichotoma Vahl. Enum. V. 2 (1806) p. 287.

An annual herb with tufted, filiform stems and very narrow leaves tapering to a fine point and having softly villous leaf sheaths. Umbel laxly compound upto 5 cm in diameter; rays upto 2.5 cm long, suberect; bracts filiform, Spikelets angular due to the acute keels to the glumes, ellipsoid, many-flowered; rhachilla stout, angular with large pits. Glumes loosely imbricate, all, or all but the lowest fertile, ovate, reddish-brown, 1-3 nerved on the back, the midnerve forming a conspicuous acute

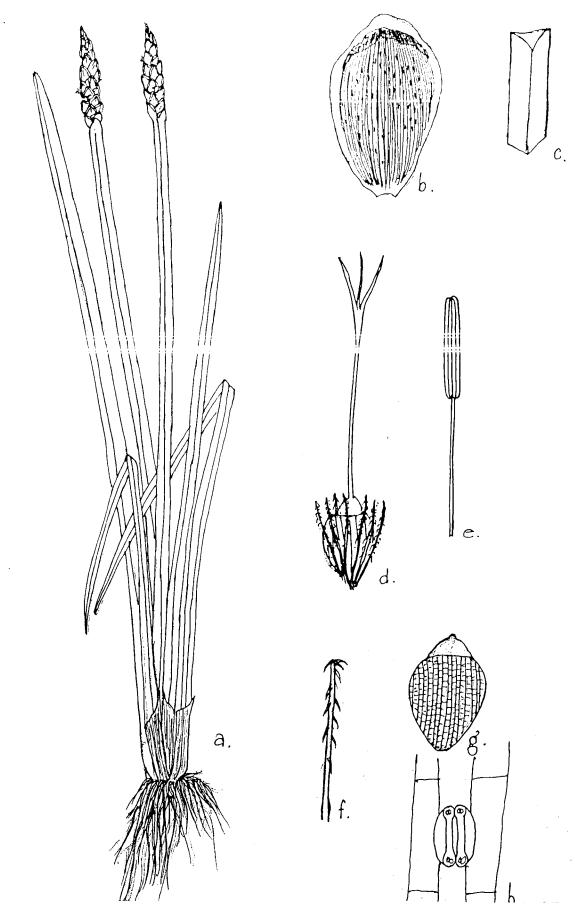


Fig. 521. Eleocharis acutangula (Roxb.) Schult., a. habit, b. inflorescence axis triangular, d. gynoecium with bristles, e. stamen, f. bristles, g. nut, h. graminaceous stomata.

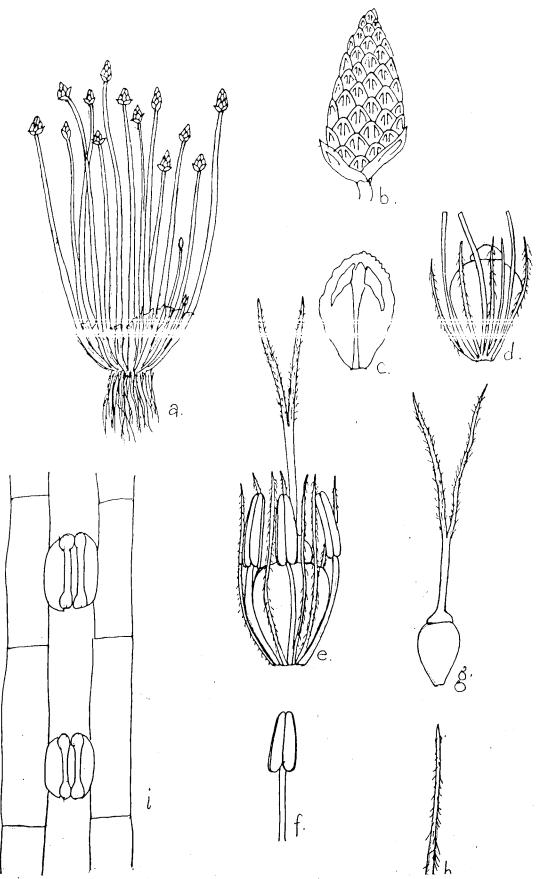


Fig. 522. Eleocharis atropurpurea Kunth., a. habit, b. inflorescence, c. involucral glume, d. nut with bristles and filaments, e. gynoecium with stamens and scales, g. gynoecium, f. stamen, h. bristles, i. graminaceous stomata.

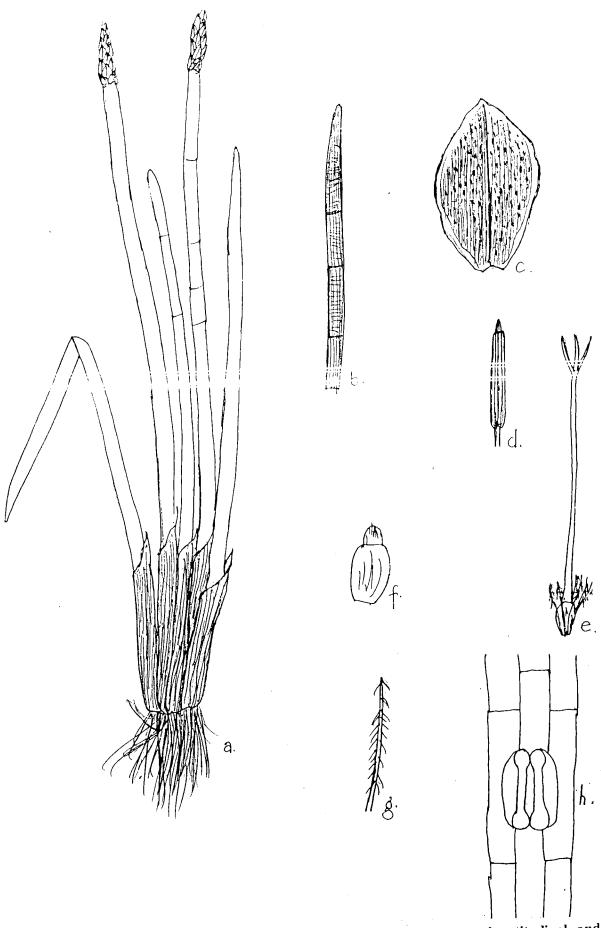


Fig. 523 Eleocharis plantaginea R. Br., a. habit, b. leaf showing longtitudinal and transverse ridges, c. glume, d. stamen, e. gynoecium with bristles, g. bristles, h. graminacous stomata.

green keel which is prolonged in to a cuspidate point. Stamens 1-3; anthers small, obtuse. Ovary obovoid, somewhat flattened; style long, base more or less flattened, pubescent; stigma 2. Nut broadly turbinate, minutely stipitate, umbonate, compressed, biconvex, with 6-9 broad trabeculate ribs, pale straw-colored or almost white; style densely villous in the upper part, with a small globose bulbous base; stigmas 2, recurved. (Fig. 524) Flowers: October-April.

#### Micromorphology (Fig. 524)

Leaf showed presence of unicellular, non-glandular, elongated trichome with thin wall and a broad lumen.

Stomata were of graminaceous type.

D/916-920.

#### 8. Fuirena ciliaris (L.) Roxb. Hort. Bengal. 81. 1814.

A perennial rhizomatous tufted creeping herb with leaves throughout the lenghth of the cuims. Leaf sheaths well developed at base; ligule tubular, leaf blades cauline, flat, usually hairy. Involucral bracts mostly short, not exceeding the inflorescence. Inflorescence of 2 or more head like clusters of spikelets. Spiklets mostly sessile many flowered; rachilla persistent, with vertically elongated pits. Flowers bisexual, glumes spirally arranged, caducous. Perianth with three bristles and three scales. Perianth scales clavate but hastate at the base, about 1.5 mm long. Stamens 3, styles caducous, not swollen at the base; stigmas 3. Nut 3-sided, obovoid, falling off enclosed in perianth. (Fig. 525)

Flowers: June-September.

# Micromorphology (Fig. 525)

The plant showed presence of non-glandular unicellular trichome with round base.

Stomata graminaceous.

D/106.

#### 9. Kyllinga triceps Rottb. Descrip. et Icon. (1773) p. 14, t. 4.

A tufted glabrous herb with a short rhizome and stems reaching 30 cm long,. Leaves shorter than the stem, linear, acute. Spikes ovoid-oblong or sub-cylindric, in threes, the middle one the largest., rhachis covered with the persistent lower glumes; bracts beneath the head 3-4, leaf-like, up to 8 cm long, two lower glumes hyaline, the lowest and second lanceolate and hyaline, the third and fourth larger, green, ovate-lanceolate, strongly nerved. Stamens 2. Ovary suborbicular; style short, stigmas 2, linear. Nut oblong or ellipsoid-oblong, yellowish-brown, much compressed, surface papillose. (Fig. 526)

Flowers: Sept.

Micromorphology (Fig. 526)

Stomata graminaceous.

D/986-988, 1224-1226.

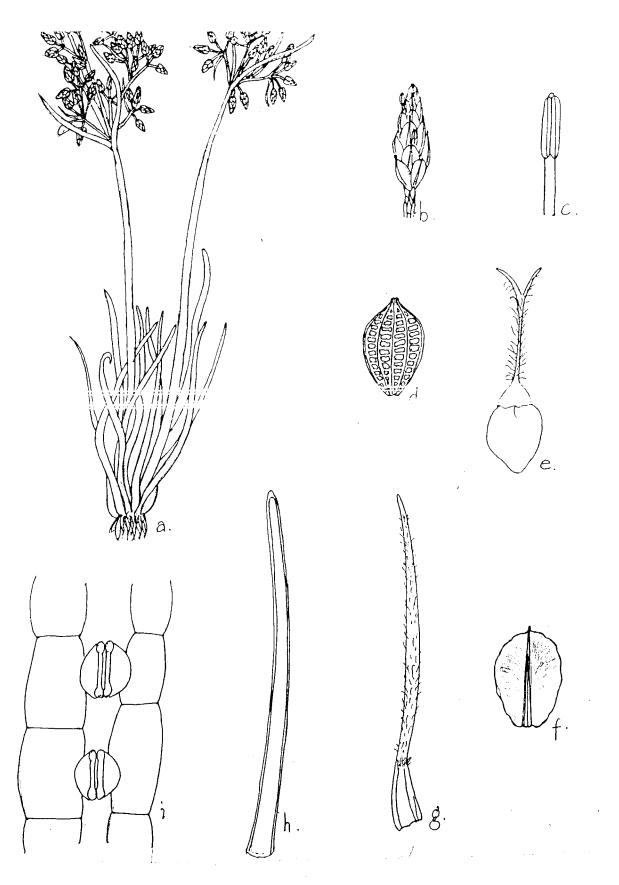


Fig. 524 Fimbristylis dichotoma Vahl., a. habit, b. inflorescence, c. stamen, d. nut, e. gynoecium, f. glume, g. leaf with leaf sheath, h. unicellular trichome with thin wall and broad lumen, i. graminaceous stomata.

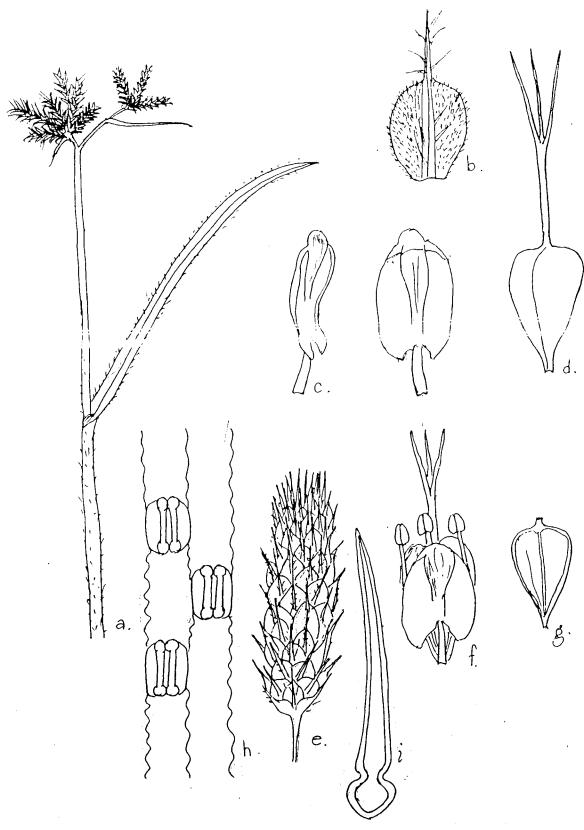


Fig. 525 Fuirena ciliaris (L.) Roxb., a. habit, b. glume, c. stamen, d. gynoecium, e. inflorescence, f. gynoecium with stamen and spathaceous scales, g. nut, h. graminaceous stomata, i. unicellular trichome with thick wall, broad lumen and constriction towards the base which gives the appearance of presence of small basal cell.

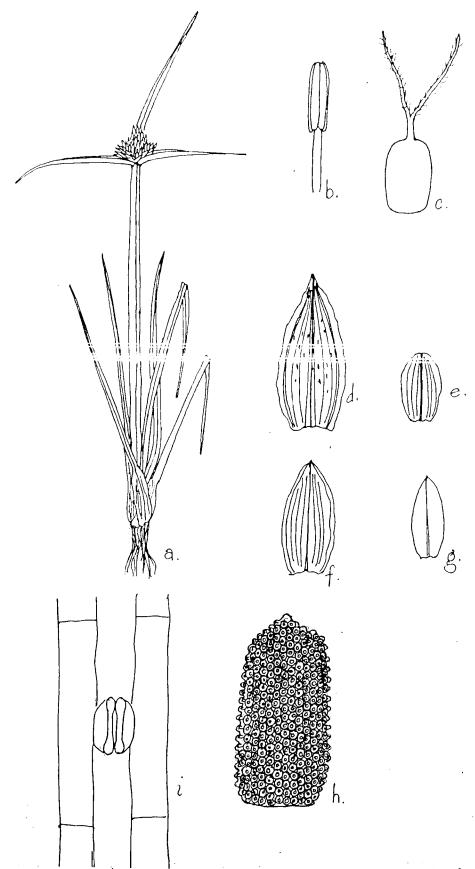


Fig. 526. Kyllinga triceps Rottb., a. habit, b. stamen, c. gynoecium, d. outermost involucral glume, f. innermost involucral glume, e. outermost floral glume, g. innermost floral glume, h. nut, i. graminaceous stomata.

# 10. Lipocarpha squarrosa (L.) Goetgh. Wageningen Agric. Univ. Pap. 89 (1): 71. 1989. (Scirpus squarrosus Linn.)

A glabrous tufted annual with filiform, terete and striate stem reaching upto 15 cm high. Leaves filiform, acuminate; sheaths short, open. Spikelets solitary or 2-4 in a cluster, globose or oblong, many-flowered; bracts 1-3, finely acuminate, leaf-like, dilated at the base, one or two sometimes 2.5 cm long. Glumes imbricate, squarrosely spreading and recurved cusp as long as or longer than the blade with a stout central nerve; hypogynous bristles 0. Stamens 1 or 2; anthers minute, oblong, apiculate, yellow. Nut obovoid-ellipsoid, trigonous, yellow, brown or ultimately black. (Fig. 527)

Flowers: October-December. **Micromorphology** (Fig. 527) Stomata graminaceous. D/241.

# 11. Pycrcus pumitus Nees, in Linnea, 9: 283, 1834 (Cyperus pumitus Linn.)

An annual with 30 cm long tufted slender stems and linear, 1-nerved leaves. Spikelets in heads, sometimes umbellate, the rays of the umbel 1-6, occasionally though rarely reaching 8 cm long; bracts 3-4, leaf-like, up to 10 cm long. Spikelets 20-50 flowered, much compressed; rhachilla stout. Glumes distichous, ovate, boat-shaped, 2-fid at the tip with a narrow herbaceous keel which is cuspidately produced at the apex, with 3-5 conspicuous brown nerves and rounded hyaline margins. Stamen 1; anthers linear. Nuts ellipsoid-oblong or subovoid, apiculate, biconvex, laterally compressed and brown. (Fig. 528)

Flowers: July-October.

Micromorphology (Fig. 528)

Stomata graminaceous and epidermal cell walls appeared pitted.

D/947-952, 1151-1153.

# 12. Schoenoplectus articulatus (L.) Palla Bot. Jahrb. Syst. 10: 299. 1888. (Scirpus articulatus Linn.)

A glabrous tall perennial herb with densely tufted, spongy and transversely septate stems upto 1 m long. Leaves 0, or the sheaths with a membranous acute tip sometimes upto 2.5 cm long. Spikelets variable in length, upto 2 cm long, ovoid-oblong, obscurely angular, rusty-brown, sessile in laterally stellately spreading clusters; bracts 0. Glumes broadly ovate, mucronate, imbricate, membranous, concave, persistent, with a subcordate base and hyaline margins. Stamens 3; anthers linear, yellow. Nut obovoid, triquetrous, black, opaque, striate with transverse wavy lines; style short; stigmas 3. (Fig. 529)

Vernacular name: Chichora Flowers: September-April.

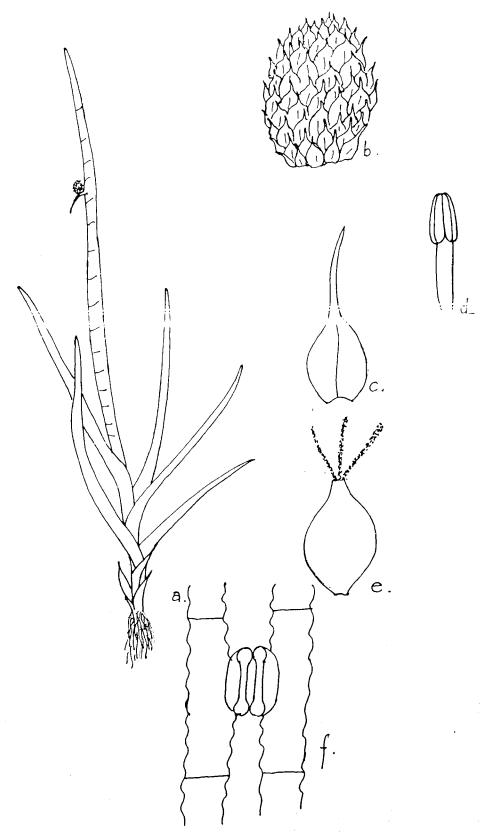


Fig. 527. Lipocarpha squarrosa (L.) Goetgh., a. habit, b. inflorescence, c. glume, d. stamen, e. gynoecium, f. graminaceous stomata.

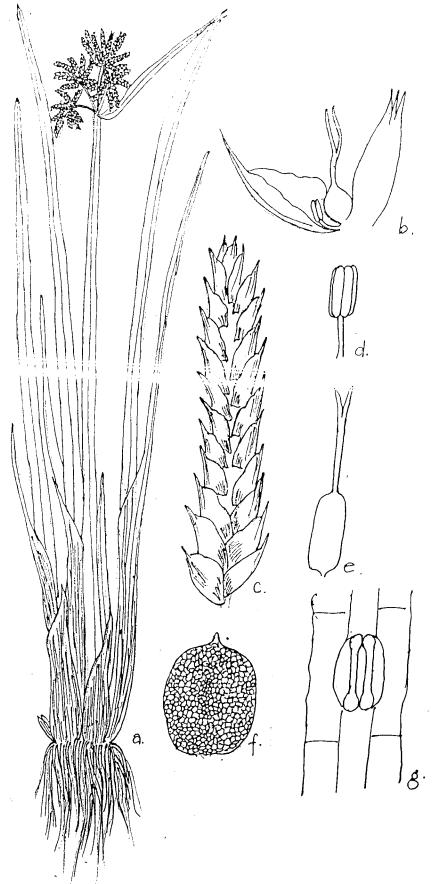


Fig. 528 Pycreus pumilus Nees., a. habit, b. spikelet open to show gynoecium and stamen, c. inflorescence, d. stamen, e. gynoecium, f. nut, g. graminaceous stomata.

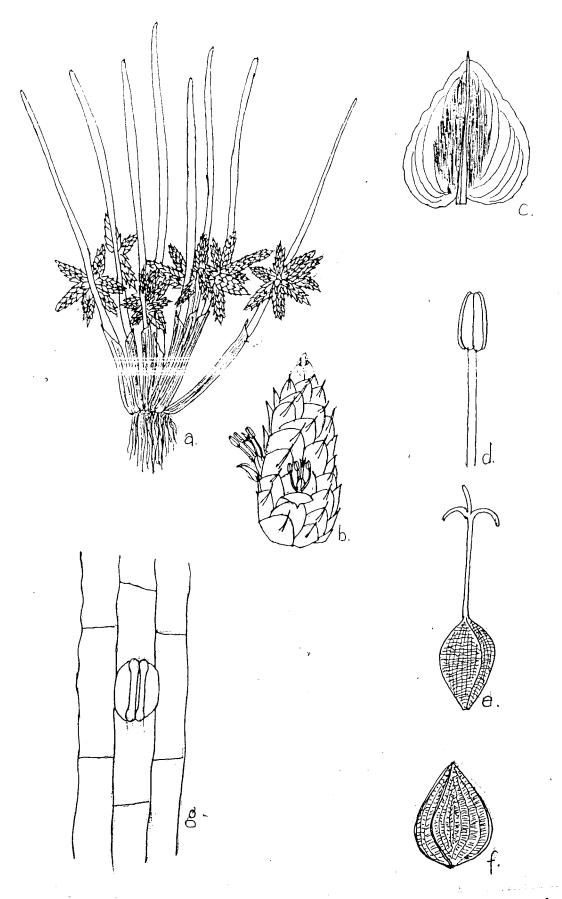


Fig. 529. Schoenoplectus articulatus (L.) Palla., a. habit, b. inflorescence, c. glume, d. stamen, e. gynoecium, f. nut, g. graminaceous stomata.

## Micromorphology (Fig. 529)

Whole plant was glabrous. Stomata were of graminaceous type. D/429, 439, 939.

# 13. *Stenophyllus barbata* (Scirpus) Rottb. *Descrip. et Icon.* (1773) p. 52. (*Bulbostylis barbata* Kunth.)

An annual reaching upto 30 cm high with tufted, filiform stems. Leaves capillary, scaberulous upwards, acuminate; sheaths short, membranous, with bearded mouths. Spikelets small, crowded in a imbricate head or umbellate; few-flowered, oblong-lanceolate, reddish-brown, crowded in a terminal head; bracts shorter than or rarely exceeding the spikelets; rhachilla stout. Glumes few or many, imbricate all round the rhachilla, 1-2 lowest and often the upper-most empty; ovate, compressed, boat-shaped, with the stout acute keel ending in a mucro. Hypogynous bristles 0. Stamen 1; anther linear. Ovary obovoid; style slender; stigmas 3. Nut globosely obovoid, trigonous with prominent angles. (Fig. 530)

Micromorphology (Fig. 530) Whole plant was glabrous. Stomata were of graminaceous type. D/925-928.

# Poaceae

## 1. Chloris barbata Sw. Fl. Ind. Occ. V. 1 (1797) p. 200.

A perennial grass with tufted stems and strong rootfibres reaching upto 1 m height. Leaves flat, narrowly linear, ligule short. Spikes 5-20 in a truncate fascicles, spikelets 3-awned. Involucral glumes two, persisting. Sterile glume bearing two small turgid awned barren glumes. Involucral glumes hyaline. Floral glumes broadly elliptic, shortly awned with densely bearded margin above the middle. Palea oblanceolate. Lodicules two, small. Stamens three. Ovary glabrous. (Fig. 531)

Flowers: November.

ì

Vernacular name: Gondvel.

Micromorphology (Fig. 531)

Stomata were of graminaceous type.
D/941.

#### 2. Coix lachryma-jobi Linn. Sp. Pl. (1753) p. 972.

The plant is an erect herb with a stout stem reaching a height of 2 m. Leaves narrowed from a broad cordate base to an acuminate tip, upto 40 cm long, serrate margins; midrib stout; sheaths long, smooth; ligule a very narrow membrane. Racemes about 7 cm long, nodding or drooping from long peduncles; lower spikelets solitary, female enclosed in a ultimately hardened polished nut like bract, through the apex of which the male portion of the spike protrudes. Male spikelets;

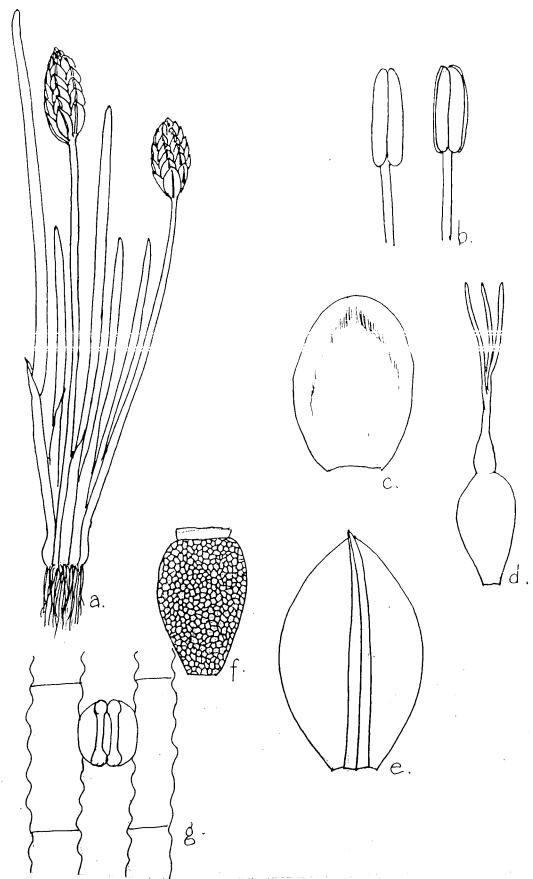


Fig. 530. Stenophyllus barbata Rottb., a. habit, b. stamen, c. floral glume, d. gynoecium, e. involucral glume, f. nut, g. graminaceous stomata.

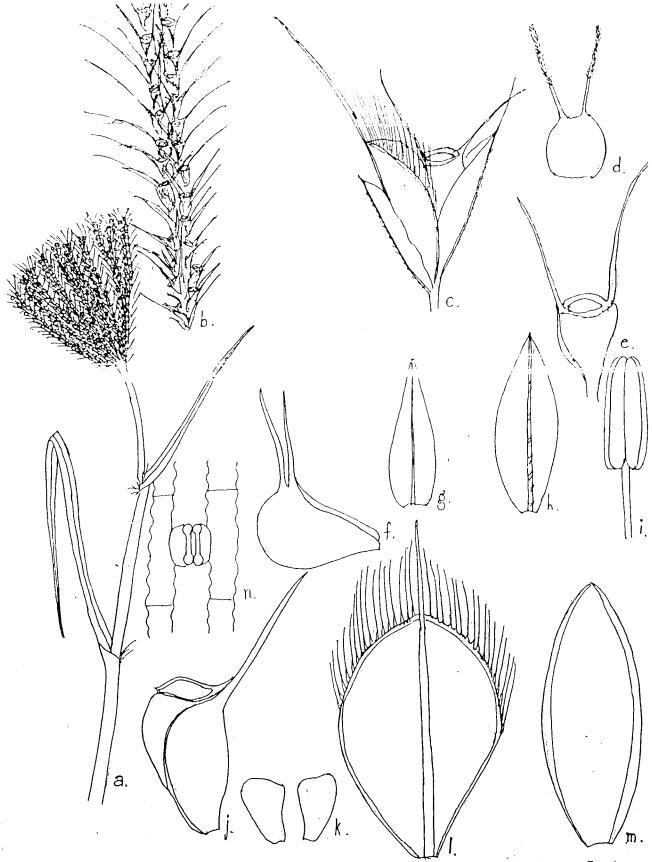


Fig. 53) Chloris barbata Sw. a. habit, b. inflorescence, c. spikelet, d. gynoecium, e. floret, f. empty lemma, g-h. glume, i. stamen, j. oblanceolate empty lemma, k. lodicules, l-m. floral glume, n. graminaceous stomata.

glumes 3. lower involucial glume elliptic-lanceolate winged. Floral glumes hyaline. Stamens 3. Female spikelets ovoid, glumes 3, lower involucial glume chartacious. Upper three thinner. Staminode minute. Ovary ovoid. Grain orbicular, bluish-grey, ventrally furrowed enclosed in the hardened globose, ovoid cylindric involucie.

Variation observed: In floras the number of glumes in spiklets were reported to be four, but the specimen I had only three glumes in both male and female spikelets (Fig. 532).

Vernacular name: Kahudo.

Flowers: August-December.

#### Micromorphology (Fig. 532)

Trichomes absent but dumb-bell shaped silica bodies was observed in the epidermis of leaves.

Stomata graminaceous.

D/850-853.

## 3. Dendrocalamus strictus Nees in Linnaea, V. 9 (1834) p. 476.

bambasa siricia Koxb.

A deciduous densely tufted bamboo with strong solid stems upto 18 m high with long internodes and stem sheaths with long triangular blade. Leaves shortly petiolate, linear-lanceolate, 25 cm long; rough and often hairy above, softly hairy beneath, with scabrous margins; nerves 3-6 pairs, with interposed pellucid glands. Inflorescence a large branching panicle of dense globular heads about 2:5 cm in diameter, upto 5 cm apart. Spikelets spinescent, the fertile 2-3. Involucral glumes 2 or more, ovate, spinescent, many-nerved; floral glumes ovate, ending in a sharp spine, surrounded by ciliate tufts of hairs; palea ovate or obovate, emarginated, the lower ones 2-keeled, the uppermost keelless, 6-8 nerved. Stamens long-exserted; anthers yellow shortly apiculate. Ovary stipitate, turbinate; style long; stigma simple, plumose. Grain ovoid to subglobose, brown. (Fig. 533)

Vernacular name: Manvel vans. Flowers: December-March.

#### Micromorphology (Fig. 533)

The plant showed presence of unicellular, non-glandular, elongated, thick walled trichome with a round bottom. Along with trichomes it also showed presence of silica bodies of oblong shaped.

Stomata were graminaceous.

D/1051, 1058, 1060.

## 5. Desmostachya bipinnata (Linn.) Stapf in Thiselt.-Dyer, Fl. Cap. 7:632. 1900.

A tall perennial with stout creeping rootstock and stout stolons clothed with leaf sheaths. Leaves many basal, fascicled very long, ligule margins with long hairs. Ligule absent. Panicle erect, columnar interrupted with branches containing unilateral spikelets. Spikelets biseriate deflexed. Floral glume coriaceous. Keels minutely scabrid. Stamens 3. Grain obliquely ovoid, trigonous and laterally compressed. (Fig. 534)

Flowers: July-November.

Vernacular name: Darbha.



Fig. 532. Coix lachryma-jobi L., a. habit, b. spikelet, c-d. involucral glume, e. lodicules, f-g. floral glume, h. gynocium with floral glumes, i. palea, j. stamen, k. gynocium, l. graminaceous stomata, m. dumbel shaped silica body.

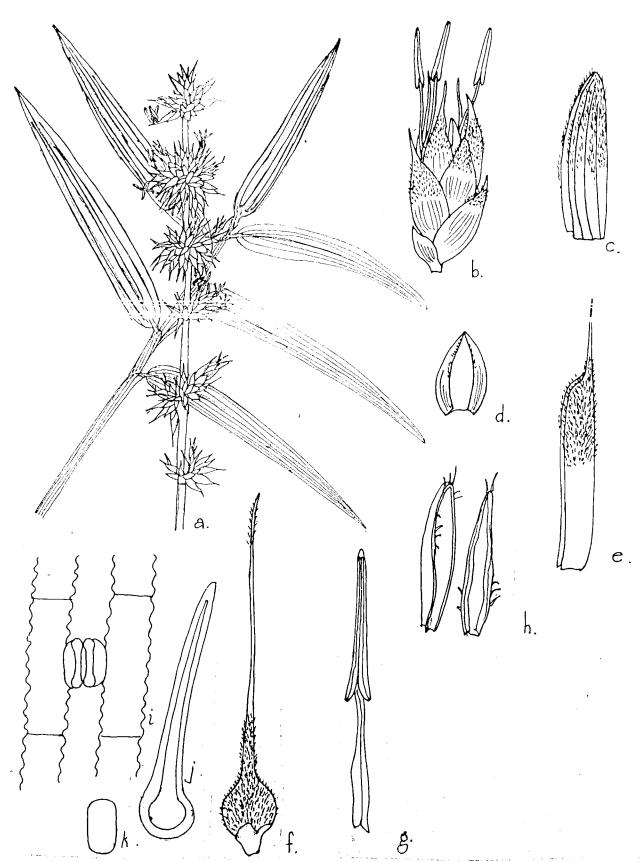


Fig. 533 Dendrocalamus stricta Nees., a. habit, b. spikelet, c-d. empty glumes, e. involucral glume, f. gynoecium, g. stamen, h. floral glume, i. graminaceous stomata, j. unicellular trichome, k. silica body.



Fig. 634. Desmostachya bipinnata Stapf. a. habit, b-d. glumes, e. spikelet, f. gynoecium, g. stamen, h-i. floral glume, j. graminaceous stomata.

Micromorphology (Fig. 534) Stomata were graminaceous, D 937-938, 1222.

# 4. Dinebra retroflexa (Vahl) Panz. in Denskshr. Acad. Wiss. 491. (Dinebra arabica Jacq. )

An annual leafy grass with tufted, stout stems upto 1 m high. Leaves linear, finely acuminate, upto 20 cm long; sheaths thin, loose, glabrous; ligule a narrow lacerate membrane. Spikes racemosely arranged along the axis of an inflorescence upto 30 cm long, single or in fascicles of 2-3 together; rhachis dorsally flattened, ventrally trigonous. Spikelets 2-3 flowered, alternate. Glumes 4-5; Involucral-glumes, 1 nerved, keeled, lanceolate, hyaline, with slightly recurved minutely scaberulous awns, the lower involucral-glume shorter than the upper; floral glumes small broadly ovate, hyaline, 1-nerved; palea hyaline, shorter than the glume, linear-oblong, with finely ciliolate keels. Louicures 2 minute. Stamens 3; anthers minute, didymous. Styles free, short; stigmas exserted at the apex of the glume, shortly penicillate. Grain ovoid, trigonous, ellipsoid-oblong, pale brown. (Fig. 535)

Flowers: August-December.

# Micromorphology (Fig. 535)

Leaf showed presence of linear, two celled trichome and more or less dumbbell shaped silica bodies.

Stomata were graminaceous.

D/179.

## 5. Echinochloa colonum (L.) Link. Hort. Berol. 2:209, 1833

Annual; stem upto 60 cm long, slender, decumbent or shortly creeping below; nodes glabrous or puberulous. Leaves upto 20 by 1 cm, narrowly lanceolate or linear, acuminate, flat, glabrous, with scaberulous margins; sheathes up to 15 cm long; ligule 0. Spikes 8-20, suberect, on the angles. Spikelets 0.5 cm long, globosely ovoid, acute or subcuspidate, more or less hispidly pubescent, second, sessile, 3-5-seriate. Glumes 6; lower involucral glume about ½ as long as the lower floral glume, broadly ovate or suborbicular, membranous, 3-nerved, ciliolate; upper invloucral glume about equal to the lower floral glume, broadly ovate, cuspidate, concave, 5-7 nerved, hairy; lower floral glume similar, empty, with a hyaline palea; upper floral glume coriaceous, broadly ovate, turgid, acute, finely striolate, polished, yellowish-white, with a coriaceous palea. (Fig. 536)

Flower: Throughout the year.

Variations observed: in the specimens I dissected there were six glumes in every spikelets, but only four glumes reported in the literature.

#### Micromorphology (Fig. 536)

Whole plant was glabrous but it showed presence of beaded (moniliform) silica bodies. Stomata graminaceous.

D/587, 961, 962.

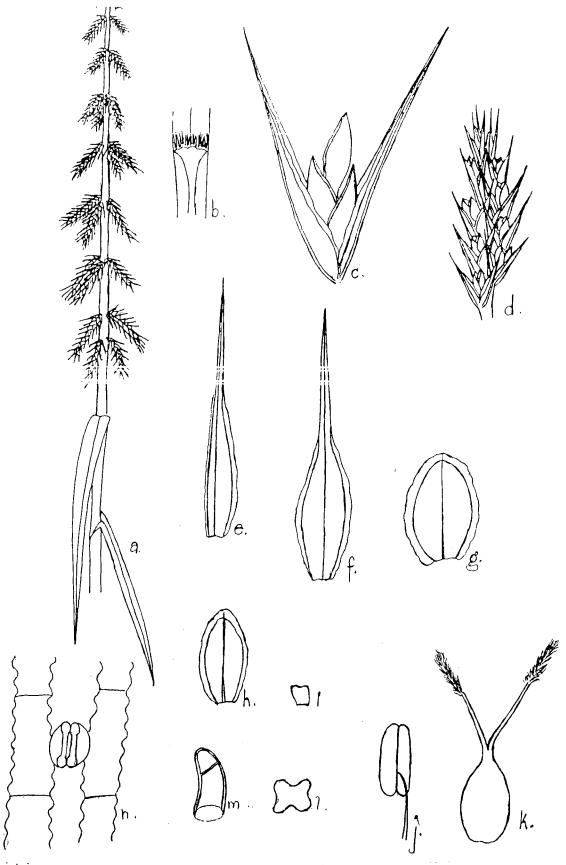


Fig. 535. Dinebra retroflexa (Vahl.) Panz., a. habit, b. ligule, c. spikelet, d. inflorescence, e-f. empty glume, g-h. floral glume, i. lodicule, j. stamen, k. gynoecium, l. silica body (dumbel shaped), m. two-celled uniseriate trichome, n. graminaceous stomata.

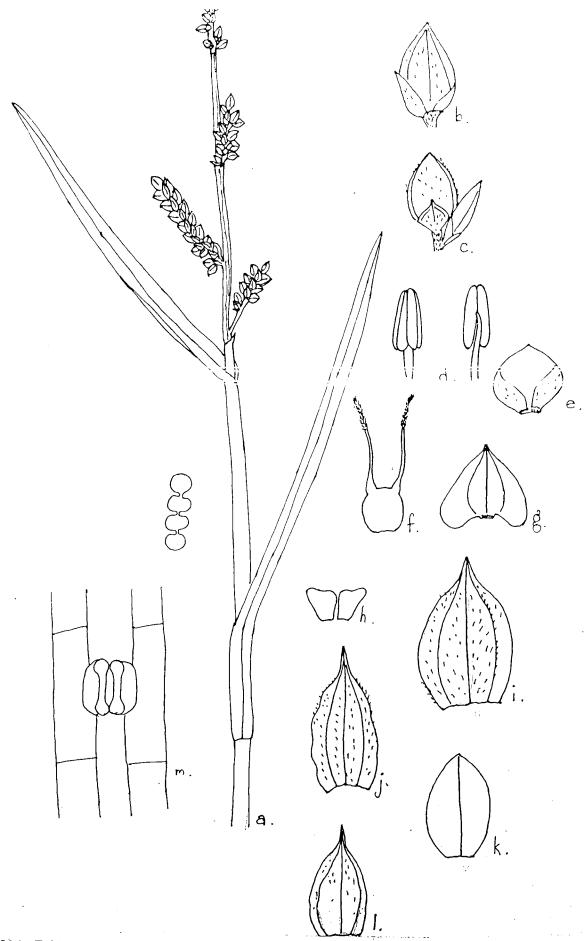


Fig. 536. Echinochloa colonum (L.) Link., a. habit, b-c. spikelet, d. stamen, e. empty outermost glume, f. gynoecium, g. empty involucral glume, h. lodicule, i-j. floral outermost k-l innerfloratglume m. gramin access. Stomata

#### 6. Eleusine aegyptiaca Desf. Fl. Atlant. V. 1 (1798) p. 85

Annual of variable habit, 15-22 cm high; stems sometimes prostrate, rooting from the proliferously branched nodes, geniculately ascending, compressed, glabrous, smooth. Leaves linear, 3-12 by 0.2-0.5 cm, tapering to a fine point, flat, glaucous, glabrous or hairy or hispidly ciliate with bulbous-based hairs; ligule a slightly ciliolate line. Spikes 2-6, digitately radiating, 1-4 cm long; rachis trigonous or dorsally flattened, rigid, often excurrent into a pungent mucro. Spikelets many, 3-5 flowered, spreading at right angles to the rachis. Glumes divaricate; lower involucral glume ovate, acute; upper involucral glume smaller (excluding the awn), suborbicular, the mid-nerve produced into a usually curved awn often as long as or sometimes longer than the glume; floral glumes gibbously ovate, mucronate or awned; palea rather shorter than its glume, ovate-oblong, obtuse or 2 fid. Anthers small. Grain subglobose, reddish, very rugose. (Fig. 537)

Micromorphology (Fig. 537)

Stomata were of graminaceous type.

Silica body is somewhat globular or dumb bell shaped.

D/214.

#### 7. Eragrostis ciliaris Link, Hort. Reg. Berol. V. 1 (1827) p. 192.

Stems upto 25 cm long, tufted, genicullately ascending, glabrous, smooth. Leaves upto 7 cm, linear, tapering to a fine point; sheaths striate, usually bearded at the mouth with long hairs; ligule a fringe of short hairs. Paniele short, upto 4 cm long, oblong, cylindric, appearing hairy from the long cilia of the palea; branches short, subcrect. Spikelets 0.25 cm long, crowded, 6-12 flowered, strongly compressed; rhachilla breaking up; pedicels very short. Glumes many Involucral glumes subequal, ovate-lanceolate, acute; floral glumes oblong, subtruncate, mucronulate, spreading; palea equal to their glumes and falling with them, the keels with long rigid cilia. Stamens 3; anthers very short. Grain elongate-ovoid. (Fig. 538)

Flowers: November.

Micromorphology (Fig. 538)

Whole plant was glabrous, but it showed presence of small oblong silica bodies.

Stomata were graminaceous.

D/856-857, 898-901.

#### 8. Eragrostis unioloides Nees. ex. Stued. Syn. Gram. (1855) p. 264.

Annual, glabrous; stems 15-45 cm long, tufted, slender, erect, or geniculately ascending, leafy chiedly at the base; internodes long. Leaves upto 15 cm, narrowed from a broad subcordate base to an acute tip, smooth; sheaths smooth, glabrous; ligule 0 or obscure. Panicle oblong or ovoid, upto 10 cm long, sparingly branched; rhachis and nodes glabrous. Spikelets 0.6 cm long, compressed, ovoid-elliptic or oblong, 20-50 flowered, shortly pedicellated, often purple; rhachilla tough, intenodes very short. Glumes elegantly distichous, spreading, keeled; invoulucral glumes subequal or the upper slightly longer than the lower, ovate, acute, 1-nerved; floral glumes broadly ovate or suborbicular, mucronulate, punctulate; plea shorter than its glume and deciduous with it. Stamens 3;

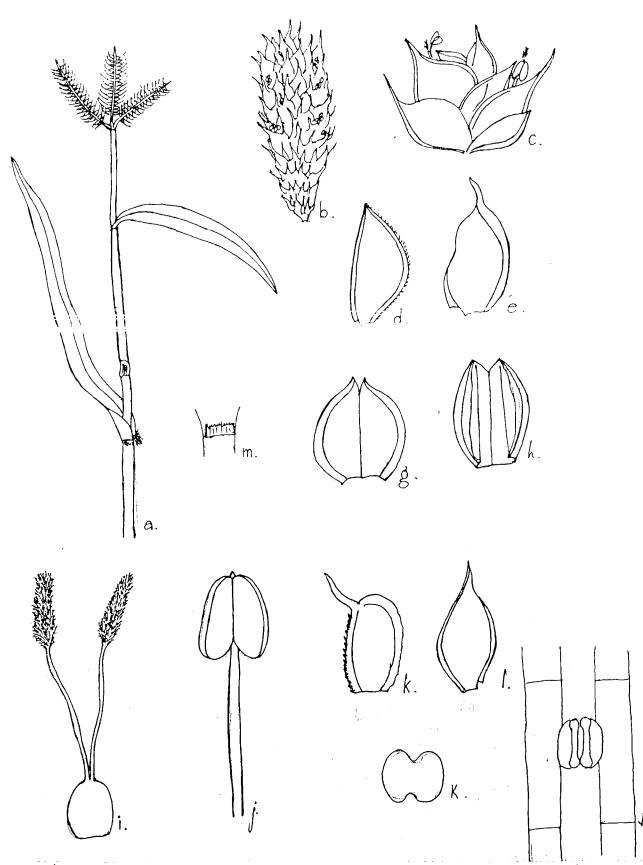


Fig. 537 Eleusine aegyptiaca Desf., a. habit, b. inflorescence, c. spikelet, d. involucral glume I, e. floral glume I, f. palea I, g. Palea II, h. involucral glume II, i. floral glume II, j. ligule, k. stamen, i. gynoecium, j. graminaceous stomata, k. silica body (dumbel shaped).

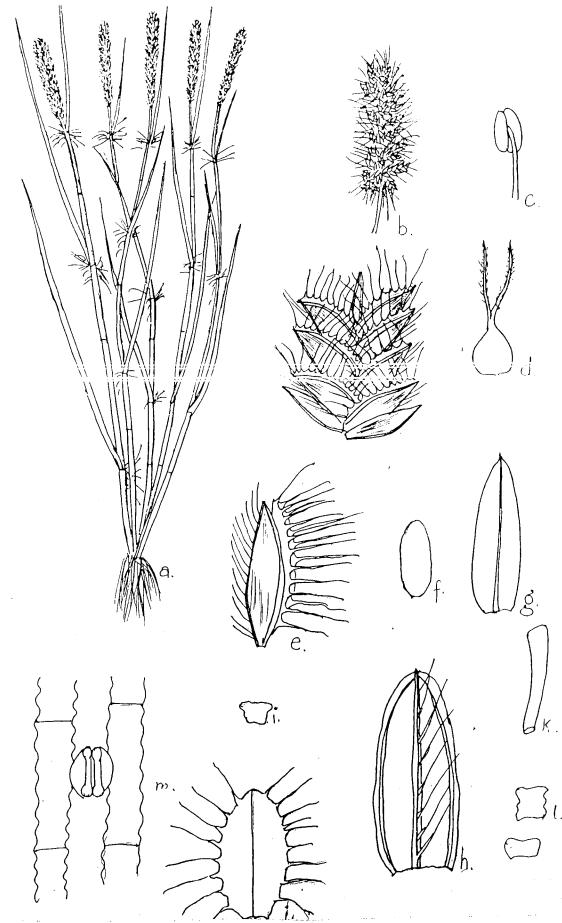


Fig. 538. Eragrostis ciliaris Link., a. habit, b. inflorescence, c. stamen, d. gynoecium, e. floret, f-g. floral glume, i. lodicule, j & h. involucral glume, k. unicellular trichome, l. silica body, m. graminaceous stomata.

athers minute. Grain obovoid or ellipsoid, laterally compressed, about orange-brown,

smooth. (Fig. 539)

Flowers: July-November.

Micromorphology (Fig. 539)
Whole plant was glabrous.

Stomata were of graminaceous type.

D/270.

# 9. Ischaemum rugosum Salisb. Ic. Stipe. Rar. (1791) p. 1, t. 1.

Annual; stems upto 60 cm long, erect or ascending, slightly thickened beneath the inflorescence, leafy, compressed; nodes glabrous or bearded. Leaves upto 15 cm, linearglabrous or sparsely hairy, the margins scabrid, the lanceolate, acuminate, flat, uppermost leaves often reduced to spathiform lanceolate sheaths which partially enclose the racemes; sheaths compressed, loose, glabrous, the mouth auricled, the auricles membranous, confluent with truncate ligules. Racemes usually 2, erect, pale yellow, glabrous, upto 8 cm long, fragile; rhachis trigonous, ciliate on the dorsal angle. Spikelets reaching 0.7 cm long or more, linear-oblong, the sessile and pedicellate closely pressed together; pedicel of the latter very short and thick, clavate, angular, confluent with the bristly thick callus of the sessile spikelet. Sessile spikelets: lower Involucral glumes cartilaginous for 2/3 of its length from the base, the cartilaginous portion pale yellow, shining, concave, crossed by 3-6 deep smooth ridges, the upper third flattened, thinner, membranous, obtuse, with green veins, the margins narrowly incurved, the outer margin winged; upper Involucral glume oblong-lanceolate, acuminate, keeled, the keel with a narrow ciliolate wing below the tip; lower floral glume ovate-lanceolate, acuminate, hyaline, male or empty, paleate, the palea hyaline, narrow; upper floral glume 0.4cm. long, deeply cleft into 2 acute lanceolate lobes; palea linear-lanceolate; awn reaching 2cm long or more, pedicellate spikelets variable, rather shorter than the sessile; lower involucral glume like that of the sessile or with fewer or sometimes more or less obscure transverse ridges, the upper half of the glume broader and more oblique; involucral glume not keeled, otherwise as in the sessile spikelet; lower floral glume as in the sessile; upper floral glume oblong, obtuse, not awned. (Fig. 540)

Flowers: September-November.

#### Micromorphology (Fig. 540)

Whole plant was glabrous, but silica bodies were present, which were dumbbell shaped. Stomata were graminaceous.

D/979, 1174-1178.

# 10. Oplismenus burmanni Beauv. Agrost. (1812) p. 54.

A very slender diffusely branched leafy grass; stems 15-45 cm long; nodes glabrous or hairy. Leaves upto 5 cm long ovate or ovate-lanceolate, acuminate, sparsely pilose with long slender white hairs; sheaths glabrous or hairy. Panicle 6 cm long; peduncle slender, usually very long; branches of panicle spike-like, few, distant, subsessile, upto 2 cm long; rhachis slender, angular, clothed with long slender white hairs nearly as long as the spikelets. Spikelets 0.25 cm long, second, solitary or 2-nate; pedicels short, hairy. Glumes

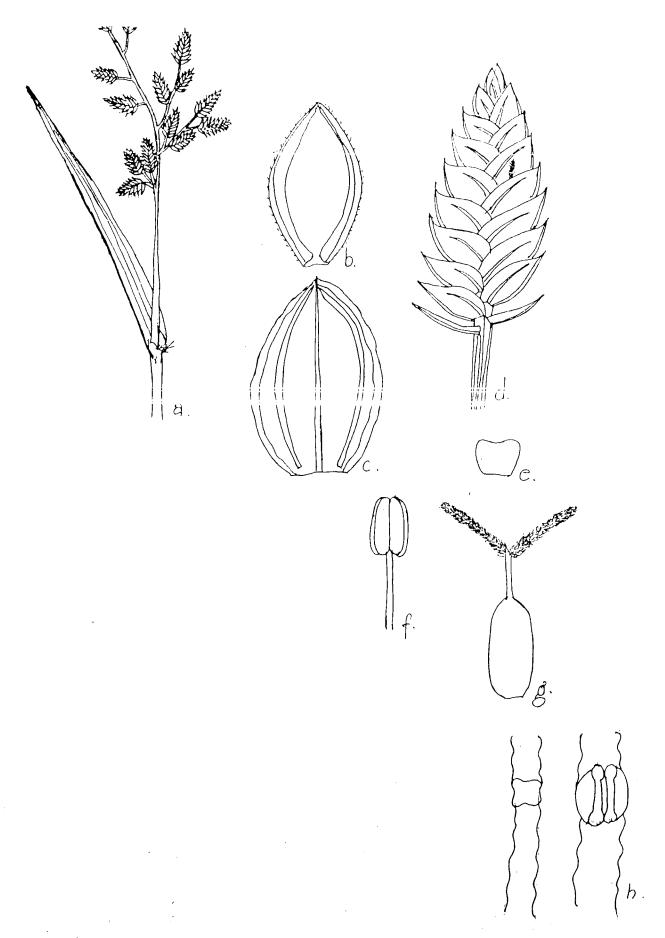


Fig. 539. Eragrostis uniloides Nees., a. habit, b. involucral glume, c. floral glume, d. inflorescence, e. lodicule, f. stamen, g. gynoecium, h. graminaceous stomata.

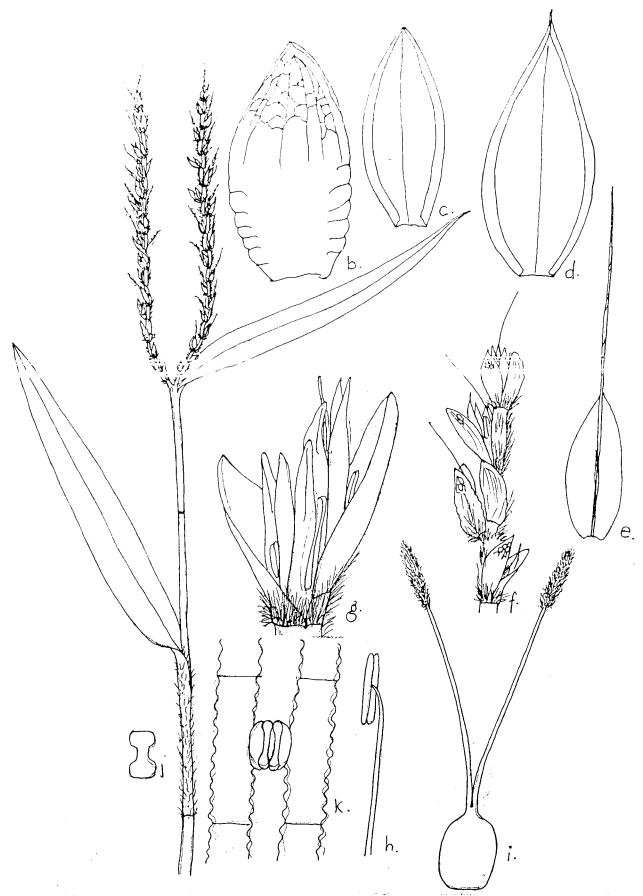


Fig. 540. Ischaemum rugosum Salisb., a. habit, b. empty glume, c. involucral glume, d. floral glume, e. palea with an awn, f. inflorescence, g. spikelet, h. stamen, i. gynoecium, j. silica body (dumbel shaped), k. graminaceous stomata.

4: lower involucial glume ovate, obtuse, 3- 5 nerved, hyaline, silky-hairy and ciliate; upper involucial glume similar and subequal to the lower, 5-nerved, with an awn reaching 0.5 cm long; lower floral glume reaching 0.25 cm long, broadly ovate, subobtuse, coneave, hyaline, silky-hairy, and ciliate, 7-9 nerved, empty, epaleate; upper floral glume as long as the lower, ovate, acute, membranous, with incurved margins; palea as long as the glume, membranous, ovate-oblong, acute, with strongly involute margins. Lodicules 2, minute, cuneate. Stamens 3, styles distinct, long; stigmas exserted at the top of the glume. Grain oblong-ellipsoid, free within the hardened glume and palea. (Fig. 541)

Vernacular name: Venupatrika. Flowers: September-October. **Micromorphology** (Fig. 541)

The plant showed presence of multicellular, uniseriate, unbranched non-glandular trichome with apical cell pointed.

Stomata were of graminaceous type.

D,434-433.

#### 11. Paspalum scrobiculatum L. Mant. Pl. 1: 29. 1767

A perennial, culms reaching a height of 150 cm. Leaves linear-lanceolate, upto 40 cm long. Leaf-sheaths keeled, ligules membranous. Inflorescence composed of 1-20 racemes, these digitate or borne on an axis up to 8 cm long, the lowest raceme 4-15 cm long, with spikelets borne singly on a ribbon-like rhachis. Spikelets broadly elliptic, obovate or suborbicular, green, becoming brown; lower glume absent; upper glume papery; lower lemma similar or rarely coriaceous, 3-5-nerved (in the latter case the nerves evenly spaced or the laterals close together); upper lemma finely striate, brown at maturity. (Fig. 542)

Flowers: April-May, October-December.

Micromorphology (Fig. 542)

Stomata were of graminaceous type.

D/104.

#### 12. Pennisetum setosum Rich. in Pers. Syn. V.1 (1805) p. 72

An erect annual, often fastigiately branched at the nodes, with stem green or purplisth. Leaves 15-25 cm long, linear, finely acuminate, glabrous or hairy; sheaths glabrous; ligule a line fringed with rather long soft hairs. Racemes 5-10 cm long, usually purplish-brown; rhachis glabrous, notched; involucel sessile; bristles unequal, the outer not ciliate, short, the inner longer, ciliate below the middle with long silky hairs (1 of the inner bristles is often much longer than the others, reaching 1.25 cm, the others 0.6-1 cm long). Spikelets 0.4 cm long, solitary within the involucel. Glumes 3 or 4; lower involucral glume minute or wanting; upper involucral glume, ovate-oblong, gradually or suddenly cuspidate, 5-nerved, hyaline; lower floral glume, oblong, obtuse, with 2 sub-obtuse lateral and an acute median tooth at the apex, 5-nerved, paleate, male, the palea, narrowly oblong, hyaline; upper floral glume, ovate-oblong, truncate, fimbriately ciliate at the tip, coriaceous, smooth and shining; palea as long as the glume, oblong, truncate,

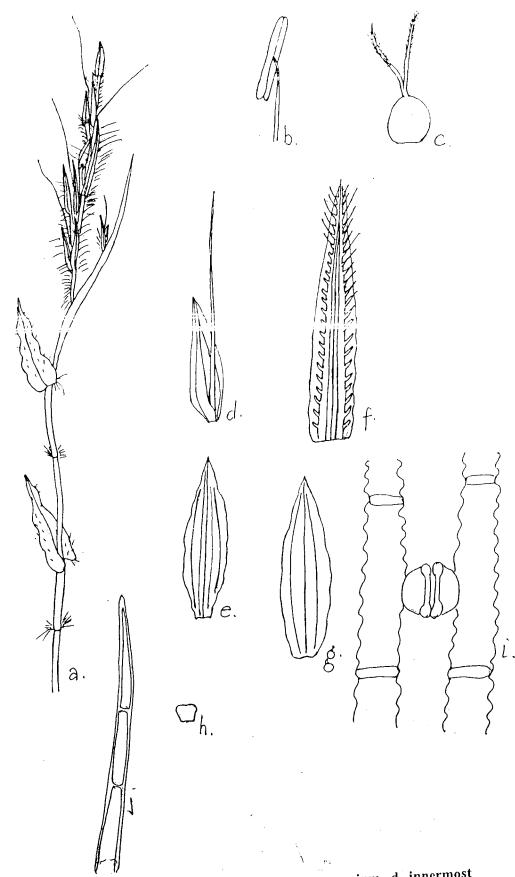


Fig. 541. Oplismenus burmanii Beauv., a. habit, b. stamen, c. gynoecium, d. innermost glume with an awn, f. outermost involucral glume, e-g. floral glume, h. lodicule, i. graminaceous stomata, j. multicellular uniseriate trichome.

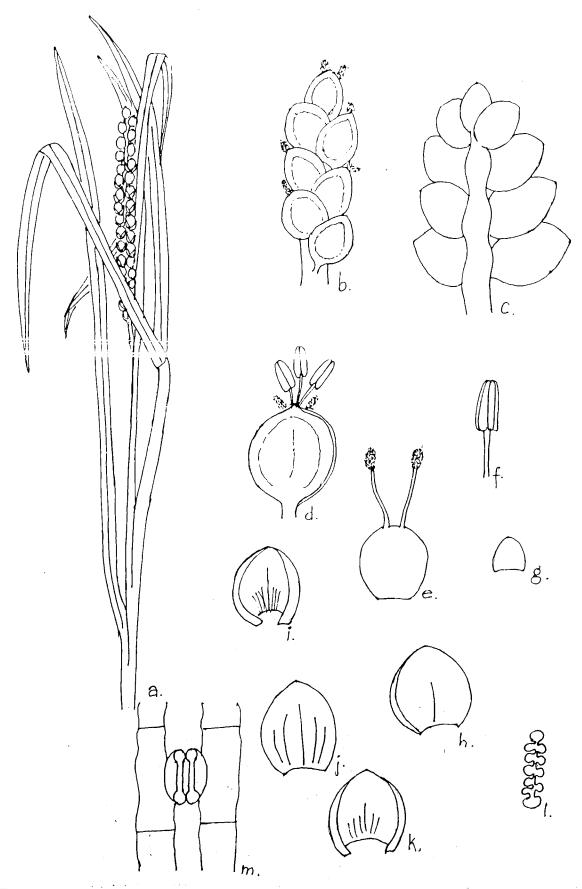


Fig. 542. Paspalum scrobiculatum L., a. habit, b-c. inflorescence, d. spikelet, e. gynoccium, f. stamen, g. empty glume, h. glume IV, i. palea, j. glume II, k. glume III, l. moniliform silica body, m. graminaceous stomata.

toothed or ciliate at the tip. Stamens 3; anthers linear, anthers nearly. Styles long, much exserted beyond the spikelet. (Fig. 543)

Flowers: August-December.

# Micromorphology (Fig. 543)

The plant showed presence of unicellular, non-glandular, elongated trichome with thick wall.

Stomata were of graminaceous type.

D/940, 946.

# 13. Setaria glauca Beauv. Agrost. (1812) p. 51.

An erect branched glabrous annual. Leaves upto 18 cm long linear, finely acuminate, flat, glabrous, with scabrid margins, ligule a ridge of hairs. Inflorescence a cylindric densely flowered spike-like raceme; bristles of involucel 6-12, pale or reddish-brown, with very short teeth. Spiklets numerous, closely set along the rhachis of the spike. Glumes 4; lower involucial glume tess than 72 as long as the spikelet, broadly ovate, 3-nerved, hyaline; upper involucial glume slightly longer than the lower, boradly ovate, 5-nerved; lower floral glume thinly membranous, as long as the upper one, the palea hyaline; upper floral glume coriaceous, elliptic, obtuse, dorsally convex transversesly rugose, pale. (Fig. 544) Flowers: October.

# Micromorphology (Fig. 545)

Unicellular non-glandular trichome with thick wall and broad lumen was observed along with dumbbell shaped and moniliform silica-bodies.

Stomata were of graminaceous type.

D/930.

#### 14. Themeda quadrivalvis (L.) Kuntze Revis. Gen. Pl. 2: 794. 1891.

A suberect annual with rooting from the lower nodes. Leaves upto 30 cm long, linear, acute, flat, glabrous; sheathes glabrous or the upper with scattered bulbousbased hairs towards the mouth; ligules membranous, rounded, glabrous. Panicle subsolitary or 2-3 nate, filiform, glabrous, undivided often to the middle, then bearing at equal distances usually shortly pedunculate dense clusters of racemes; spathes linear to subulate from a broad based bristles; racemes 1-1.5 cm long, crect. Involucral spikelets whorled, sessile, persistent, linear-lanceolate, acute or acuminate, glume beset along the winged keels with stiff bristles form large not winged, glabrous. Bisexual spikelet solitary, not exserted from the involucre, long, narrow, linear-lanceolate; callus very short, subobtuse, bearded with short reddish hairs; lower Involucral glume obtuse, brown, shinning, obscurely 6-7 nerved; upper Involucral glume glabrous; lower floral glume awned; awn 2.5-4 cm long, slender. (Fig. 546; 547)

Flowers: September-January.

## Micromorphology (Fig. 548)

Stomata were of graminaceous type. Dumbbell shaped silica bodies were also present. D/902-904.

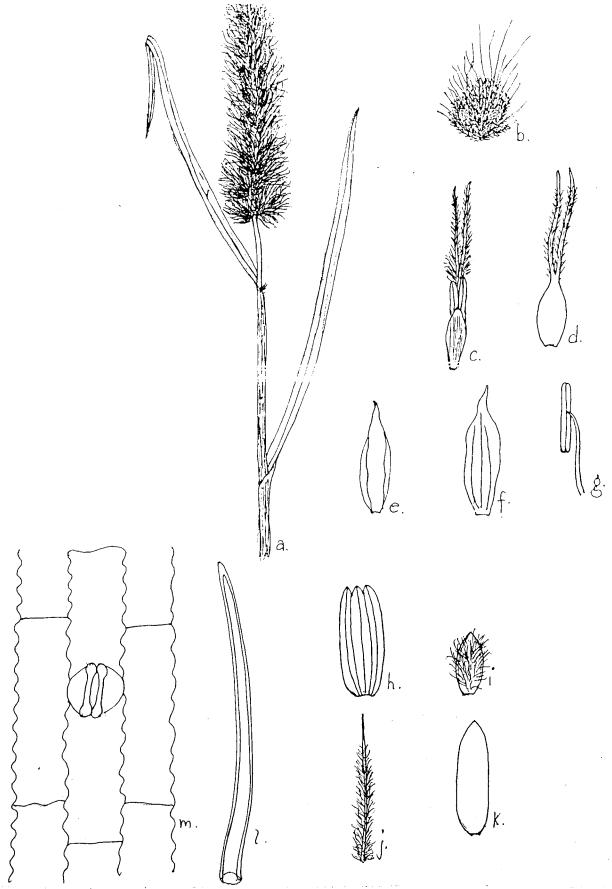


Fig. 543. Pennisetum setosum Rich., a. habit, b. involucel, c. spikelet, d. gynoecium, e. glume II inner side, f. glume II outer side, g. stamen, h. glume III, i. glume I, j. bristles, k. glume IV, l. unicellular trichome with thin wall and broad lumen, m. graminaceous stomata.

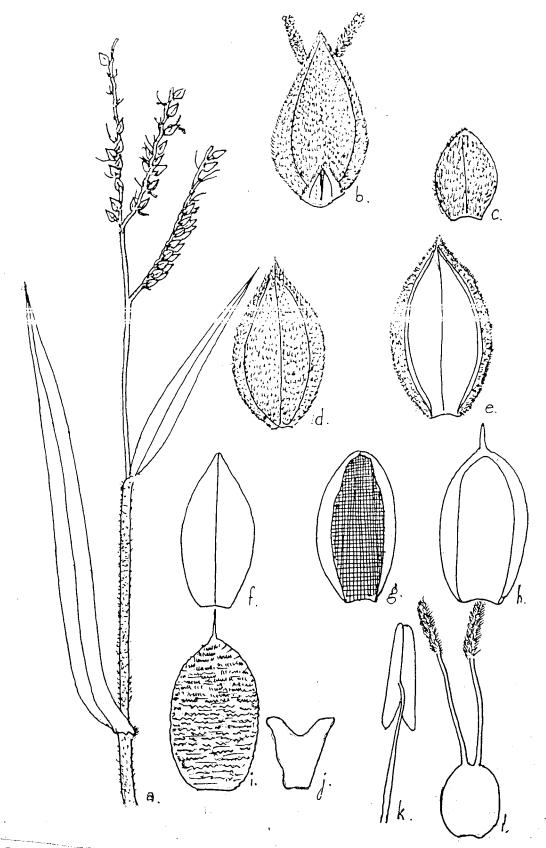


Fig. 544 Setaria glauca Beauv., a. habit, b. spikelet, c. empty glume, d-e. outer involucral glume, f-g. inner involucral glume, h-i. foral glume, j. lodicules, k. stamen, l. gynoecium.

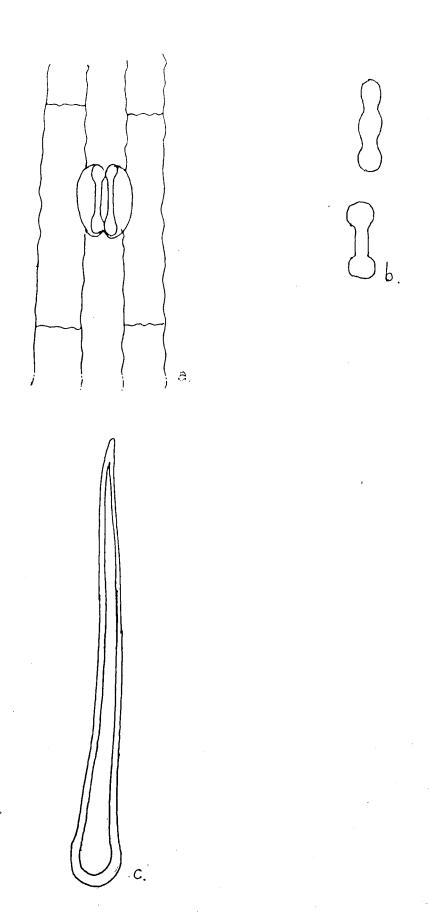


Fig. 545. Setaria glauca a. graminaceous stomata, b. moniliform and dumbbell shaped silica body, c. unicellular trichome with thick wall and broad lumen.

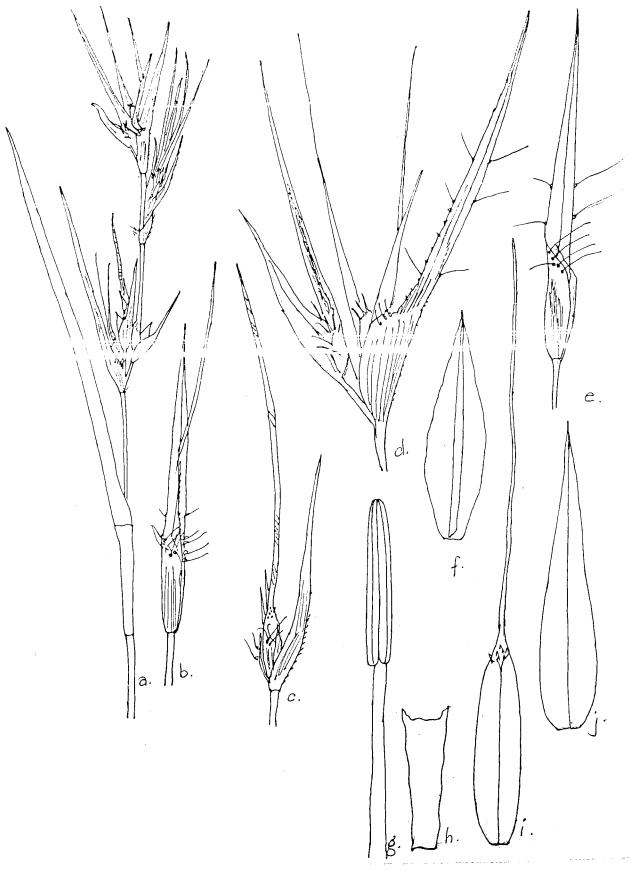


Fig. 546. Themeda quadrivalvis Kuntze., a. habit, b. involucral spikelet, c. pedicellate spikelet, d. inflorescence, e. spathe, f, & j. pedicellate glumes.

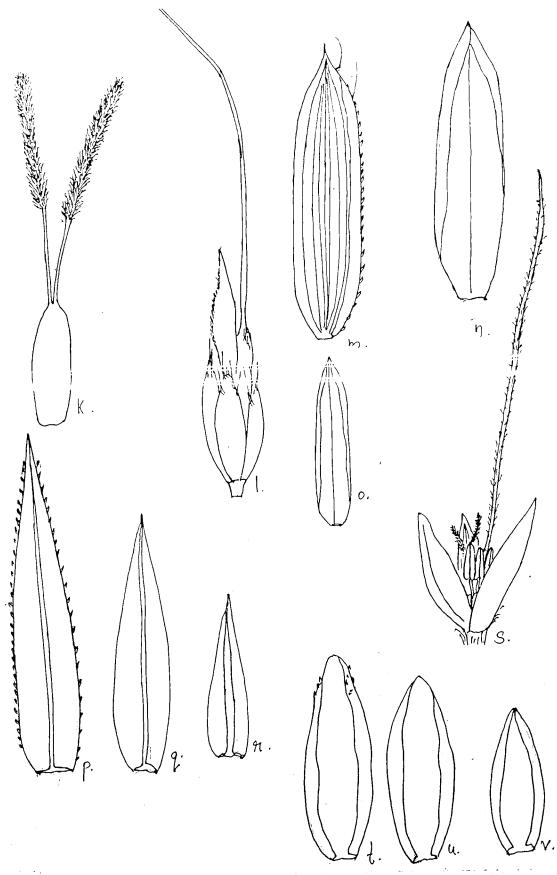


Fig. 547 Themeda quadrivalvis Kuntze., i. pedicellate glumes, h. lodicule, g. stamen, k. gynoecium, l. involucral and pedicellate spikelets, m-o. involucral spikelet glumes, s. bisexual spikelet, p-r. pedicellate spikelet glumes, r-v. bisexual spikelet glumes.

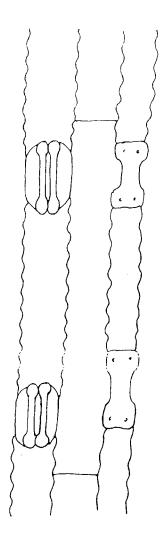


Fig. 548. Themeda quadrivalvis Kuntze., a. graminaceous stomata and Silica body (dumbbell shaped)