



# FASCICLES OF FLORA OF INDIA

**FASCICLE 19**

Edited by  
**M.P. Nayar**  
**K. Thothathri**  
**M. Sanjappa**

**BOTANICAL SURVEY OF INDIA**

**Alangiaceae . . . . .K.M. Matthew**  
**Burmanniaceae . . . . .P.K. Hazra**  
**Cochlospermaceae . .T.K. Paul & M.P. Nayar**  
**Cornaceae . . . . .K.M. Matthew**  
**Lardizabalaceae . .M.P. Nayar & T.K. Paul**  
**Lobeliaceae . . . . .V.K. Haridasan**  
**. . . . .& P.K. Mukherjee**  
**Malvaceae . . . . .T.K. Paul & M.P. Nayar**  
**Nyssaceae . . . . .K.M. Matthew**

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## ALANGIACEAE nom. cons.

A. P. de Candolle, Prodr. 3:203. 1828 (Alangieae)

K.M. Matthew\*

Deciduous or evergreen trees, shrubs or climbers; branchlets at times spinescent; indumentum various, persistent to glabrescent; pith one-third diam. of branchlets; leaf scars triangular or circular. Leaves alternate, simple, entire to lobate; blade elliptic, ovate, obovate, ovate-lanceolate or oblong, chartaceous or thin-coriaceous, apex acute, acuminate or obtuse, base truncate, acute, oblique or sub-cordate, nerves marginally connected or free, exstipulate. Inflorescence cymose, axillary, (sub) sessile or pedunculate, ramiflorous; pedicels articulated, distinct or indistinct. Flowers bisexual, cream or greenish; bracts triangular, linear or ovate. Calyx tube adnate with the ovary, with free teeth. Petals 4-10, lorate, valvate, deciduous. Stamens as many as petals or to thrice as many, in one whorl, as long as petals; filaments villous, basally thickened; anthers elongate, flattened, dorsifixed; dehiscence latero-longitudinal. Ovary inferior, 1 or 2-locular, with 1 pendulous, anatropous ovule each; style simple, glabrous or indumented; stigma capitate, lobed, clavate or lanceolate. Disc cushion-like. Drupe ellipsoid, ovoid or globose, ribbed, crowned with the persistent disc and calyx lobes; seed one in each cell or one aborted; cotyledons leafy, flat or crumpled.

*Distrib* : 1 genus with 17 species in the world; 5 species in India.

Alangiaceae, first treated as a separate family by A.P. de Candolle (l.c.) was followed by Lindley (Nat. Syst. Bot., ed. 2, 39. 1836) including the genera *Alangium* and *Marlea*. C.B. Clarke (in Hook. f., Fl. Brit. India 2:741. 1879) treated these genera under the Cornaceae. Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8:260. 1898 combined these two genera into *Alangium* in the Cornaceae. Wangerin (Engl., Pflanzenr. IV, 220 b : Heft 41:1-24. 1910) transferred *Alangium* from the Cornaceae into the unigeneric Alangiaceae. This has generally been followed later.

### ALANGIUM Lam., nom. cons.

Lam., Encycl. 1:174. 1783; DC., Prodr. 3:203. 1828; Benth. & Hook. f., Gen. Pl. 1:949. 1867; Hook. f., Fl. Brit. India 2:741. 1879; Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8:260. 1898; Wangerin in Engl., Pflanzenr. IV, 220 b, Heft 41:6. 1910; Gamble, Fl. Pres. Madr. 1:571. 1919 (Repr. ed. 1:404. 1957); Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16:140. 1939; Hutch. Gen. Fl. Pl. 2:49. 1967 & Fam. Fl. Pl. ed. 3, 217. 1973; Eyde in Journ. Arnold Arbor. 49:167-192. 1968; Mukherjee in Bull. Bot. Surv. India 10:330. 1968 (1969). *Marlea* Roxb., Pl. Corom. 3:80. t. 283. 1820 & Fl. Ind. 2:261. 1824; Benth. & Hook. f., Gen. Pl. 1:949. 1867; C.B. Clarke in Hook. f., Fl. Brit. India 2 : 742. 1879.

\*Rapinat Herbarium, St. Joseph's College, Tiruchirapalli.

### Characters of the family.

*Distrib.* : 17 species in the world; 5 in India. Throughout India, Nepal, Bhutan, Burma, China, Vietnam, Japan, Sumatra, Java, Borneo, New Guinea, Philippines, Eastern Australia, Sri Lanka, Trop. Africa, Madagascar, Comoro Isls.

*Ecol.* : Upto 900 m in the Indian peninsula; to 7500 m in the Himalayas. Dry deciduous to evergreen forests.

*Chr. No.* :  $2n = 22$  in *A. begoniifolium* Baillon &  $2n = 16$  in *A. lamarckii* Thw. (Federov, Chr. No. Fl. Pl. 17, 1974)

### KEY TO THE SPECIES

- 1a. Inflorescence (sub) sessile. Stamens twice or thrice as many as petals. Fruits (sub) globose. Cotyledons crumpled .. *A. salvifolium* 5
- 1b. Inflorescence pedunculate. Stamens as many as petals; Fruits ellipsoidal to ovoid. Cotyledons flat :
  - 2a. Leaves penninerved *A. javanicum* 4
  - 2b. Leaves palmi or triplinerved :
  - 3a. Branchlets hirsute. Peduncle under 1 cm. Style glabrous; stigma sub-clavate. Ovule 1. Fruit deeply grooved *A. barbatum* 2
  - 3b. Branchlets glabrous. Peduncle over 3 cm. Style hirsute or tomentose; stigma capitate. Ovules 2, rarely 1 or 3; Fruits obscurely grooved :
  - 4a. Petioles 1.5-3 cm. Blade orbicular to broad oblong; Inflorescence over 8-flowered. Bracts triangular; Filaments hairy, apically thickened and bearded; Stigma lobed. *A. chinense* 3
  - 4b. Petioles 3.5-5 cm. Blade suborbicular, ovate or oblong-ovate; Inflorescence upto 3-flowered. Bracts linear. Filaments glabrous, not apically thickened. Stigma entire *A. alpinum* 1
- 1. *Alangium alpinum* (C.B. Clarke) W. Smith & Cave in Rec. Bot. Surv. India 6:96, t. 2, 1914; Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16: 167, 1939; H. Hara, Fl. East. Himal. 1:219, 1966 et 2:88, 1971; Matthew, Enum. Fl. Pl. Kurseong 71, 1981. *Marlea begoniifolia* Roxb. var. *alpina* C.B. Clarke in Hook. f., Fl. Brit. India 2:744, 1879.

*Local Names* : Palit-myok (Lepcha).

Deciduous trees upto 12 m tall; branchlets ascending; internodes obscurely angular. Blade suborbicular, ovate or oblong-ovate, glabrous above, sparsely hairy below, apex acuminate, base rounded, subtruncate or cordate, margins wavy; petioles 3.5-5 cm. Inflorescence axillary, 4-10 cm, 3-flowered; pedicels 1 cm, elongating to 3 cm in fruit. Calyx lobes 6-8. Petals 6-8. Stamens 6-8; filaments glabrous, 5-6 mm. Fruits to  $20 \times 8-9$  mm; seed 1.

*Fls.* : Jan.-Aug.; *Frts.* : Oct.-Nov.

*Distrib.* : INDIA : E. Himalaya to 2700 m; EAST NEPAL, BURMA, CHINA (Yunnan).

2. *Alangium barbatum* (R.Br.) Baillon ex Kuntze, Revis. Gen. Pl. 273. 1891; Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8: 262. 1898; Wangerin in Engl. Pflanzenr. IV, 220 b, Heft 41:16. 1910; Kanjilal & Das, Fl. Assam 2:369. 1938; Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16:188. 1939. *Marlea barbata* R. Br., Names and Notes Ind. Pl. (1828-1849) et in R. Br., Misc. Bot. works 2:534. 1867; C.B. Clarke in Hook. f., Fl. Brit. India 2:743. 1879.

Shrubs or trees upto 6 m tall; branchlets shaggy, hirsute to glabrescent. Blade broadly ovate to obovate or oblong, seldom lobed or toothed but once, 10-15 (-18) × 5-8 cm, chartaceous, hirsute throughout below, on the midrib and veins above, apex acute to acuminate, base cordate or rounded; petioles 2-2.5 cm. Inflorescence hirsute, branched twice, 12-25 mm; flowers 3 to 15 or more; peduncles 3-10 mm; pedicels 2-10 mm. Calyx lobes 4 to 7. Petals 4 to 7, hirsute outside, glabrous inside, 6-10 mm. Style glabrous, 4-8 mm; stigma subclavate. Ovary 1-celled; ovule 1. Fruits 1-seeded.

*Fls.* : June-Aug.; *Frts.* : Oct.-March.

*Distrib.* : INDIA : Assam; BHUTAN, BURMA, CHINA, VIETNAM.

3. *Alangium chinense* (Lour.) Harms in Ber. Deutsch. Bot. Ges. 15:24. 1897; Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16:169. 1939; Ghafoor, Fl. W. Pak. 50:1. 1973. *Stylidium chinense* Lour., Fl. Cochinch. 1: 221. 1790. *Marlea begoniifolia* Roxb., Pl. Corom. 3:80. t. 283. 1820 & Fl. Ind. 2:261. 1832; DC. Prodr. 4:267. 1830; C.B. Clarke in Hook. f., Fl. Brit. India 2:743. 1879; Collett, Fl. Siml. 218. 1902; Duthie, Fl. Upper Gang. Pl. 1:369. 1960 (Repr. ed.); Prain, Beng. Pl. 1:399. 1963 (Repr. ed.). *A. begoniifolium* Baillon, Hist. Pl. 6: 270. 1876; Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8:261. 1898; Wangerin in Bot. Jahrb. Syst. 29:505. 1900; Cave & W. Smith in Rec. Bot. Surv. India 6:4:93-97, t. 1, 1914; Kanjilal & Das, Fl. Assam 2:369. 1938; Gamble, Fl. Pres. Madr. 404. 1957 (Repr. ed.); Haines, Bot. Bih. & Or. 2:436. 1961 (Repr. ed.).

*Local Names* : Palit-king (Lepcha).

Deciduous trees upto 20 m tall; branchlets horizontal; internodes clearly angular. Blade orbicular to broad oblong, 9-11 × 6-8 cm, glabrous above, tufts of hairs in the axils of nerves below, base rounded or subcordate, subequal, entire, glabrous; petioles 1.5-3 cm. Inflorescence axillary, 3-7 cm, dichotomous, 8-12-flowered. Calyx lobes 6-8. Petals 6-8. Stamens 6-8; filaments hairy. Style hirsute; stigma capitate, 2-4-lobed. Fruits 8 × 6 mm, ovoid, glabrous, obscurely ribbed.



*Type* : Cochinchina, Loureiro (P, Holotype; BM, Isotype).

*Frts.* : July-Aug.

*Distrib.* : INDIA : Andhra Pradesh, W. Bengal, Sikkim, Assam, Outer Himalaya; NEPAL, BURMA, CHINA, JAPAN, MALAY ARCHIPELAGO, PHILIPPINES, SUMATRA, JAVA, E. & W. AFRICA.

*Uses* : Leaves as fodder for cattle in the Himalayas and wood for building.

4. *Alangium javanicum* (Blume) Wangerin in Engl., Pflanzenr. IV, 220 b, Heft 41:14. 1910; Bloembergen in Bull. Jard. Bot. Buitenzorg, III, 16:218. 1939. *Styrax javanicum* Blume, Bijdr. 671. 1825. *Marlea ebenacea* C.B. Clarke in Hook. f., Fl. Brit. India 2:742. 1879.

Trees upto 15 m tall; branchlets stout, glabrescent. Blade elliptic to oblong, 12-20 × 4-7 cm, thin coriaceous, penninerved, apex acuminate to caudate, base cuneate, margin entire; petioles 1 cm. Inflorescence fulvous-pubescent, short, 4-8 flowered. Calyx lobe 6(5), truncate, soft-pubescent. Petals 6(5), compactly pubescent outside, sparsely so inside. Stamens 6(5); filaments woolly. Style pilose; stigma elongate with 4 longitudinal stripes; ovule 1. Drupes ellipsoidal, 15-20 × 12-15 mm, obscurely grooved.

*Fls.* : Jan.-March.

*Distrib.* : INDIA : Andamans; MALACCA.

5. *Alangium salvifolium* (Linn. f.) Wangerin in Engl., Pflanzenr. IV, 220 b, Heft 41:9 1910; Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16:149. 1939; Gamble, Fl. Pres. Madr. 1:404. 1957; (Repr. ed.) *Grewia salvifolia* Linn. f., Suppl. 409. 1781. *A. lamarckii* Thwaites, Enum. Pl. Zeyl. 133. 1859; Dalzell & Gibson, Bomb. Fl. 109. 1861; Beddome, Fl. Sylv. 215. 1872; C. B. Clarke in Hook. f., Fl. Brit. India 2:741. 1879; Trimen, Handb. Fl. Ceyl. 2:285. 1894; Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8: 261. 1898; Duthie, Fl. Upper Gang. Pl. 1:368. 1960 (Repr. ed.); Haines, Bot. Bih. Or. 2:436. 1961 (Repr. ed.); Prain, Beng. Pl. 1:398. 1963 (Repr. ed.).

Deciduous or evergreen stragglers, shrubs or trees upto 20 m tall; branchlets at times spinescent, tomentose to glabrescent. Blade oblong to oblong-lanceolate, 8-18 × 2.3-7 cm, chartaceous to subcoriaceous, glabrescent, apex obtuse, base cuneate, margin entire. Inflorescence (sub) sessile, densely rusty-tomentose, often in clusters of 4 to 8 flowers, at times fewer, even single; pedicels 2-8 mm. Flowers cream, fragrant, 12-30 mm long. Calyx-tube 2.5 mm long; lobes 5-10, each 3 mm long, toothed. Petals 4-10, basally swollen and apically obtuse, 12-30 mm long, tomentose outside, less so inside. Stamens 10-30; filaments 4-12 mm long, apically geniculate and bearded. Ovary 1-celled; ovule 1, pendulous; style glabrous, 8-24 mm; stigma capitate. Disc lobed. Drupes subglobose, 9-24 × 6-16 mm, red when ripe.

- 5a. Shrubs or trees upto 6(10) m. Leaves oblong-lanceolate, often obovate. Flowering twig generally leafless; Inflorescence (sub) sessile. Petals 5-10 . . . ssp. *salvifolium*
- 5b. Straggling or climbing shrubs upto 20 m. Leaves oblong-obovate. Flowering twig leafy. Inflorescence pedunculate. Petals 4-7 . . . ssp. *sundanum*
- 5a. ssp. *salvifolium* — *A. salvifolium* (Linn.) Wangerin ssp. *decapetalum* (Lam.) Wangerin in Engl. Pflanzenr. IV, 220 b, Heft 41:11. 1910; Bloembergen in Bull. Jard. Bot. Buitenzorg III, 16:152. 1939. *A. decapetalum* Lam., Encycl. 1:174. 1783; DC., Prodr. 3:203. 1828; Wight & Arn., Prodr. Fl. Ind. Or. 325. 1834; Wight, Icon. t. 194. 1839. *A. salvifolium* (Linn. f.) ssp. *hexapetalum* (Lam.) Wangerin in Engl. Pflanzenr. IV, 220 b, Heft 41:9. 1910, quoad nomen., excl. descr.

Deciduous shrubs or trees upto 6 (10) m. Blade oblong-lanceolate, 8-12 × 2.5-4.5 cm (new foliage following the flowers measure less). Inflorescence sessile. Sepals 5-10. Petals 5-10. Stamens 10-30.

*Distrib.* : INDIA : in deciduous forests upto 400 (800)m ; AFRICA (Comoro Isls.), SRI LANKA, CHINA, VIETNAM, THAILAND.

- 5b. ssp. *sundanum* (Miq.) Bloembergen in Bull. Jard. Bot Buitenzorg III, 16:156. 1939. *A. sundanum* Miq. Fl. Ind. Bat. 1:774. 1856. *A. hexapetalum* Lam., Encycl. 1:174. 1783; DC., Prodr. 3:203. 1828; Roxb., Fl. Ind. 2:502. 1832; Wight & Arn., Prodr. Fl. Ind. Or. 326. 1834; Gamble, Fl. Pres. Madr. 1:404. 1957. (Repr. ed.), *A. salvifolium* ssp. *hexapetalum* Bloembergen in Blumea 1:250. 1935.

Evergreen stragglers or climbers upto 20 m. Blade oblong-obovate to elliptic, 10-18 × 5-7 cm. Inflorescence subsessile. Sepals 4-7. Petals 4-7. Stamens 10-20.

*Notes* : The considerable confusion existing around this complex has been cleared by Turrill & Milne-Redh. in Fl. Trop. E. Afr. ALANGIACEAE 9. 1958 : "Wangerin recognized two subspecies, *hexapetalum* (Lam.) Wangerin and *decapetalum* (Lam.) Wangerin .... Bloembergen saw Lamarck's types and showed that both were the same taxon — *decapetalum* and that the form which Wangerin called *hexapetalum* should be known as subsp. *sundanum* (Miq.) Bloemb. .... Linnaeus' type is subsp. *decapetalum* which taxon must therefore be called subsp. *salvifolium* ".

*Distrib.* : INDIA : in evergreen forests to 800 m; SRI LANKA, MALAY PENINSULA, SUMATRA, JAVA, PHILIPPINES, KANGAEAN ISL., LESSER SUNDA ISL., CELEBES, SALAJAR & NEW GUINEA.

## BURMANNIACEAE

Blume, Enum. Pl. Jav. 1:27.1827

P. K. Hajra\*

Herbs, autotrophic or saprophytic, annual or perennial. Stem simple or branched. Leaves in autotrophic species crowded at stem-base, oblong or linear, simple; sessile or reduced to scales in saprophytic species. Flowers bisexual, regular, terminal, solitary, fascicled or cincinnate. Perianth superior, persistent, tubular or infundibular-campanulate, winged or not, 3-merous. Stamens 3 or 6, inserted in perianth tube; anthers bilocular, dehiscent by slits. Ovary inferior, 1-3-locular; style short; stigma entire or 3-lobed; ovules many. Capsules loculicidal; seeds minute, many, ellipsoid-oblong; albumen scanty.

*Distrib.* 17 Genera and ca 125 species distributed in the tropics and subtropics of both hemispheres. 2 genera and 10 species in India.

### KEY TO THE GENERA

- 1a. Perianth-tube cylindrical or trigonous, 3-winged;  
Stamens 3, erect, sessile or subsessile. Ovary 3-locular *Burmannia* 1
- 1b. Perianth infundibular-campanulate, not winged;  
Stamens 6, pendulous; filaments inserted in perianth tube and  
recurved towards base of flowers. Ovary unilocular *Haplothysia* 2

### 1. BURMANNIA

Linn. Sp. Pl. 287. 1753 et Gen. Pl. ed. 5. 139. 1754; Benth. & Hook. f., Gen. Pl. 3:457. 1883 (Repr. ed., 1965); Hook. f., Fl. Brit. India 5:664. 1888; Jonker, Mon. Burmann. in Meded. Bot. Mus. Utrecht 57. 1938 et in van Steenis, Fl. Males. ser. 1,4:15.1948; Rao & Verma in Bull. Bot. Surv. India 12(1-4):141. 1970(1972); Balakrishnan, Fl. Jowai 462. 1983; Cramer in Dassanayake et Fosberg, Fl. Ceylon 4:153-159. 1983.

Herbs, autotrophic or saprophytic. Stem simple or branched. Leaves in basal rosettes and a few scattered on stem, linear-lanceolate, acuminate, upper shorter and appressed to stem or all reduced to scales. Flowers solitary, fascicled or unilâteral on branches of forked cyme. Perianth tubular, entirely or partially persistent; tube 3-winged; lobes 6, small, biseriate. Anthers 3, sessile or subsessile in perianth-throat. Ovary inferior, 3-locular; style equalling perianth tube; stigmas 3, obconical or suborbicular. Fruits dehiscent or indehiscent; seeds many.

*Type* *Burmannia disticha* Linn.

*Distrib.* C. 60 species, tropics of both hemispheres, Southern United States, Southern Brazil, Bôlivia, Mozambique, Southern China, South-east Asia, Japan and Southern Australia. 9 species in India; 3 endemic.

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\*Botanical Survey of India. Howrah.

*Uses.* According to Campbell (a label on a sheet in DD, G. Watt 8129) *B. coelestis* is used by the Santals for medicinal purposes.

### KEY TO THE SPECIES

- 1a. Autotrophic herbs. Radical rosette-leaves present :  
 2a. Robust herbs with prominent rosette-leaves;  
 Flowers many, in bilbid cymes . . . . . *B. disticha* 4  
 2b. Slender herbs with minute rosette-leaves.  
 Flowers solitary or few in fascicles :  
 3a. Flowers 8-15 mm long. Flower-wings elliptical:  
 Perianth-lobe margins double . . . . . *B. coelestis* 3  
 3b. Flowers 4.5-7.0 mm long. Flower-wings orbicular-obovate;  
 Perianth-lobe margins single . . . . . *B. pusilla* 7  
 1b. Saprophytic herbs. Radical rosette-leaves absent :  
 4a. Flowers clustered at top of stem, usually  
 capitate, wingless . . . . . *B. championii* 2  
 4b. Flowers solitary or often a few on a branched inflorescence,  
 winged :  
 5a. Connective without crests at apex . . . . . *B. wallichii* 9.  
 5b. Connective with crests at apex :  
 6a. Outer perianth-lobes with involute rounded  
 lateral lobes . . . . . *B. nepalensis* 6.  
 6b. Outer perianth-lobes without lateral lobes :  
 7a. Outer perianth-lobes with a thick fleshy bag on  
 inner side . . . . . *B. candelabrum* 1.  
 7b. Outer perianth-lobes without fleshy bags :  
 8a. Stem leaves appressed; scale like. Perianth-margin  
 not involute . . . . . *B. indica* 5  
 8b. Stem leaves spine-like scales. Margin of outer  
 perianth involute . . . . . *B. stricta* 8.

1. *Burmannia candelabrum* Gagnep. in Bull. Soc. Bot. Fr. 54:462.1907; Jonker *l.c.* 160; Rao & Verma *l.c.* 143. *B. candida* Griff. ex Hook. f., Fl. Brit. India 5:665. 1888 p.p. *B. coelestis* non D. Don (1825); Fischer in Gamble, Fl. Pres. Madr. 3:1399. 1928 p.p. (Repr. ed. 3:979. 1957 p.p.).

Stem 6.0-20.0 cm high, filiform, simple or branched. Scales *c.* 2.0 mm long, appressed, lanceolate, acute. Flowers solitary or a few on curved branches. Bracts *c.* 2.0 mm long, lanceolate. Flowers 8.0-10.0 mm long, prominently 3-winged, usually blue. Outer perianth lobes ovate, rounded. Inner lobes small, lanceolate. Perianth-tube *c.* 2.0 mm long, cylindrical. Connective oblong, with 2 lateral arms; crests two, acute, divergent; spur basal, acute. Ovary 4.0-6.0 mm long, obovoid to clavate, style filiform; stigmas funnel-shaped, sessile. Capsule obovoid or clavate.

*Type:* East Bengal, Griffith 5598 (P, CAL, K!, W)

*Fls. & Frts.:* Aug.-Nov.

*Distrib.* INDIA : Meghalaya, Maharashtra, Karnataka, Tamil Nadu, Kerala; BANGLADESH.

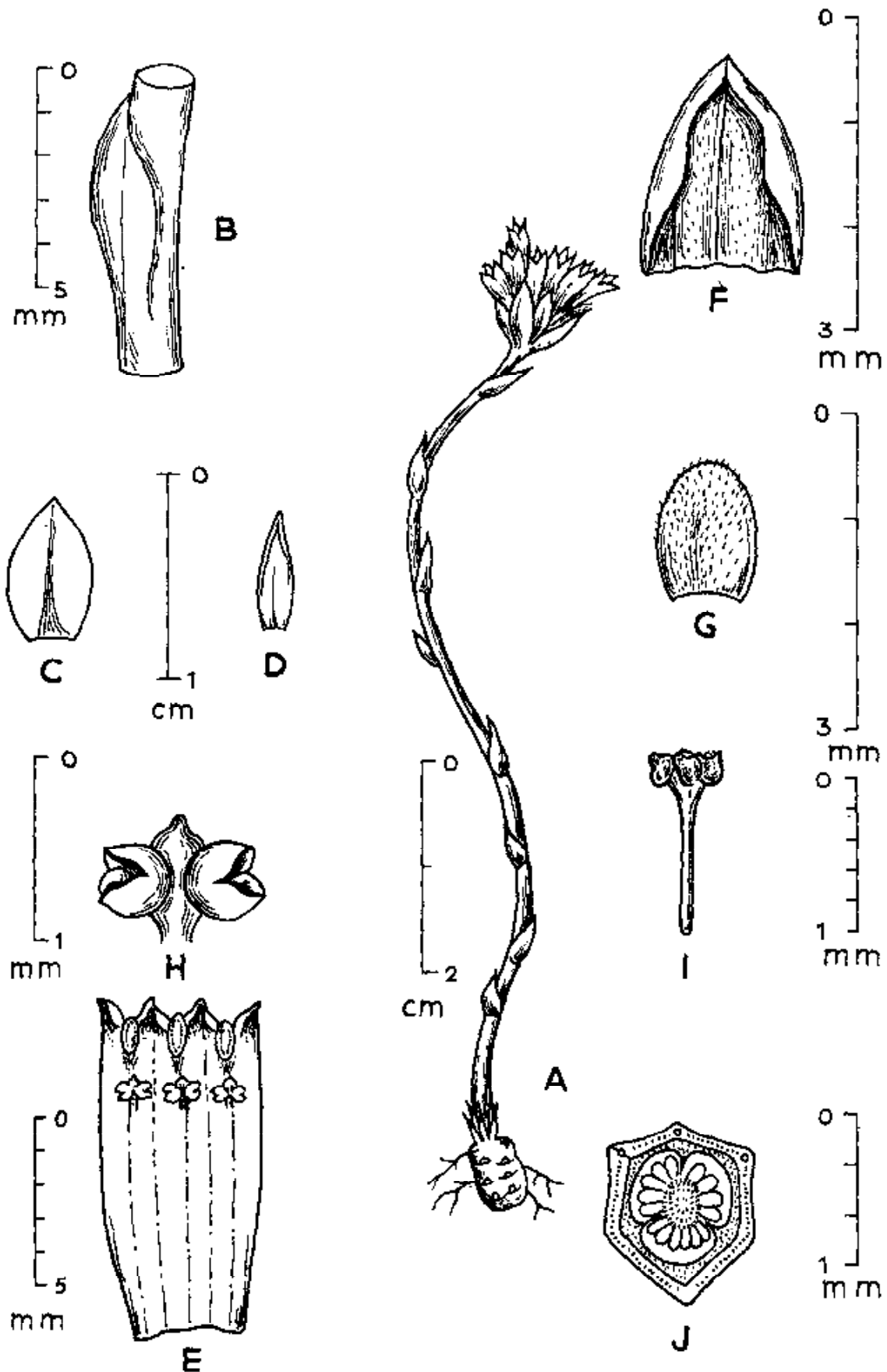


Fig. 1 *Burmannia championii* Thw.

A. Habit. B. Portion of stem with leaf. C. & D. Bracts. E. Perianth split open with anthers and inner perianth lobes. F. Outer perianth lobe-inner view. G. Inner perianth lobe. H. Stamen. I. Style and stigmatic lobes. J. T.S. of ovary.

*Ecol* : In open grasslands and marshy places. 1000-1600 m.

*Exsicc.* : Karnataka : Annoor, Mysore, 3,000 ft, *Cleghorn s.n.* (CAL, K, BM); North Kanara, 1886, *W. A. Talbot* 1976 (CAL, DD, K). Maharashtra : Concan, *Dalzel s.n.* C.N.H. Acc. No. 449053 (CAL). Meghalaya : Kollong Rock, 5,500 ft, 7th Nov. 1871, *C. B. Clarke* 15417 (CAL); Mamloo, 4,000 ft, 23 Oct. 1871, *C. B. Clarke* 15823 (BM); Mamloo, Khasia, 4000 ft, 15th Oct. 1886, *C. B. Clarke* 45427A(K); Lailangkot, 4,000 ft, 11.8.1890, *H. Collett* 42(DD); Laitlyngkot, 6,000 ft, 17.10.1945, *N. L. Bor* 153 (DD). Tamil Nadu : Annamallay, *Wight* 2938 (CAL).

2. *Burmannia championii* Thw. Enum. Pl. Zeyl. 325. 1864; Hook. f., Fl. Brit. India 5:666.1890; Jonker *l.c.* 38; Balakrishnan in Bull. Bot. Surv. India. 18(1-4): 230-231. 1976(1979); Joseph, Ansari et Mohanan in Journ. Bombay Nat. Hist. Soc. 76:552-553. 1980. Fig. 1

Stem 6.0-12.0 cm high, simple, slender, white, scaly. Scales 2.0-4.0 mm long, many, spirally arranged, lanceolate, acute. Bracts c. 3.0 mm long, lanceolate, acute. Flowers 6.0-12.0 mm long, white. Outer perianth-lobes 1.0-2.0 mm long, erect, acute, with involute lateral lobes. Inner lobes erect, spatulate. Anthers sessile; crest obscure. Ovary c. 3.0 mm long, oblong-obovoid; style thick-filiform; stigma 3-lobed, subsessile, funnel-shaped. Capsule ellipsoid-oblong, dehiscent irregularly.

*Type* : Ceylon (Sri Lanka), *Thwaites* 2735 (Herb. PDA) Isotypes (BM!, CAL, B, G-BIOS, G-DEL, GOTT, P, DR, W).

*Fls. & Frts.* : June-Aug.

*Distrib.* INDIA : Andaman & Nicobar Islands, Kerala; SRI LANKA, MALAYAN PENINSULA, SOUTHERN CHINA, JAPAN, MALAYAN ARCHIPELAGO.

*Ecol* : Dense evergreen hill forests, on humus covered soil, in moist places and near streams.

*Exsicc.* : Kerala : Travancore, Parambikulam, 19.11.1952, *K. C. Jacob s.n.* (K).

3. *Burmannia coelestis* D. Don, Prodr. Fl. Nepal. 44.1825; Royle, Illustr. Bot. Himal. 373, t. 91, f. 1. 1839; Hook. f. Fl. Brit. India 5:665. 1888; Prain, Beng. Pl. 2:998. 1903 (Repr. ed. 2:750. 1963); Haines, Bot. Bih. & Or. 2:1125. 1921 (Repr. ed. 3:1175. 1961); Fischer in Gamble, Fl. Pres. Madr. 3(8):1399. 1928 (Repr. ed. 3:979. 1957); Jonker *l.c.* 120; Rao & Verma *l.c.* 142; Ramam. in Saldanha & Nicolson, Fl. Hassan Dist. 809. 1976; Matthew, Ill. Fl. Tamiln. Carn. Pl. 690. 1982 et Fl. Tamiln. Carn. 1549.1983; Balakrishnan, Fl. Jowai 2:462. 1983. *B. triflora* Roxb. Hort. Beng. 87.1814. *nom. nud.*

Stem 8.0-30.0 cm high, simple or branched. Rosulate-leaves 3.0-20.0 × 1.5-2.0 mm, linear-lanceolate, acute or acuminate, 3-nerved. Cauline leaves upto

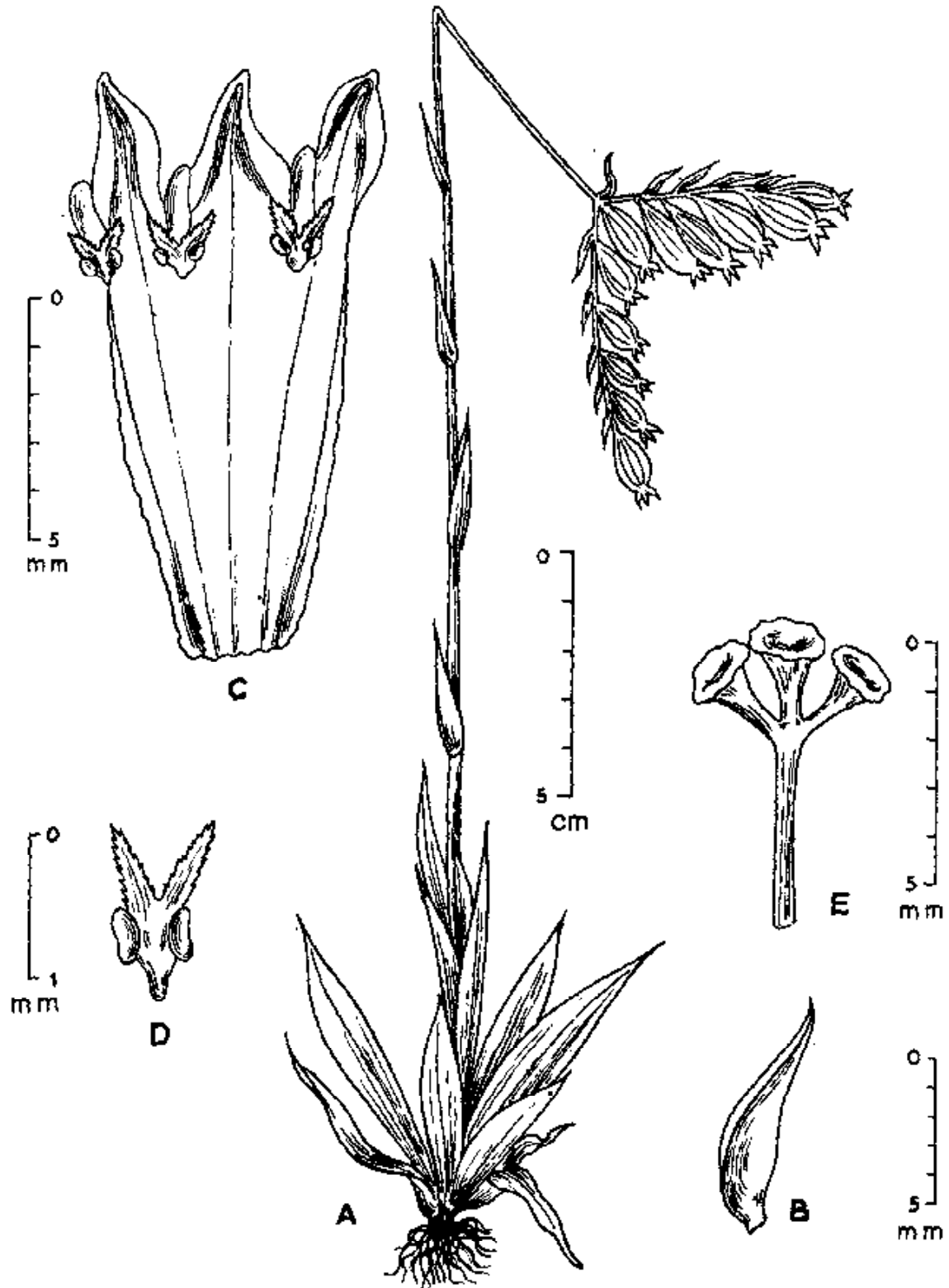


Fig. 2 *Burmannia disticha* Linn.

A. Habit. B. Bract. C. Perianth lobe split open with anthers and inner perianth lobe. D. Anther. E. Style and stigmatic lobes.

1.0 cm long, linear-lanceolate, subulate. Bracts c.  $4.0 \times 1.0$  mm, lanceolate, acute. Flowers prominently 3-winged, blue or purplish with yellow lobes. Outer perianth-lobes c. 1.0 mm long, erect, obovate, apiculate. Inner lobes lanceolate. Perianth-tube c. 5.0 mm long. Connective with two short lateral arms; crests apical divergent; spur basal, obtuse. Ovary c. 5.0 mm long, ellipsoid to obovoid; style filiform; stigmas 3, sessile, funnel-shaped. Capsule obovoid, truncate, dehiscing transversely.

*Type* : Nepal, Wallich 9005 (CAL, K!, G-BIOS, GH, L, NY).

*Fls. & Frts.* June-Nov.

*Distrib.* : INDIA : Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Rajasthan, Sikkim, Tamil nadu; W. Bengal; SRI LANKA, MALAYAN PENINSULA, CHINA, JAPAN, MALAYAN ARCHIPELAGO, NEPAL.

*Ecol.* : In marshy places, 500-1500 m.

*Exsicc.* : Assam : Bamanigaon, 25.1.1949, *Thakur Rupchand* 2410 (MICH). Bihar : Palamau, Chota Nagpur, 2,000 ft, Dec. 1880, *J. S. Gamble* 8759 (K); Chota Nagpur, c. 2,000 ft, 21.8.1953, *F. G. W. Kerr* 2338 (BM); Hazaribagh, Chota Nagpur, 16.1.1874, *C. B. Clarke* 26562 (BM). Kerala : Travancore, Lockhartgap and Periakanal, Sept., 1937 *Edward Barnes* 1660 (K). Madhya Pradesh : Kanha National Park, Mandla district, Nov., 1970, *R. M. Singhal* s.n. DD Acc. No. 145637 (DD). Meghalaya : Khasia, *Griffith* 72(K); Khasia, 3-5,000 ft, *J.D.H. & T.T.* s.n. (BM, CAL); Laitlyngkot, Khasi Hills, 6,000 ft, 30.7.1949, *Walter N. Koelz* 23333 (MICH); Below Mawphlang, Khasi Hills, 4,000 ft, 15.9.1949, *Thakur Rupchand* 2322 (MICH); Barapani, 3,000 ft, 21.10.1943, *N. L. Bor* 17830 (DD). West Bengal : Siliguri, 5,000 ft, 3.12.1875, *C. B. Clarke* 26562 (BM); Siliguri, Jan. 1875, *G. King* s.n. C.N.H. Acc. No. 448992 (CAL); Siliguri, Bengal, 3.12.1875, *C. B. Clarke* 26755 A & B (K).

*Burmattia disticha* Linn. Sp. Pl. 1:287. 1759; Hook. f., Fl. Brit. India 5:644. 1888; Fischer in Gamble, Fl. Pres. Madr. 3(8):1399. 1928 (Repr. ed. 3:979. 1957); Jonker *l.c.* 115; Rao & Verma *l.c.* 142; Balakrishnan *l.c.* 462. Fig. 2

Stem 10.0-70.0 cm high, simple. Rosulate-leaves  $2.0-12.0 \times 0.5-1.5$  cm, linear or lanceolate, acuminate to acute. Cauline leaves  $2.0-7.0 \times 0.5-0.6$  cm. Bracts  $4.0-10.0$  mm long, lanceolate, acute. Flowers  $10.0-15.0$  mm long, crowded, sessile or sub-sessile, blue or purple, with yellow tipped greenish lobes, oblong or elliptic in outline. Outer perianth-lobes c. 2.0 mm, triangular, erect, acute; margin thick, fleshy, double. Inner-lobes c. 1.5 mm long, linear-lanceolate, obtuse, thick. Connective with two distinct acute crests at apex; spur obtuse, hanging at base. Ovary c. 10 mm long, ellipsoid to obovoid; style thick-filiform; stigmas 3, funnel-shaped. Capsule obovoid, truncate, dehiscing irregularly with transverse clefts.

*Type* : Ceylon (Sri Lanka), *Hermann* s.n. (BM!, G-DEL, L).



*Fls. & Frts.* : June-Sept.

*Distrib.* : INDIA : Karnataka, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal; NEPAL, SRI LANKA, CHINA, BURMA, MALAYAN PENINSULA, PHILLIPPINE ISLANDS, INDO-CHINA, CELEBES, NEW GUINEA, AUSTRALIA, HONGKONG, SUMATRA, BORNEO.

*Ecol.* Open places, in grass lands, marshes and paddy fields; 1000-1500m.

*Exsicc.* : Karnataka : Chikmagalur district, 5.9.1980, *Saldanha* KPF 12171 (CAL). Manipur : Manipur, *S. K. Mukerjee* s.n. (CAL). Meghalaya : Khasia, *Griffith* s.n. (BM); Khasia, 3-4,000 ft, *J.D.H. & T.T.* s.n. (BM); Khasia, Nungklao, 4,500 ft, 25.8.1885, *C. B. Clarke* 40110 D(BM); Khasia, Surareem, 5,000 ft, 6.10.1886, *C. B. Clarke* 45176 (BM); Khasi Hills, Umdong valley, 5,500 ft, 9.10.1914, *U. Kanjilal* 4579(DD); Barapani, Khasi Hills, 3,000 ft, 23.5.1949, *Walter N. Koelz* 22777 (MICH); Mawphlang, 6,000 ft, 10.8.1949, *Kingdon-ward* 18748 (BM); Cherrapunjee, 4,000 ft, 20.5.1952, *Thakur Rup Chand* 5781 (MICH); Nongstoin area, 17.6.1958, *G. Panigrahi* 16371 (CAL). Nagaland : Nagaland, Aug. 1886, *D. Prain* s.n. CNH Acc. No. 448921 (CAL). W. Bengal : Jalpaiguri, Oct. 1873, *J. S. Gamble* 1306A(K).

5. *Burmannia indica* Jonker in Meded. Bot. Mus. Utrecht 51:161. 1938.

Stem 10.0-23.0 cm high, filiform, simple. Scales 1-4 mm long, linear-lanceolate, acuminate. Bracts 1.0-2.5 mm long, lanceolate, acute. Inflorescence 1-flowered or 3-5-flowered, bifid-cincinnus. Flowers 8.0-9.0 mm long, subsessile, purplish, prominently 3-winged. Outer perianth-lobes 1-2 mm long, erect, triangular, acute, with thick swollen margin. Inner lobes 0.5-1.0 mm long, linear, acute, thick, swollen. Connective trapeziform with two divergent, obtuse, curved, apical crests and a basal obtuse spur. Ovary c. 7 mm long, obovoid or obconical; style 5-10 mm long; stigmas 3, sessile, curved, funnel-shaped, sub-bilabiate. Capsule obovoid or orbicular, dehiscing with transverse slits.

*Type* : India, Travancore, *Meebold* 12915 (B).

*Fls. & Frts.* : Dec.

*Distrib.* : INDIA : Kerala; endemic. So far recorded only from the type locality.

6. *Burmannia nepalensis* (Miers) Hook. f., Fl. Brit. India 5:666.1888; Jonker *l.c.* 155; Hara, Fl. E. Himal. 424. f. 27. 1966; Hara *et al.*, Enum. Fl. Pl. Nepal 1:30. 1978; Rao & Verma *l.c.* 142. *Gonyanthes nepalensis* Miers in Trans. Linn. Soc. London 18:537. t. 38. f. 1. 1841. *Cyanotis nepalensis* Miers ex Wall. Cat. n. 9006. 1849, *nom. nud.*

Stem 5.0-15.0 cm high, erect, slender, simple. Scales 2.0-3.0 mm long, appressed, elliptic, obtuse or acute. Inflorescence usually 1-4-flowered, sometimes a double cincinnus upto 5-flowered. Flowers 3.0-6.5 mm long, shortly pedicellate,

prominently 3-winged, white or often tinged with yellow. Outer perianth-lobes 0.5-1.5 mm long, triangular. Inner perianth-lobes c. 1.0 mm long, obovate, rhomboid. Perianth tube c. 2.0 mm long. Connective with two divergent crests at apex; spur subacute, hanging. Ovary sub globose; style filiform; stigmas sub-sessile, funnel-shaped. Capsule sub-globose dehiscent with horizontal slits.

*Type* : Nepal, Wallich 9006 (BM!, CAL).

*Fls. & Frts.* : Aug.-Oct.

*Distrib.* : INDIA : Meghalaya; NEPAL, S. CHINA, PHILLIPPINES, INDO-CHINA.

*Ecol.* : On humus-covered soil or rocks, among mosses, 1000-1500 m.

*Exsicc.* : Meghalaya : Khasia, 3,000 ft, J.D.H. & T.T. s.n. (BM, CAL).

7. *Burmannia pusilla* (Wall. ex Miers) Thw. Enum. Pl. Zeyl. 325. 1864 excl. var. B; Hook. f., Fl. Brit. India 5:665. 1888; Jonker *l.c.* 130; Rao & Verma *l.c.* 142. *B. coelestis* D. Don var. *pusilla* (Wall. ex Miers) Trim. Handb. Fl. Ceyl. 4:131. 1898; Cooke, Fl. Pres. Bomb. 2:672. 1907 (Repr. ed. 3:174. 1967). *B. coelestis* non D. Don (1825): Fischer in Gamble, Fl. Pres. Madr. 3(8):1999. 1928 p.p. (Repr. ed. 3:979. 1957 p.p.). *Tripteranthus pusilla* Wall. ex Miers in Trans. Linn. Soc. 18:537. 1841. *Cyananthus pusilla* Wall. ex. Miers in Wall. Cat. n. 9008. 1849.

Stem 5.0-20.0 cm high, slender, simple or branched, green. Rosulate-leaves 3.0-5.0 × 1.5 mm, often lacking. Scales 1.0-2.0 mm long, lanceolate or elliptic, acute-acuminate. Bracts 1.0-2.0 mm long, lanceolate or elliptic, acute. Flowers violet or bluish, solitary, prominently 3-winged. Outer perianth lobes c. 1.0 mm long, obtuse, with thick margin. Inner lobes c. 1.0 mm long, fleshy, linear-lanceolate. Connective with two apical crests; spur obtuse, hanging. Ovary c. 2.0 mm long, ellipsoid to obovoid; style filiform; stigmas 3, sessile. Capsule obovoid, indehiscent.

*Type* : India, Concan, Wallich 9008 (BM!, CAL, K, G-DEL).

*Fls. & Frts.* : Aug.-Sept.

*Distrib.* : INDIA : Kerala, Maharashtra, Meghalaya, Tamil Nadu; SRI LANKA, INDO-CHINA

*Ecol.* : In moist places or on water-dripping rocks.

*Exsicc.* : Kerala : Moolamatham, c. 100 km east of Ernakulam, 20.11.1970, C.D.K. Cook & B.J. Bull 233 (K). Maharashtra : Concan, Stocks & Law s.n. (K, BM); near Mahabaleshwar, 15.1.1973, C.C. Townsend 73/23(K); Lonavala on way to Ambavne, Poona district, 1.12.1963, Venkata Reddi 68357 (CAL). Meghalaya : Shillong, 5,500 ft, 24 Aug. 1886, C. B. Clarke 44653B(BM); Khasia & Jaintia hills, Jowai area, Sept., 1972, A. Tessiorandall 188(K); Khasya, 3-5000 ft, J.D.H. & T.T. s.n. C.N.H. Acc. No. 449031 (CAL); Maushmai forest, Shillong,

14.9.1976, *U. Chatterjee & N.C. Saha* 13589 (CAL). Tamil Nadu : Kanyakumari district, upper Kodayar, ca 1300 m, 7.8.1977, *A.N. Henry* 49650 (CAL); Madras, 4,000 ft, 23.12.1937, *Walter Koelz* 10746 (K).

8. *Burmannia stricta* Jonker in Meded. Bot. Mus. Utrecht 51:156. 1938.

Stem 5.0-13.5 cm high, unbranched. Leaves 0.5-1.5 mm long, scalelike, lanceolate, acuminate. Bracts ca 1.0 mm long, lanceolate, obtuse. Inflorescence 1-2-flowered. Flowers 6.0-12.0 mm long, sessile, prominently 3-winged. Outer perianth-lobes c. 1.0 mm long, triangular, acute, margin involute. Inner ones c. 0.5 mm long, linear, acute. Perianth-tube 3.0-4.0 mm long, cylindrical. Connective with two divergent, obtuse crests at apex and two short lateral arms, bearing thecae; spur tapering at base, hanging. Ovary c. 2.5-5.0 cm long, ellipsoid-obovoid; style thick-filiform; stigmas 3, cristate, funnel-shaped. Capsule ellipsoid to obovoid.

*Type* : India, Cochin, *Meebold* 12337 (BRSL, B, CAL).

*Fls. & Frts.* : Nov.

*Distrib.* : INDIA : Kerala (Cochin) so far known only from type locality.

9. *Burmannia wallichii* (Miers) Hook. f., Fl. Brit. India 5:666. 1888; Jonker *l.c.* 145. *Gonyanthes wallichii* Miers in Trans. Linn. Soc. 18:537. 1841.

Stem 8-15 cm high, slender, erect, white or purplish. Scales c. 2 mm long, lanceolate-elliptic, acute. Bracts c. 1.0 mm long, lanceolate, acute. Flowers 1-2, c. 6.0 mm long, pedicellate, narrowly 3-winged, white or purplish. Outer perianth-lobes c. 1.0 mm long, obtuse-triangular, erect. Inner perianth lobes minute, rounded at tip. Perianth tube c. 3.0 mm long. Connective oblong, without crest at apex; spur transparent, hanging. Ovary c. 2.0 mm long, obovoid; style thick-filiform; stigmas 3, bowl-shaped. Capsule obovoid.

*Type* : Burma, *Wallich* 399=2137 (BM!, G-DEL).

*Fls. & Frts.* : Nov.-Dec.

*Distrib.* : INDIA : Kerala, Tamil Nadu; BURMA, MALAYSIA, THAILAND, INDO-CHINA, HONGKONG, HAINAN, JAPAN.

*Ecol.* : In grassland; c. 1500 m.

*Exsicc.* : Tamil Nadu : Coimbatore, Atamalai, 4400 ft, 13.12.1909, *C.E.C. Fischer* 1460 (DD).

## 2. HAPLOTHISMIA

Airy Shaw in Kew Bull. 1952:277. 1952.

Saprophytic herbs. Roots clustered, fleshy, dark-brown. Inflorescence few-flowered, pseudo-racemose; pedicel elongated. Flowers hermaphrodite actinomorphic, 3-merous, slightly drooping. Perianth infundibular-campanulate, adnate to ovary; segments 6, equal, free at apex, subulate, persistent. Stamens 6; filaments inserted on perianth-tube and recurved towards base of flower; anthers pendulous, obovate, basifixed. Ovary inferior, obovate to obconical, unilocular; style very short; stigma 3-lobed; ovules many, anatropous. Fruits capsule, loculicidal, many-seeded. Seeds dark-brown; testa prominent, reticulate.

*Type* : *Haplothismia exannulata* Airy Shaw

*Distrib.* : 1 species in India.

***Haplothismia exannulata*** Airy Shaw in Kew Bull. 1952. 277. 1952.

Stem 10.0-25.0 cm high, slender, simple or 5-branched, pale-cream-coloured. Scales many, spathe like, ovate-lanceolate; lower 3.0-4.0 mm; upper 8.0-9.0 mm long, acute, membranaceous. Inflorescence 3-6-flowered, minutely crisped-puberulous. Pedicels 3.5-5.5 cm long, erect or spreading. Flowers creamy outside; tube pale-brown within. Perianth with hypanthium 10.0-20.0 mm long; tube c. 8.0 mm across at mouth, at base 10-nerved, above 15-nerved, segments 5-8 mm long, 1-nerved. Filaments pale-violet. Ovary 3-4 mm long.

*Type* : India, Travancore-Cochin, 25.10.1951, A. Abraham & K.C. Jacob (Herb. Univer. Trivandrum, K!).

*Fls. & Frts.* : Oct.

*Distrib.* : INDIA : Kerala; not known after the type collection.

*Ecol.* : In shady places, on dark humus soil, 450-600 m.

## COCHLOSPERMACEAE

Planch. in Hook. Lond. Journ. Bot. 6:305 (1847) (Cochlospermeae)

T.K. Paul\* and M.P. Nayar\*

Shrubs, rhizomatous subshrubs or trees. Leaves alternate, palmately lobed, stipulate. Inflorescence racemose or paniculate, flowers bisexual. Sepals 5, imbricate, deciduous. Petals 5, free, imbricate or subcontorted. Stamens numerous, filaments free, anthers bilocular, linear, pollen releases through a terminal pore like slits. Ovary 1-locular with parietal placentation, style simple with minutely denticulate stigma. Fruit a 3-5-valved capsule. Seeds straight or cochleate-reniform, glabrous or covered with woolly hairs. Endosperm copious, cotyledons broad.

*Distrib* : 2 genera (*Cochlospermum*, *Amoreuxia*) and c. 25 species, distributed in the tropical regions of the World.

Cochlospermaceae is allied to Bixaceae but differs in having palmately lobed leaves, 3 to 5-valved capsules and seeds with oily endosperm, but in Bixaceae the leaves are unlobed, capsules 2-valved and seeds with granular or starchy endosperm.

This family is represented in India by only one genus *Cochlospermum* Kunth.

### COCHLOSPERMUM

Kunth, Malv. 6. 1822 (Conserved name); Benth. & Hook. f., Gen. Pl. 1:124. 1862; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:189. 1874; Poppendick, Bot. Jahrb. 101(2):215. 1980.

*Type* : *Cochlospermum religiosum* (Linn.) Alston (= *C. gossypium* DC.)

Trees or shrubs with woody subterranean root stock. Leaves palmately or digitately compound with 5-9 lobes; stipules subulate. Sepals 5, dimorphic, deciduous. Petals 5, obovate, cuneate at base, more or less deeply emarginate at apex. Stamens numerous, free or slightly connate at base. Seeds cochleate-reniform, hairy.

*Distrib* : A genus comprising of c. 11 species. *Cochlospermum religiosum* (Linn.) Alston is the only species in India, commonly known as "white silk cotton tree."

*Cochlospermum religiosum* (Linn.) Alston Handb. Fl. Ceyl. 6:14. 1931; Corner, Wayside trees 174. 1940; Van Steenis. Fl. Males. 1, 4:62. 1949; Poppendick, Bot. Jahrb. 101(2):233. 1980. *Bombax religiosum* Linn. Sp. Pl. 512. 1753 ('religiosa'). *Bombax gossypium* (non. Linn.) Cav. Diss. Bot. 5: 297, t. 156.

\*Botanical Survey of India, Calcutta.



*Cochlospermum religiosum* (Linn.) Alston

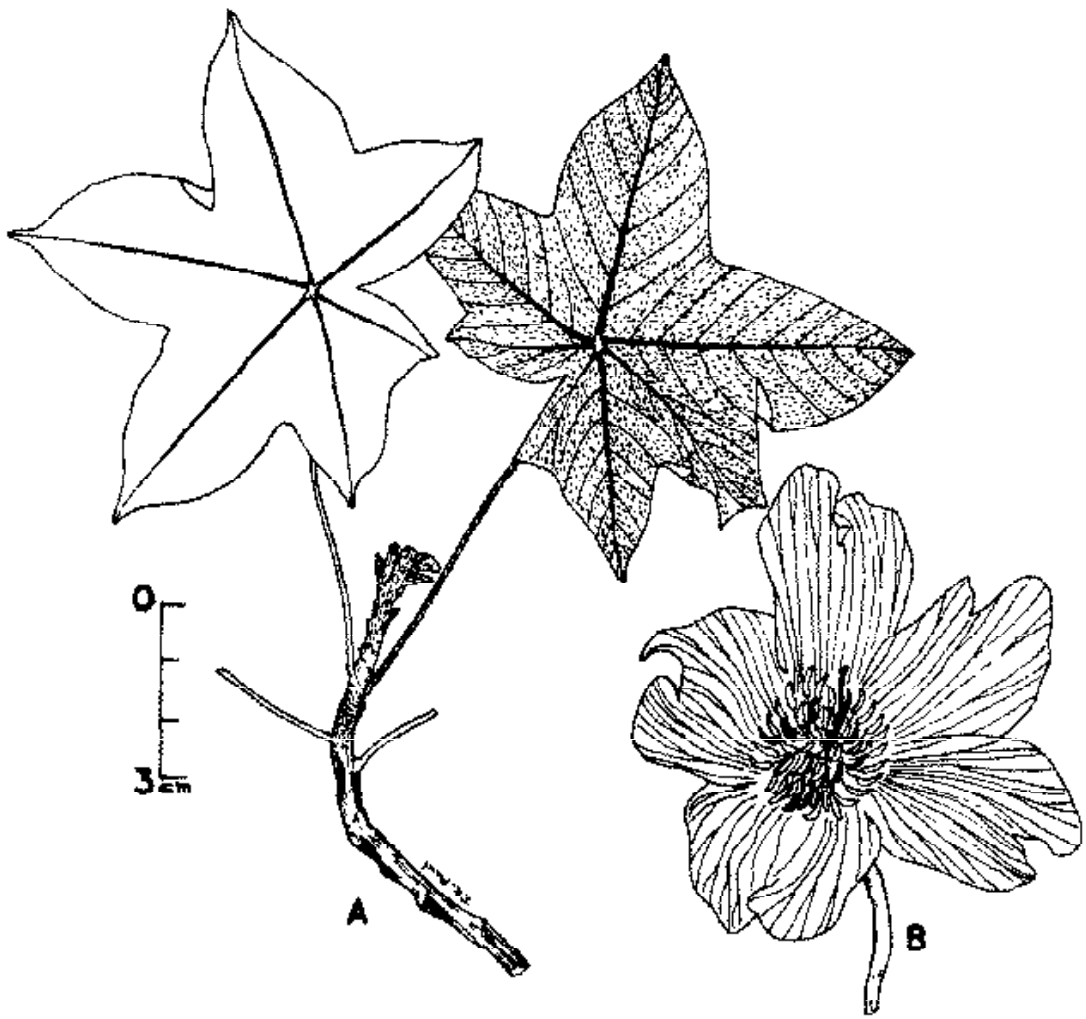


Fig. 3 *Cochlospermum religiosum* (Linn.) Alston A. Habit B. Flower

*Cochlospermum gossypium* DC. Prod. 1:527. 1824; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:190. 1874; Cooke. Fl. Pres. Bomb. 1:53. 1901 (Repr. ed. 1:56. 1958); Duthie, Fl. Upper Gang. Pl. 1:58. 1903 (Repr. ed. 1:56. 1960); Brandis, Indian Trees 38. 1906; Gamble, Fl. Pres. Madr. 1:50. 1915 (Repr. ed. 1:36. 1957); Haines, Bot. Bih. & Or. 1:34. 1921 (Repr. ed. 1:35. 1961). **Fig. 3**

*Local Names* : Kumbi, Galgal (H.); Arasinaburaga (Kan.); Apparutakka (Mal.); Ganeri (Mar.); Kondagogu (Tel.)

Trees upto c. 10 m high with crooked branches. Leaves 6-25 × 7-20 cm, palmately lobed, base cordate, apex of the lobes acute to acuminate, margin undulate, both surfaces densely tomentose when young, upper surface glabrous when mature; petioles 5-20 mm long, tomentose ultimately glabrous; stipules 5-10 mm long, linear-subulate, hairy, caducous. Flowers in simple raceme or in loosely branched, terminal, panicles; pedicels 2-3 cm long, tomentose. Calyx 2-3 cm across; sepals 2.0-2.5 × 1-2 cm, deltoid-ovate; acute, hairy, caducous. Corolla 5-10 cm across; petals 3-6 × 2-3 cm, obovate, notched at the apex, glabrous, golden yellow. Stamens numerous on an eglandular disk, filaments c. 1 cm long, unequal, anthers 5, curved, c. 5 × 1 mm, falcate, orange coloured. Ovary globular; style 1.5-2.0 cm, glabrous. Capsules obovate, 5-10 cm long, dehisce longitudinally into 5 valves. Seeds 6-8 × 3-4 mm, reniform to cochleate, brownish woolly, hairy.

*Type* : "Althaea arbor.....religiosa", Hermann's Ceylon herbarium no. 32 (BM, Lectotype).

*Fls.* : Jan.-March; *Frts* : March-June.

*Distrib* : INDIA : Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, Maharashtra and throughout South India; SRI LANKA, MALESIA.

*Ecol* : Grows mostly in dry gravelly soil.

*Notes* : This tree is ornamental with handsome yellow flowers when it is devoid of leaves during January to March and the pear-shaped fruits ripen before the new leaves appear. It is the source of 'Kutara gum' and is often planted in the temple gardens in India.

*Exsicc.* : Uttar Pradesh : Dehra Doon, 1869, *King s.n.* (CAL). Bihar : Hazaribagh, 9th April 1884, *Clarke 34626* (CAL). Andhra Pradesh : Way to Thirumalai, Chittoor dist., 280 m, 2.3. 1959, *Subramanyam 7829* (CAL). Tamil Nadu : Madras, *Wight s.n.* (CAL). Kerala : Attapadi valley, 2200 ft, 22.1.1911, *Fischer 2469* (CAL).



## CORNACEAE nom. cons.

Dumortier, Anal. Fam. Pl. 33, 34. 1829 (Corneae)

K.M. Matthew (assisted by S. Alamelu)

Deciduous or evergreen unarmed trees or shrubs. Leaves opposite or alternate, simple, exstipulate. Inflorescence terminal, of cymose panicles or heads. Flowers bisexual or unisexual, actinomorphic. Calyx 4 or 5-lobed or subtruncate. Petals 4 or 5, free. Stamens as many as petals. Receptacle urceolate, campanulate, hemispherical or ovoid. Ovary inferior, 1 or 2 (3 or 4) - locular; ovule solitary, pendulous; style simple; stigma capitate or 2 - 4-fid; ovule solitary, pendulous. Disc cushion-shaped. Fruit a drupe or a berry.

*Distrib.* : 10 genera and 90 species in the tropical and temperate regions; 4 genera and 10 species in India.

### KEY TO THE GENERA

- 1a. Flowers bisexual. Leaves entire :
- 2a. Leaves alternate or decussate. Petals apically inflexed;  
Ovary 1-locular . . . . . *Mastixia* 3
- 2b. Leaves opposite. Petals not apically inflexed;  
Ovary 2-locular . . . . . *Cornus* 2
- 1b. Flowers unisexual. Leaves serrate or dentate :
- 3a. Trees. Leaves alternate, base sheathing, nerves palmate;  
Flowers white. Ovary 2-locular. Fruit a drupe. . . . . *Toricellia* 4
- 3b. Shrubs. Leaves opposite, without sheathing base, nerves  
pinnate. Flowers dull purple. Ovary 1-locular;  
Fruit a berry . . . . . : *Aucuba* 1

### 1. AUCUBA

Thunb. Diss. Nov. Gen. 3:61. 1783 & Fl. Jap. 4, tt. 12 & 13. 1784; Benth. & Hook. f., Gen. Pl. 1:950. 1867; Engl. & Prantl, Nat. Pflanzenfam. III, 8:268. 1898; Wangerin in Engl. Pflanzenr. IV, 229, Heft 41:38, figs. 9-10. 1910; Hutch. Gen. Fl. Pl. 2:46. 1967.

Dioecious shrubs; branchlets terete. Leaves opposite, simple, petiolate, margin serrate. Flowers in pseudo-axillary or terminal panicles; pedicels jointed; bracteoles 2. Staminate flowers : Calyx 4-toothed. Petals 4. Stamens 4. Disc 4-angular. Pistillate flowers : Calyx-tube urceolate, limb 4-toothed. Petals 4. Ovary 1-locular, ovule 1, pendulous; style simple; stigma capitate. Disc entire, fleshy. Berry ellipsoid, crowned by calyx-teeth and style.

*Distrib.* : A genus with 3 species in the world; 1 in India.

*Aucuba himalaica* Hook. f. & Thom. ex Hook. f. Ill. Himal. Pl. t. 12. 1855; Clarke in Hook. f. Fl. Brit. India 2:747. 1879; Wangerin in Engl. Pflanzenr. IV, Heft 41:41. 1910. H. Hara, Fl. East. Himal. 1:232 & 644. 1966, 2:92. 1971.

Shrubs 4(5) m; branchlets dichotomous, spreading or scandent. Blade lanceolate, 13-18 × 4-5 cm, glabrous above, base obtuse, margin denticulate, apex acuminate; petioles 2.8 cm. Panicles terminal on short lateral branches, densely pilose. Flowers dull purple. Staminate flowers : Petals 4, ovate, 3 × 1.5 mm. Stamens 4. Pistillate flowers : Calyx-tube hirsute. Petals 4, coriaceous. Berries elliptic, 12 × 6 mm, crowned by calyx and disc, red when ripe.

*Fls.* : June.

*Distrib.* : INDIA : E. Himalaya, Sikkim to N. Assam, Manipur; NEPAL, N. BURMA.

## 2. CORNUS

Linn. Sp. Pl. 117. 1753 & Gen. Pl. ed. 5, 14. 1754; Benth. & Hook. f. Gen. Pl. 1:950. 1867; Hutch. Gen. Fl. Pl. 2:47. 1967; Ghazanfar, in Fl. W. Pak. 88:1. 1975.

Trees and shrubs. Leaves opposite, simple, entire, broadly ovate to elliptic-lanceolate, petiolate, exstipulate. Inflorescence cymose, of panicles or heads; involucre bract, when present, petaloid. Flowers bisexual, 4-merous. Calyx adnate to the ovary for three-fourth of the length. Petals 4, with midrib prominent. Stamens 4. Ovary 2-celled; ovule 1 in each cell, pendulous; style simple, stigma capitate. Disc prominent. Drupes globose to elliptic, crowned with calyx lobes and disc, smooth or reticulate, free or united into a syncarp.

*Distrib.* : Chiefly asiatic and american, also in Europe, Burma and Hongkong. 5 species in the world and 3 in India.

### KEY TO THE SPECIES

- |     |  |     |                          |
|-----|--|-----|--------------------------|
| 1a. | Flowers sessile, aggregated into heads; involucre bracts petaloid. Fruits aggregated                     | ..  | <i>C. capitata</i> 1     |
| 1b. | Flowers pedicellate, in branched lax cymes; involucre bracts inconspicuous or 0. Fruits not aggregated : |     |                          |
| 2a. | Leaves ovate to broadly ovate. Involucre bracts 0. Style apically swollen. Fruits pubescent              | ..  | <i>C. macrophylla</i> 2  |
| 2b. | Leaves elliptic-lanceolate. Involucre bracts present; Style linear. Fruits glabrous                      | ... | .... <i>C. oblonga</i> 3 |

1. *Cornus capitata* Wall. ex Roxb. Fl. Ind. 1:434. 1820; Clarke in Hook. f. Fl. Brit. India 2:745. 1879; Collett, Fl. Siml. 220. 1902; Brandis, Indian Trees 356. 1906; Wangerin in Engl. Pflanzenr. IV, 229, Heft 41:89. 1910. Ghazanfar in Fl. W. Pak. 88:3. 1975. *Cynoxylon capitata* (Wall.) Nakai in Cat. Sem. & Spor. Hort. Bot. Univ. Tokyo 23. 1924. *Dendrobenthamia capitata* (Wall) Hutch. in Ann. Bot., n.s., 6:93. 1942. *Benthamidia capitata* (Wall) H. Hara in Journ. Arnold Arb. 29:115. t. 4 a, 1948. Fl. East. Himal. 2:92. 1971.

Trees upto 10 m tall. Leaves apically crowded on the branchlets; leaf scars prominent. Blade elliptic, 7-10 × 2.5-4 cm, chartaceous to thin-coriaceous, acute at base and apex, entire, with appressed hairs above, glabrous below; petioles 1 cm. Inflorescence a terminal hemispherical head, 1.2-0.8 cm; peduncle 6 cm; bracts 4, broadly obovate, apically mucronate, 2.5-3 × 2-2.5 cm, petaloid, yellowish-white. Flowers sessile, 1.3 × 2 mm. Calyx lobes 4, rounded. Petals 4, oblong, inflexed, canescent outside. Stamens 4; anthers oblong. Drupes coalescing into a depressed-globose head, 2-3 cm across, yellowish when young, reddish when ripe.

*Fls.* : April-Oct. *Frts.* : Nov.-Jan.

*Distrib.* : INDIA : Himalaya, Punjab to Sikkim, Khasia & Naga hills; BHUTAN, N. BURMA, N. VIETNAM, W. & C. CHINA.

*Uses* : Wood used for fuel. Fruits edible and preserved.

*Chr. No.* : 2n = 22 (Federov, Chr. No. Fl. PL. 236. 1974 & Goldblatt in Ann. Missouri Bot. Gard. 65 : 652. 1978).

2. *Cornus macrophylla* Wall in Roxb. Fl. Ind. 1:433. 1820; DC. Prodr. 4:272. 1830; Clarke in Hook. f., Fl. Brit. India 2:744. 1879; Collett, Fl. Siml. 219. 1902. Brandis, Indian Trees 355, 1907; Ghazanfar in Fl. W. Pak. 88:3. 1975. *C. controversa* Hemsley ex Prain in Bot. Mag. t. 8261 in textu (Jun. 1909); Hemsley in Bull. Misc. Inform. 1909:331 (Oct. 1909); Wangerin in Engl. Pflanzenr. IV, 229, Heft 41:49. 1910; Stapf in Bot. Mag. t. 8464. 1912; H. Hara, Fl. East. Himl. 2:92. 1971.

Trees upto 14 m tall. Leaf scars cushion-shaped. Blade broadly ovate, 10-14 × 4-8 cm, glabrous above, glaucous below with minute appressed hairs, base often oblique, margin entire, apex long acuminate; petioles 2-2.5 cm. Panicles terminal, decussate, terminating in cymes, minutely hairy. Calyx urceolate, white hairy, 4-toothed. Petals 4, oblong, 6 mm, pubescent outside. Stamens 4. Styles 4-5 mm, apically swollen. Ovary 2-locular, with 1 ovule each. Drupes 2-seeded, globose, 5 × 4 mm, crowned with calyx lobes and disc.

*Fls.* : April-May; *Frts.* : June-July.

*Distrib.* : INDIA : E. Himalaya, Sikkim, Manipur, BHUTAN, VIETNAM, CHINA, FORMOSA, KOREA, JAPAN.

*Uses* : Fruits edible; leaves as fodder; wood yields excellent charcoal for gun powder.

*Chr. No.* :  $2n = 20$  (Federov, Chr. No. Fl. Pl. 236. 1974).

3. *Cornus oblonga* Wall. in Roxb. Fl. Ind. 1:432. 1820; DC. Prodr. 2:272. 1830; Clarke in Hook. f., Fl. Brit. India 744. 1879; Collett, Fl. Siml. 220. 1902. Brandis, Indian Trees 355. 1907; Ghazanfar in Fl. W. Pak. 88:4. 1975.

Trees upto 10 m tall; branchlets with reniform leaf scars. Blade elliptic-lanceolate, 10-12 × 3-4 cm, sub-coriaceous, glabrous above, hirtellous below with prominent nerves; petioles 1-2 cm. Inflorescence of terminal branched cymes; peduncle 2-2.5 cm, striate; pedicels 3 mm; involucre bracts 2-3 mm, ovate-lanceolate. Calyx teeth 4, minute, persistent. Petals 4, each 4 mm. Stamens 4; filament subulate, 4 mm. Receptacle campanulate, hirtellous, 4 × 3 mm; style 3 mm. Drupes elliptic, 6 × 5 mm, glabrous.

*Fls.* : Sept.-Dec.; *Frts.* : Jan.-April.

*Distrib.* : INDIA : Himalaya, Kashmir to Sikkim, Khasia, Manipur, BHUTAN, BURMA, W. CHINA.

*Cornus officinalis* Siebold & Zucc. (Fl. Jap. 1:100, t. 50. 1839) occurs in cultivation. *Chr. No.* :  $2n = 18$  (Federov, Chr. No. Fl. Pl. 236. 1974).

### 3. MASTIXIA

Blume, Bijdr. 654. 1826; Benth. & Hook. f. Gen. Pl. 1:950. 1867; Harms in Engl. & Prantl, Nat. Pflanzenfam. III, 8:262. 1898; Wangerin in Engl. Pflanzenr. IV, 229, Heft 41:19. 1910; Hutch. Gen. Fl. Pl. 2:45. 1967; Matthew in Blumea 23:61. 1976. *Bursinopetalum* Wight, Icon. 3, 3:4. 1845.

Unarmed, resinous, evergreen trees upto 25 m. Leaves alternate or decussate, simple, apex acute to caudate, base truncate to attenuate, margin entire. Thyrses terminal, branched to 4 times with branchlets of the first order decussate (Oppositae) or spirally arranged (Alternae), terminating in cymes. Flowers bisexual, greenish or yellowish. Calyx 4- or 5-lobed. Petals 4 or 5, ovate to oblong-elliptic, apically inflexed, thick. Stamens 4 or 5, ovate to oblong-elliptic, apically inflexed, thick. Stamens 4 or 5, alternating with the petals; filaments subulate; anthers dorsifixed, connivent by margins in bud, abutting on, and alternating with, the disc lobes. Ovary inferior, 1-locular, surmounted by the fleshy disc. Ovule 1, pendulous laterally from the roof of the locule. Drupe ovoid, ellipsoid or oblong, surmounted by the calyx and disc.

*Distrib.* : 13 species in India, Sri Lanka, Bhutan, S. China, Burma, Thailand, Vietnam, Hainan, Malesia and Solomon Islands; 4 species (with 2 subspecies) in India.

*Chr. No.* : Consequent on the erection of the two series *Oppositae* and *Alternae* (Matthew in *Blumea* 23:58, 1976), an attempt was made to count the chromosomes from each. In one species each from the two series counted, differing chromosome numbers were obtained:  $2n=22$  in *Oppositae* and  $n=13$  in *Alternae* (refer Goldblatt in *Ann. Missouri Bot. Gard.* 650-655, 1978).

### KEY TO THE SPECIES

- 1a. Branchlets, leaves and inflorescence branches decussate;  
Nodes flattened. Fruits generally ovoid  
(Ser. *Oppositae*) . . . . . *M. trichotoma* var *maingayi* 4
- 1b. Branchlets, leaves and inflorescence branches  
scattered ('alternate'). Nodes terete. Fruits generally  
ellipsoid or oblong (Ser. *Alternae*) :
- 2a. Flowers basically 4-merous . . . . . *M. tetrandra* var *tetrandra* 3
- 2b. Flowers basically 5-merous :
- 3a. Fruits ovoid to oblong, upto  
1-(1.5) cm across . . . . . *M. pentandra* var *chinensis* 2
- 3b. Fruits subglobose to ellipsoid, over 2 cm across . . . . . *M. arborea* 1

1. *Mastixia arborea* (Wight) Beddome, *Fl. Sylv.* 216, t. 1872; Clarke in Hook. f., *Fl. Brit. India* 2:745. 1879, p.p. Trimen, *Handb. Fl. Ceyl.* 2:287. 1894; Harms in *Engl. & Prantl, Nat. Pflanzfam.* III, 8:262, fig. 81. 1898; Gamble, *Man. Ind. Timb.* 391. 1902; Bourdillon, *For. Trees Travancore* 208. 1908; Rama Rao, *Fl. Pl. Travancore* 200. 1914; Chowd. & Ghosh in *Indian For. Rec.* 4:14, t. 4. 1946; Gamble, *Fl. Pres. Madr.* 1:405. 1957 (Repr. ed.); Matthew in *Blumea* 23:87. 1976. *Bursinopetalum arboreum* Wight, *Icon.* 3; 3. t. 956. 1845; Dalzell & Gibson, *Bombay Fl.* 28. 1861; Drury, *Handb. Ind. Fl.* 1:124. 1864. *Mastixia pentandra* auct. non Blume : Clarke in Hook. f., *Fl. Brit. India* 2:746. 1879; Gamble, *Man. Ind. Timb.* 391. 1902; Cooke, *Fl. Pres. Bombay* 1:576. 1903; Bourdillon, *For. Trees Travancore* 208. 1908; Wangerin in *Engl. Pflanzenr.* IV. 229, Heft 41:26. 1910, p.p.; Talbot, *For. Fl. Bombay & Sind* 2:80. 1911; Rama Rao, *Fl. Pl. Travancore* 200. 1914. Gamble, *Fl. Pres. Madr.* 1:405. 1957 (Repr. ed.).

Trees upto 21 m tall; branchlets stout, scattered, subglabrous to villous. Leaves scattered; blade obovate, elliptic to elliptic-lanceolate, 4-20 × 2-10 cm, coriaceous; subglabrous, base cuneate to attenuate, apex acute to caudate; nerves 3-9 pairs; petioles stout, 1.5-3 cm. Thyrses upto 10 cm, stout, appressed-hairy to ferruginous velvety when young, sparsely so later, branched to 4 times; receptacle subglabrous to appressed hairy. Sepals 5, broader than long and valvate or as long as broad and imbricate, puberulous to appressed-hairy outside. Petals 5, thin to thick, appressed hairy to glabrous outside. Stamens 5. Fruits subglobose or ellipsoid, 1.8-3.8 × 2 cm.

## KEY TO THE SUBSPECIES

- 1a. Length of sepals not exceeding half their width. Basal bracts generally under 5 mm. Leaves 4-12 × 2-5 cm; Inflorescence subglabrous to rusty tomentose when young . . . . . *ssp. arborea*
- 1b. Length of sepals equal to their width. Basal bracts above 10 mm. Leaves 10-20 × 5-10 cm. Inflorescence densely ferruginous-velvety when young . . . . . *ssp. meiziana*

The two subspecies, at first sight so different, are clearly altitudinal replacements — the former occurring on the hills at 1000-1800 m, the latter occurring at the foothills generally under 300 m. Other distinguishing characters are that in *ssp. arborea* the leaves are smaller and dry black, inflorescence is puberulous and the bracts are triangular while in *ssp. meiziana* the leaves are larger and dry brown, the inflorescence is velutinous and the bracts foliaceous.

*ssp. arborea*

*Local Names* : Gulle (Kan.); Mattippal (Tam.) :

Branchlets subglabrous. Blade obovate to elliptic, 4-12 × 2-5 cm, coriaceous; nerves 4-6 pairs. Inflorescence upto 6 cm, rusty-tomentose when young, subglabrous later; lower bracts lanceolate, upto 5 mm, thick, subglabrous; flower buds under 5 mm across. Sepals broader than long, valvate. Petals appressed-hairy to subglabrous outside, rather thick.

*Type* : Sispara, Neilgherries, *Wight s.n.* (K; Kew. neg. 9917).

*Fls.* : March-May; *Frts.* : May onwards.

*Distrib.* : Western Ghats of the Indian Peninsula, 1000-1800 m.

*Ecol.* : In Moist evergreen forests. At Agumbe in Shimoga dist. (Karnataka), trees were found locally abundant in association with *Pandanus* sp., *Elaeocarpus* sp. and *Calophyllum* sp. but not widely distributed. The percentage of seed germination is high, though seeds are viable only for a few weeks at most as is the rule generally with evergreen species. Saplings stand transplantation well. Cut stumps do not coppice. Among 25 old seeds (under Matthew 14471) collected from the ground, more than half had the endocarp gnawed open by some rodent.

*Uses* : Of late, trees over girth 1.8 m are being felled for plywood industry; a tree yields about 2 cubic metres of timber. The Indian Plywood Research Institute, Bangalore, has recommended it for plywood manufacture with reservation. The wood may be used only for the core, not for the face veneers. Logs should be peeled within a week of felling and the sheets need a special adhesive. Owing to these limitations, the wood is not the first choice in plywood industry.

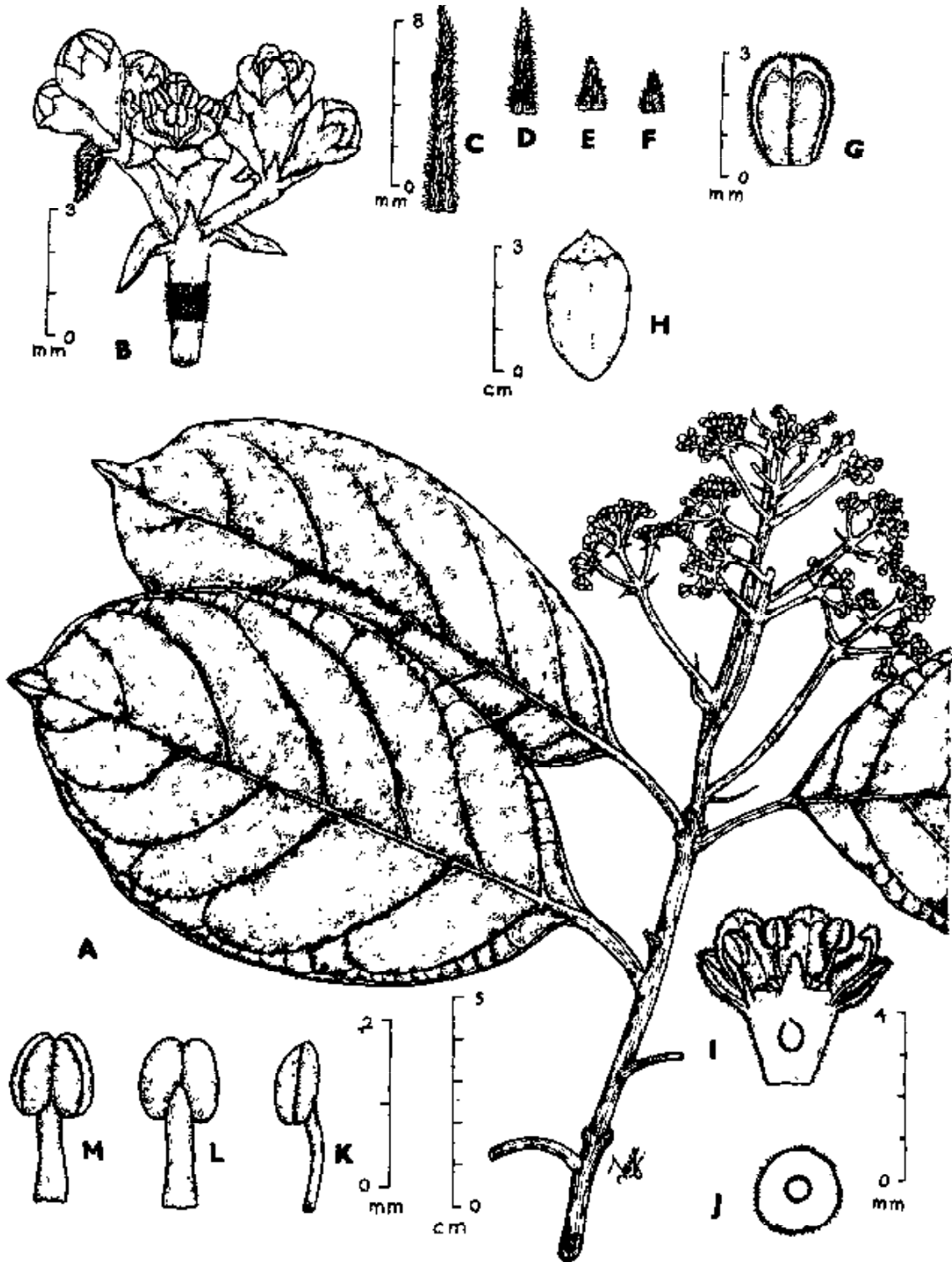


Fig. 4 *Mastixia arborea* (Wt.) Bedd. ssp. *meziana* (Wang.) Matthew

A. A branch with flowers. B. Branched inflorescence. C-F. Bracts and bracteoles. G. Petal. H. Fruit. I. L.S. of flower. J. T.S. of ovary. K-M. Stamens in different views.

ssp. *meziana* (Wangerin) Matthew in *Blumea* 23:89. 1976. *M. meziana* Wangerin in *Fedde Rep.* 4:336. 1907.

Branchlets densely ferruginous-villous when young, subglabrous later. Blade elliptic to oblong-elliptic, 10-20 × 5-10 cm, chartaceous to coriaceous; nerves 5-6 pairs. Inflorescence 10 cm, densely ferruginous-velvety when young, sparsely so later; lower bracts foliaceous, rather thin, 15 mm, villous; flower bud 5 mm across. Sepals as long as broad, imbricate. Petals appressed-hairy outside, rather thin. Fig. 4

*Type* : Concan, *Stocks, Law s.n.* (B. Iso GH, K, W).

*Fls.* : March-May; *Frts.* : May onwards.

*Distrib.* : Foothills of the Western Ghats of the Indian peninsula; in evergreen forests, upto 300 (900) m.

2. *Mastixia pentandra* Blume, *Bijdr.* 654. 1826 ssp. *chinensis* (Merr.) Matthew in *Blumea* 23:83. 1977. *M. chinensis* Merr. in *Sunyatsenia* 3:256. 1937. *M. arborea* auct. non (Wight) Beddome : Clarke in *Hook. f., Fl. Brit. India* 2:745. 1879, p.p.; Kanjilal & Das, *Fl. Assam* 2:370. 1938; Hundley & Chit, *Trees & Shr. Burma*, ed. 3, 119. 1961.

*Local Names* : Belong jigri (Garo); Goch Dimoru (Asm.)

Trees upto 20 m tall; branchlets stout. Blade elliptic to elliptic-oblongate, 12-18 × 3-6 cm, nerves 5-6 pairs, base attenuate, apex acute to acuminate, petioles stout, 1.8-2.5 cm. Thyrses upto 8 cm, appressed-hairy; bracts under 3 mm. Sepals 5, broader than long. Petals 5, appressed-hairy outside. Stamens 5. Drupes ovoid to oblong, 2-2.5 × 1 cm.

*Type* : Yunnan, *Henry* 12414 (NY, holo; A, K, NY, iso).

*Fls.* : March-June; *Frts.* : August-May.

*Distrib.* : N.E. INDIA, BHUTAN, S. CHINA, VIETNAM, BURMA, THAILAND, MALAY PENINSULA.

3. *Mastixia tetrandra* (Thwaites) Clarke in *Hook. f., Fl. Brit. India* 2 : 745. 1879; Trimen, *Handb. Fl. Ceyl.* 2 : 287, t. 47. 1894; Danser in *Blumea* 1 : 56. 1934, p.p., var. *tetrandra* Matthew in *Blumea* 23 : 78. 1976. *Bursinopetalum tetrandrum* Wight ex Thwaites, *Enum. Pl. Zeyl.* 42. 1858. *Mastixia arborea* (Wight) Beddome in *Fl. sylv.* 216. 1872, p.p.

Trees upto 20 m tall; branchlets slender, scattered, puberulous. Leaves scattered; blade elliptic, 4-10 × 1-5 cm, chartaceous; nerves 4-6 pairs; petioles 1.5 cm. Thyrses upto 8 cm, branched twice. Sepals 4. Petals 4. Stamens 4. Drupe oblong, 1.5-2 × 1-1.2 cm.

*Type* : Ceylon, *Thwaites* CP 2441 (BM, Holo; BO, CAL, FI, G, GH, K, L, MH, MY, P, US, W, Iso).



*Fls.* : Jan.-May; *Frts.* : June-Oct.

*Distrib.* : INDIA (Andamans), SRI LANKA. The only Indian sheet seen is King's Coll. 210 from Port Blair (CAL).

4. *Mastixia trichotoma* Blume, Bijdr. 655. 1826 var. *maingayi* (Clarke) Danser in Blumea 1:63. 1934; Clarke in Hook. f., Fl. Brit. India 2:746. 1879. Matthew in Blumea 23:70. 1976 & Fl. Mal. I, 8(2):63. 1977.

Trees upto 17 m tall; branchlets yellowish, stout, woolly. Leaves decussate; blade elliptic, 12-15 × 4-7 cm, coriaceous, base truncate, apex acuminate; nerves 5-6 pairs; petioles 1.5-2 cm. Thyrses 12 cm, branched to 4 times, yellowish, velutinous; basal bracts spatulate, 2.2 cm. Sepals 4. Petals 4. Stamens 4. Disc orange yellow. Drupe ovoid, grey.

*Type* : Malacca, *Maingay* 2680 = Kew distr. 711 (K).

*Fls.* : July; *Frts.* : July.

*Distrib.* : *Balakrishnan, N.P.* 3934 from Great Nicobar is the only member of the series *Oppositae* known from India. As such, this material becomes the western most distribution within the *Oppositae*.

#### 4 TORICELLIA

DC. Prodr. 4:257. 1830; Benth. & Hook. f. Gen. Pl. 1:952. 1867; Engl. & Prantl, Nat. Pflanzenfam. III, 8:267. 1898; Wangerin in Engl. Pflanzenr. IV, 229, Heft 41:31, fig. 5. 1910; Hutch. Gen. Fl. Pl. 2:46. 1967 (*Toricellia*).

Dioecious, deciduous trees. Leaves simple, alternate; blade cordate, lobulate, palmately nerved, margin dentate, apex acute; petioles elongate, with sheathing base. Inflorescence a terminal, thyrsoid, pendulous panicle. Flowers minute. Staminate flowers : Calyx-lobes 5. Petals 5. Stamens 5. Disc flat. Pedicels not jointed. Pistillate flowers : Calyx-tube ovoid, minute 5-toothed. Petals 0. Stamens 0. Ovary 2-locular, ovule 1, pendulous in each locule. Style simple; stigmas 3-5, cylindrical. Drupes ovoid.

*Distrib.* : A genus and 3 species in the world; 1 species in India.

*Toricellia tiliifolia* DC. Prodr. 4 : 257. 1830; Clarke in Hook. f., Fl. Brit. India 2 : 748. 1879. Wangerin in Engl. Pflanzenr. IV, 229, Heft 41 : 31. 1910; H. Hara, Fl. East Himal. 1 : 232. 1966; 2 : 93. 1971. *Sambucus tiliifolia* Wall., Cat. 483. 1829.

Deciduous trees; branchlets terete. Blade cordate, lobulate, 20 × 19 cm, palmately 5-7-nerved, margin serrate; petioles 13 cm. Peduncles 12 cm. Pedicels 1 cm. Staminate flowers : Calyx teeth minute. Petals tomentose outside. Anthers oblong, basifixed. Disc flat. Pistillate flowers : Calyx-lobes 3-5, irregular. Disc inconspicuous. Drupes obliquely ovoid, crowned with stigmas, purple when ripe.

*Distrib.* : INDIA : Eastern Himalaya; CHINA.

## LARDIZABALACEAE

Decaisne in Arch. Mus. Hist. Nat. Paris 1:185 (1839) (Lardizabaleae)

M. P. Nayar\* and T. K. Paul\*

Shrubs, twining or rarely erect, monoecious or dioecious. Leaves alternate, compound, digitate or palmate, rarely pinnate, petiolate, petioles swollen at the base, exstipulate, simple hairy. Flowers in raceme, often axillary and fascicled, unisexual, actinomorphic, trimerous. Sepals 3 to 6 in one or two series, imbricate or the outer valvate, inner often petaloid. Petals 6, smaller than sepals, nectariform or absent. Stamens 6, filaments free or connate, anthers free, dehisce longitudinally with connectives often protruding; staminodes 6 or absent in female flowers. Carpels 3 or more in female flowers, superior, free, erect but soon divergent, 1-locular and generally many ovules in parietal placentation; stigma oblique, subsessile; pistillodes present or absent in male flowers. Fruit a fleshy follicle or berry, indehiscent or opening by dorsal suture at maturity. Seeds ovoid or subreniform with fleshy copious endosperm and small embryo.

*Distrib.* : 9 genera and 36 species distributed in E. Asia, Himalayas to China, Japan and S. America (Chile).

This family is included under the family Berberidaceae (Benth. & Hook. f., Gen. Pl. 1:40.1862; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:108.1872) from which it differs by its climbing habit, unisexual flowers, extrose anthers and gynoecea of 3 or more free carpels. It also differs from Menispermaceae in being primarily monoecious (rarely dioecious or bisexual), presence of more than one ovule in each carpel and absence of bony endocarp.

### KEY TO GENERA

- 1a. Erect shrubs. Leaves pinnate with several pairs of opposite leaflets *Decaisnea* 1
- 1b. Climbing shrubs. Leaves trifoliolate or digitately compound:
- 2a. Stamens free *Holboellia* 2
- 2b. Stamens united into a column ... *Parvatia* 3

### 1. DECAISNEA

Hook. f. & Thoms. in Proc. Linn. Soc. 2:350. 1854; Benth. & Hook. f., Gen. Pl. 1:42. 1862; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:107. 1872; Rehder, Man. Cult. Trees and Shrubs, ed. 2. 220. 1951; Willis, Dict. ed. 7:550. 1966; Grierson & Long, Fl. Bhutan 1(2):329. 1984.

Erect shrubs, stem with large scars of fallen leaves. Leaves pinnately compound. Inflorescence racemose. Flowers unisexual, pedicels slender. Sepals

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\*Botanical Survey of India, Calcutta-700 001.

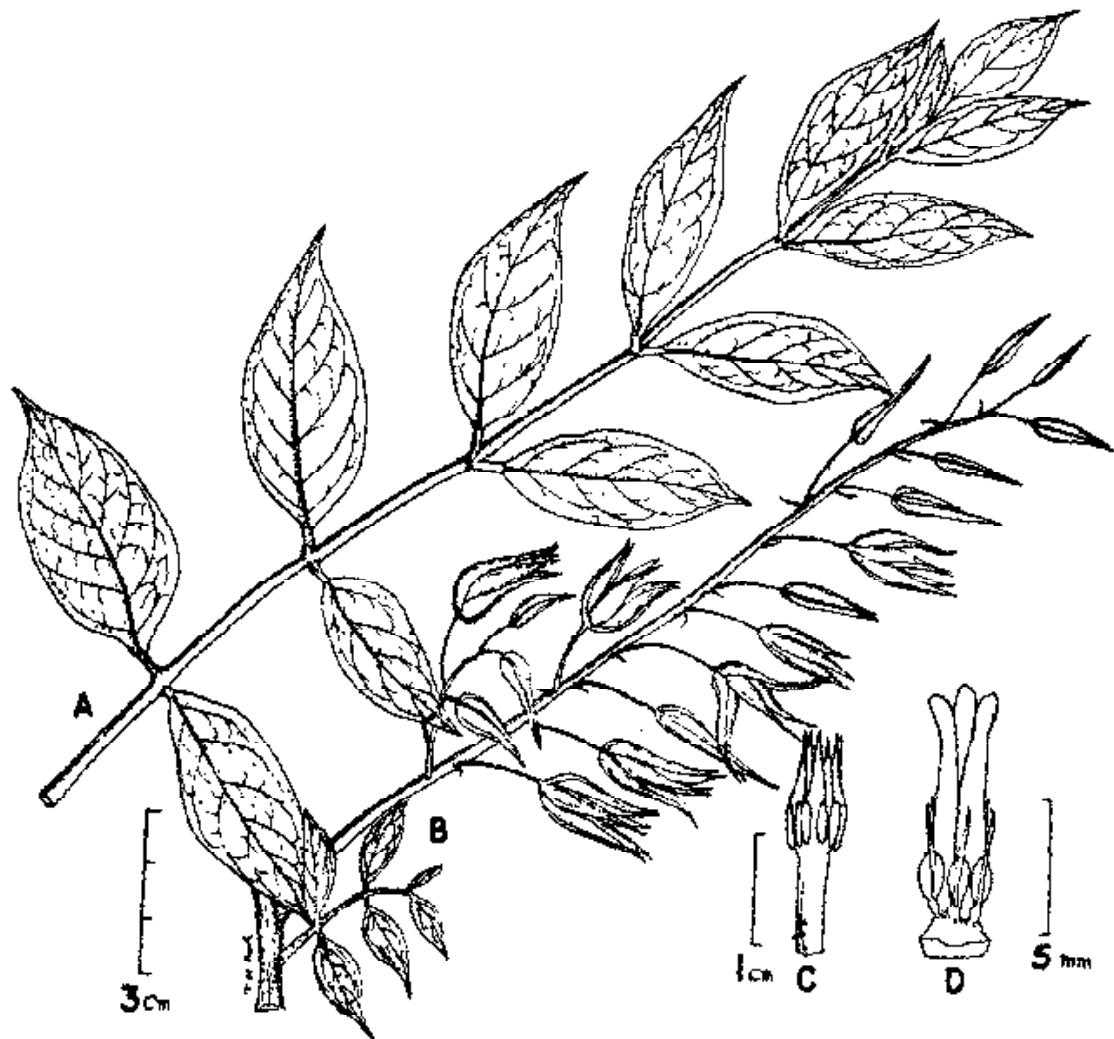


Fig. 5 *Decaisnea insignis* (Griff.) Hook. f. & Thoms. A. Leaf. B. Flowering twig. C. Stamens. D. Carpels with abortive stamens.

6, lanceolate, long acuminate, petaloid, petals absent. Male flowers with 6 stamens, stamens connate into a column, anthers oblong. Female flowers with 6 small, free staminodes and 3 oblong carpels, one or each maturing into fruit. Fruit a follicle, each with numerous seeds in 2 rows imbedded in fleshy pulp.

*Distrib.* : A small genus with 2 Asian species; only one species is recorded from India.

*Decaisnea insignis* (Griff.) Hook. f. & Thoms. in Proc. Linn. Soc. 2:350. 1854; Hook. f. & Thoms., Fl. Ind. 213. 1855; Hook. & Thoms. in Hook. f., Fl. Brit. India 1:107. 1872; Hara Fl. E.Himal. 34. 1971. *Slakia insignis* Griff., Itin. Notes 187. 1848. Fig. 5

Erect shrubs 3-5 m high. Leaves pinnately compound with 5-10 pairs of leaflets, petiolate; petioles 10-24 cm long; leaflets 5-10 × 2-4 cm, ovate-oblong, apex acuminate, base acute, margin entire, glaucous beneath, glabrous, petiolulate; petiolule 2-8 mm long, somewhat swollen at base. Inflorescence 10-25 cm long, in raceme. Flowers 10-20 mm across, pale green with slight purple tinge towards the apex. Sepals 10-20 × 2-4 mm, linear-lanceolate. Petals absent. Male flowers with 6 stamens, stamens connate basally into a column, c. 15-20 mm long, reduced to minute staminodes in female flowers, staminodes c. 3 mm long. In female flowers carpels 3, free, about half as long as the sepals, oblong, glabrous, stigma oblong, each carpel maturing into separate diverging fruit. Fruit 3-5 × 1.0-1.5 cm, oblong, base and apex somewhat rounded, fleshy, seeds numerous in 2 rows. Seeds c. 10 × 6 mm, ovate-rounded, glabrous, brownish black.

*Type* : Bhutan, Griffith 1838 (CAL)

*Fls.* : May-June; *Frts.* : July-August.

*Distrib.* : INDIA : Eastern Himalaya, BHUTAN, CHINA.

Fruits are edible and used by Iepchas of Sikkim.

*Exsicc.* : India : Arunachal Pradesh : Kalaktang to Morsing (Kameng F.D.). 18.5.1958, Panigrahi 15886 (CAL). Sikkim : Lachen, 8000', 7.7.1909, Smith & Cave 954 (CAL); Talung, 8000', 15.7.1906, Cave 92 (CAL).

## 2. HOLBOELLIA

Wall., Tent. Fl. Nep. 23. 1824; Benth. & Hook. f., Gen. Pl. 1:42. 1862; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:108. 1872; Rehder, Man. Cult. Trees and Shrubs. ed. 2:220. 1951; Willis, Dict. ed. 7:550. 1966; Jafri in Fl. W. Pak. 60:1. 1974; Grierson & Long, Fl. Bhutan 1(2):330. 1984.

Climbing and twining shrubs. Leaves compound, coriaceous. Inflorescence racemose in axillary fascicles; plant monoecious. Flowers unisexual, bracteate, fragrant. Sepals 6, biseriate. Petals 6, reduced, orbicular or nectariform. Male

flowers with 6-free stamens and with or without rudimentary pistillodes. Female flowers with 6 small staminodes and 3 carpels. Carpels 1-locular with numerous ovules in parietal placentation. Fruit a berry, glabrous. Seeds small, blackish, embedded in pulp.

*Distrib.* : A small genus with 6 species distributed in Eastern Asia; 2 species in India.

#### KEY TO THE SPECIES

- 1a. Leaves with acute or short acuminate apex, petioles 4-8 cm long. Racemes much shorter than petiole. Anthers with distinct filament *H. latifolia* 2
- 1b. Leaves with long acuminate apex becoming spinescent during maturity, petiole 1.5-4.0 cm long. Racemes much longer than petiole. Anthers sessile *H. khasiana* 1

1. *Holboellia khasiana* T. K. Paul *et* Nayar in Bull. Bot. Surv. India 27:105 1986. [Fig. 6]

Climbing shrubs, bark of the mature stem and branches striated, glabrous, apical portion of the stem often twining. Leaves alternate, digitately compound, 4-5 foliolate, coriaceous, petiolate; petioles 1.5-4.0 cm long; leaflets ovate-elliptic, 3.0-6.5 × 1-3 cm, apex long acuminate, becoming spinose in dried leaves, margin entire, slightly revolute, glabrous, petiolulate; petiolule 4-8 mm long. Inflorescence racemose in axillary fascicles, racemes longer than petiole; plants monoecious. Flowers unisexual, actinomorphic, bracteate; pedicels 3-5 mm long. Sepals 6, biseriata, 5-8 × 1-3 mm, outer 3 sepals ovate-lanceolate, inner 3 linear, glabrous. Petals 6, minute or inconspicuous, nectariform. Stamens 6, free, sessile, anthers c. 2 mm long, reduced to minute staminodes in female flower. Carpels 3 (reduced to minute pistillode in male flower), free, about as long as the sepals, oblong, glabrous. Fruit not seen.

*Holotype* : Khasia, Cherra, *Herb. Griffith s.n.* Acc. no. 16830 (CAL).

*Notes* : *Holboellia khasiana* differs from *H. latifolia* Wall. in having : leaves with long acuminate apex becoming spiny during maturity, petioles short (1.5-4.0 cm long), racemes much longer than the petioles and anthers sessile.

2. *Holboellia latifolia* Wall., Tent. Fl. Nep. 24, t. 16. 1824; Hook. f. & Thoms., Fl. Ind. 1:215. 1855; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:108. 1872; Kanjilal & Das, Fl. Assam 1(1):61. 1934; Jafri in Fl. W. Pak. 60:2, 1974.

Climbing shrubs c. 3-5 m high with corky bark in mature stem, glabrous, branches and twigs often twining at the apical portion. Leaves alternate,

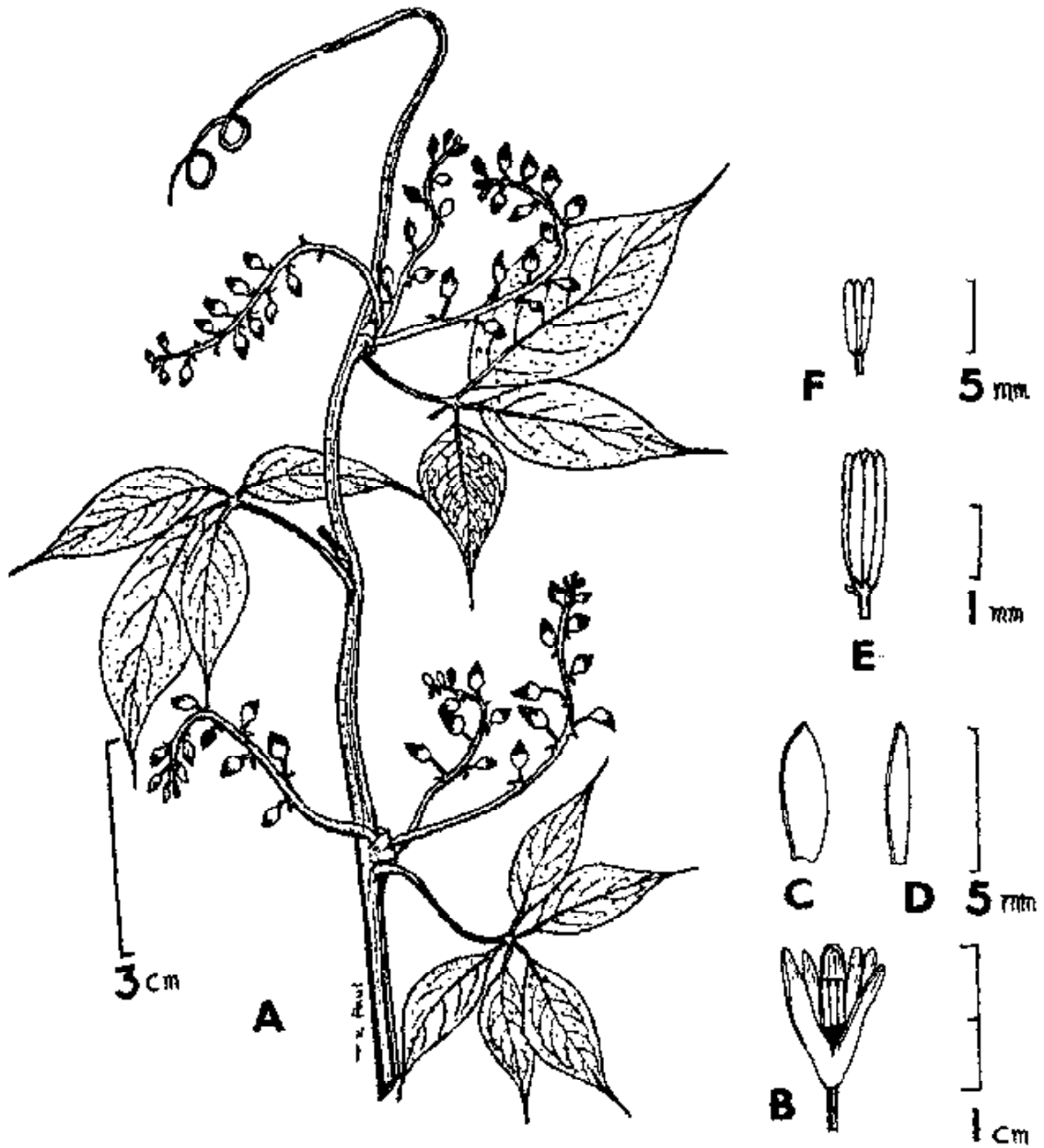


Fig. 6 *Holboellia khasiana* T.K. Paul et Nayar.

A. Habit. B. Flower open. C. Outer sepal. D. Inner sepal. E. Stamens. F. Carpels.

digitately compound, 3-9 foliate, petiolate; petioles 4-8 cm long; leaflets 4-13 × 1-5 cm, ovate, oblong or ovate-lanceolate, apex acute to slightly acuminate, margin entire, glabrous, somewhat shining above, pale beneath, usually 3-nerved at the base, petiolulate, petiolule 0.3-5.0 cm. Racemes few flowered in axillary fascicles, peduncle as long as the petiolule. Pedicels 5-12 mm long, purplish. Flowers 10-20 mm across, green or purplish green. Sepals 10-15 × 2-5 mm, oblong or oblong-elliptic. Petals orbicular or nectariform, minute or inconspicuous. Stamens *c.* 2/3 as long as the sepals, reduced to minute staminodes in female flowers. Carpels free, *c.* half as long as the sepals, oblong, stigma sessile, one or each maturing into separate diverging fruit. Fruits 5-10 × 2-6 cm, oblong or ovate-oblong. Seeds *c.* 2 mm long, orbicular.

### KEY TO THE VARIETIES

- 1a. Leaflets ovate or oblong ..... var. *latifolia*  
 1b. Leaflets narrow lanceolate ..... var. *angustifolia*  
 var. *latifolia* — [Fig. 7]

*Type* : Nepal Himalaya, *Wall Cat.* no. 4950 (K-W, CAL)

*Fls.* : March-June; *Frts.* : June-Aug.

*Distrib.* : INDIA : Himalayan region : Uttar Pradesh, West Bengal, Assam, Meghalaya, Sikkim, Manipur, Arunachal Pradesh; PAKISTAN.

*Notes* : Fruits are edible.

*Exsicc.* : Uttar Pradesh : Gurhwal, *Herb. Falconer* 92 (CAL); Mussorie, 6.4.1900, *Mackinnon s.n.* (CAL). West Bengal : Tonglu (Darjeeling Dist.), 28th May, 1902, *Lace* 2246 (CAL); Darjeeling, 6500, July 1880, *Gamble* 8208 (CAL). Sikkim : *Without precise locality*, *J.D.H. s.n.* (CAL); Risbah, March 1878, *Lister s.n.* (CAL).

var. *angustifolia* (Wall.) Hook. f. & Thoms. in *Fl. Brit. India* 1:108. 1872. *H. angustifolia* Wall., *Tent. Fl. Nep.* 24t. 17. 1824.

*Type* : Nepal, *Wall. Cat.* no 4951 (CAL)

*Distrib.* : INDIA : Confined to Himalaya : Uttar Pradesh Sikkim, Arunachal Pradesh, Meghalaya; NEPAL, BHUTAN.

*Exsicc.* : India : Uttar Pradesh : On way to Jumnotri (Tehri-Garhwal), 2000 m, 17 June 1961, *M. A. Rau* 15821 (CAL); Kanol (Garhwal), 2500 m, 20th June 1959, *M. A. Rau* 10360 (CAL). Meghalaya : Dumpep I.B. vicinity (K. & J. Hills), 16th April 1969, *A. S. Rao* 47422 (ASSAM)

### 3. PARVATIA

Decaisne in *Arch. Mus. Hist. Nat. Paris* 1 : 190 t. 12A. 1839; Benth. & Hook. f., *Gen. Pl.* 1 : 42. 1862; Hook. f. & Thoms. in *Hook. f., Fl. Brit. India* 1 : 108. 1872.

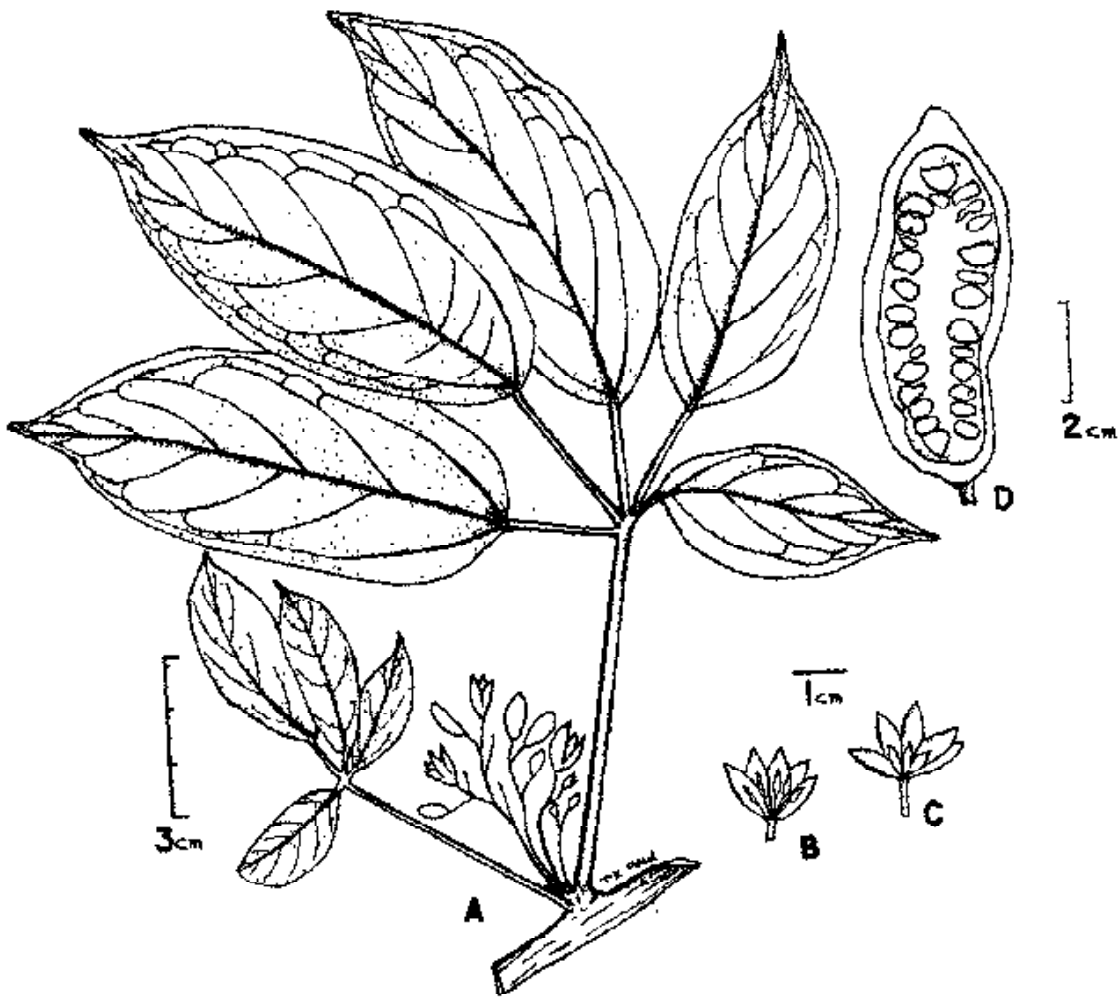


Fig. 7 *Holboellia latifolia* Wall. A. Habit. B. Male flower. C. Female flower. D. Fruit vertically cut to expose seeds.



Climbing evergreen shrubs with pinnately trifoliate coriaceous leaves. Inflorescence racemose in axillary fascicles; plants monoecious. Flowers unisexual, actinomorphic, bracteate. Sepals 6, biseriate. Petals 6, smaller than the sepals. Male flowers with 3, monadelphous stamens, anthers oblong, long apiculate. Female flowers with 6 minute staminodes and 3 carpels, stigma sessile, many ovules in each carpel. Fruit a berry, indehiscent. Seeds numerous, embedded in pulp.

*Distrib.* : A small genus comprising of c. 3. species distributed in Eastern Himalaya; 2 species in India.

#### KEY TO THE SPECIES

- 1a. Leaves ovate-lanceolate, apex acuminate. Stamens 3,  
staminal column 1.5 mm long *P. brunoniana* 1
- 1b. Leaves ovate-elliptic, apex acute or rounded. Stamens 6,  
staminal column 5 mm long . . . *P. elliptica* 2

1. *Parvatia brunoniana* (Wall.) Decaisne in Arch. Mus. Hist. Nat. Paris 1:190 t. 12A. 1839; Hook. f. & Thoms., Fl. Ind. 1:214. 1855; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:108. 1874. *Stauntonia brunoniana* Wall. Cat. no. 4952; 1824 nom. nud. Hemsl. in Kew. Bull. 9, t. 2843. 1909. *S. trifoliata* Griff. Notulae 4:330. 1854. [Fig. 8]

Large evergreen climbing shrubs, bark of the old branches corky. Leaves alternate, pinnately compound, 3-foliate, petiolate; petioles 3-12 cm long; leaflets 5-12 × 2-4 cm, ovate or ovate-lanceolate, apex acuminate, rarely obtuse, margin entire, slightly revolute, glabrous, paler beneath; petiolule of the middle leaflet longer, 1-3 cm long. Flowers in axillary racemes, racemes solitary or 2-4; pedicels c. 2 mm long. Flowers 5-10 mm across, greenish-yellow. Sepals 10-12 × 2-3 mm, oblong-lanceolate. Petals c. 2 × 0.5-1 mm, lanceolate, much smaller than sepals. Stamens 3, monadelphous, staminal column c. 1.5 mm long, anthers 2.0-2.5 mm long, oblong, apiculate, reduced to 6 staminodes, c. 1 mm long in female flowers. Carpels 3 (reduced to minute pistillodes in male flower), free, 2.5-3.0 mm long, oblong, glabrous, with sessile stigma, one or all maturing into separate diverging fruits. Fruits oblong or ovate-oblong, indehiscent. Seeds numerous, embedded in pulp.

*Type* : Montes Silhet Wall. Cat. no. 4952 (CAL).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : INDIA : Assam, Meghalaya ; BANGLADESH.

*Exsicc.* : India : Meghalaya : Khasia, 16th Oct. 1886, Clarke 45297 A (CAL); Khasia hills, Garden collector s.n. (CAL).

2. *Parvatia elliptica* (Hemsl.) Nayar et Paul comb nov. *Stauntonia elliptica* Hemsl. in Kew Bull. 9, t. 2844. 1909; Kanjilal & Das, Fl. Assam 1(1):60. 1934.

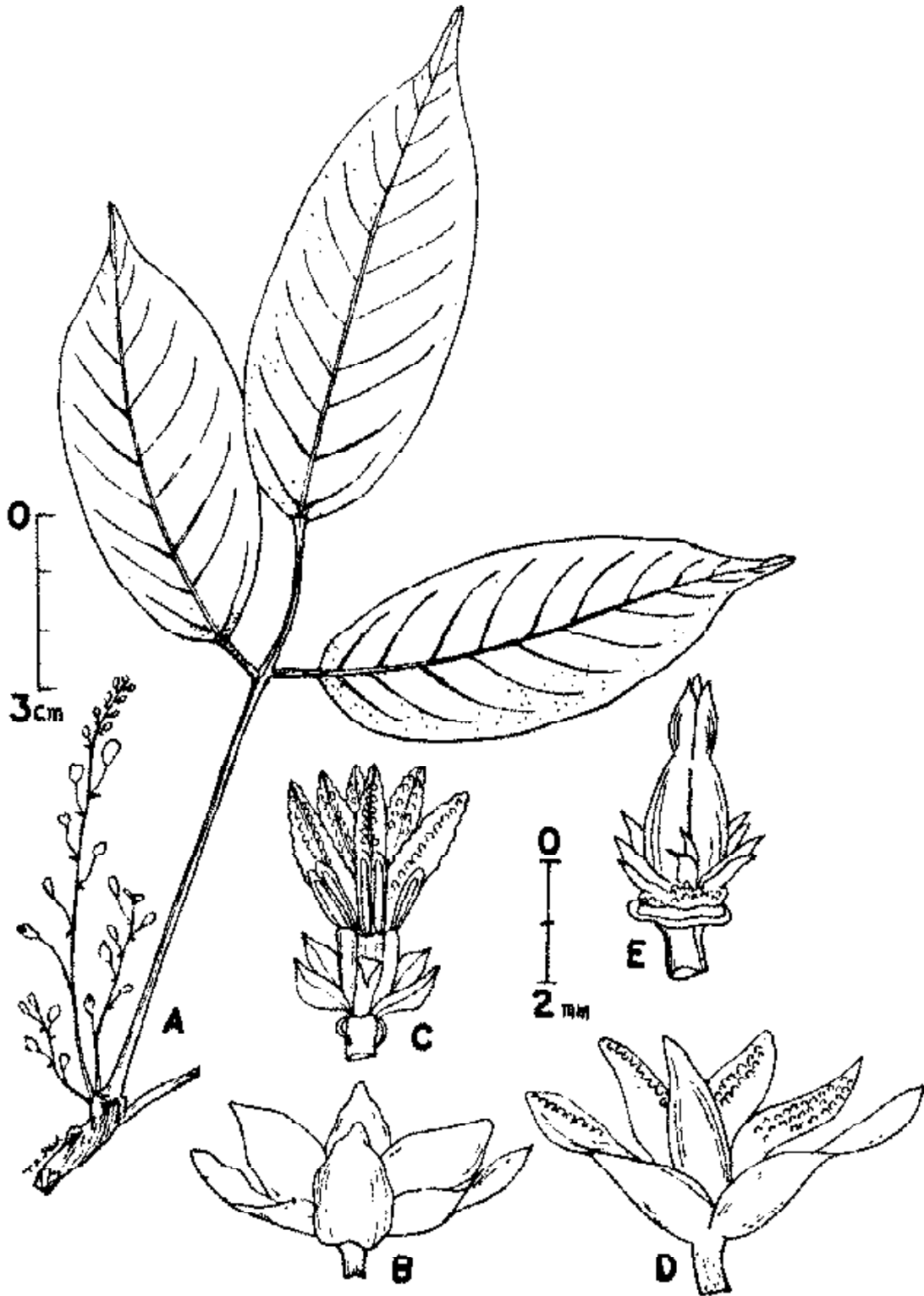


Fig. 8 *Peruvia brunoniana* (Wall.) Decaisne. A. Habit. B. Male flower open. C. Stamens and glands. D. Female flower. E. Pistillate glands and abortive stamens.

Large climbing shrubs, stems and branches striated. Leaves pinnately 3-foliolate, petiolate; petioles 4-8 cm long; leaflets 4-10 × 2-5 cm, ovate or elliptic, apex acute or rounded, margin entire, glabrous, paler beneath; petiolule of the middle leaflet longer, 1.0-2.5 cm long. Flowers in axillary racemes, racemes in fascicles from imbricately bracteate axillary tubercles; pedicels 3-5 mm long. Sepals 6, 5-10 × 2-4 mm, ovate or elliptic. Corolla greenish-yellow; petals *c.* 1 mm long, much smaller than sepals. Stamens 6, monadelphous, *c.* 5 mm long, anthers oblong, reduced to staminodes in female flowers. Carpels 3 (reduced to minute pistillodes in male flower), oblong, glabrous. Fruits oblong, *c.* 5 cm long and 2.5 cm across. Seeds numerous, embedded in pulp.

*Type* : Gauhatty, Assam, *Simons s.n.* Acc. no. 16832 (CAL).

*Fls. & Frts.* : Oct.-June.

*Distrib.* : INDIA : Assam.

*Exsicc.* : India : Assam : Locality not mentioned, *Jenkins s.n.* (CAL) (2 sheets); Sandiya, 23. 11.1911. *Burkill* 35773 (CAL); Belijan, Jaboca, Oct. 1898, *Prain's Collector* 160 (CAL).

## LOBELIACEAE

V. K. Haridasan\* and P. K. Mukherjee\*

R. Br. in Trans. Linn. Soc. Lond. 12 : 133. 1817; A. DC. in DC., Prodr. 7:399. 1839; Hutchinson, Fam. Fl. Pl. (1 ed.) : 293. 1926, et ibid. (2 ed.) : 477. 1959. *Campanulaceae* – tribe *Lobelieae* A. DC., Monogr. Camp. 36. 1830; Benth. in Benth. & Hook. f., Gen. Pl. 2:542. 1876; Clarke in Hook. f., Fl. Brit. India 3:422. 1881; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:109. 1960. *Campanulaceae* – subfam. *Lobelloideae* Schönl. in Engl. & Prantl, Nat. Pflanzenfam. 4, 5:63. 1894; Wimmer in Engl. & Diels, Pflanzenr. Heft 106:1. 1943.

Annual or perennial herbs, shrubs or small trees, with milky latex. Leaves simple, exstipulate, sessile or petiolate or lower ones petiolate and upper ones sessile. Flowers solitary, axillary or in simple or branched, lax or dense inflorescences, bisexual or unisexual, zygomorphic. Pedicels 2-bracteolate or ebracteolate. Calyx-tube united with the ovary forming a hypanthium; teeth 5, equal or slightly unequal, persistent. Corolla irregular, very rarely regular, sympetalous forming a tube below; tube entire or wholly or partially cleft up to the base on one side; lobes equal or unequal, differentiated into two dorsal, two lateral and one ventral, valvate. Stamens 5, alternating with the corolla lobes, free from the corolla or loosely attached to it basally; filaments flattened, cohering by their margins into a tube for the whole length or free upto three-fourth from the base; anthers connivent, bilocular, basifixed, three posterior slightly longer than the two anterior ones and incurved at their tips, all or two anterior ones only penicillate or barbate or rarely all not barbate. Pistil 2-carpellary or rarely 1-carpellary (not in Indian taxa), ovary inferior or semi-inferior, ovules many on axile placentation; style 1, undivided; stigma 2-lobed or rarely undivided (not in Indian taxa), with a tuft of hairs at base, very short. Fruit a capsule or a berry crowned by the persistent calyx-teeth. Seeds with small straight embryo and copious endosperm.

Type : *Lobelia* Linn.

Distrib. : C. 30 genera and 1200 species (V. H. Heywood Fl. Pl. World : 256. 1978); mainly tropical and subtropical, rich in America, Africa, Asia and Europe. In India 3 genera and 21 species.

### KEY TO THE GENERA

- 1a. Corolla zygomorphic; tube cleft on one side upto the base or slightly above the base and often curved; lobes unequal:
  - 2a. Fruits dehiscent through apical valves; Ovary conical at top *Lobelia* 2
  - 2b. Fruits indehiscent. Ovary flat at top ... *Pratia* 3
- 1b. Corolla actinomorphic, tube entire and straight, lobes equal .. *Hippobroma* 1

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## 1. HIPPOBROMA

G. Don, Gen. Syst. 3:717. 1834; McVaugh in Bull. Torr. Bot. Cl. 67:783. 1940. *Laurentia* sect. *Isotoma* (R. Br.) Wimmer in Engl. & Diels. Pflanzenr. Heft. 107:398. 1953. p.p.; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:140. 1960, p.p.

Annual or biennial (Perennial ?) erect glabrous or pubescent herbs with acrid milky poisonous juice. Stem simple or branched, winged. Leaves alternate, sessile, decurrent at base, elliptic to oblanceolate, repand-dentate, dentatures often re-denticulate, at times ciliate, acute or obtuse. Flowers solitary, axillary. Bract densely hirsute. Hypanthium obconic or campanulate, hirsute. Calyx-teeth linear, acuminate, remotely callose-denticulate, ciliate. Corolla hypocrateriform, white, pubescent externally; tube narrowly cylindrical; lobes lanceolate, acute, spreading. Filaments arising with and attached to the corolla-tube, except at the apex, extending upto the corolla mouth or slightly beyond; anthers white-penicillate at apex. Carpels 2; styles slender, glabrous. Capsules ellipsoid, sparsely hirsute. Seeds ellipsoid or suborbicular, slightly compressed, epiderm foveolate-reticulate.

*Distrib.* : India, Sri Lanka, S.E. Asia, North, Central and South America, Hawaii Islands, Madagascar, Mauritius.

1. *Hippobroma longiflora* (Linn.) G. Don, Gen. Syst. 3:717. 1834; McVaugh in Bull. Torr. Bot. Cl. 67:783. 1940. *Lobelia longiflora* Linn. Sp. Pl. 930. 1753. *Laurentia longiflora* (Linn.) Endl. Gen. Pl. 582. 1838. Wimmer in Engl. & Diels, Pflanzenr. 107:405. 1953, excl. var.; Santapau in Journ. Bomb. Nat. Hist. Soc. 53(1):156. 1955. Moeliono in van Steenis, Fl. Males. Ser. 1, 6:140. 1960.

*Local name* : Horse Poison, Madam Fate (Eng.).

Herbs upto 45 cm tall. Leaves 4.2-12.2 × 0.8-2.7 cm. Pedicels 2-8 mm. Bracteoles 2.0-3.5 mm long, Hypanthium 7-8 × 3-4 mm. Calyx teeth 0.7-1.6 cm long. Corolla-tube 4-7.5 × 1.5-2 mm; lobes 11-12 × 3-4 mm. Filaments free from the corolla for 7 mm; anthers 4-2 mm long. Styles 4.0-7.3 cm long. Capsules 10-17 × 9-10 mm. Seeds 0.5-0.8 mm long.

*Type* : Hortus Upsaliensis (Upsala) Coll. (?) s.n. (Microfiche LINN !).

*Fls. & Frts.* : Throughout the year.

*Ecol* : A weed in damp places, stream banks, fields, cleared grounds, against walls etc. up to an elevation of 1000 m above sea-level.

*Uses* : Cultivated for its attractive flowers (Santapau l.c.).

*Notes* : The plant is highly poisonous, especially to horses, due to the presence of an alkaloid "Isotomine". It acts as a violent purgative on internal consumption. It causes a burning inflammation in the eyes, and also paralysis in human beings.

## 2. LOBELIA

Linn. Sp. Pl. 2:929. 1753 et Gen. Pl. : 401. 1754. A. DC. in DC., Prodr. 7:357. 1839; Benth. in Benth. & Hook. f., Gen. Pl. 2:551. 1873 Clarke in Hook. f., Fl. Brit. India 3:423. 1881; Schon. in Engl. & Prantl, Nat. Pflanzenfam. 4(5) : 66. 1894; Wimmer in Engl. & Diels, Pflanzenr. Heft. 107: 408. 1953.

Annual or perennial, decumbent or erect herbs, glabrous or hairy, rarely arborescent. Leaves alternate, petiolate or sessile or lower ones petiolate and upper ones sessile, much varying in shape and size, often bractiform apically. Flowers pedicellate, often bracteate, solitary, axillary or in lax or dense racemes or panicles, bisexual or rarely unisexual. Calyx teeth shorter or longer than the corolla-tube. Corolla often fenestrated, lobes 2 dorsal, 2 lateral and 1 ventral, united in various degrees forming a funnel-shaped or cylindrical tube. Filaments free from the corolla and also at their bases upto three fourth of their length; anthers all or only anterior two penicillate or barbate or very rarely all not barbate at their apices. Stigma 2-lobed, capitate, later subrotund to oblong and divaricate. Capsules dehiscent through two apical valves. Seeds of various shapes.

*Type* : *Lobelia cardinalis* Linn.

*Distrib.* : C. 365 species in the tropics and sub tropics of all the continents, chiefly in Africa, North and South Americas, Asia and Europe. India : 16 species; 3 endemic.

## KEY TO THE SPECIES

- 1a. Stems triolate all or only 2 anterior anther penicillate at apex:
- 2a. Seeds trigonous; all anthers penicillate at apex :
- 3a. Plants diffuse-decumbent, erect or suberect rooting at or near the base; 2 anterior filaments twice as broad as the rest at the free basal ends :
- 4a. Bracteoles minute or nil; corolla 3.0-3.5 mm long :
- 5a. Plants pubescent, decumbent to ascending *L. terminalis* 15
- 5b. Plants glabrous, erect *L. microcarpa* 10
- 4b. Bracteoles conspicuous; corolla 4.5-9.0 mm long *L. alsinoides* 1
- 3b. Plants prostrate often rooting at nodes; all filaments equally broad at the free basal ends *L. zeylanica* 16
- 2b. Seeds ellipsoid; only 2 anterior anthers penicillate at apex :
- 6a. Plants decumbent or prostrate; corolla 5.5-14.5 mm long:
- 7a. Leaves truncate or caudate at base; bracteate flowers blue *L. dichotoma* 5
- 7b. Leaves cordate or decurrent at base; ebracteate; flowers rosy *L. chinensis* 3
- 6b. Plants erect; corolla 3.0-3.5 mm long *L. heyneana* 8

- 1b. Stems terete ; only 2 anterior anthers barbate at apex  
or very rarely all not barbate :
- 8a. Flowers in lax or dense racemes :
- 9a. Only 2 anterior anthers barbate at apex :
- 10a. Capsules subglobose or ovoid; flowering pedicels oriented  
in all directions of the rachis :
- 11a. Calyx-teeth few to many gland-denticulate, pubescent,  
hirsute or ciliate :
- 12a. Lower bracts longer and upper bracts shorter than the  
flowering pedicels :
- 13a. Plants 20-90 cm tall; corolla blue, violet, purple or rarely  
white; calyx-teeth linear-lanceolate or subulate :
- 14a. Calyx-teeth linear-lanceolate; corolla 14-20.5 mm long;  
filaments 10.5-11 mm long . . . . . *L. erectiuscula* 7
- 14b. Calyx-teeth subulate; corolla 24.5-29 mm long;  
filaments 12.0-13.0 mm long . . . . . *L. colorata* 4
- 13b. Plants more than 90 cm ; corolla white; calyx-teeth  
oblong or linear . . . . . *L. nicotianaefolia* 12
- 12b. All bracts longer than the flowering pedicels . . . . . *L. mishmica* 11
- 11b. Calyx-teeth entire, glabrous . . . . . *L. pyramidalis* 13
- 10b. Capsules oblong-ellipsoid; most of the flowering pedicels  
towards one side of the rachis
- 15a. Cauline leaves denticulate or gland-denticulate; calyx-teeth  
entire or 1-2 denticulate near the base on either margin . . . . . *L. rosea* 14
- 15b. Cauline leaves obscurely serrate or serrulate without glands;  
calyx-teeth 4-5 or more denticulate on either margin . . . . . *L. doniana* 6
- 9b. All anthers not barbate at apex . . . . . *L. leschenaultiana* 9
- 8b. Flowers solitary, axillary . . . . . *L. beddomeana* 2

1. *Lobelia alsinoides* Lam. Encyl. 3:588. 1792; A. DC. in DC., Prodr. 7:378. 1839; Wimmer in Engl. & Diels, Pflanzenr. Heft. 107:571. 1953, excl. var; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:126. 1960, *p.p.* Hara, Fl. E. Himal. Rep. 1:327. 1966; Ramaswamy & Razi, Fl. Bangalore Dist. 603. 1973; Bennet, Fl. Howrah Dist. 366. 1975, *p.p.*; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan Dist. 568. 1976; Raizada & Saxena, Fl. Mussoorie 396. 1978. *L. trigona* Roxb., Fl. Ind. (ed. Carey & Wall.) 2:111. 1824; A. DC. in DC. Prodr. 7:379. 1839; Wt. Ic. 4: t. 1170. 1848; Hook. f. Ic. Pl. 4: t. 538. 1841, excl. *L. trialata* & *L. heyneana*; Clarke in Hook. f., Fl. Brit. India 3:423. 1881; Prain, Beng. Pl. 1:633. 1903 (Repr. ed. 1:466. 1963); Cooke, Fl. Pres. Bomb. 2:72. 1904 (Repr. ed. 2:130. 1953); Duthie, Fl. Upp. Gang. Pl. 1:497. 1905 (Repr. ed. 1:452. 1961); Gamble, Fl. Pres. Madr. 2:736. 1921 (Repr. ed. 2:518. 1957); Haines, Bot. Bih. & Or. 2:500. 1922 (2:524. 1961). *L. stipularis* Roth in Roem. & Schult. Syst. Veg. 5:67. 1819.

*Local name* : Chauric arek (Santal).

Annual branching glabrous herbs to 40cm. tall. Stems trigonous or triolate. Leaves lower petiolate and upper sessile, ovate or elliptic, caudate at base, crenate, cuspidate-dentate or serrate, acute, 5-24 × 3-22 mm; petiole upto 6 mm long. Flowers solitary, axillary or in apical lax racemes. Pedicels slender, longer or shorter than the subtending leaves. Calyx-teeth subulate, entire, 2-4 mm long. Corolla bluish to lilac; dorsal lobes falcate-oblong or falcate-ovate, 1.5-3.5 mm long; lateral and ventral lobes oblong-ovate, 1-3 mm long, tube 3-6 mm long. Filaments free half of their length, 2.5-5.5 mm long, 2 anterior densely ciliate, rest glabrous or sparsely ciliate; anthers 0.75-1.25 mm long. Styles 4.5-7.0 mm long. Capsules obconic to obovoid, 2.5-4 × 2-3 mm. Seeds ± 0.4 mm long.

*Type* : Bonne — Esperance *M. Sonnerat* (P Microfiche !)

*Fls. & Frts.* : Throughout the year

*Distrib.* : INDIA : Throughout; SOUTH CHINA, BURMA, BANGLADESH, MALESIA.

*Ecol.* : Grows in open or shady muddy swamps, sandy alluvium of the river bank, near ponds, nallahs, cultivated fields etc., often in association with grasses and composites upto an altitude of 2,195 m from sea level.

*Uses* : Leaves eaten as a pot herb in Chota-Nagpur (Duthie l.c.)

2. *Lobelia beddomeana* Wimmer in Engl. & Diels, Pflanzenr. Heft 107:645. 1953. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960, *p.p.* non Roth ex Roem. & Schult., 1819.

Annual, branching, pubescent, erect herbs, upto 20 cm tall. Branches densely grey-pubescent, sparsely leaved. Leaves ovate or elliptic, rounded or obtuse at base, dentate or denticulate, acute, herbaceous, hairy on both the surfaces. Flowers solitary, axillary. Bracts subpetiolate. Pedicels to 2 cm long. Hypanthium subglobose. Calyx-teeth lanceolate-linear, denticulate, 9-10 mm long. Corolla white, lobes coherent at least at the beginning, 22 mm long. Filaments 11 mm long; anthers dorsally pubescent, 5 mm long.

*Type* : Neilgherry Hills (Nilgiri hills) — *R. H. Beddome* 4716 (WU, Photograph !).

*Distrib.* : INDIA : Nilgiri Hills; apparently endemic.

*Notes* : The account is based broadly on the photograph of the type specimen and the description by Wimmer (l.c.), who considers it as allied to *L. nicotianaefolia* Roth. ex Roem. & Schult.



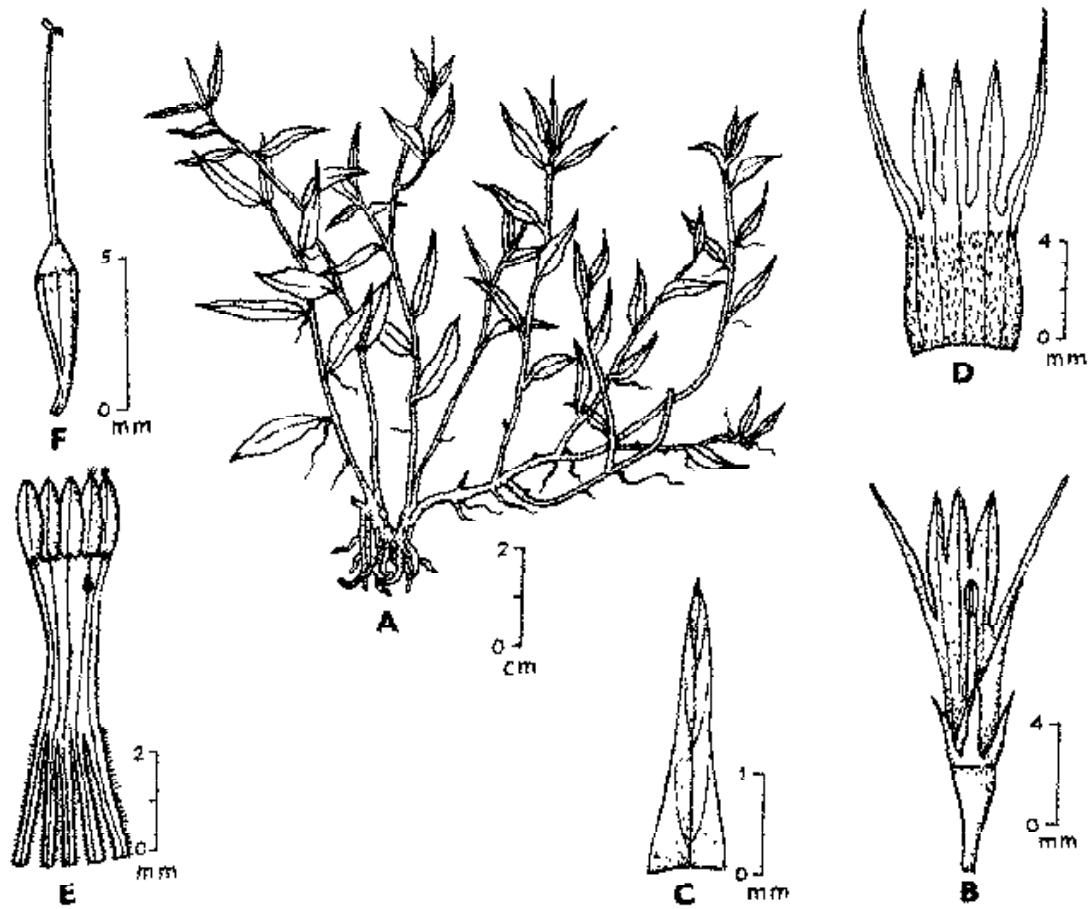


Fig. 9 *Lobelia chinensis* Lour.

A. Habit. B. Flower. C. Calyx teeth. D. Corolla-spreadout. E. Stamens split open. F. Pistil.

3. *Lobelia chinensis* Lour. Fl. Cochinch. 514. 1790; A. DC. in DC. Prodr. 7 : 360. 1839; Wimmer in Engl. & Diels, Pflanzenr. Heft 107 : 609. 1953; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:130. 1960; Hara, Fl. East. Himal. Rep. 1:327. 1966. *L. radicans* Thunb. in Trans. Linn. Soc. 2:330. 1794; Clarke in Hook. f., Fl. Brit. India 3:425. 1881; Prain, Beng. Pl. 1:634. 1903 (Repr. ed. 1:466. 1963); Haines, Bot. Bih. & Or 2:501. 1922 (Repr. ed. 2:526. 1961). *Isolobus roxburghianus* A. DC. in DC. Prodr. 7:353. 1839.

Fig. 9

Prostrate glabrous herbs with angular-striate stems, sparsely foliate; branches up to 11 cm long. Leaves petiolate or sessile, entire or remotely few denticulate, acute, 10-25 × 2-7 mm, terminal leaves gradually reduced. Flowers solitary, axillary, ebracteate; pedicels 7-25 mm long. Calyx-teeth subulate to narrow-triangular, obscurely few denticulate near the base, 1.5-3 mm long. Corolla green with pink marks, rose or rosy-white, densely pilose within; dorsal lobes linear, 5-8.5 mm long, lateral and ventral lobes lanceolate; tube 4-7 mm long. Filaments 4-7 mm long, free up to two thirds, 2 anterior densely pilose on their free margins; anthers 1-2 mm long. Styles hairy at base, 5-7 mm long. Capsules obconical, 4-5 × 1.5-2 mm. Seeds broadly ellipsoid, ±0.5 mm long.

*Type* : China, Canton, *Loureiro* (*P. n. v.*)

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : Bihar, West Bengal, Assam, Meghalaya and Maharashtra; BANGLADESH, CHINA, JAPAN, JAVA

*Chr. No.* :  $2n=14$  (Les, Y. N. in Journ. Korean Res. Inst. Better Living 2:141-145. 1969).

*Ecol.* : Grows in damp places, grassy fields, along streams, walls of drains etc. up to an elevation of 1220 m from sea level.

*Uses* : The plant is used for fevers and asthma in China and the roots as antirheumatic in Indo-China (R.N. Chopra *et al.* Suppl. Gloss. Ind. Med. Pl. : 58. 1969).

*Notes* : Kitamura (Fl. and Fauna Nep. Himal. : 242. 1955) proposed a new variety — var. *pilosa* from Nepal differing from the type by its leaves being minutely hirsute on both surfaces and stems being minutely hirsute in young stage. However, the Indian forms examined are completely glabrous.

4. *Lobelia colorata* Wall. Pl. As. Rar. 2:42. 1831; A. DC. in DC., Prodr. 7:380. 1839; Clarke in Hook. f., Fl. Brit. India 3:426. 1881; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:655. 1953, excl. var.; Sengupta & Mallick in Rec.

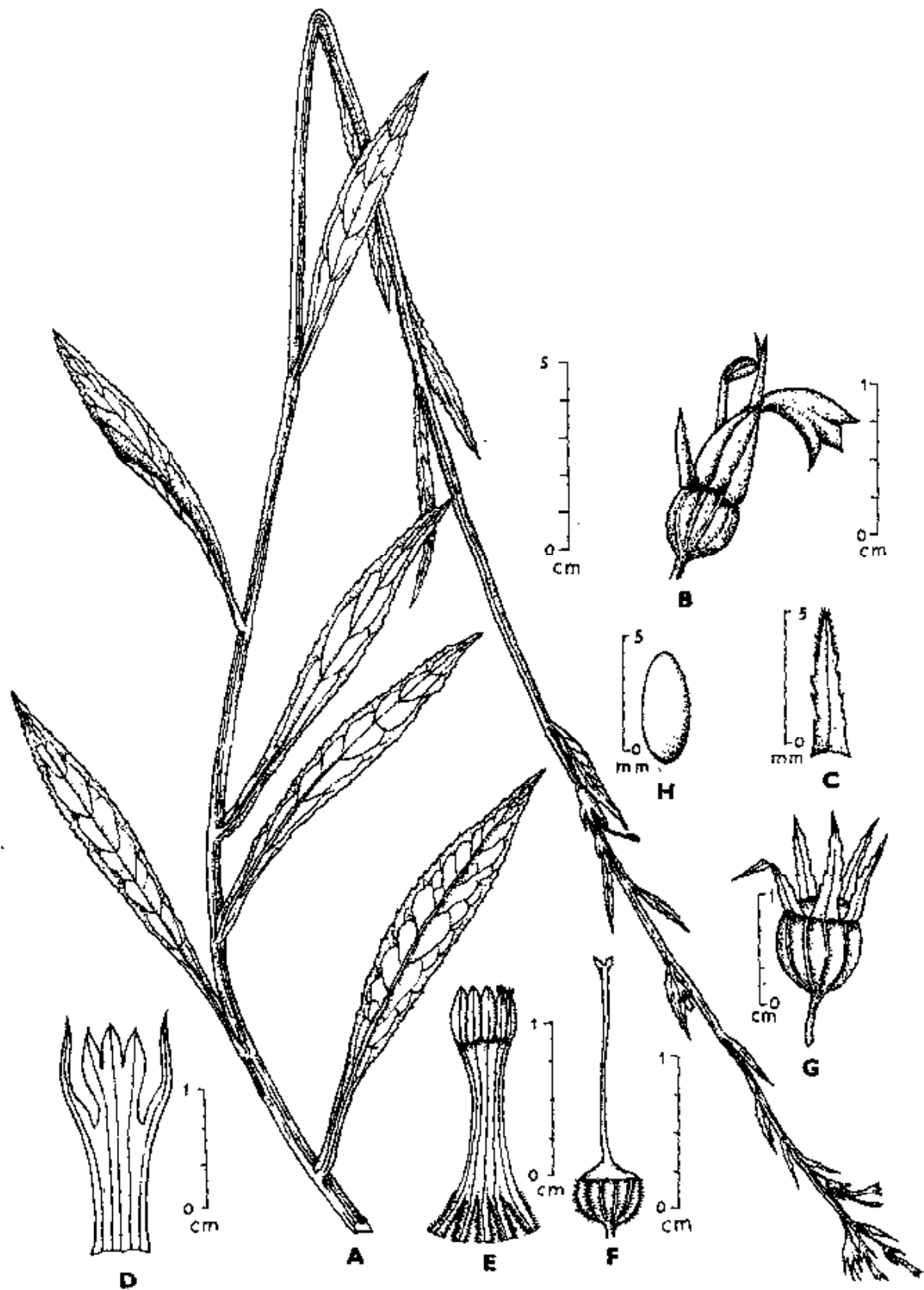


Fig. 10 *Lobelia colorata* Wail.

A. Habit. B. Flower. C. Calyx-teeth. D. Corolla-spreadout. E. Stamens-split open.  
 F. Pistil. G. Fruit. H. Seed.

Bot. Surv. India 20:135. 1973. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960 *p.p.* non Roth ex Roem. & Schult.; Balakr., Fl. Jowai : 278. 1981, *p.p.* Fig. 10

Erect, pale to deeply purplish, simple or rarely branched glabrous herbs. 20-90 cm tall. Radical leaves petiolate; petiole 2-14.5 cm long; lamina narrowly elliptic or elliptic-oblongate, obscurely crenulate, 3.2-21 × 0.9-3.9 cm; cauline leaves petiolate, sessile upwards and bractiform, oblongate or linear-lanceolate, caudate, remotely gland-dentate, acute, 4-16 × 0.8-2.6 cm. Inflorescence laxly to densely racemose. Bracts elliptic-lanceolate to lanceolate. Pedicels 4-9 mm long. Calyx-teeth remotely few gland-dentate, 3.5-7 mm long. Corolla purple, violet or rarely white; dorsal lobes falcate-linear, 11 mm long, lateral and ventral lobes lanceolate-ovate or ovate, 4-4.5 mm long, tube 10-17 mm long. Filaments free up to one-third of the length; anthers 3-4.5 mm long. Styles 14-15 mm long. Capsules subglobose or ovoid, glabrous, ± 6.5 mm in diam. Seeds narrowly ellipsoid, ± 0.5 mm long.

*Type* : India, Pundua, F. De Silva in Wall. List n. 1307 (CAL !).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : Khasi and Jaintia hills of Meghalaya; S.E. CHINA.

*Ecol.* : Grows as a weed in the temperate regions, in marshy places, grasslands, hills and along ditches, at elevations between 1220-1860 m.

5. *Lobelia dichotoma* Miq., Fl. Fl. Ind. Bat. 2:576. 1856; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:476. 1953. *L. zeylanica* Clarke in Hook. f., Fl. Brit. India 3:425. 1881. incl. var. *walkeri*, *p.p.*; Gamble, Fl. Pres. Madr. 736. 1921 (Repr. ed. 2:518. 1957), *p.p.*; *L. heyneana* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:129. *p.p.* 1960, non Roth. ex Roem. & Schult.,

Annual decumbent branching herbs; branches tripartite, 14-48 cm long. Lower leaves petiolate, sessile upwards, truncate or caudate, crenate-serrate to incised-crenate-serrate and cartilagenous at margins, obtuse or acute, 9-28 × 2-16 mm. Flowers solitary, axillary, minutely 2-bracteate at base, 7-18 mm long. Calyx-teeth linear-lanceolate, entire or remotely denticulate, 3.5 mm long. Corolla deep blue; dorsal lobes falcate, linear-oblong, 3.5-4.5 mm long; lateral and ventral lobes oblong-ovate or spatulate, 3.0-6.5 mm long; tube 4.5-6 mm. Filaments 4.0-5.0 mm long; anthers 1-1.5 mm long. Styles 4.5-6 mm long. Capsules obovoid, 6 × 4 mm. Seeds ellipsoid, ± 9.5 mm long.

#### KEY TO THE VARIETIES

- 1a. Lower leaves at least petiolate;  
corolla 8-12.5 mm long var. *dichotoma*
- 1b. All leaves sessile; corolla 5.5 mm long var. *aligera*

var. *dichotoma*

*Type* : Java op den Sello, *Horsfield*

*Fls. & Frts.* : Nov.-June.

*Distrib.* : INDIA : Confined to small pockets in Karnataka, Kerala and Tamil Nadu; SRI LANKA, JAVA.

*Ecol.* : Grows in moist grassy places, on bunds of rice fields, at elevations between 1067-2074 m.

var. *aligera* (Haines) Wimmer in Ann. Naturh. Mus. Wien 56:345. 1948. *L. aligera* Haines in Journ. Asiat. Soc. Beng. n. ser. 15:316. 1920. *L. zeylanica* var. *aligera* (Haines) Haines, Bot. Bih. & Or. 2:501. 1921 (Repr. ed. 2:525. 1961). *L. heyneana* Moeliono in van Steenis, Fl. Males. ser. 1, 6:129. 1960 *p.p.* non Roth ex Roem. & Schult.

Decumbent annual glabrous herbs. Stem trialate, 20.0-46.0 cm long. Leaves elliptic-oblong or oblong, decurrent at base, crisped-serrate and cartilagenous at margins, acute or obtuse, 11.0-27.0 × 3.0-8.0 mm. Hypanthium sparsely hairy. Seeds broadly ellipsoid.

*Type* : India : Mountains of Chotanagpur, 3000 ft., near streams, *H. Haines s.n. (K,n.v.)*

*Distrib.* : INDIA : Concan Bihar, Kerala and Maharashtra; endemic.

*Ecol.* : Grows near streams in hills at elevation of 915 m.

*Notes* : Differs from the type by its sessile leaves and shorter corolla. The description is drawn mainly from the single specimen that was authenticated by Wimmer (*l.c.*) and also from the details given by Haines (*l.c.*) and Wimmer (*l.c.*).

The cartilaginous nature of the leaf margins and calyx-teeth, cited by Wimmer as present in var. *aligera*, has been observed in the typical variety also.

6. *Lobelia doniana* Skotts. in Act. Hort. Bot. Gothob. 4:19, f. 12. 1928. *L. pyramidalis* D. Don in Sim's Bot. Mag. 50: t. 2387. 1823 *et* Prodr. Fl. Nepal 147. 1825, *p.p.*; A. DC. in DC., Prodr. 7:381. 1839, *excl. var.*; Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2:29. 1858; Clarke in Hook. f., Fl. Brit. India 3:426. 1881, *p.p.*; Biswas, Pl. Darjeeling and Sikkim Himal. 1:492. 1966. *L. seguinii* Leville & Van var. *doniana* (Skotts.) Wimmer in Engl. & Diels, Pflanzenr. Heft 107:651. 1953. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960, *p.p.* non Roth ex Roem. & Schult.; Balakr. Fl. Jowai : 278. 1981, *p.p.*

*Local name* : Ja-tang-pem (Kh.).

Erect simple or branching herbs, 70-105 dm tall. Leaves sessile, elliptic-oblancheolate, elliptic-lanceolate to lanceolate, decurrent at base, acuminate, 3.6-17.0 × 0.6-4.2 cm. Inflorescence densely racemose; rachis glabrous or pubescent towards the apex only. Bracts linear-lanceolate to lanceolate, longer than the pedicels. Pedicels 4-10 mm long. Calyx-teeth linear or linear-lanceolate, 9.0-16.5 mm long. Corolla bluish-violet to purple; dorsal lobes falcate-linear, 11.5-15.0 mm long, lateral and ventral lobes ovate-lanceolate, 5-7 mm long, tubes 10-20 mm. Filaments 10-15.5 mm long, one-third free at base; anthers 3-5.5 mm long. Styles 11.5-19.5 mm long. Capsules 9-12 × 4-7 mm. Seeds ellipsoid, ± 0.4 mm long.

*Type* : Nepalia, 1821, *F. de Silva* (?) in *Wall. List* n. 1302/1 (K, Microfiche).

*Fls. & Frts.* : Sept.-May.

*Distrib.* : INDIA : Uttar Pradesh, West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland; NEPAL, BHUTAN, S. CHINA.

*Ecol.* : Grows in shady moist soils, hill-slopes, crevices of dry rocks, in dry streams, in Oak-Rhododendron forests etc. at elevations between 610-3050 m.

7. *Lobelia erectiuscula* Hara in *Journ. Jap. Bot.* 4:328. 1965, et *Fl. East Himal.* 1:327. 1966. *L. erecta* Hook. f. & Thoms, in *Journ. Linn. Soc. Bot.* 2:28. 1858, non De Vries 1845; Clarke in Hook. f., *Fl. Brit. India* 3:426. 1881; Wimmer in *Engl. & Diels, Pflanzenr. Heft 107:656.* 1953; Biswas, *Fl. Darjeeling and Sikkim Himal.* 1:493. 1966. *L. nicotianaefolia* Moeliono in van Steenis, *Fl. Males. Ser. 1, 6:123.* 1960, *p.p.* non Roth ex Roem. & Schult. Fig. 11

Erect, 20-90 dm tall herbs, simple or branched near the apex. Leaves lower petiolate and sessile upwards; petiole up to 6.0 mm long; lamina elliptic, elliptic-lanceolate or oblong, caudate, repandly crenate, obscurely dentate or serrate, acute or obtuse, 1.7-10.7 × 0.6-4.2 cm. Inflorescence laxly or densely racemose. Bracts elliptic or lanceolate. Pedicels 3-5 cm long. Calyx-teeth remotely gland-dentate, 7.5-11.0 mm. Corolla blue or purple, villous, within; dorsal lobes falcate-linear, 7-11 mm long; lateral and ventral lobes lanceolate-ovate, 4.0-5.5 mm long; tube 7.0-12.5 mm long. Filaments free up to half of the length; anthers 4-3 mm long. Styles 12.0-12.5 mm long. Capsules broadly subglobose to globose, 7-8 × 7.0-11.5 mm. Seeds ellipsoid, ± 0.5 mm long.

*Type* : Sikkim, Chula, 10-12000 ft., 6-11-1849, *J. D. Hooker s.n.* (CAL) (Isotype CAL !).

*Fls. & Frts.* : July-Oct.

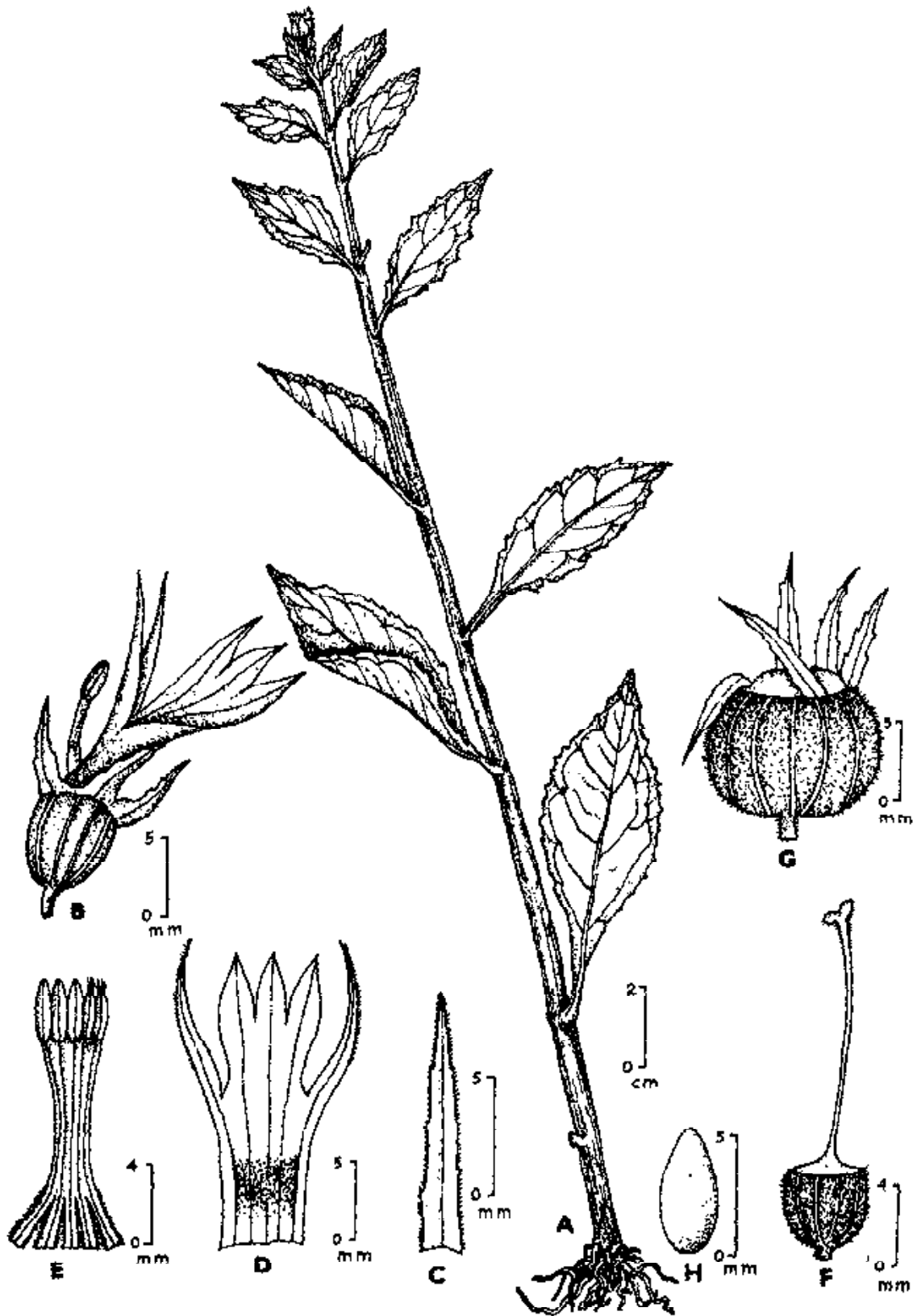


Fig. 11 *Lobelia erectuscula* Hara

A. Habit. B. Flower. C. Calyx-teeth. D. Corolla-spreadout. E. Stamens-split open.  
F. Pistil. G. Fruit. H. Seed.

**Distrib.** : INDIA : West Bengal, Sikkim and Nagaland; Bhutan, S.E. CHINA.

**Ecol.** : Grows in the alpine region at altitudes between 2440-3965 m.

8. *Lobelia heyneana* Roth ex Roem. & Schult., Syst. Veg. 5:50. 1819; Wimmer in Engl. Diels, Pflanzenr. Heft 107:473. 1953, *p.p.*; Santapau in Rec. Bot. Surv. India. 16:158. 1953; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:129. 1960; Haru, Fl. East. Himal. 1:327. 1966; *L. micrantha* Hook. Exot. Fl. 1:t. 44. 1823, non HBK. *L. trialata* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. : 157. 1825; A. DC. in DC., Prodr. 7:360. 1839; Clarke in Hook. f., Fl. Brit. India 3:425. 1881; Prain, Beng. Pl. 1:634. 1903 (Repr. ed. 1:466. 1963). Cooke, Fl. Pres. Bombay 2:72. 1904 (Repr. ed. 2:130. 1958); Duthie, Fl. Upper Gang. Pl. 1:497. 1905 (Repr. ed. 1:452. 1961); Bamber, Pl. Panjab : 364. 1916; Gamble, Fl. Pres. Madr. 2 :736. 1921 (Repr. ed. 2:518. 1957); Haines, Bot. Bih. & Or. 2:501. 1922 (Repr. ed. 2:525. 1922).

Annual, glabrous, 3.3-40.0 cm tall, simple or branched, triolate herbs. Leaves lower petiolate, upwards gradually sessile; petiole up to 10 mm; lamina broadly ovate or oblanceolate, subcordate, truncate or caudate at base, mucronulate-crenate or mucronulate dentate, acute or obtuse 4-25 × 1-22 mm. Flowers solitary, axillary, pedicels 4-10 mm long. Calyx-teeth subulate, entire, 1.0-1.5 mm long. Corolla bluish purple; dorsal lobes subfalcate, oblong-lanceolate, 1.0-1.25 mm long, lateral and ventral lobes ovate, 0.75-1.0 mm long, tubes 2.0-2.75 mm. Filaments 2.25-2.75 mm long, basally free for slightly more than half of the length; anthers 0.5-0.75 mm long. Style 2.5-3.0 mm long. Capsules obconic to obovoid, 3-5 × 1.5-2.0 mm. Seeds ellipsoid, ± 0.3 mm long.

**Type** : India Orientali, 1814, B. Heyne (Photograph B !).

**Fls. & Frts.** : July-Apr.

**Distrib.** : INDIA : Uttar Pradesh, West Bengal, Sikkim, Assam, Nagaland, Manipur, Bihar, Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh; CHINA, THAILAND, JAVA, ETHIOPIA.

**Ecol.** : Grows as a weed in moist clayey soil, laterite soil etc. of paddy field embankments, cornfields, sal forests, in association with species of *Ammania*, on grassy slopes etc. at elevations between 503-2150 m.

**Notes** : The variety *lamiifolia*, distinguished hitherto from *L. heyneana* by all its leaves being petiolate with cordate bases and incise-dentate margins, is merged with the typical variety, following Moeliono (1960), as these characters often intergrade.



9. **Lobelia leschenaultiana** (Presl.) Skottsbo. in Act. Hort. Bot. Gothob. 4:4. f. 2-7. 1928; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:659. 1953. *Rapuntium leschenaultianum* Presl., Prodr. Monogr. Lebel. 24. 1836. *Lobelia excelsa* Roxb., Fl. Ind. (ed. W. Carey & Wall.) 2:114. 1824, non Bonpl. 1813; Wall. Pl. As. Rar. 2:42. 1831; A. DC. in DC., Prodr. 7:381. 1839; Clarke in Hook. f., Fl. Brit. India 3:427. 1881, *p.p.*; Wt. Ic. t. 1173-74 in *Pro Syn.*; Gamble, Fl. Pres. Madr. 2:737. 1921 (Repr. ed. 2:518. 1957). *L. aromatica* Moon ex Wt. Ic. 4:t. 1172. 1848. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960, *p.p.*; non Roth ex Roem. & Schult.; Balakr. Fl. Jowai 278. 1981, *p.p.*

*Local Names* : Wild Tobacco (Eng.); Rasneegaha (Sinh.); Kattupokalai, Oumari (Tam.).

Annual or biennial (?) erect, villous herbs, upto 15 cm tall. Stem woody, hollow. Leaves lower in rosettes, petiolate; upper petiolate or sessile; petioles 3-6 mm; lamina lanceolate or elliptic-lanceolate tapering towards the base, double-serrate or gland-denticulate, acuminate, herbaceous, 5-30 × 2-3 cm. Inflorescence terminal, densely racemose, simple or very rarely lax and branched; 25-60 cm long. Bracts sessile, lanceolate or linear. Pedicels 1.0-2.5 cm long. Calyx-teeth linear-subulate, remotely few gland-dentate, 11-16 mm long. Corolla bluish-violate; dorsal lobes falcate-linear, 18-27.5 mm long, lateral and ventral lobes lanceolate, 12.0-15.0 mm long, tube 15-22 mm long. Filaments 21-24 mm long, basally free for one-third of the length; anthers 5.5-7.5 mm long. Styles 23-27 mm long. Capsules broadly obovoid or subglobose, 4-6 × 6-9 mm. Seeds oblong, oblong-ovoid or globose, ± 0.5-0.7 mm long.

*Type* : Neelagiri (Nalgiri), *Leschenault* in *Wall. List* n. 1305 (K, Microfiche!).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : Tamil Nadu and Kerala; SRI LANKA.

*Ecol.* : Grows on forest edges, forest clearings, on roadsides etc. at elevations between 1150-2440 m.

*Uses* : Leaves used as masticatory (Moon, Cat. Pl. Ceyl. : 14. 1821); leaves smoked as Tobacco (R. N. Chopra *et al.* Gloss. Ind. Med. Pl. : 156. 1956); leaf-infusion spray for control of aphids and mites on vegetable crops (R. N. Chopra *et al.* Suppl. Gloss. Ind. Med. Pl. : 58. 1969).

10. **Lobelia microcarpa** Clarke in Hook. f., Fl. Brit. India 3 : 424. 1881; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:574. 1953. *L. alsinoides* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:126. 1960, *p.p.*; non Lamk. 1792. Bennet Fl. Howrah Dist. : 366. 1975. *p.p.*

Annual branching herbs, 7.5-12.5 cm tall. Leaves lower short-petiolate, upper sessile and bracteiform, elliptic-ovate, elliptic-oblong or linear, rounded

to caudate at base, crenate-dentate, obtuse to acuminate, 3-13 × 1-8 mm. Flowers in lax racemes. Pedicels 3-18 mm long. Calyx-teeth narrowly linear, ± 1.75 mm long. Corolla blue, dorsal lobes subfalcate, ± 1.25 mm long, lateral and ventral lobes ovate, ± 0.5 mm long, tube 2-3 mm. Filaments 2.5-3.0 mm long, free at the base for one third of the length, 2 anterior ciliate; anthers 0.5-0.75 mm long. Styles 2.0 mm long. Capsules subglobose, 2.0 mm in diam. Seeds ± 0.3 mm long.

*Type* : "Tenasserim and Andamans" — *Helper* Kew dist. n. 3447 (Isosyntype : CAL !); Moulmeyn — *Lobb* 846 (Syntype, Photograph K !).

*Distrib.* : INDIA : West Bengal and Andaman & Nicobar Islands; BURMA, LAOS, JAVA.

*Notes* : *L. microcarpa* has been treated as a synonym of *L. alsinoides* by Moeliono (1960) but is differentiated by its erect stem, ebracteolate pedicels and smaller flowers.

11. *Lobelia mishmica* Clarke in Hook. f., Fl. Brit. India 3:426. 1881; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:654. 1953.

Annual erect, pubescent, branched herbs, stems terete, fistular. Upper leaves petiolate; elliptic, alternate at base, obsolete dentate or denticulate, subacute, sparsely pilose on both surfaces, 17-32 mm; petioles up to 3.0 mm. Racemes leafy, elongate, ± 38 cm long. Bracts petiolate. Pedicels ± 6 mm long. Calyx-teeth linear-lanceolate, gland-denticulate, 5-7 mm long. Corolla purple-red. Capsules globose, hirsute, 5.0 mm in diam. Seeds 0.3 mm long.

*Type* : Mishmee (Mishmi mts.) Premsonge — *Griffith* Kew dist. n. 3446 (Photograph K !).

*Distrib.* : INDIA : (Mishmi mts.); endemic.

*Notes* : No specimen of this species could be located in the Indian herbaria.

12. *Lobelia nicotianacfolia* Roth ex Roem. & Schult. Syst. Veg. 5:47. 1819; Wall. in Roxb. Fl. Ind. (ed. Carey & Wall.) 2:110. 1824; A. DC. in DC., Prodr. 7:381. 1839; Wt. IC. 2:111, t. 135. 1850. Clarke in Hook. f., Fl. Brit. India 3:427. 1881, incl. var.; Cooke, Fl. Pres. Bombay 2:72. 1904 (Repr. ed. 2:131. 1958); Gamble, Fl. Pres. Madr. 2:736. 1921, incl. var. (Repr. ed. 2:518. 1957); Skottsb. in Act Hort. Bot. Gothob. 4:9, f. 8-11. 12b. 1928; Wimmer in Engl. Diels, Pflanzenr. Heft 107:643. 1953 incl. var. *trichandra*; Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960, non Roth ex Roem. & Schult., *p.p.*; Ramamoorthy, in Saldanha & Nicolson, Fl. Hassan Dist. : 568. 1976, *L. trichandra* Wt. Ic. 4:t. 1171. 1848; Skottsb. in Act. Hort. Bot. Gothob. 4:16, f. 12d & 18. 1928. *L. courtallensis* Nair in Proc. Ind. Acad. Sci. 87(B):105. 1978, *syn. nov.*

*Local Names* : Kadu-hogge-soppu (Kan.); Kattupokala (Mal.); Bokenal, Deonal, Dhawal (Mar.); Devanala (Sansk.); Rasnee (Sinh.); Kattupokalai, Upperchedi (Tam.); Adavipogaku (Tel.).

Erect, pachycaulous pubescent, herbs, 200 cm tall. Stems occasionally branched near the apex. Lower leaves petiolate, lanceolate or narrowly elliptic, 11.5-38.0 × 3.8-7.0 cm; petioles 1.0-1.9 cm; upper leaves petiolate or sessile, petioles up to 4.0 mm long; lanceolate or linear-lanceolate, tapering at the base, serrate, sinuate-dentate, dentate or gland-denticulate, acute or acuminate, 2.8-15.5 × 0.8-3.1 cm. Inflorescence a simple or branched, dense or lax raceme. Flowers bracteate, pedicellate. Bracts lanceolate, lower longer and upper shorter than the flowering pedicels, 9.0-30.0 mm long. Calyx-teeth linear, acute, remotely few gland-denticulate, 8.5-13.5 mm long. Dorsal lobes of the corolla falcate-linear, 14.0-25.0 mm long, lateral and ventral lobes lanceolate or lanceolate-ovate, 5.0-8.5 mm long; tube 12-25 mm long. Filaments 11.5-16.5 mm long, basally free for one-third of the length; anthers densely pilose to glabrous on their backs, 3.5-6.0 mm long. Styles 17.0-22.0 mm long. Capsules broadly subglobose, 6-9 mm in diam. Seeds ellipsoid or ovoid, ± 0.4 mm long.

*Type* : India Orientali, 1818, B. Heyne in Wall. List n. 1304 (K, Microfiche!).

*Fls. & Frts.* : Nov.-July

*Distrib.* : INDIA : Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu; SRI LANKA.

*Ecol.* : Grows in evergreen forests, on roadsides etc. of the hills and mountains at elevations between 750-2000 m above sea level.

*Chr. No.* : n=14 (Kausik in Journ. Ind. Bot. Soc. 17:161-67. 1938).

*Uses* : Infusion of leaves used for asthma, stomach ailments, and as an antispasmodic. Leaf-dust irritates the nostrils and throat like tobacco. Leaves and seeds contain an acro-narcotic poison, the alkaloid "lobeline". Seeds preferred to Datura poison. Roots used in scorpion-biting. The dried hollow sticks used as Koluri horns (called "panwa" in the Konkan) for collecting herds of cattle and for scaring wolves (Watt, Dict. Econ. Prod. India 5:86-87. 1891; Rama Rao, Fl. Pl. Travancore : 230. 1914; R. N. Chopra *et al.* Gloss. Ind. Med. Pl. : 156. 1956).

*Notes* : A large number of specimens of var. *trichandra* from Peninsular India, which could be examined, varied much in stature, indumentum of the stem, flower size, hairiness of the anthers on their backs and often could not be separated from the typical variety. Hence the former is merged with *L. nicotianaeifolia* following Moeliono (1960), though his lumping of many other species into a single entity is not agreed to by us.

13. *Lobelia pyramidalis* Wall. in As. Res. 13:376. 1820; D. Don, Prodr. Fl. Nepal. 157. 1825, *p.p.*; A. DC. in DC., Prodr. 7:381. 1839, var. *β*; Clarke in Hook.

f., Fl. Brit. India. 3:426, 1881, *p.p.*; Skottsbo. in Act. Hort. Gothob. Bot. 4:17 & 21, f. 12c & 25-31, 1928; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:646, 1953; Hara, Fl. East. Himal. Rep. 1:327, 1966; Sengupta and Malick in Rec. Bot. Surv. India 20:135, 1973. *Repuntium wallichianum* Presl, Prodr. Monogr. Lobel : 24, 1836. *Lobelia wallichiana* (Presl.) Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2:29, 1858. *L. stimulens* Buch.-Ham. ex D. Don Prodr. Fl. Nepal : 157, 1825. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123, 1960. *p.p.*; non Roth ex Roem. & Schults.; Balakr., Fl. Jowai 278, 1981, *p.p.*

*Local name* : Atia Chao (Kh.); Yakley Bir (Nep.).

Glabrous, erect, branching herbs, 30-65 cm tall. Stem fistular. Leaves sessile, oblanceolate to linear-lanceolate, tapering at base, callose-denticulate or serrulate, acute to acuminate, glabrous, 3.0-16.2 × 0.4-1.8 cm. Inflorescence paniculate. Bracts fused with the pedicels for up to 1.0 mm, entire or serrulate, 1.0-4.2 × 0.1-0.5 cm; pedicels 6.0-18.0 mm long. Calyx-teeth linear, acuminate, 8-12 mm long. Corolla white to pale-lilac, densely pilose within the tubular region; dorsal lobes falcate-linear, 9.5-12.0 mm long, lateral and ventral lobes lanceolate, 4.5-5.0 mm long, tube 7-12 mm long. Filaments 7.5-8.5 mm long, basally free for one-third of the length, free margins short-ciliate; anthers pilose on their backs, 3.0-1.5 mm long. Styles 9-11 mm long. Capsules subglobose, glabrous, 4-7 mm in diam. Seeds oblong, oblong-ellipsoid to ellipsoid, 0.3-0.5 mm long.

*Type* : Nepalia, Wall. List n. 190/2 (K, microfiche !).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland and Manipur; NEPAL, BHUTAN, UPPER BURMA.

*Ecol.* : Grows in moist soil, on dry rocks, specially in temperate mountain zones, at elevations between 564-2135 m.

*Uses* : Used in Nepal as a stimulant; cultivated as an ornamental (Wimmer *ibid.* Heft 106:29, 30, 1943).

14. *Lobelia rosea* Wall. in Roxb. Fl. Ind. (ed. Carey & Wall.) 2:115, 1824 et Pl. As. Rar. 2:42, t. 152, 1831; A. DC. in DC., Prodr. 7:381, 1839; Clarke in Hook. f., Fl. Brit. India 3:427, 1881; Wimmer in Engl. & Diels, Pflanzenr. Heft 107:653, 1953; Sengupta & Malick in Rec. Bot. Surv. India 2:136, 1973. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123, 1960, *p.p.* non Roth ex Roem & Schult.; Balakr., Fl. Jowai 278, 1981, *p.p.*

*Local name* : Dudhiya, Duduyen, Surtipatey (Nep.)

Annual, villous, branching herbs, 15-40 cm tall. Leaves lower petiolate, upper sessile; petioles upto 2.0 cm long; lamina lanceolate or oblong-lanceolate, cordate, acute, puberulous to tomentose on the upper surface and sparsely to densely tomentose on the lower surface, 3.7-17.0 (-30.0) × 0.8-4.0 cm. Inflorescence

terminal or lateral panicles. Bracts sessile, lanceolate to linear-lanceolate, 1.0-2.4 × 0.4-1.0 cm. Pedicels 5.0-12.0 mm long. Calyx teeth linear, 6.0-14.5 mm long. Corolla rosy; dorsal lobes falcate-linear, 14-16 mm long, lateral and ventral lobes ovate or lanceolate-ovate, 4.5-8.0 mm, tube 12-18 mm long. Filaments 11.0-12.0 mm long, basally free for upto half of the length; anthers densely pilose on their backs, 3.0-3.5 mm long. Styles 14-16 mm long. Capsules 8-10 × 5-7 mm. Seeds ellipsoid, ± 0.3 mm long.

*Type* : Nepal, Noakote, March 2, 1821, *Wallich's Collector* (?) in *Wall. List n.* 1301 (K, Microfiche !).

*Fls. & Frts.* : Sept.-May.

*Distrib.* : INDIA : Uttar Pradesh, West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur; NEPAL, BHUTAN, BANGLADESH, LAOS.

*Ecol.* : Grows in damp forests, at elevations between 610-2440 m.

15. *Lobelia terminalis* Clarke in Hook. f., *Fl. Brit. India* 3:424. 1881; Prain, *Beng. Pl.* 1:633. 1903 (Repr. ed. 1:466. 1963); Haines, *Bot. Bih. & Or.* 2:500. 1922 (Repr. ed. 2:525. 1961); Wimmer in *Engl. & Diels, Pflanzenr. Heft* 107:573. 1953. *L. alsinoides* Moeliono in van Steenis, *Fl. Males. Ser. 1*, 6:120. 1960, *p.p.* non Roth ex Roem & Schults., 1819 non Lamk. 1792; Bennet, *Fl. Howrah Dist.* 366. 1975, *p.p.*

Herbs, upto 5.5-25 cm tall with angular stems. Leaves sparse (crowded in var. *minuta*) lower petiolate, upper sessile and bracteiform; petioles up to 1.5 mm long; lamina ovate or rhomboid-ovate, truncate to caudate at base, sharply dentate, acute, 2-12 × 1-18 mm. Flowers solitary, mostly from the upper axils. Pedicels 5-25 mm long. Calyx-teeth subulate, 0.75-1.5 mm long. Corolla bluish-violet or purple-tinged; dorsal lobes falcate-oblong, ± 1.0 mm long, lateral and ventral lobes oblong-ovate, ± 0.5 mm long, tube ± 2.5 mm long. Filaments 2.0-2.2 mm long, lower half of the length free, 2 anterior ciliate; anthers 0.5-0.7 mm long. Styles 2.0-2.5 mm long. Capsules globose, 2.0-2.5 mm in diam. Seeds ± 0.3 mm long.

#### KEY TO THE VARIETIES

- 1a. Stems few branched, branches ascending;  
Leaves sparsely arranged var. *terminalis*
- 1b. Stems much branched, branches spreading;  
Leaves closely arranged var. *minuta*

var. *terminalis*

*Type* : W. Mymensingh, Bhyadanga, 20 Nov. 1868, *C. B. Clarke* 8044 (Isotype CAL !).

*Distrib.* : INDIA : Bihar, West Bengal. Madhya Pradesh; LAOS, THAILAND.

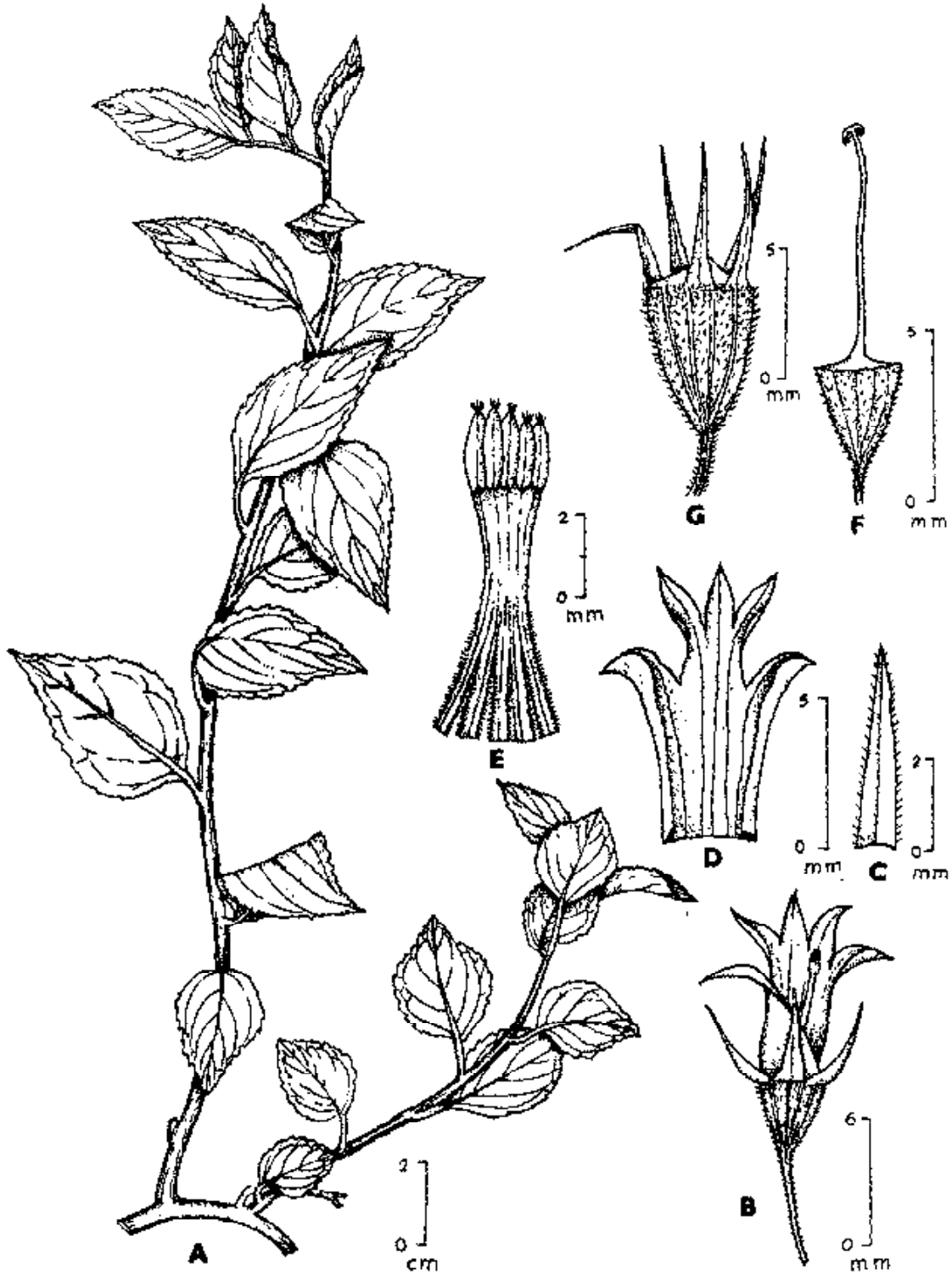


Fig. 12 *Lobelia seylonica* Linn.

A. Habit. B. Flower. C. Calyx-teeth. D. Corolla-spreadout. E. Stamens-split open.  
F. Pistil. G. Fruit.

*Chr. No.* :  $n=7$  (N. K. Bhattacharya, *Cytologia* 37(3):435-443. 1972).

*Ecol.* : Grows in damp soil, meadows, near lakes, among grasses at the foot of hills etc. upto an elevation of 8000 m from sea level.

*Notes* : *L. terminalis* has been merged with *L. alsinoides* by Moeliono (*l.c.*) but can be easily separated from the latter by its pubescence, inconspicuous bracteoles and smaller flowers.

var. *minuta* Clarke in Hook. f., *Fl. Brit. India* 5:424. 1881; Wimmer in Engl. Diels, *Pflanzenr. Heft* 107:574. 1953.

Prostrate herbs, 2.5-5.0 cm tall with closely arranged leaves.

*Type* : Darjeeling Terai, Phansidowa, 500 ft, 17 Dec. 1876, C. B. Clarke 31778 (Photograph K !).

*Fls. & Frts.* : Nov.-Feb.

*Distrib.* : INDIA : West Bengal, Sikkim, endemic.

16. *Lobelia zeylanica* Linn. *Sp. Pl.* : 932. 1753; Moeliono in van Steenis, *Fl. Males. Ser. 1*, 6:128. 1960; Hara, *Fl. East. Himal. Rep.* 1:328. 1966. *L. hirta* Wall. in Roxb. *Fl. Ind.* (ed. Carey & Wall.) 2:113. 1824. *L. affinis* Wall. ex G. Don *Gen. Hist.* 3:709. 1834, non Mirbach, 1805; A. DC. in DC., *Prodr.* 7:360. 1838; Clarke in Hook. f., *Fl. Brit. India* 3:424. 1881, incl. var.; Prain, *Beng. Pl.* 1:633. 1903 (Repr. ed. 1:466. 1963); Haines, *Bot. Bih. & Or.* 2:500. 1922 (Repr. ed. 2:525. 1961); Biswas, *Pl. Darjeeling and Sikkim Himal.* 1:493. 1966. *L. succulenta* Blume, *Bijdr.* 728. 1826; A. DC. in DC., *Prodr.* 7:373. 1839; Wimmer in *Ann. Naturh. Mus. Wien* 56:361. 1948, incl. var. et in Engl. & Diels, *Pflanzenr. Heft* 107:576. 1953, incl. var. Fig. 12

Stems trigonous throughout or terete at base and trigonous upwards, pubescent or rarely glabrous. Leaves petiolate; petioles 1.5-14.0 mm long; broadly ovate, or elliptic-ovate, cordate, truncate or rounded at base, mucronulate-dentate or dentate, acute or obtuse, puberulous or pubescent on both surfaces, 10-42 × 5-28 mm. Flowers solitary, axillary, basally 2-bracteolate, shorter or up to three times longer than the subtending leaves; pedicels 12-15 mm long. Calyx-teeth linear-lanceolate, subulate, 3.5-8.0 mm long. Corolla violet to purple; dorsal lobes subfalcate, oblong-ovate, 2.5-3.0 mm long; lateral and ventral lobes oblong-ovate to lanceolate, 2.0-2.5 mm long, tube ± 6 mm long. Filaments 4.0-8.0 mm long, free at base for upto three-fourth of the length; anthers 1.5-1.0 mm. long. Styles 5.5-7.5 mm long. Capsules obconical to obovoid, sparsely pilose, 4.0-6.0 × 3.0-3.5 mm. Seeds ± 4 mm long.

*Type* : *Zeylanica, Osbeck (?) s.n.* (LINN Microfiche !).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : Bihar, West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Madhya Pradesh; BANGLADESH, SRI LANKA, CHINA, LAOS, VIETNAM, THAILAND, MALAYSIA, SINGAPORE, JAVA, BORNEO, NEW GUINEA, FIJI ISLANDS.

*Pollen* : 3 colpate; subprolate,  $26.0 \times 22.0 \mu$  in size. Exine  $2.0 \mu$  thick, sexine striate.

*Ecol* : Grows in open or shady moist soils, river banks, mountain slopes, hedges of rice fields etc. at elevations upto 1830 m.

*Uses* : Leaves boiled and eaten as a vegetable with rice (Moeliono *l.c.*)

*Notes* : The name *Lobelia zeylanica* is a much confused one in literature. However, Moeliono's (1960) clarification about the applicability of the name is followed here.

The variety *lobbiana* is merged here with *L. zeylanica*, as the large number of specimens which could be studied, exhibited a wide range of leaves and flowers, especially varying in their size and not always according to a definite pattern. Hence Moeliono's *l.c.* merger of the two is accepted here.

### DOUBTFUL SPECIES

1. *Lobelia camptodon* Wimmer in Ann. Naturh. Mus. Wien 56:366. 1948, et in Engl. & Diels, Pflanzenr. Heft 107:637. 1953. *L. excelsa* Wight, Ic. 4:t. 1173-74. 1850, non Leschen. ex Roxb 1824; Clarke in Hook. f., Fl. Brit. India 3:427. 1881, *p.p.*, ex *L. nicotianaefolia* Roth ex Roem. & Schult. var. *Macrostemon* Skottsb. in Act. Hort. Bot. Gothob. 4:13, f. 14. 1928. *L. nicotianaefolia* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:123. 1960, *p.p.* non Roth ex Roem. & Schults. 1819.

Wimmer described this species by raising the variety *macrostemon* Skottsb. of *L. nicotianaefolia*, and doubtfully referred this plant to Nilgiri hills. He distinguished this species from *L. nicotianaefolia* by its much longer filaments (26 mm) and also cited *L. excelsa* Wt. as a synonym. The type specimen (Ceylon, Thwaites 2592 — Isotype, GOËT), whose photograph could be examined, also did not differ much from the typical *L. nicotianaefolia* specimens from Peninsular India. The filament length for the Indian specimens varied from 11.0-16.5 mm. Hence the occurrence of the species *L. camptodon* in India is doubted.

### 3. PRATIA

Gaud. in Ann. Sc. Nat. 5:103. 1825; A. DC. in DC., Prodr. 7:340. 1839; Benth. in Benth. & Hook. f., Gen. Pl. 2:550. 1876; Hook. f., Fl. Brit. India 3:422. 1881; Wimmer in Engl. & Diels, Pflanzenr. Heft 106:104. 1943. *Piddingtonia* A. DC. in DC., Prodr. 7:341. 1839. *Speirema* Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2:27. 1858.

Annual or perennial, weak, prostrate, or tall, erect and robust herbs. Leaves alternate, sessile or petiolate. Flowers pedicellate, solitary, axillary or rarely in terminal or lateral racemes. Hypanthium globose to ellipsoid. Calyx-teeth 5, equal or slightly unequal, patent, rarely reflexed, ovate, oblong to



linear, entire, dentate or serrate. Corolla tube dorsally cleft upto the base or upto three-fourth of the length from the base; limb 5-partite, dorsal lobes 2, lateral lobes 2 and ventral lobe 1, dorsal lobes united with the lateral lobes and the lateral lobes united with the ventral lobe for various degrees. Stamens 5, alternating with the corolla-lobes. Filaments free at their bases for various degrees and connate above; two anterior anthers setose or penicillate at apices, glabrous to sparsely pilose on their backs. Ovary 2-carpellary; style 1, stigma 2-lobed or emarginate. Berrys fleshy, round or slightly depressed at apex, crowned by the calyx-teeth. Seeds many, minute, ellipsoid or globose.

*Type* : *Pratia repens* Gaud.

*Distrib.* : C. 26. species (Wimmer *l.c.* 105. 1943) in Australia, New Zealand, Philippines, Malaysia, Sri Lanka, India, China, Africa, and America. 3 species in India; 1 endemic.

*Ecol.* : Found in moist forests, mountains, grasslands, and open fields.

#### KEY TO THE SPECIES

- 1a. Rambling erect herbs rooting at the base:
- 2a. Leaves glandular-denticulate, entire towards the base;  
Pedicels 5-8 cm long, 2-bracteate *P. longipedicellata* 1.
- 2b. Leaves serrulate or denticulate on the margins;  
Pedicels 0.7-4.4 cm long, ebracteate .. *P. montana* 2.
- 1b. Weak fleshy trailing herbs rooting at the nodes ... *P. nummularia* 3.

1. *Pratia longipedicellata* (Fischer) Wimmer in Engl. & Diels, Pflanzenr. Heft 108:833. 1968. *Lobelia longipedicellata* Fischer in Kew Bull. 1940:298. 1941.

Glabrous herbs upto 1.0 m tall. Stem simple, fistular, striate, 5.0 mm in diam. Leaves petiolate; petioles thick, 5-10 mm long; lamina oblong-lanceolate, caudate, obtuse to acuminate; minutely translucent-dotted, yellowish-green, glabrous, 5-15 × 1.3-3.5 cm. Flowers solitary, from the axils of the upper leaves, absent in the uppermost-axils. Pedicels 2-bracteate, 5-8 cm long; bracts linear, caducous, 2-15 mm long. Calyx-teeth linear-lanceolate, obtuse or subacute, entire or subdenticulate, 1-3 × 3.5-5.3 mm, corolla dark purple, puberulous below, 15-18 mm long; dorsal lobes linear, 11 mm long, lateral and ventral lobes lanceolate, 7-8 mm long. Stamens 14 cm long; filaments ciliate at base; anthers glabrous on their backs, 5 mm long. Styles stout, pubescent just below the stigma; stigma 2-lobed. Berrys subglobose, 8 mm in diam. Seeds ± 0.7 mm long.

*Type* : Assam, Delei valley, 28°21' N, 96°37' E, 9-7-1928, F. Kingdon-Ward 8445 (K, Holotype, photograph!).

*Fls. & Frts.* : October.

*Distrib.* : INDIA : Assam, Delei valley; endemic.

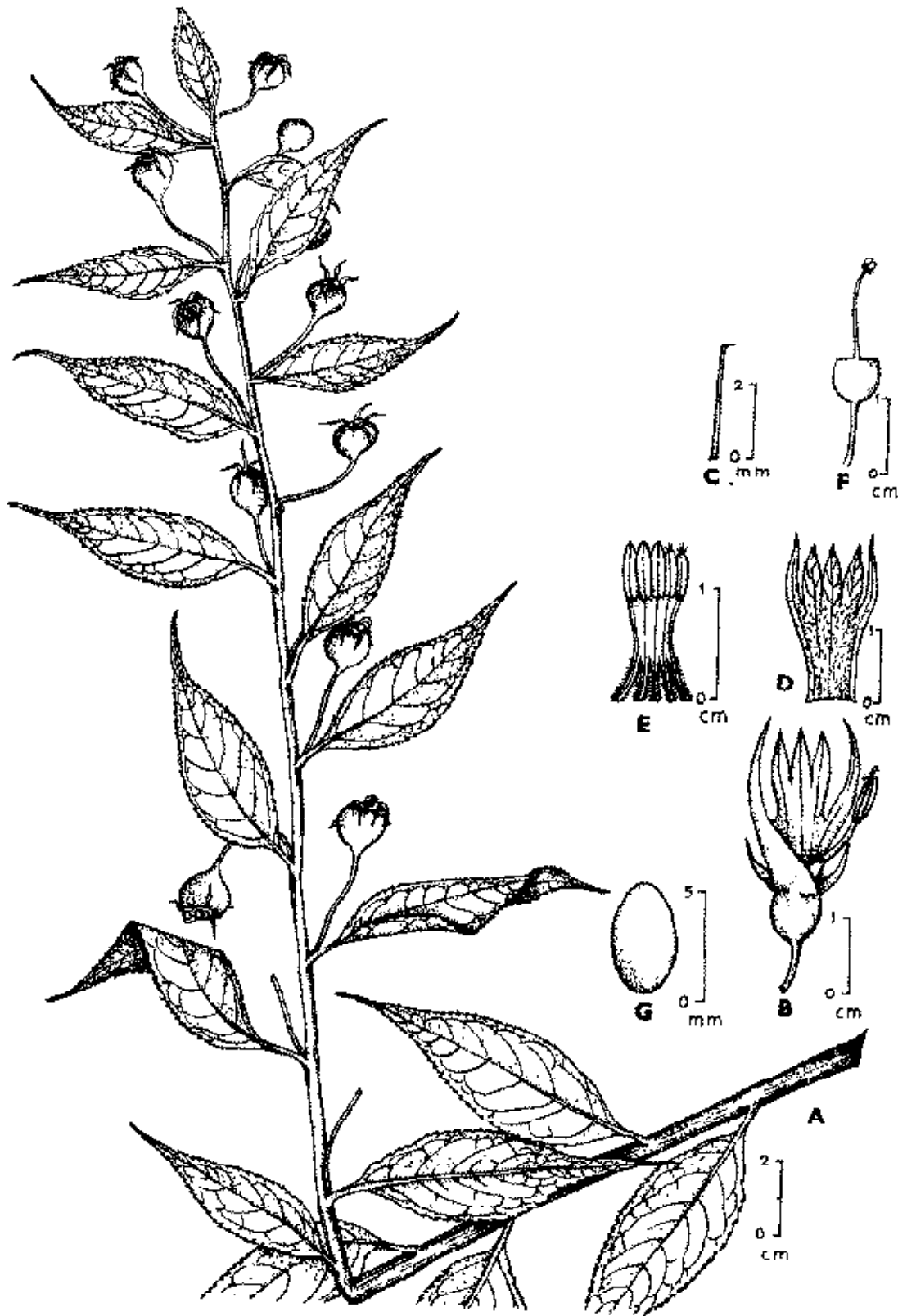


Fig. 13 *Pratia montana* (Reinwdt, ex Bl.) Hassk.

A. Habit. B. Flowers. C. Calyx-teeth. D. Corolla-spreadout. E. Stamens-split open.  
F. Pistil. G. Seed

2. *Pratia montana* (Reinw. ex Bl.) Hassk. *Flora* 25(2), Beibl. 2:23. 1842; Clarke in Hook. f., *Fl. Brit. India* 3:423. 1881; Wimmer in Engl. & Diels, *Pflanzenr. Heft* 106:116. 1943; Biswas, *Pl. Darjeeling and Sikkim Himal.* 1:492. 1966; Hara, *Fl. East. Himal. Rep.* 1:328. 1966, et *Rep.* 2:131. 1971. *Lobelia montana* Reinw. ex Bl. *Bijdr.* 728. 1825; A. DC. in DC., *Prodr.* 7:386. 1839; Moeliono in van Steenis, *Fl. Males. Ser. 1*, 6:132. 1960; Rao & Balakr. in *Rec. Bot. Surv. India* 20(2):136. 1973. *Speirema montana* (Reinw. ex Bl.) Hook. f. & Thoms. in *Journ. Linn. Soc. Bot.* 2:27. 1858. *Lobelia deleiensis* Fischer in *Kew Bull.* 207. 1941. *L. wardii* Fischer, *Ibid.* 298. 1941. *Pratia montana* var. *deleiensis* (Fischer) Wimmer in Engl. & Diels, *Pflanzenr. Heft.* 107:833. 1953. *P. wardii* (Fischer) Wimmer l.c. Fig. 13

Stems simple or branched, glabrous, 3-12 dm. Leaves alternate, petiolate, elliptic, oblong-elliptic or lanceolate, attenuate, serrulate or denticulate, glabrous, rarely puberulous on the lower surface, 2.8-17.6 × 0.3-5.8 cm; petioles 2-11 mm long. Flowers solitary; almost from every upper axil. Pedicels upcurved at the apex, shorter than the subtending leaves, 7-44 mm long. Calyx-teeth linear or linear-lanceolate, entire, acute, often reflexed at apex, 4.0-13.5 mm long. Corolla greenish-white, greenish-blue or violet with two purple gibbositities inside, pilose within the tubular region; tube 13-22 mm long; dorsal lobes lanceolate-linear to linear, 8-12 mm long, lateral and ventral lobes lanceolate or oblong-lanceolate, 7-8 mm long. Filaments basally free for upto half of the length, ciliate on the free margins, 6.5-8.5 mm long; anthers yellow, two anterior setose at apex; glabrous to puberulous on their backs, 6.5-3.5 mm. Styles 10-13.5 mm long. Berries bright yellowish to dark purple, globose, depressed at apex, 8-14 mm in diam. Seeds ellipsoid, ± 0.5 mm long.

*Type* : Without any precise locality, *Reinwardt s.n.* (L, Photograph!).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : West Bengal, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Tripura; S. CHINA, VIETNAM, MALAYSIA, SUMATRA, JAVA.

*Ecol.* : Grows in moist shady forests, open glades, roadsides etc., forming clumps at elevations between 366-2897 m.

*Uses* : Cultivated as an ornamental (Wimmer l.c. : 30. 1943).

*Notes* : *P. wardii* and *P. montana* var. *deleiensis* are treated synonymous to *P. montana* unlike Wimmer (1968) as the distinguishing characters are too meagre.

3. *Pratia nummularia* (Lam.) A. Br. & Aschers. *Index Sem. Hort. Berol. Append.* 6. 1861; Kurz in *Journ. As. Soc. Beng.* 46(2):210. 1877; Wimmer in Engl. & Diels, *Pflanzenr. Heft* 106:112. 1943; Hara, *Fl. East. Himal. Rep.* 1:328. 1966. *Lobelia nummularia* Lam. *Encycl. Bot.* 3:589. 1792. *L. begonifolia* Wall. in *As. Res.* 13:377. 1820; Wall. in Roxb. *Fl. Ind.* (ed. Carey & Wall.) 2:115. 1824; Wall. *Pl. As. Rar.* 2:43. 1831. *Pratia begonifolia* (Wall.) Lindl. *Bot. Reg.* 16:t. 1373. 1830; Clarke in Hook., *Fl. Brit. India* 3. 422. 1881;

Gamble, Fl. Pres. Madr. 2:735. 1921 (Repr. ed. 2:518. 1957); Biswas, Pl. Darjeeling and Sikkim Himal.: 492. 1966. *Piddingtonia nummularia* (Lamk.) A. DC. in DC., Prodr. 7:341. 1839. *Lobelia angulata* Moeliono in van Steenis, Fl. Males. Ser. 1, 6:133. 1960, *p.p.*, non Forst; Balakr. Fl. Jowai 278. 1981, *p.p.*

*Local name* : Ingmachin (Kh.) Nilo Ghodtapre, Tofnephoga (Nep.).

Pubescent herbs. Leaves alternate, petiolate; petioles 2-14 mm long; lamina rotundate-ovate, suborbicular, often unequally 2-lobed by the oblique midvein, cordate to reniform at base, mucronulate-dentate, acute or obtuse, glabrous or pubescent, 5-23 × 5-28 mm. Flowers solitary, axillary. Pedicels glabrous, 5-97 mm long. Hypanthium ellipsoid tapering into the pedicels, 2.5-4.5 × 1.0-1.5 mm. Calyx-teeth linear, remotely few-denticulate. Corolla greenish-white to purple, 4-8.5 mm long; dorsal lobes falcate, acute, 3.25-5 mm long, lateral and ventral lobes ovate to oblong-ovate, acute, 3-3.5 mm long. Filaments free upto two-third of the length, two anterior pubescent on the margins; anthers greyish or bluish-black, two anterior few setose at apex, and posterior three glabrous, puberulous on their backs, 1.0-0.75 mm long. Styles 3.0-5.5 mm long. Berrys dark-violet or purple, ellipsoid, 5.5-11.0 mm long and 4.5-10.0 mm broad. Seeds broadly ellipsoid, ± 0.5 mm long.

*Type* : Ex Java — Comerson (P, Microfiche!).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Tamilnadu; BANGLADESH, NEPAL, BHUTAN, CHINA, BURMA, VIETNAM, THAILAND, MALAYSIA, PHILIPPINES, SRI LANKA.

*Chr. No.* : 2n=12 (Hsu, C.C. *Taiwania* 14:11-27. 1958).

*Ecol.* : Grows on marshy soil, side walls, nallahs, rocks etc., at elevations between 475-3050 m.

*Uses* : H. G. Carter (1678 CAL) has mentioned that the plant makes "good poultices when mixed with Ginger and Tobacco"; cultivated as an ornamental (Wimmer (*l.c.*) : 30. 1943); pounded leaves used by Javanese for treatment of sprue (R. N. Chopra *et al.*, *Suppl. Ind. Med. Pl.* : 383. 1969).

*Notes* : *Pratia nummularia* was merged with *Lobelia angulata* Forst. [= *P. angulata* (Forst.) J. D. Hook. by Moeliono (1960).

The former is a creeping herb, rooting at nodes having triangular-mucronulate-dentate leaves with cordate to reniform bases while the latter is a prostrate form rooting at the base possessing repand-dentate subentire or obscurely denticulate leaves with cuneate bases. *P. nummularia* is widely distributed from the Eastern Himalayas to Java whereas *P. angulata* is confined to the New Zealand islands. It is considered that the two species are quite distinct as suggested by Wimmer (*l.c.*).

## MALVACEAE

Juss. Gen. Pl. 271 1789

T.K. Paul\* and M.P. Nayar\*

Annual or perennial herbs to shrubs, rarely trees, woody climber (*Hibiscus scandens* Roxb.). Stems usually fibrous with mucilaginous sap, bark with dilated rays. Indumentum almost always stellate hairy or with lepidots, simple hairy, sometimes also gland hairs. Leaves alternate, petiolate, simple, entire to variously lobed or dissected, sometimes with extra-floral nectaries on the veins beneath. Stipules present. Flowers actinomorphic, bisexual, rarely unisexual or sub-dioecious (*Kydia*), axillary, 1 to many-flowered, sometimes disposed in terminal racemose spikes in consequence of the upper leaves being absent, pentamerous. Calyx connate in the middle or below, valvate, lobed or rarely entire or spathaceous, sometimes with nectaries on the veins outside, persistent or caducous, sometimes accrescent, often subtended by persistent epicalyx, epicalyx segments 3 to many, free or connate, subulate to leafy. Corolla convolute or less commonly imbricate, adnate to the base of the staminal column and falling off with it, usually the limb of petals asymmetric. Stamens numerous, monadelphous which surrounds the ovary and style, apex of the staminal column 5 toothed (tribe *Hibisceae* and *Ureneae*) or entire; anthers dorsifixed, monothecal, pollen echinate. Ovary superior, 3-5 or many loculed; ovules 1-many per locule in axile placentation: styles as many as or twice as many carpels, often united to various degree with an equal number of stigmas which are more or less distinct or almost united. Fruit a capsule or schizocarp or rarely anomalous kind of berry (*Malvaiviscus*). Capsule 3 to many seeded; mericarps 1-many seeded. Seeds albuminous, hairy or glabrous, embryo straight with a terete radicle and yellow twisted cotyledons.

*Distrib* : 88 genera and c. 2300 species distributed in the tropics, subtropics and temperate regions of the World. 24 genera and c. 104 species in India.

### KEY TO THE TRIBES

- 1a. Style branches the same number as the carpels or the style undivided and the stigma entire :
- 2a. Fruit a capsule. Staminal column 5-toothed at apex, antheriferous throughout or major portion of it :
- 3a. Carpels remain attached to one another and to the central axis at maturity. Stipules simple Tribe. *Hibisceae* 3
- 3b. Carpels separate from the central axis at maturity. Stipules lacinate or completely divided into 2 or 3 segments Tribe. *Decaschisteeae* 2
- 2b. Fruit a schizocarp, breaking into mericarps at maturity. Staminal column without teeth, apex split up into numerous anthers :

\*Botanical Survey of India, Calcutta.

- 4a. Stigmas decurrent on the adaxial side of the style; style branches filiform to narrowly clavate Tribe. *Malveae* 4  
 4b. Stigmas apical or nearly so, capitate, discoid or obliquely truncate, Tribe. *Abutilineae* 1  
 1b. Style branches twice as many as carpels Tribe. *Ureneae* 5

## 1. TRIBE : ABUTILEAE

## KEY TO THE GENERA

- 1a. Seeds 2 or more in each mericarp :  
 2a. Epicalyx segments absent :  
 3a. Carpels 1-locular, ovules 2 or more per mericarp; Flowers solitary, axillary, rarely in panicles :  
 4a. Stem erect, stout. Carpels slightly inflated or not. Mericarps more or less pointed, mucronate or aristate at the apex, wall of mericarps thick *Abutilon* 2  
 4b. Stem ascending, weak. Carpels prominently inflated at maturity; Mericarps rounded at apex, wall of mericarps thin and papery .. .. . *Herissantia* 9  
 3b. Carpels more or less divided into 2 superposed locules, ovules 3 per locule. Flowers in lax panicles .. *Wissadula* 24  
 2b. Epicalyx present .. *Modiola* 17  
 1b. Seed one in each mericarp :  
 5a. Epicalyx present .. *Malvastrum* 16  
 5b. Epicalyx absent:  
 6a. Lateral walls of the mericarp persistent or disintegrate after maturity. Leaves ovate to orbicular, lanceolate or linear *Sida* 21  
 6b. Lateral walls of the mericarp disintegrate before maturity. Leaves hastate .. *Anoda* 5

## 2. TRIBE : DECASCHISTEAE

## KEY TO THE GENUS

- Epicalyx segments 10, unequally connate below. Stipules lacinate or completely divided into 2 or 3 segments. Carpels separate from the central axis at maturity *Decaschistia* 6

## 3. TRIBE : HIBISCEAE

## KEY TO THE GENERA

- 1a. Epicalyx segments winged during fruiting, ultimately spreading:  
 2a. Flowers in dense panicles (20 to 30 flowers), small (0.8-1.5 cm across), staminal column short (c. 3 mm), 5-armed; Style 3-branched or 3 cleft at the apex; Fruit loculicidally dehiscent .. *Kydia* 11

- 2b. Flowers solitary or in short panicles of 2-5 flowers, flowers large (2.0-2.5 cm across), staminal column long (c. 10 mm), unarmed. Style 2-branched. Fruit indehiscent *Nayariophyton* 18
- 1b. Epicalyx segments not winged, rarely spreading :
- 3a. Style distally divided into 5, spreading at maturity; stigmas more or less capitate or globose :
- 4a. Calyx regularly 5-toothed or 5-lobed, not spathaceous, persistent :
- 5a. Capsule winged . . . . . *Fioria* 7
- 5b. Capsule not winged . . . . . *Hibiscus* 10
- 4b. Calyx irregularly 2-3-lobed, spathaceous, deciduous *Abelmoschus* 1
- 3b. Style undivided; stigmas ribbed or lobed :
- 6a. Epicalyx segments 3, large, leafy, cordate, persistent :
- 7a. Style branches coherent into a club-shaped mass; Seeds obovoid or angled, cottony . . . . . *Gossypium* 8
- 7b. Style branches spreading at length; Seeds reniform, pubescent with minute hairs . . . . . *Senra* 20
- 6b. Epicalyx segments 3-8, small, linear-lanceolate, mostly caducous . . . . . *Thespesia* 22

## 4. TRIBE : MALVEAE

## KEY TO THE GENERA

- 1a. Epicalyx segments free . . . . . *Malva* 14
- 1b. Epicalyx segments connate at the base :
- 2a. Epicalyx segments 3-6. Central axis of the fruit often projecting above the mericarps. Seeds smooth or transversely ribbed *Lavatera* 12
- 2b. Epicalyx segments 6-9. Central axis of the fruit not projecting above the mericarps. Seeds radially ribbed :
- 3a. Staminal column 5-angled. Flowers sessile. Corolla 3 cm or more in diameter. Mericarp sub-bilocular . . . *Alcea* 3
- 3b. Staminal column cylindrical. At least some of the flowers on conspicuous pedicels or peduncles. Corolla not more than 3 cm in diameter. Mericarp 1-loculed . . . . . *Althaea* 4

## 5. TRIBE : URENEAE

## KEY TO THE GENERA

- 1a. Flowers in dense heads intermixed with foliaceous bracts. Epicalyx absent *Malachra* 13
- 1b. Flowers solitary, axillary or in axillary clusters without foliaceous bracts. Epicalyx present :
- 2a. Fruit berry like, fleshy. Petals auriculate *Malvastrum* 15
- 2b. Fruit neither berry like nor fleshy. Petals not auriculate :

- 3a. Mericarps usually with glochidia, rarely smooth Leaves  
with nectary on the midrib beneath *Urena* 23
- 3b. Mericarps muricate or 1-3 retroseely barbed awns at the apex, never  
glochidiate. Leaves without nectary *Pavonia* 19

### 1. ABELMOSCHUS

Medic. Malv. 46. 1787; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6:49.1890; Hochr. in Candollea 2:81.1914; Kearney in Amer. Mid. Nat. 46:110. 1951; Hochr. in Taxon 4:118-119. 1955; Hutch. Gen. Fl. Pl. 2:545. 1967. *Hibiscus* sect. *Abelmoschus* (Medic.) DC. Prod. 1:449. 1824; Hochr. in Ann. Cons. Jard. Bot. Geneve 4:148. 1900.

Herbs, undershrubs or trees, often prickly hairy. Leaves palmilobed to parted, often hastate or sagittate or with pennilobed to parted segments, rarely entire, without any extrafloral nectaries. Flowers axillary or in terminal racemes by replacement of upper leaves; pedicel inarticulate. Epicalyx segments 4-16, usually free, persistent or caducous. Calyx spathaceous, lobed or toothed at the apex, split to the base on one side, dropping together with the corolla. Corolla large, mostly yellow with a dark purple centre, sometimes creamy white or pink. Staminal column included, antheriferous throughout. Ovary 5 locular, many ovuled; style 1, distally 5 armed; stigmas cushion like, discoid. Capsule ovoid to oblong or cylindrical, beaked or mucronate, loculicidally dehiscent with longitudinal slits towards the base. Seeds numerous in each locule, reniform.

*Distrib.* : C. 15 species in the tropics, subtropics and temperate regions of the Old World; 7 species in India. In the tropical America it occurs as introduced cultivated plant or as weed.

Most of the species of this genus occur in South-East Asia including Burma, Siam, Indo-China and South China which can be considered as the centre of distribution.

Two species *Abelmoschus esculentus* and *A. moschatus* are cultivated in India. The stem bark of most of the species yields tough, lustrous fibres and can be used as important genetic resources for improvement of the quality fibres. *Abelmoschus moschatus* seeds yield 'Ambrette oil' while *Abelmoschus esculentus* yields fruits usually used as vegetable. There are several varieties, cultivars and land races in the latter species. *Abelmoschus tuberculatus* and *A. tuberculatus* var. *deltoidifolius* are important wild germplasm material which can be used for crop improvement.

*Ecol.* : In India the species of this genus grow in waste lands, roadsides, grass lands, and as secondary vegetation in wet deciduous to semi-evergreen forest in tropical and subtropical regions.



## KEY TO THE SPECIES

- 1a. Epicalyx segments 6-16, linear to lanceolate, caducous after dehiscence of the capsule :
- 2a. Capsule not exceeding the epicalyx. Epicalyx segments 10-16, each 20-50 mm long *A. crinitus* 2
- 2b. Capsule exceeding the epicalyx. Epicalyx segments 6-10 (rarely 12), each 5-15 mm long :
- 3a. Capsule ovoid to oblong, upto 8 cm long *A. moschatus* 6
- 3b. Capsule long fusiform, upto 25 cm long :
- 4a. Capsule sparsely hairy or glabrescent, 7-25 cm long. Corolla 5-8 cm across *A. esculentus* 3
- 4b. Capsule densely studded with bristle bearing tubercles, 1.5-5.0 cm long. Corolla 1.5-2.5 cm across *A. tuberculatus* 7
- 1b. Epicalyx segments 4-6, ovate, caducous after dehiscence of the capsule (rarely linear to lanceolate, but caducous before expansion of the corolla):
- 5a. Epicalyx segments linear to lanceolate, deciduous before expansion of the corolla. Calyx in bud lageniform. Capsule oblong with a short beak covered with short stiff hairs . . . . *A. ficulneus* 4
- 5b. Epicalyx segments ovate, deciduous after dehiscence of the capsule. Calyx in bud ovoid. Capsule oblong-ovoid, hispid and usually prickly by long stiff hairs :
- 6a. Epicalyx segments 1.0-2.5 × 0.5-1.0 cm, free, segments shorter than the capsule *A. manihot* 5
- 6b. Epicalyx segments 2-3 × 1-2 cm, connate at the base, segments as long as the capsule or longer *A. angulosus* 1

1. *Abelmoschus angulosus* Wall. ex Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1:53. 1834; Wight, Ic. 3, t. 951. 1845; Borss. in Blumea 14:104. 1966. *Hibiscus angulosus* (Wt. & Arn.) Steud. Nomencl. ed. 2, 1:758. 1840; Mast. in Hook. f., Fl. Brit. India 1:341. 1874; Cooke, Fl. Pres. Bombay 1:111. 1903. (Repr. ed. 1:118. 1958); Gamble, Fl. Pres. Madr. 1:97. 1915 (Repr. ed. 1:70. 1957). *Abelmoschus angulosus* var. *grandiflorus* Thw. En. Pl. Zey. 26. 1858. *Hibiscus angulosus* var. *grandiflorus* (Thw.) Mast. in Hook. f., Fl. Brit. India 1:341. 1874. *Abelmoschus angulosus* var. *purpureus* Thw. En. Pl. Zey. 26. 1858. *H. angulosus* var. *purpureus* (Thw.) Mast. in Hook. f., Fl. Brit. India 1:341. 1874. *H. setinervis* Dunn in Kew Bull. 324. 1914.

*Local Name* : Makhaniyo Bhindo (Guj.).

Herbs c. 2.5 m tall, young branches with simple and stellate hairs. Leaves 3-15 cm across, 3-7 lobed; petiole longer than the lamina. Stipules 10-15 × 3-5 mm. Flowers solitary; pedicels 2-6 cm long, accrescent upto 10 cm. Epicalyx 4-5 parted, segments 2-3 × 1-2 cm. Calyx c. 3 cm long. Corolla yellow with deep purple centre, rarely white, sometimes finally deep pink; petals c. 8 × 6 cm. Capsule 3.0-4.5 × 1.5-2.0 cm. Seeds 3-4 mm long, minute hairs in concentric rings, blackish.

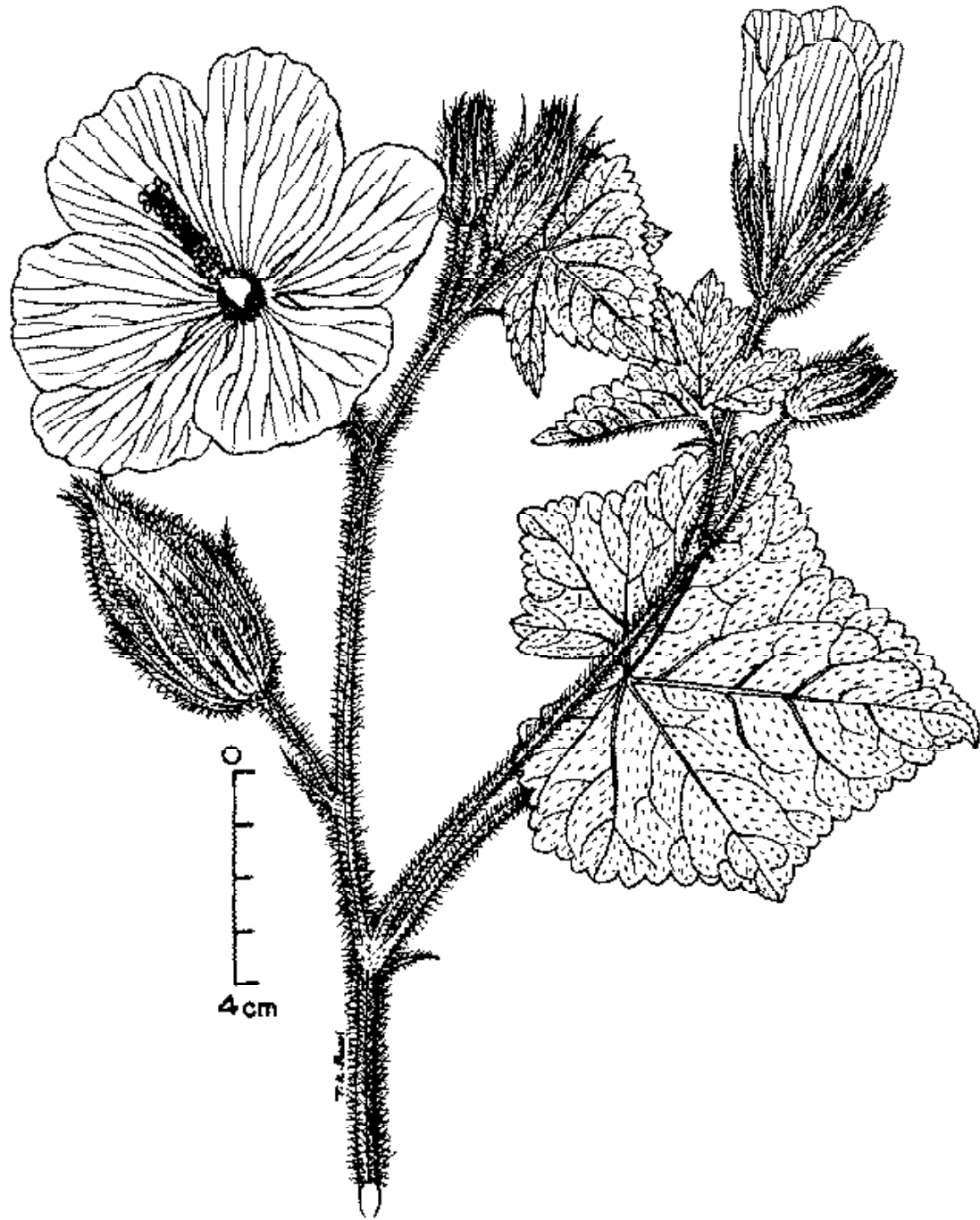


Fig. 14 *Abelmoschus crinitus* Wall.

*Type* : India : Nilgiri hills *Wallich* 1927-1 (Lectotype: K-W; Photo!).

*Fls. & Frts.* : Throughout the year particularly from November-February.

*Distrib.* : INDIA : Western & Southern Peninsular India, Gujarat, Maharashtra, Tamil Nadu, Kerala; PAKISTAN, SRI LANKA, KAMPUCHEA, LAOS, VIETNAM, SUMATRA, JAVA.

*Exsicc.* : **Tamil Nadu** : Thulukkamparai (Tirunelveli Dt.), 900 m, 17.2.1972, *Karthikeyan* 40156 (MH); **Rallia** (Nilgiri dt.), 2424 m, Oct. 1883, *Gamble* 12964 (CAL); **Bellaji dhola** (Coimbatore), 1515 m, 18.11.06, *Fischer* 1338 (CAL); **Kerala** : Kandaloor forest (Kottayam dt.), 2000 m, 24.1.1964, *Sebastine* 18440 (MH).

*Chr. No.* :  $2n=56$  (Ford in *Genetica* 31:263. 1938).

*Notes* : It is an extremely variable species regarding the shape of the leaves, colour of the corolla and indumentum. But it can be easily distinguished from the other species of this genus by its chartaceous, angular, accrescent epicalyx having 4-5 connate segments.

*Pollen* : Panporate, spheroidal, average size  $14 \mu$ ; range 140-168  $\mu$ . Pores circular (diameter  $7 \mu$ ) or slightly elliptical. Interporal distance 23  $\mu$ . Exine 4.2  $\mu$  thick, spinate (Spine: height 25  $\mu$ ; base mount-like, callose at the joint between collum and base; tip rounded; basal cushion : not formed). Columella of ectine free. In some grains spine show bifurcations at the tip, or lateral protuberances. [P.K.K. Nair in *Bull. Nat. Bot. Gard.* 63:23. 1962].

2. *Abelmoschus crinitus* Wall. *Pl. As. Rar.* 1:89, t. 44. 1830; Borss. in *Blumea* 14:103. 1966; Abedin in *Fl. W. Pak.* 130:25. 1979. *Bamia crinita* Wall. *Cat. no.* 1922. 1829 *nom. nud.* *Hibiscus crinitus* (Wall.) G. Don, *Gen. Syst.* 1:380. 1831; Rehder in *Journ. Arn. Arb.* 15:94. 1934. *B. cancellata* Wall. *Cat. no.* 1920. 1829. *nom. nud.* *H. cancellatus* Roxb. (*Hort. Beng.* 51. 1814 *nom. nud.*) *Fl. Ind. ed. Carey* 3:201. 1832. *non* L.f. 1781; Mast. in *Hook. f., Fl. Brit. India* 1:342. 1874; Duthie, *Fl. Upper Gang. Pl.* 1:92. 1903 (*Repr. ed.* 1:87. 1960); Prain, *Beng Pl.* 1:265. 1903 (*Repr. ed.* 1:181. 1963); Haines, *Bot. Bih. & Or.* 1(2) :64. 1921 (*Repr. ed.* 1:67. 1961) *A. cancellatus* (Roxb.) Voigt, *Hort. Sub. Calc.* 119. 1845. Fig. 14

Herbs c. 0.5-1.5 m tall with tuberous tap root. Stems and branches hirsute by shiny simple hairs, glabrescent. Leaves 5-8 cm across, angular or 5-7 palmilobed to palmiparted, apex of lobes acute or acuminate, base deeply cordate, margin coarsely dentate-serrate; petiole 0.5-24.0 cm long. Stipules 1-3 cm long. Pedicel 1-2 cm long, accrescent upto 4 cm. Epicalyx segments 10-16, 20-50 mm long. Calyx 2-5 cm long. Corolla yellow with purple centre; petals 4-9 × 2-4 cm. Capsule 2-4 × 2-3 cm. Seeds 3-5 mm, rusty tomentose in concentric rings throughout, rarely glabrous.

*Type* : Birma (Burma), Prome, *Wallich* 1922 (Holotype: K-W, Photo!).

*Fls. & Frts.* : July-Dec.

*Distrib.* : Throughout INDIA; PAKISTAN, BURMA, CHINA, MALESIA, PHILIPPINES.

*Exsicc.* : Uttar Pradesh : Helang (Garhwal), 1400 m, 13.8.1963, *Bhattacharyya* 29308 (CAL). Bihar : Hundrugagh (Chotanagpur), Sept. 1896, *Prain s.n.* (CAL); Palamau (Chotanagpur), Dec. 1880, *Gamble* 8894 (CAL); Meghalaya : Khasia, *Hook. f. & Thomson s.n.* (CAL).

*Notes* : It is a polymorphic species in the degree of incision of the leaves and the density of the indumentum. The capsules are more or less enclosed by the epicalyx segments.

The tuber-like swollen tap root enables the species to withstand periodic burning of the vegetation (Borssum Waalkes, 1966).

3. *Abelmoschus esculentus* (Linn.) Moench Meth. Pl. 617. 1794; Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1:53. 1834; Borss. in Blumea 14:100. 1966; Abedin in Fl. W.Pak. 130:25. 1979. *Hibiscus esculentus* Linn. Sp. Pl. 696. 1753; Mast. in Hook. f., Fl. Brit. India 1:343. 1874; Cooke, Fl. Pres. Bombay 1:112. 1901 (Repr. ed. 1:119. 1958); Duthie, Fl. Upper Gang. Pl. 1:93. 1903 (Repr. ed. 1:87. 1960); Prain, Beng. Pl. 1:265. 1903 (Repr. ed. 1:180. 1963); Haines, Bot. Bih. & Or. 1(2):65. 1921 (Repr. ed. 1:68. 1961); *H. longifolius* Willd. Sp. Pl. 3:827. 1800; Roxb. Fl. Ind. ed. Carey 3:210. 1832.

*Local Names* : Bhindi, Bhindi tori, Ram turai (Hindi); Dehras (Beng.); Binda (Guj.); Bhende (Kan.); Bhendi (Mar.); Bandai, Venda (Mal.); Venda, bendi (Tel.); Vendai (Tam.).

Herbs c. 0.5-2.0 m tall, stems and branches scattered with short stiff simple hairs, glabrescent. Leaves 4-20 × 4-25 cm, lamina variously dissected, usually 5-7 lobed, apex of lobes acute to sub-acuminate, base cordate; Petiole 4-30 cm long. Stipules c. 1 cm long, entire or 2-fid. Pedicel 5-15 mm long, accrescent upto 5 cm. Epicalyx segments 7-10, 5-10 × 1.0-2.5 mm. Calyx 2-3 cm long. Corolla yellow or whitish yellow with dark purple centre; petals upto 5 cm long. Capsule 7-20 (-25) cm long. Seeds 3-5 mm, minutely warty, glabrous dark brown.

*Type* : Herb. Linn. n. 875. 31 (Holotype : LINN; Photo!).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : Cultivated in most tropical countries including India.

*Exsicc.* : Uttar Pradesh : Lucknow, 24.11.1909, *R.K. Das* 39905 (BSIS). Assam : Dibrugarh, 16.10.1915, *Bartei* 331 (BSIS). Tripura : Agartala, 303 m, 24.9.14, *Debbarmann* 2 (CAL). Orissa : Padikud (Chilka Lake), Ganjam dt., 11.8.1913, *Hooper* 39605 (CAL).

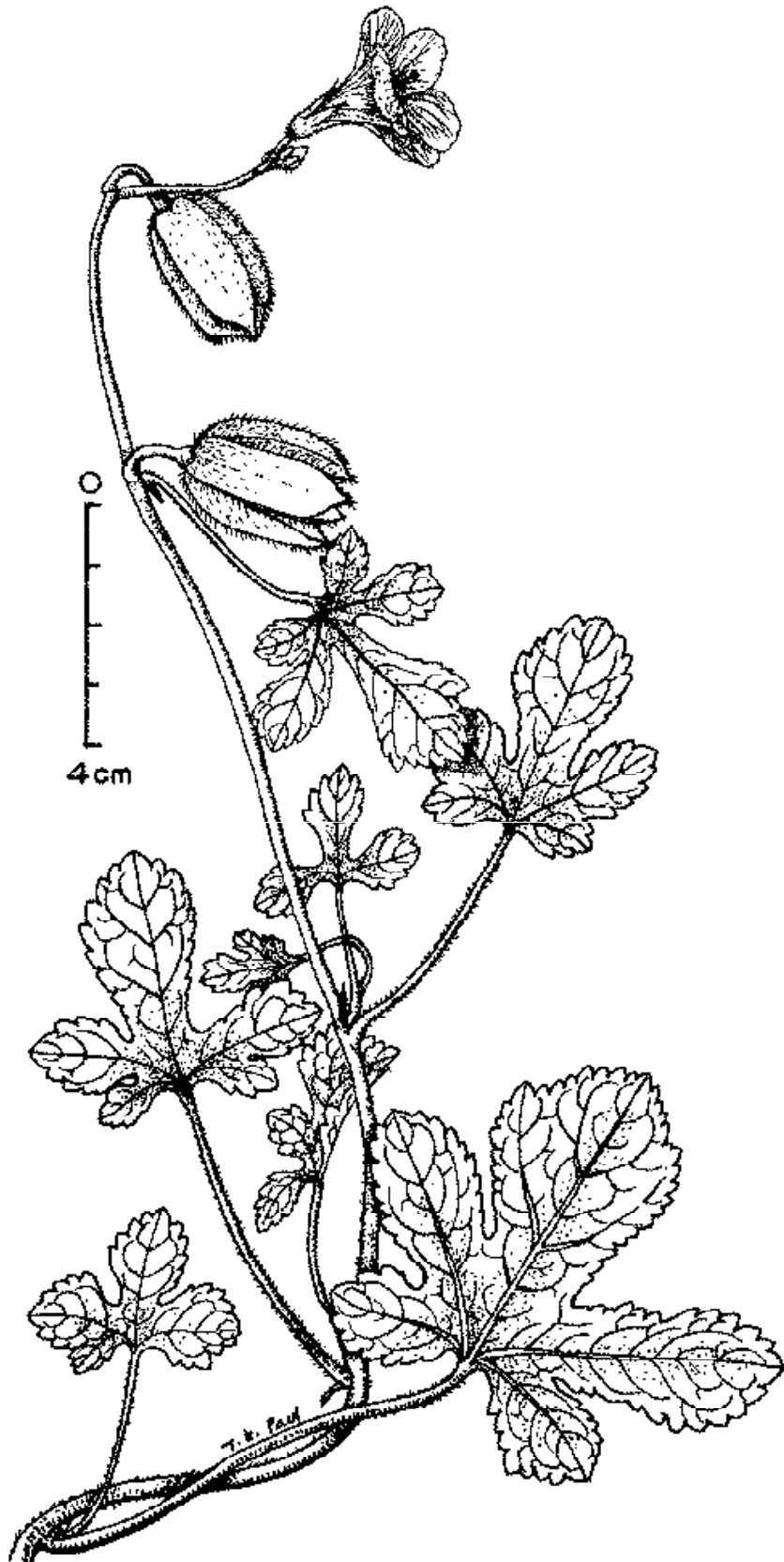


Fig. 15 *Abelmoschus ficulneus* (Linn.) Wt. & Arn.

*Chr. No.* :  $2n=72$  (Teshima, in Journ. Fac. Agric. Hokkaido Univ. 34:155. 1935).

*Uses* : Unripe fruit is used as vegetable which is rich in protein and starch. The mucilage from the fruits and seeds are medicinal.

*Notes* : Numerous cultivars of this species are under cultivation. Some of the best cultivars are 'clemson', 'spineless', 'American long green' and 'white velvet'. A new type 'Pusa Makhmali', evolved by the Indian Agricultural Research Institute bears green pods 6-8 inch long, straight, 5 ribbed and smooth. (Amberkar in Bull. dep. Agric. Bombay, No. 146. 1927; Venkataramai, Madras Agric. Journ. 1945. 53. 221.).

4. *Abelmoschus ficulneus* (Linn.) Wt. & Arn. in Wt. Cat. 14. 1833 *et* in Prod. Fl. Pen. Ind. Or. 1:53. 1834; Wt. Ic. : t. 154. 1839; Hochr. in Candollea 2:86. 1824; Borss. in Blumea 14:101. 1966; Abedin in Fl. W. Pak. 130:26. 1979. *Hibiscus ficulneus* Linn. Sp. Pl. 695. 1753; Mast. in Hook. f., Fl. Brit. India 1:340. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4:153. 1900; Cooke, Fl. Pres. Bombay 1:110. 1901. (Repr. ed. 1:111. 1958); Duthie, Fl. Upper Gang. Pl. 1:91. 1903 (Repr. ed. 1:86. 1960); Prain, Beng. Pl. 1:265. 1903 (Repr. ed. 1:180. 1963); Haines, Bot. Bih. & Or. 1(2):66. 1921 (Repr. ed. 1:69. 1961). Fig. 15

*Local Names* : Ran bhendi (Hindi); Ban-dheras, Jangli Bhindi (Beng.); Nelabenda, Parupubenda (Tel.) Kattuvendai (Tam.); Deola dula, Kapasiya (Punj.).

Herbs or undershrubs 0.5-2.0 m, young branches simple hairy, rarely with small prickly hairs with bulbous base, glabrescent. Leaves 2-12 cm across, palmately 3-5 lobed, lobes 2-8 × 1-4 cm, apex rounded or obtuse, base cordate; petiole 1.5-20.0 cm. Stipules 4-10 mm long. Pedicel 1.0-1.5 cm long, accrescent upto 3 cm. Epicalyx segments 5-6, each 5-10 × 1.0-1.5 mm. Calyx in bud condition lageniform 3 mm long. Corolla white with deep purple centre, 1.5-2.0 cm in diameter; petals 2-3 × 1-2 cm. Capsule 2.0-4.5 × 1.5-2.0 cm. Seeds c. 3 mm, tomentose by stellate hairs in concentric rings throughout, blackish,

*Type* : Dillenius, Hort. Elth., t. 157. f. 190 (Lectotype).

*Fls.* : Sept.-Nov.; *Frts.* : Nov.-March.

*Distrib.* : INDIA : Uttar Pradesh, West Bengal, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Kerala; PAKISTAN, SRI LANKA, EAST AFRICA, NORTH AUSTRALIA, MALESIA.

*Exsicc.* : Madhya Pradesh : Nagpur, 19.1.91, *Duthie* 10317 (CAL). Andhra Pradesh : Balapalle, 250 m, 21.2.1963, *Ellis* 15732 (MH); Rechapalli (Karimnagar dt.), 300 m, 22.12.1964, *Subbarao* 22246 (MH). Kerala : Waliar-South Malabar, 300 m, 5.3.1910, *Fischer* 1774 (CAL).

*Chr. No.* :  $2n=72$  (Hardas & Joshi in Indian Journ. Genet. 14:47. 1954).

*Uses* : Seeds are used for flavouring coffee and yield an oil. Stem yields an excellent fibre.

*Notes* : It can be easily recognised by its characteristic flask-shaped calyx in bud condition and blunt hairy capsules. The leaves resemble the leaves of *Ficus carica* Linn., hence the specific epithet.

5. *Abelmoschus manihot* (Linn.) Medic. Malv. 46. 1787; *ampl.* Hochr. in Candollea 2:87. 1924. *Hibiscus manihot* Linn. Sp. Pl. 696. 1753; *ampl.* Hochr. in Ann. Cons. Jard. Bot. Geneve 4:153. 1900.

Herbs or undershrubs with glabrous or densely hispid stem. Leaves 5-30 cm across, mostly 3-9 lobed to parted, sometimes entire, apex acute to acuminate, base cordate, margin dentate or serrate; petiole 2.5-23.0 cm long. Stipules 5-25 × 1.5 mm. Pedicel 1-4 cm long, accrescent upto 6.5 cm long. Epicalyx segments 4-6, segments 1.0-2.5 × 0.5-1.0 cm. Calyx 2-3 × 0.5-2.0 cm. Corolla yellow with a small purple centre; petals 3.5-8.0 × 2.5-6.0 cm. Capsule 3-7 × 1.5-2.5 cm, acuminate with 5 prominent costa. Seeds 3-4 mm, with stellate hairs in concentric rings, dark brown or blackish.

*Notes* : Hochreutiner (1900) recognised four varieties under *Hibiscus manihot* Linn : var. *genuinus*, var. *timorensis*, var. *tetraphyllus* and var. *pungens* particularly based on the variable leaf characters.

However Borssum Waalkes (1966) considered two subspecies i.e. ssp. *manihot* and ssp. *tetraphyllus*. The ssp. *manihot* includes all the cultivated forms and ssp. *tetraphyllus* (Hornem.) Borss. covering the wild ones. The ssp. *tetraphyllus* is subdivided into two varieties viz. *tetraphyllus* and *pungens* as done by Hochreutiner (Ann. Cons. Jard. Bot. 154-155. 1900) based on the indumentum character of the margin of the epicalyx segments.

According to Borssum (l.c.) the varieties possess more or less distinct altitudinal distribution of its own i.e. the var. *tetraphyllus* is distributed upto 400 m from sea level and var. *pungens* from 400-1600 m in Malesia. But in India, it has been found that there is no sharp altitudinal distinction of these two varieties. The var. *tetraphyllus* is recorded upto 800 m from the sea level and var. *pungens* recorded upto 1800 m from the sea level.

#### KEY TO THE SUBSPECIES

- 1a. Stems without prickly hairs ssp. *manihot*  
 1b. Stems more or less densely covered with prickly hairs ssp. *tetraphyllus*  
 ssp. *manihot*. *Hibiscus manihot* Linn. Sp. Pl. 696. 1753; Sims in Curtis Bot. Mag. 42. t. 1702. 1815; Prain, Beng. Pl. 1:266. 1903 (Repr. ed. 1:181. 1963); Gamble, Fl. Pres. Madr. 1:97. 1915 (Repr. ed. 1:69. 1957).

*Type* : Hortus Cliffortianus s.n. (Lectotype : BM – Herb. Cliff.)

*Fls. & Frts.* : July-December.

*Distrib.* : Mainly cultivated in South-Eastern Asia and sometimes escape from cultivation. Due to deliberate selection and propagation many cultivars have acquired smooth forms which are quite different from wild, hairy and prickly ones.

*Exsicc.* : Nagaland : Kohima, 1363 m, July 1886, *Prain s.n.* (CAL). Arunachal Pradesh; Palin to Sayata (Subansiri F.D.), 19.11.1964 *Sastry 40749* (CAL). Gujarat : Baroda (Indira Avenue Rd. to Hanging bridge), 1.3.56, *G.L. Shah 6793* (BLAT). Maharashtra : Mumbra, 5.1.1954, *Shenoy 1981* (BLAT).

*Chr. No.* :  $2n=66$  (Skovsted in *Genetica* 31:263.1935).

*Pollen* : Panporate, spheroidal (average size  $113\ \mu$ ; range  $154-168\ \mu$ ). Pore circular (diameter  $11.2\ \mu$ ). Interporal distance  $21\ \mu$ . Exine  $2.8\ \mu$  thick, being  $5.6\ \mu$  at the base of spines, spinate. (Spine : height  $25\ \mu$ , basal diameter  $7\ \mu$ , tip acute. Interspinal distance  $25\ \mu$ ; basal cushion; low, columella forming the cushion being free). [P.K.K. Nair in *Bull. Nat. Bot. Gard.* 63:18. 19626].

*Uses* : The mucilage extracted from root is used for sizing paper in China and Japan. The plant yields a tough fibre resembling jute. The leaves are also eaten.

ssp. *tetraphyllus* (Roxb. ex Hornem.) Borss. in *Blumea* 14:97. 1966. *Hibiscus tetraphyllus* Roxb. ex Hornem. Hort. Hafn. 661. 1815.

Undershrubs c. 3 m high. Stems, petioles, pedicels and veins of the leaves densely hirsute by stiff shiny simple hairs, rest portion pubescent with minute stellate or simple hairs or glabrous.

*Distrib.* : Throughout INDIA, PAKISTAN, INDO-CHINESE PENINSULA, SOUTH CHINA, MALESIA, NORTH AUSTRALIA.

#### KEY TO THE VARIETIES

- 1a. Margin of the epicalyx segments pubescent by a dense cloth of short, soft, white simple hairs var. *tetraphyllus*  
 1b. Margins of the epicalyx segments hispid by stiff simple hairs var. *pungens*

var. *tetraphyllus* (Roxb. ex Hornem.) Borss. in *Blumea* 14:98. 1966. *Hibiscus tetraphyllus* Roxb. [Hort. Beng. 52. 1814. *nom. nud.*] ex Hornem. Hort. Hafn. 661. 1815; Roxb. Fl. Ind. ed. Carey 3:211. 1832; Mast. in Hook. f., Fl. Brit. India 1:341. 1874; Prain, Beng. Pl. 1:266. 1903 (Repr. ed. 1:181. 1963). *H. manihot* var. *tetraphyllus* (Roxb. ex Hornem.) Hochr. in *Ann. Cons.*



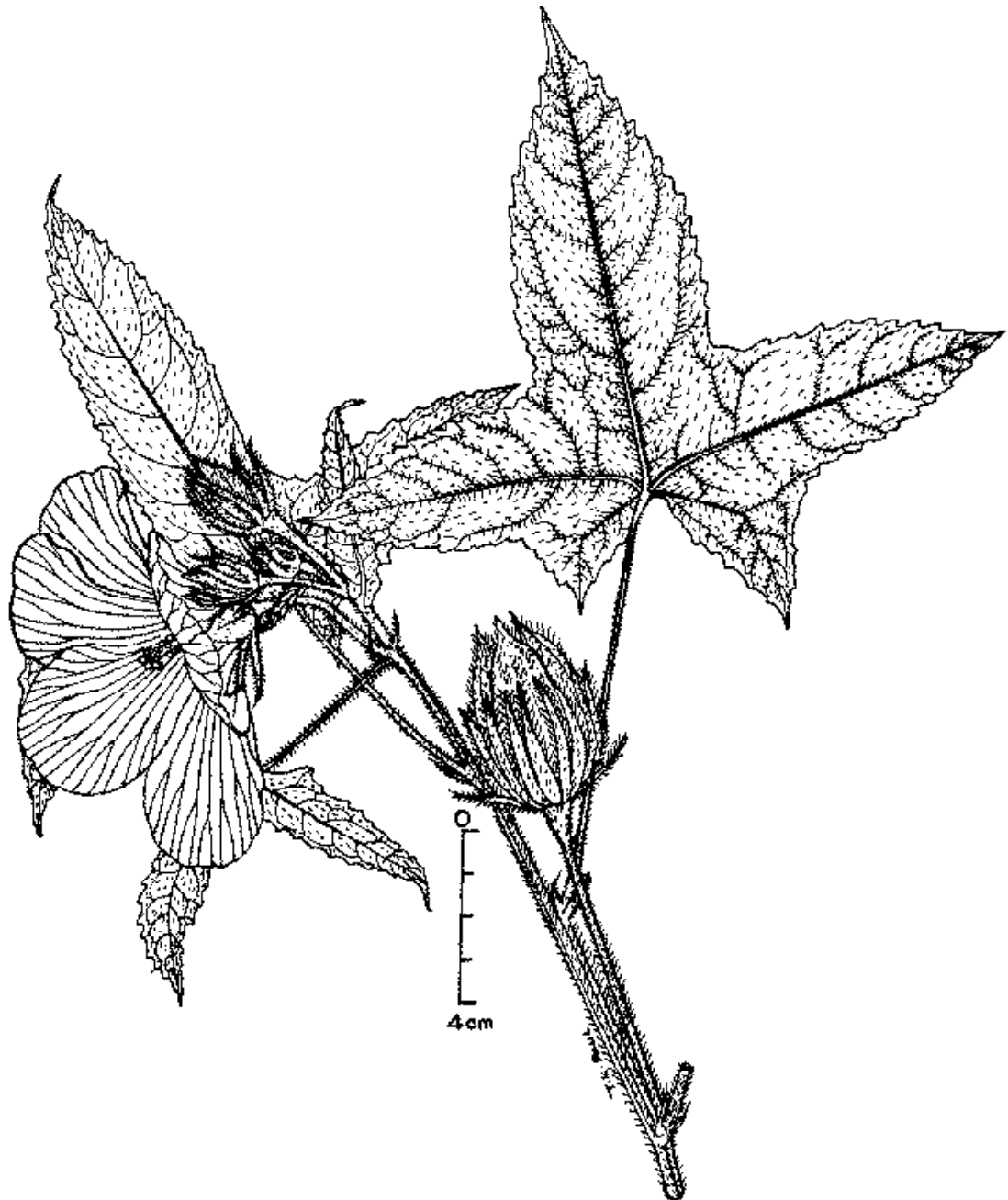


Fig. 16. *Abelmoschus moschatus* Medic.

Jard. Bot. Geneve 4:155. 1900. *Abelmoschus manihot* var. *tetraphyllus* (Roxb. ex Hornem.) Hochr. in *Candollea* 2:87. 1924.

*Type* : India : Hort. Bot. Calc. Wallich 1925 (Isotype : K-W; Photo)

*Distrib.* : INDIA : Rajasthan, Gujarat, Maharashtra, Karnataka, Kerala; MALESIA, EAST NEW GUINEA, NEW IRELAND.

*Exsicc.* : Karnataka : N. Canara (Sumpkond), 15.11.1895, Talbot 3505 (CAL). Kerala : Kavalay, 606 m, Nov. 1909, Meebold 12147 (CAL); Chandanathode (Cannanore dt.), 800 m, 31.10.1965, Ellis 26327 (MH).

*Uses* : Stem yields tough fibre.

var. *pungens* (Roxb.) Hochr. in *Candollea* 2:87. 1924; Hu, Fl. China, fam. 153. 36 t. 18, f. 6. 1955; Borss. in *Blumea* 14:99. 1966. *Hibiscus pungens* Roxb. (Hort. Beng. 52. 1814, nom. nud.) Fl. Ind. ed. Carey 3:213. 1832; Mast. in Hook. f., Fl. Brit. India 1:341. 1874; Kanjilal *et al.* Fl. Assam 1:144. 1934; Abedin in Fl. W. Pak. 130:27. 1979.

*Type* : India : Botanic Garden Calcutta (From Nepal ?) Roxburgh s.n. (Lectotype: BR-Herb. Mart.).

*Distrib.* : INDIA : West Bengal, Bihar, Assam, Manipur, Nagaland, Tripura, throughout the tropical Himalayas from Kumaon to Sikkim; PAKISTAN, PHILIPPINES, CHINA, SUMATRA, N. AUSTRALIA.

*Exsicc.* : Uttar Pradesh : Bundel khand, 10.12.86, Duthie 6337 (DD). Meghalaya : Khasia, 303-1212 m, J.D.H. & T.T. s.n. (CAL). Arunachal Pradesh : Kameng F.D. (Kalaktang), 15.5.1958, Panigrahi 15652 (CAL). Nagaland : Naga Hills, 1363 m, Sept. 1886, Prain s.n. (CAL).

*Notes* : According to Roxburgh, Dr. Buchanan sent the seeds from Nepal to the Calcutta Botanic Garden where the plants blossomed.

6. *Abelmoschus moschatus* Medic. Malv. 46. 1787; Hu, Fl. China, fam. 153 p. 38. 1955; Borss. in *Blumea* 14:90. 1966. *Hibiscus abelmoschus* Linn. Sp. Pl. 696. 1753; Mast. in Hook. f., Fl. Brit. India 1:342. 1874; Cooke. Fl. Pres. Bombay 1:112. 1901 (Repr. ed. 1:118. 1958); Duthie, Fl. Upper Gang. Pl. 1:92. 1903 (Repr. ed. 1:87. 1960); Gamble, Fl. Pres. Madr. 1:97. 1915 (Repr. ed. 1:69. 1957). Fig. 16

*Local Names* : Musk dana (Hindi, Beng. & Guj.); Hab-ul-musk (Arb.); Gorukhia-korai (Asm.); Kasturibende (Kan.); Kattukasthuri (Mal.); Kasturibhenda (Mar.); Lata kasturika (Sans.); Kasturi benda (Tel.); Varttilai kasthuri, Katukasthuri (Tam.).

Herbs or undershrubs upto c. 3m high, hirsute throughout. Leaves 4-18 × 3-20 cm, angular or 3-7 palmilobed to palmiparted, upper leaves narrower often hastate or sagittate, lobes linear, lanceolate, ovate, obovate-oblong; petioles 2-20 cm long. Stipules 5-10 mm. Pedicel 1.5-6.0 cm, accrescent upto 15 cm.

Epicalyx segments 6-10, linear 10-15 × 1-2 mm. Calyx 1.5-3.0 cm high. Corolla c. 10 cm across, yellow with dark purple centre. Capsule 4-8 × 2.5-3.5 cm with a rostrum of c. 5 mm. Seeds 3-4 mm, concentrically ribbed, glabrous or minutely stellate hairy, often musk-scented.

*Type* : Hortus Cliffort. (Lectotype : BM-Herb. Cliff.).

*Fls.* : July-Oct.; *Frts.* : Oct.-Dec.

*Distrib.* : INDIA : Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Arunachal Pradesh, Assam, Meghalaya, Tripura, Gujarat, Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Andaman and Nicobar Islands; BANGLADESH, CHINA, INDO-CHINA, THAILAND, MALAYA PENINSULA, INDONESIA, FIJI ISLANDS.

*Exsicc.* : Uttar Pradesh : Bindal river banks, 680 m, *T.A. Rao* 934 (BSD). West Bengal : Matha (Purulia), 14.9.65, *Malik* 326 (CAL). Assam : Dalgam, April 1902, *Sk. Mokim* 293 (CAL); Saduja (Lakhimpur), 25.8.1909, *Burkill* 32689 (CAL). Meghalaya. Khasia & Jaintia hills, 30.10.1966, *Panigrahi* 4148 (CAL).

*Pollen* : Average size 113 μ (range 95-123 μ). Exine 11.2 μ thick at spine base, the columella composing the basal cushion of excrecence system being fused. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63:20, 1962].

*Uses* : 'Ambrette seed oil' is extracted by steam distillation of crushed seeds and used in high grade perfumery. The seeds are reported to use as a flavouring agent for coffee. In India, they are mostly employed as an adulterant for animal musk and in perfumes.

*Notes* : It is easily recognised by its ovoid to oblong capsule exceeding the epicalyx, valves of the capsule chartaceous and musk-scented seeds.

7. *Abelmoschus tuberculatus* Pal et Singh in Bot. Gaz. 113. 458.1952; Raizada, Suppl. Fl. Upper Gang. Pl. 25. 1976.

Herbs or undershrubs c.1 m high. Stems strigose with simple hairs, glabrescent. Leaves 4-12 × 5-15 cm, lower and middle leaves 5-7 lobed, 8-12 × 10-15 cm, lobes ovate-oblong with 2-3 lobules in each, upper leaves 3-5 lobed, palmatisect, 4-6 × 6-8 cm; petiole 2-15 cm long. Stipules 3-8 mm long. Pedicel 4-8 mm long, accrescent upto 1.5 cm. Epicalyx segments 9-12, each c. 1 cm long. Calyx lobes 1.0-2.5 × 1 cm. Corolla yellow or white with deep purple centre; petals 1.5-3.5 × 1.0-1.5 cm. Capsule 1.5-5.0 cm long and c. 1.0-1.5 cm across, densely studded with bristle bearing tubercles. Seeds 3-5 mm in diameter, glabrous or densely villous, dark brown or black.

#### KEY TO THE VARIETIES

- 1a. Leaves palmilobed to palmatisect. Seeds smaller, 3 mm in diameter, glabrous var. *tuberculatus*  
 1b. Leaves deltoideform, 3-5 lobed. Seeds larger, 4-5 mm in diameter, densely villous var. *deltoideifolius*

var. **tuberculatus** — *A. tuberculatus* Pal et Singh in Bot. Gaz. 113. 458. 1952.

*Type* : India : Uttar Pradesh, Saharanpur, Oct. 1946, H.B. Singh 950 (K, DD!).

*Fls. & Frts.* : Oct.-Feb.

*Distrib.* : INDIA : Rajasthan, Uttar Pradesh, Madhya Pradesh.

*Chr. No.* :  $2n=58$  (Joshi A.B. & Hardas in Curr. Sci. 22:384. 1953).

*Notes* : It is closely allied to *A. esculentus* (Linn.) Moench in vegetative as well as reproductive characters but differs from it by having smaller flowers profuse fruiting, capsules smaller and densely studded with bristle bearing tubercles.

var. **deltoideifolius** T.K. Paul et Nayar in Bull. Bot. Surv. India 24(1-4):215. 1982.

*Type* : India : Jhalawar (Rajasthan), 19.9.64, B.M. Wadhwa & D.M. Verma 7581 (Holotype, CAL).

*Fls. & Frts.* : Sept.-Nov.

*Distrib.* : INDIA : Rajasthan, Gujarat, Madhya Pradesh.

*Exsicc.* : Rajasthan : Jhalawar, 21.9.64. Wadhwa & Verma 7524 (CAL); Jhalawar, 14.9.64, Wadhwa 5452 (CAL).

*Notes* : It can be easily recognised by its deltoideiform leaves with 3-5 lobes and large densely villous seeds.

## 2. ABUTILON

Mill. Gard. Dict. ed. 4, 1. 1754; Benth. & Hook. f. Gen. Pl. 1:204. 1862; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6:37. 1890; Hutch., Gen. Fl. Pl. 2:554. 1967.

Annual or perennial herbs, undershrubs or shrubs. Leaves simple or lobed, mostly cordate, acute or acuminate, palminerved, without nectary. Flowers axillary, solitary, sometimes in loose panicles by replacement of the upper leaves, rarely in loose corymbose racemes; pedicel jointed in the upper half. Epicalyx absent. Calyx usually campanulate; lobes 5, connate upto middle or below. Corolla rotate, campanulate, usually yellow, white, orange or pink, rarely with a dark purple centre. Staminal column shorter than the petals, strongly widened at the base. Carpels 5-40; style branches as many as carpels, filiform to clavate, stigmatose only at the apex; stigma capitate. Schizocarp globular, campanulate, rarely discoid; mericarps 5-40, dehiscent, flattened-reniform, apex round, acuminate or biaristate, often falling leaving a truncate, slender columella. Seeds 2-9 per mericarp, reniform to subreniform, upper ones ascending; lower ones pendulous or horizontal, finally falling out of mericarp.

*Distrib.* : c. 150 species in the tropical and subtropical regions of both the hemispheres. 13 species in India.

*Ecol.* : Most of the species grow gregariously and forming clumps in the jungles of lowlands. Flowers usually open in the afternoon or evening.

### KEY TO THE SPECIES

- 1a. Carpels 5-12 :
- 2a. Carpels 5 :
- 3a. Calyx lobes 0.7-1.0 cm long, connate below middle;  
Staminal column c. 5.5 mm long, filaments  
c. 15 mm long . . . . . *A. persicum* 9
- 3b. Calyx lobes c. 2 cm long, connate in the middle. Staminal  
column c. 20 mm long, filaments c. 3 mm long *A. ranadei* 11
- 2b. Carpels 8-12 :
- 4a. Petals 2.5-4.5 cm long, erect, mostly red to orange *A. striatum* 12
- 4b. Petals less than 2 cm long, spreading, yellow :
- 5a. Schizocarp cylindric, about 1 cm or less than 1 cm long
- 6a. Pedicels shorter than the petiole. Mericarps awned;  
Seeds c. 2 mm across, minutely puberulous. Upper surface  
of the leaves glabrescent or minutely stellate pubescent  
and lower surface densely stellate pubescent *A. ramosum* 10
- 6b. Pedicels equal to or longer than the petiole. Mericarps without  
awn. Seeds 1.0-1.5 mm across, glabrate. Both surfaces of the leaves  
densely stellate pubescent *A. fruticosum* 2
- 5b. Schizocarp ovoid to subcylindric, more than 1 cm long :
- 7a. Flowers solitary, axillary or in axillary clusters of 2-3 or in  
terminal racemes by the reduction of the upper leaves;  
Schizocarp ovoid :
- 8a. Staminal column stellate hairy. Mericarps with erect,  
less than 1 mm long awns :
- 9a. Plant densely covered with long spreading patent simple hairs;  
Calyx lobes longer or as long as the schizocarp *A. grandifolium* 3
- 9b. Plant with short appressed stellate hairs. Calyx lobes shorter  
than schizocarp *A. pakistanicum* 7
- 8b. Mericarps with 2 erecto-patent 3-7 mm long awns;  
Staminal column glabrous *A. theophrasti* 13
- 7b. Flowers 2-5 in axillary long (upto 10 cm) peduncled cymes, rarely  
solitary. Schizocarp subcylindric *A. neelgherrense* 6
- 1b. Carpels more than 15 :
- 10a. Stems, petioles and pedicels with dense long patent simple  
hairs and few minute stellate hairs and short viscid glandular  
hairs. Corolla orange yellow with a purple centre *A. hirtum* 4
- 10b. Stems, petioles and pedicels densely stellate pubescent with  
few simple hairs. Corolla with or without purple centre :

- 11a. Corolla yellow to pale yellow without purple centre. Leaves ovate-cordate. Mericarps dorsally and ventrally stellate hairy; Calyx lobes ovate to lanceolate :
- 12a. Staminal column 2-3 mm long. Schizocarp c. 1 cm across; mericarps c. 10 × 5 mm, gradually acuminate *A. bidentatum* 1
- 12b. Staminal column 5-7 mm long. Schizocarp 1.5-2.5 cm across; mericarps 10-15 × 7-10 mm, acute to acuminate, obtuse or rounded . . . . . *A. indicum* 5
- 11b. Corolla yellow with deep brown centre. Leaves orbicular to round-cordate, apex acute. Mericarps hairy on the dorsal margin. Calyx lobes deltoid to ovate *A. pannosum* 8
1. *Abutilon bidentatum* A. Rich. Tent. Fl. Abyss. 68. 1847; Mast. in Hook. f., Fl. Brit. India 1:326. 1874.

Annual or perennial undershrubs with downy branches. Stems, petioles and pedicels densely hirsute with stellate and simple hairs. Leaves 1.5-20.0 × 1-17 cm, ovate, apex acute or scarcely acuminate, base cordate, margin irregularly toothed, both the surface densely pubescent with stellate and few simple hairs; petiole 1-17 cm long. Stipules 1-2 mm long, subulate. Flowers in panicles of 2-3 or solitary, axillary; pedicel 2-4 cm long, jointed towards the apex. Calyx c. 6 mm across, cup shaped, free up to the middle, lobes 5-6 × 2-3 mm, ovate, acute, outside densely pubescent with stellate and simple hairs, inside with long simple hairs. Corolla yellow without purple centre; petals 5-7 × 3-4 cm. Staminal column 2-3 mm long, stellate hairy, filaments 0.5-1.0 mm long. Schizocarp c. 1 cm across; mericarps 16-20, each c. 10 × 5 mm, oblong, gradually acuminate, bidentate at the apex, marginal portion densely stellate hairy, 3 seeds per mericarp. Seeds c. 1.5 mm across, reniform, minutely stellate hairy, brownish black.

#### KEY TO THE VARIETIES

- 1a. Leaves 1.5-5.0 × 1.0-4.5 cm; petioles 1.0-3.5 cm long *var. bidentatum*
- 1b. Leaves 20 × 17 cm; petioles up to 17 cm long *var. majora*

*var. bidentatum* — *A. bidentatum* A. Rich., Tent. Fl. Abyss. 68. 1847; Mast. in Oliver Fl. Trop. Afr. 186. 1868 et in Hook. f., Fl. Brit. India 1:326. 1874; Cooke, Fl. Pres. Bombay 1:96. 1901 (Repr. ed. 1:102. 1958); Abedin in Fl. W. Pak. 130:64. 1979. Fig. 17

*Type* : Abyssinia, *Dellion & Petit s.n.* (Isotype : P); *Syntype* : *Sida (Abutilon) bidentata* Hochst. in Sched. in Pl. Schimper. Abyss. Sect. 11. n. 1003 (K).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : Rajasthan, Gujarat, Punjab, Delhi, Maharashtra; PAKISTAN, ARABIA, TROPICAL AFRICA.

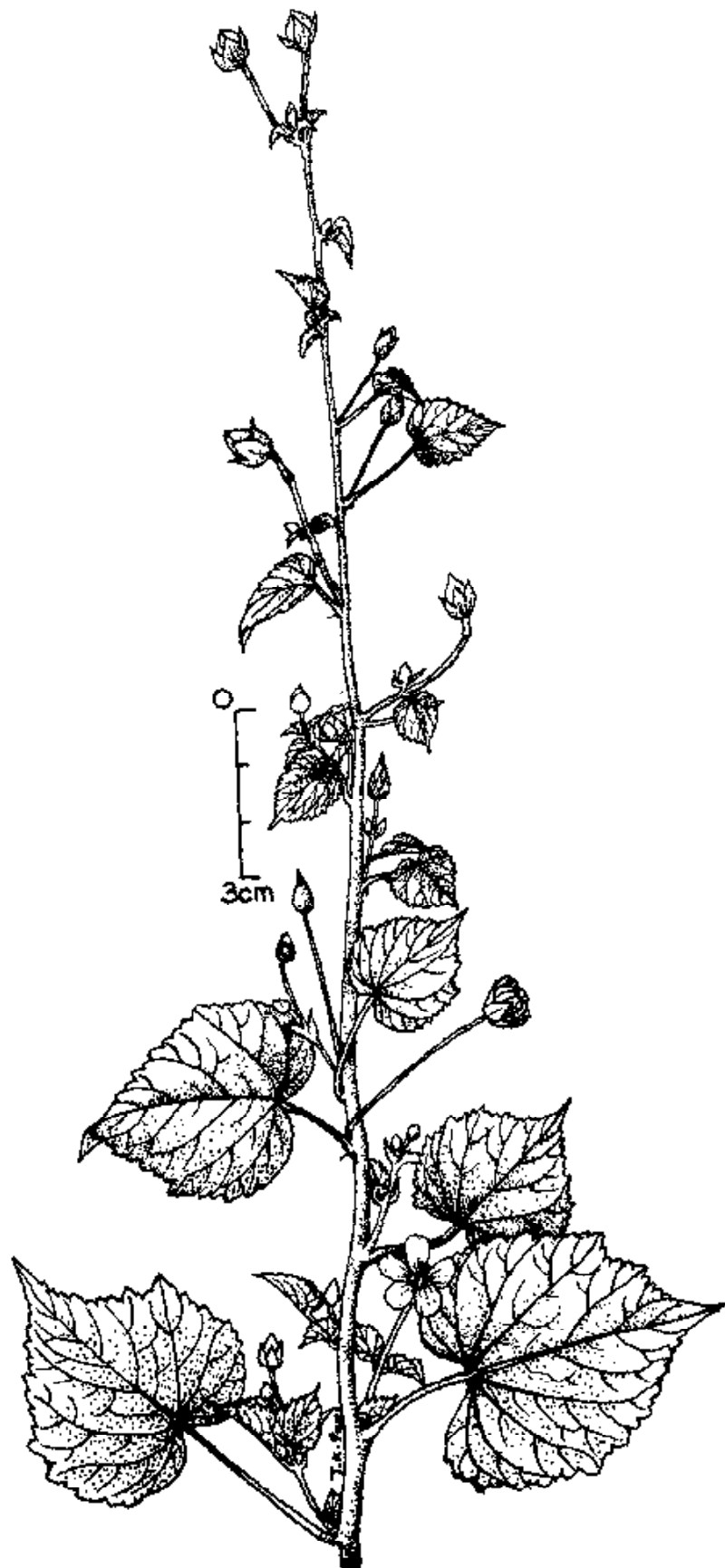


Fig. 17 *Abutilon bidentatum* Hochst. var. *bidentatum*

*Exsicc.* : Punjab : *Without precise locality*, 303 m, T.T. s.n. (CAL). Rajasthan: Amer Road (Jaipur), 25.12.63, S. Sharma 355 (CAL). Gujarat : Cutch, *Stolizka* s.n. (MH).

*Pollen* : Average size 72  $\mu$  (range 70-74  $\mu$ ). Exine thickness 2.8  $\mu$  at spine base. Basal cushion low with a shallow interspinal depression. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63:7. 1962].

var. *majora* (Blatt. & Hall.) Bhandari, Fl. Ind. Des. 59. 1978. *Abutilon indicum* var. *major* Blatt. & Hall. in Journ. Bomb. Nat. Hist. Soc. 26(1):266. 1918.

*Type* : India Amarasagar in ruderatis, Jaisalmer, Nov. 1918, *Blatter* 5644 (Holotype: BLAT !).

*Distrib.* : INDIA : Rajasthan, endemic.

*Notes* : This variety is distinguished from the type by its larger leaves and longer petioles.

2. *Abutilon fruticosum* Guill. et Perr. in Guill. et al., Fl. Senegamb. Tent. 1:70. 1830; Mast. in Hook. f., Fl. Brit. India 1:328. 1874.

Erect undershrubs, 60-120 cm high. Stems woody, young portion of the stem densely pubescent with minute whitish stellate hairs. Leaves 1.5-9.0  $\times$  1-8 cm, ovate, apex acute, base cordate, denticulate, 5-9 nerved at the base, both surfaces densely pubescent with whitish stellate hairs; petiole 0.5-7.0 cm long, stellate pubescent. Stipules 1.5-3.0 mm long, linear, stellate hairy. Flowers solitary, axillary; pedicel equal to or longer than the petiole, jointed 2-3 mm below the corolla, stellate pubescent. Calyx campanulate, 4-6 mm across, free to the middle, lobes 4-5  $\times$  2-3 mm, ovate, acute or slightly acuminate, 3-nerved, both the surface densely stellate-pubescent. Corolla yellow; petals 6-10  $\times$  4-5 mm. Staminal column 3-4 mm long, antheriferous towards the apex, sparsely stellate hairy. Schizocarp 5-8 mm across, oblong acute; mericarps 10, each 5-11  $\times$  5-6 mm, obliquely truncate, without any awn, stellate-tomentose in the marginal portion, 2-3 seeds per mericarp. Seeds 1.0-1.5 mm across, reniform, glabrate with stout white or brown simple straight or hooked hairs.

#### KEY TO THE VARIETIES

- 1a. Schizocarp sparsely stellate hairy, pale greenish in colour var. *fruticosum*  
 1b. Schizocarp densely stellate hairy, golden yellow in colour var. *chrysocarpa*

var. *fruticosum* — *A. fruticosum* Guill. et Perr. in Guill. et al., Fl. Senegamb. Tent. 1:70. 1830; Mast. in Hook. f., Fl. Brit. India 1:328. 1874; Cooke, Fl. Pres. Bombay 1:98. 1901 (Repr. ed. 1:104. 1958); Abedin in Fl. W. Pak. 190:57. 1979. *Sida amaena* Wall. Cat. 1848. 1826 *nom. nud.*

*Type* : Senegal, Suffal, *Leprieur* s.n. (Holotype : P).



*Fls.* : Aug.-Sept.; *Frts.* : Sept.-Jan.

*Distrib.* : INDIA : Rajasthan, Gujarat, Punjab, Maharashtra; PAKISTAN, ARABIA, JAVA, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : On the way to Majlar (Jaisalmer dt.), 375 m, 31.8.1976, *Shetty* 3394 (CAL); Left side of Khaida Lake (Jodhpur dt.), 24.11.1972, *R. Singh* 325 (CAL); Osian (Jodhpur), 27.8.1977, *A.N. Singh* 4422 (CAL).

*Pollen* : Average size  $59 \mu$  (range 49-56  $\mu$ ). Exine thickness  $1 \mu$ , being  $5.6 \mu$  at spine base. Spine height  $5.6 \mu$  tip pointed. Basal cushion sharply defined. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63:7. 1962].

var. *chrysocarpa* Blatt. & Hall. in Journ. Bomb. Nat. Hist. Soc. 26(1):227. 1918; Bhandari, Fl. Ind. Des. 61.1978.

*Type* : India, On rocks, vinjorai, Jaisalmer (Rajasthan), Nov. 1917, *Blatter* 5660 (BLAT !).

*Distrib.* : INDIA : Rajasthan. Endemic.

*Notes* : var. *chrysocarpa* differs from the type by having its dense stellate hairy schizocarp which is golden yellow in colour.

3. *Abutilon grandifolium* (Willd.) Sweet, Hort. Brit. ed. 1. 53. 1826; Borss. in Blumea 14:166. 1966; Abedin in Fl. W. Pak. 130:58. 1979. *Sida grandifolia* Willd. En. Hort. Berol. 2:724. 1809. *S. mollis* Ortega, Hort. Metrit. Dec. 65. 1800 non Rich. 1792. *Abutilon molle* (Ortega) Sweet, Hort. Brit. ed. 2. 65. 1830.

Shrubs 1-3 m tall, densely covered with long spreading patent simple hairs. Leaves 3-15 × 2-12 cm, ovate or lanceolate, somewhat orbicular, rarely 3 angled, apex acuminate to obtuse, base cordate, margin coarsely serrate; petiole 2-10 cm long. Stipules 8-14 mm long, linear-lanceolate. Flowers axillary, 1-3 flowers on a common peduncle; pedicel equal to or longer than the petiole. Calyx lobes 1.0-2.5 × 0.5-1.5 cm, ovate, connate at the base. Petals 1.0-1.5 cm long and broad, obovate, yellow. Staminal column shorter than the petals, stellate hairy. Schizocarp 1.0-1.5 cm across, ovoid; mericarps 10, each 5-7 mm broad, shortly beaked. Seeds 2-3 per mericarp, c. 2 mm across.

*Fls. & Frts.* : Oct.-Apr.

*Distrib.* : Tropical America and Africa, introduced in other tropical countries. In India it is cultivated as ornamental plant.

*Exsicc.* : Uttar Pradesh : Dehra Dun, 7.10.1925, *B.L. Gupta* s.n. (DD); New forest, Dehra Dun, 20.1.1932, *Raizada* s.n. (DD).

4. *Abutilon hirtum* (Lamk.) Sweet, Hort. Brit. ed. 1:53. 1826; Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1:56. 1834; Borss. in Blumea 14:168. 1966; Abedin in Fl. W. Pak. 130:65. 1979. *Sida hirta* Lamk. Encyl. 1:7. 1783.

Annual herbs or undershrubs upto c. 2m high, much branched, somewhat viscid with unpleasant smell. Stems hirsute with long patent simple, minute stellate and glandular hairs. Leaves 2.5-12.0 × 3.5-13.0 cm, orbicular to broadly ovate, apex acute, base cordate, margin irregularly dentate, 7-9 nerved at the base, both the surfaces pubescent with minute stellate hairs, veins with long simple hairs; petiole 3-20 cm long, hirsute with long patent simple and gland hairs. Stipules 0.5-1.0 × 0.1-0.3 cm, linear to lanceolate, reflexed, stellate velutinous. Flower solitary, axillary; pedicel 1.5-4.5 cm long, accrescent up to 5.5 cm long, jointed at 1-10 mm below the flower. Calyx campanulate, 7-10 mm long, free up to the middle, lobes 5-10 × 4-6 mm, accrescent up to c. 1.5 cm, ovate or deltoid, acute to slightly acuminate, somewhat reflexed in fruit, outside densely stellate pubescent, inside with patent simple hairs. Corolla orange-yellow with a purple centre; petals longer than the calyx lobes, obovate, apex rounded, often emarginate, spreading, finally reflexed, at base ciliate, outside stellate-pubescent, inside glabrous. Staminal column 5-7 mm long, lower conical part stellate hairy, upper tubular part glabrous. Schizocarp 1-2 cm across, globular, indented at apex; mericarps 20-25, separating early, each 10-15 mm high, radially 7-10 mm, broadly ovate-reniform, shortly acuminate, sometimes rounded, dorsally stellate tomentose. Seeds 3 per mericarp, c. 2.5 mm across, reniform, punctate by minute stellate hairs, hilum densely stellate hairy, brownish black.

#### KEY TO THE VARIETIES

- 1a. Leaves orbicular-ovate, serrulate or denticulate . . . var. *hirtum*  
 1b. Leaves ovate, irregularly and deeply serrate . . . var. *heterotrichum*

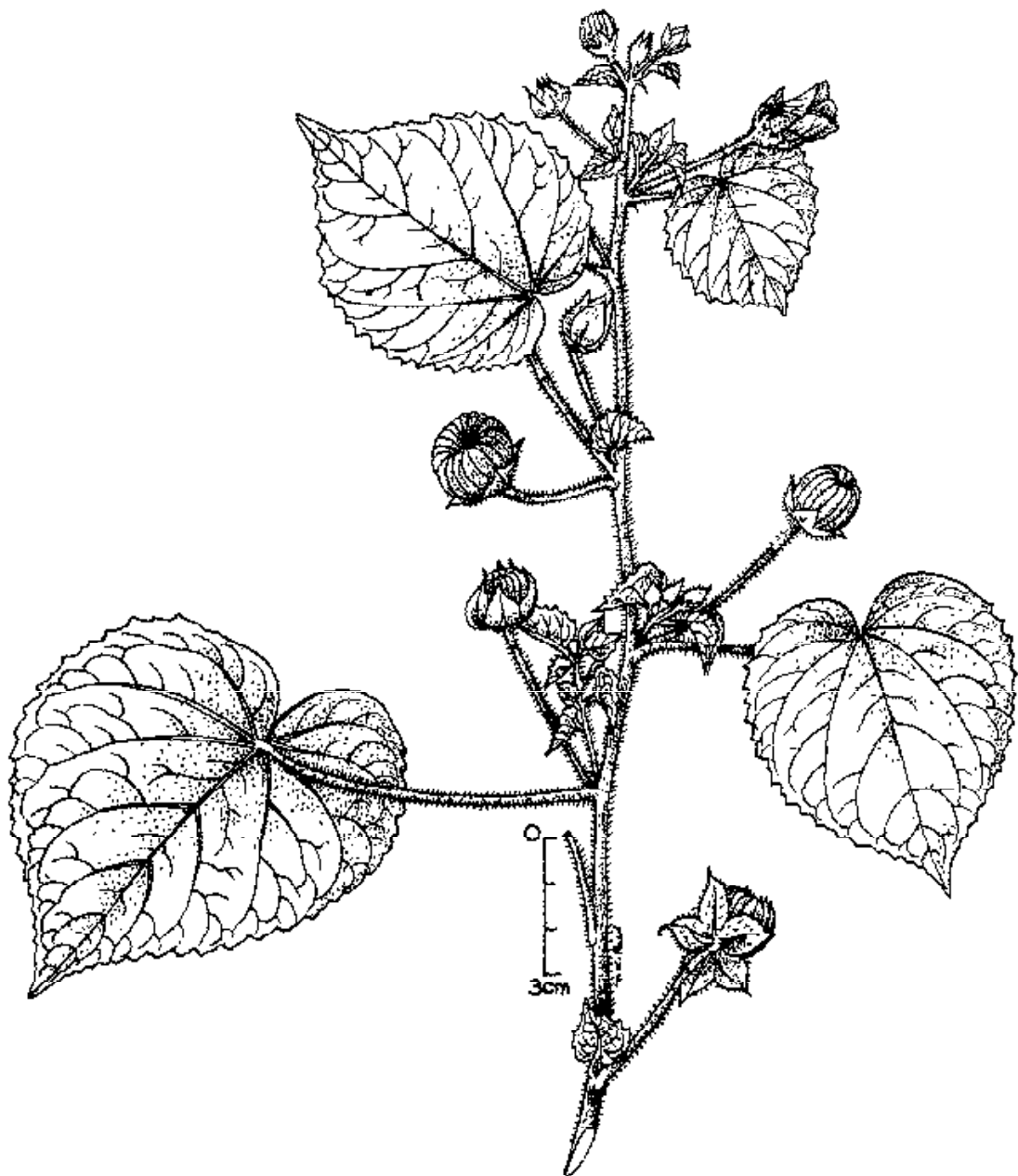
var. *hirtum* — *A. hirtum* (Lamk.) Sweet, Hort. Brit. ed. 1:53. 1826. *Sida hirta* Lamk. Encyl. 1:7. 1783. *S. graveolens* Roxb. (Hort. Beng. 50. 1814 *nom. nud.*) ex Hornem. Hort. Hafn. Suppl. 77. 1819; Roxb. Fl. Ind. ed. Carey. 3:179. 1832. *Abutilon graveolens* (Roxb. ex Hornem.) Wt. & Arn. ex Wight Cat. 13. 1833; Mast. in Hook. f., Fl. Brit. India 1:327. 1874; Cooke, Fl. Pres. Bombay 1:97. 1901 (Repr. ed. 1:103. 1958); Duthie, Fl. Upper Gang. Pl. 1:83. 1903 (Repr. ed. 1:78. 1960). Fig. 18

*Type* : India : Sonnerat s.n. (Holotype P — LA).

*Fls. & Frts.* : Oct.-Apr.

*Distrib.* : INDIA : Rajasthan, Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Kerala, Gujarat, Bihar, Orissa, West Bengal, Assam; PAKISTAN, SRI LANKA, MALESIA, AUSTRALIA,

*Exsicc.* : West Bengal : Panchala (Howrah dt.), 10.11.1964, Bennet 1050 (CAL). Assam : Tezapore, March 1902, Chatterjee s.n. (CAL). Tamil Nadu : Forest College compound (Coimbatore), 468 m, 29.11.64, Chandrabose 28635 (CAL); Maruthamalai (Coimbatore) 653 m, 28.9.56, Sebastine 894 (MH).



Figs. 18 *Abutilon hirtum* (Lamk.) Sweet

*Pollen* : Average size 81  $\mu$  (range 77-84  $\mu$ ). Basal cushion not formed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63:8. 1962].

var. *heterotrichum* (Hochst. ex Mattei) Cuf. in Bull. Jard. Bot. De L'etat 29(1) :536. 1959. *A. heterotrichum* Hochst. ex Mattei, Boll. Ort. Bot. Palermo n. s. 1(2):90. 1915.

*Type* : Abyssinia, Dschadscha, 1 Oct. 1854, *Schimper* 2306 (K, P).

*Distrib.* : INDIA : Gujarat, Tamil Nadu; PAKISTAN, ETHIOPIA.

*Note* : The variety *heterotrichum* differs from var. *hirtum* by its ovate leaves with coarse, deep and irregularly serrate margin.

A new record for India.

5. *Abutilon indicum* (Linn.) Sweet, Hort. Brit. ed. 1:54. 1826, *emend.* Hochr. in Ann. Cons. Jard. Bot. Geneve 6:19. 1902; Borss. in Blumea 14:170. 1966. *Sida indica* Linn. Cent. Pl. 2:26. 1756.

Annual or perennial herbs or undershrubs, upto c. 3 m high. Stems, petioles and pedicels densely or sparsely velutinous with minute stellate and simple hairs. Leaves 1.5-7  $\times$  1-6.5 cm, ovate to suborbicular, apex acute or acuminate, cordate at base. Stipules linear. Flowers solitary, axillary; pedicel longer than petiole, jointed towards the apex, accrescent. Calyx 5-8 mm across, shorter or as long as the schizocarp. Corolla 1.5-2.5 cm in diameter, yellow to orange without purple centre; petals broadly obovate, apex truncate, rounded or emarginate, base ciliate. Staminal column 5-7 mm long, conical at the basal part, stellate hairy, upper portion tubular, glabrous. Schizocarp 1.5-2.5 cm in diameter, globular, apex flat or slightly indented; mericarps 15-22, reniform, upper part with a short acute mucro, dorsally and ventrally stellate hairy, laterally glabrous, smooth, blackish. Seeds 2-3 per mericarp, 2-3 mm in diameter, reniform, minutely stellate hairy or glabrescent, brownish-black.

#### KEY TO THE SUBSPECIES

- 1a. Calyx shorter than schizocarp, spreading at maturity. Mericarps shortly acuminate at apex ..... *ssp. indicum*
- 1b. Calyx about as long as the schizocarp, appressed. Mericarps long acute at apex, obtuse or rounded :
- 2a. Apex of the leaves obtuse to acute or shortly acuminate, coarsely stellate hairy. Mericarps long acute at apex ..... *ssp. guineensis*
- 2b. Apex of the leaves long acuminate, velutinous with short stellate hairs. Mericarps usually rounded or obtuse, rarely long acute at apex ..... *ssp. albescens* (var. *australiense*)

ssp. *indicum*. — *A. indicum* (Linn.) Sweet, Hort. Brit. 54. 1826; Mast. in Hook. f., Fl. Brit. India 1:326. 1874; Cooke, Fl. Pres. Bombay 1:96. 1901 (Repr. ed. 1:102. 1958); Prain, Beng. Pl. 1:260. 1903 (Repr. ed. 1:176. 1963); Duthie, Fl. Upper Gang. Pl. 1:83. 1903 (Repr. ed. 1:78. 1960); Gamble, Fl. Pres. Madr. 1:91. 1915 (Repr. ed. 1:65. 1957); Haines, Bot. Bih. & Or. 1(2):61. 1921 (Repr. ed. 1:64. 1961); Hu, Fl. China, fam. 153. p. 32. t. 8 f. 9 et t. 17. f. 10. 1955; Abedin in Fl. W. Pak. 130:69. 1979. *Sida indica* Linn. Cent. Pl. 2:26. 1756; Roxb. Fl. Ind. ed. Carey 3:179. 1832. *S. populifolia* Lamk. Encyl. 1:7. 1783. *Abutilon populifolium* (Lamk.) Sweet, Hort. Brit. ed. 1:53. 1826. *A. indicum* var. *populifolium* (Lamk.) Wt. & Arn. ex Mast. in Hook. f., Fl. Brit. India 1:326. 1874.

*Type* : H.U., Linn. Herb. n. 866. 29 (Lectotype : LINN Photo !).

*Fls. & Frts.* : Sept.-April.

*Distrib.* : Throughout INDIA; Tropical and subtropical regions of both the Old and New World.

*Exsicc.* : Uttar Pradesh : Pilibhit, 18.9.1972, *Malhotra* 50885 (CAL). Bihar : Chota Nagpur, Dec. 1880, *Gamble* 8756 (CAL). West Bengal : Goabaria (Howrah), 2.11.53, *Naskar s.n.* (CAL). Assam : Sibsagar, *Masters* 624 (CAL).

*Chr. No.* :  $2n=42$  (Skovsted in C.R. Lab. Carls. S: Physiol. 23:195. 1941).

*Pollen* : Size  $80 \mu$ . columella of ectine  $\pm$  fused. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63:7. 1962].

*Uses* : Leaves, barks, roots and seeds are medicinal. The medicinal importance of this plant is known among the local from long back, referred in Ayurveda and Unani system of medicine.

ssp. *guineense* (Schumach.) Borss. in Blumea 14:175. 1966. *Sida guineensis* Schumach. Kongl. Danske Vidensk. Selsk. Skr. 4:81. 1829. *S. asiatica* Linn. Cent. Pl. 2:26. 1756. *Abutilon asiaticum* (Linn.) Sweet, Hort. Brit. ed. 1:53. 1826; Mast. in Hook. f., Fl. Brit. India 1:326. 1874; Cooke, Fl. Pres. Bombay 1:96. 1901 (Repr. ed. 1:102. 1958); Duthie, Fl. Upper Gang. Pl. 1:82. 1903 (Repr. ed. 1:78. 1960); Gamble, Fl. Pres. Madr. 1:91. 1915 (Repr. ed. 1:65. 1957).

*Type* : Guinea (Holotype : BM).

*Fls. & Frts.* : Oct.-Nov.

*Distrib.* : INDIA : Central to South; ASIA, TROPICAL AFRICA, AUSTRALIA.

*Exsicc.* : India : Andhra Pradesh : Polavaram, Godavari river, 25. 11.1902, *C.A. Barber* 4787 (MH).

*Notes* : ssp. *guineense* is allied to ssp. *indicum* but differs in having stem with dense woolly hairs, leaves more or less scabrid on the upper surface, large corolla, mericarps long acute with woolly stellate hairs on the dorsal surface.

ssp. *albescens* var. *australiense* Hochr. in Ann. Cons. Jard. Bot. Geneve 6:20. 1902; Borss. in Blumea 14:175. t. 19. (a.b.). 1966; Chandrabose in Bull. Bot. Surv. India 12(1-4): 276. 1970. *A. indicum sensu* Span. in Linnaea 15:171. 1841. *A. graveolens* in Forbes Nat. Wand., App. 6:500. 1885. [ non Roxb. ex Hornem. Wt. & Arn. ex Wight] Britton

*Type* : Timor, Forbes 3330 (Lectotype : G).

*Distrib.* : INDIA : Andhra Pradesh; MALESIA AUSTRALIA.

*Exsicc.* : Andhra Pradesh : Krishna river bank (Nalconda dt.), 16.12.1959, K.M. Sebastine 9803 (MH).

*Notes* : It differs from other two subspecies of *A. indicum* (Linn.) Sweet by having its leaves with long acuminate apex and mericarps with acute apex.

6. *Abutilon neelgherrense* Munro ex Wt. Ill. 1:66. 1840; Gamble, Fl. Pres. Madr. 1:91. 1915 (Repr. ed. 1:66. 1957); Chandrabose *et al.* in New Botanist VI (3):129. 1979.

Undershrubs or shrubs 2-3 m high, branches ascending. Stems and branches velutinous by minute stellate hairs. Leaves 4.5-11.0 × 2.5-9.5 cm, broadly ovate, apex acute to acuminate, cordate at base, margin coarsely crenate to dentate or nearly entire, 7-11 nerved at the base, both the surface stellate pubescent; petiole 2.5-10.0 cm, minutely stellate hairy, basal portion of the main veins and petioles with both stellate and some simple hairs. Stipules 5-20 mm long, linear, stellate pubescent. Flowers usually 2-5 in axillary long peduncled cymes, rarely solitary in axils; peduncle upto 10 cm long, densely stellate pubescent; pedicel 0.5-5.0 cm long, jointed near the apex, densely stellate pubescent. Calyx 5-8 mm across, campanulate, free upto the middle or below, lobes 6-12 × 3-7 mm, ovate to ovate-lanceolate, acute or acuminate, each with one prominent mid-vein, both the surface stellate pubescent. Corolla 1.5-3.0 cm across, yellow; petals 1.5-2.0 × 0.8-1.7 cm, broadly obovate, obtuse or truncate, ciliate at the base. Staminal column 5-10 mm long, glabrous or densely stellate pubescent, antheriferous towards the apex. Schizocarp 2.0 cm across, subcylindric, deeply indented at the apex; mericarps 8-12, each 15 × 8 mm, flattened reniform with a short mucro, densely pubescent with stellate hairs. Seeds 2-3 per mericarp, c. 3.5 × 2.5 mm, subreniform, tubercled, glabrous, hilum pubescent.

#### KEY TO THE VARIETIES

- 1a. Staminal column 8-10 mm long, glabrous var. *neelgherrense*  
 1b. Staminal column 5 mm long, densely stellate pubescent var. *fischeri*

var. *neelgherrense* — *A. neelgherrense* Munro ex Wt. Ill. 1:66. 1840.

*Type* : Neelgherris, Munro (?) (K).

*Distrib.* : INDIA : Andhra Pradesh, Tamil Nadu.

*Exsicc.* : Karnataka : Bellary, 1880, *Beddome* s.n. (MH). Tamil Nadu : Kuridimalai R.F. (Coimbatore dt.), 1000 m, 19.1.1976, *Chandrabose* 47205 (MH); Aliyar submergible area, 350 m, 25.11.1962, *Sebastine* 15390 (MH). var. *fischeri* Paul *et* Nayar in Bull. Bot. Surv. India 25:183 (1983) 1985.

*Type.* : Tamil Nadu : Coonoor river beach, 1200ft. Coimbatore dt. 10.1.1910, *C.E.C. Fischer* 1581 (Holotype : CAL).

*Distrib.* : INDIA : Tamil Nadu (endemic).

7. *Abutilon pakistanicum* Jafri & Ali in Jafri. Fl. Kar. 220. 1966; Bhandari, Fl. Ind. Des. 61.1978; Abedin in Fl. W. Pak. 130:59. 1979. *Abutilon cornutum* Dalz. *ex* Cooke, Fl. Pres. Bombay 1:98. 1908 (Repr. ed. 1:104. 1958) *non* Sweet 1830.

Erect undershrubs, 20-100 cm high with appressed stellate hairs. Leaves 3-8 cm across, orbicular, apex shortly acuminate to subobtuse, base cordate, margin entire or slightly crenate; petiole 1-9 cm long. Stipules 5-8 mm long, linear. Flowers solitary, axillary or in terminal racemes by reduction of the upper leaves; pedicel 0.8-1.8 cm long. Calyx lobes connate below middle, 7-10 × 4-5 mm, lanceolate to ovate. Petals 7-9 × 5-7 mm, obovate, pale-yellow. Staminal column very short, stellate hairy. Schizocarp 1 cm or more across; mericarps 8-10, each 1.2 × 0.6 cm, with 1 mm long awn. Seeds 3 per mericarp, c. 2 mm across, furfuraceous.

*Type.* : India, Sind, Aug. 1858, *Dalzell* s.n. (K).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : North West Rajasthan; PAKISTAN.

*Notes.* : Differs from *Abutilon grandifolium* (Willd.) Sweet by having plant with appressed hairs, calyx lobes shorter than the schizocarp while in *A. grandifolium* (Willd.) Sweet, plants are with long spreading hairs and calyx lobes longer than schizocarp.

8. *Abutilon pannosum* (Forst. f.) Schlect. Bot. Zeit. 9:828. 1851; Abedin in Fl. W. Pak. 130:72. 1979. *Sida pannosa* Forst. f. in Comment. Soc. Reg. Sci. Gotting. ser. 2:9. 1787. *S. glauca* Cav. Icon. 1:8. t. 11. 1785. *S. mutica* Delile (Fl. Aegypt. illustr. 20. n. 633. 1813 *nom. nud.*) *ex* DC., Prodr. 1:470. 1824. *Abutilon glaucum* (Cav.) Sweet, Hort. Brit. 1:54. 1826; Gamble, Fl. Pres. Madr. 1:91. 1915 (Repr. ed. 1:66. 1957). *A. muticum* (Delile *ex* DC.) Sweet, Hort. Brit. ed. 2:65. 1830; Mast. in Hook. f., Fl. Brit. India 1:327. 1874. *Sida tomentosa* Roxb. Fl. Ind. ed. Carey 3:178. 1832. *Abutilon tomentosum* Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1:56. 1834.

*Local Name.* : Makhmali kapat (Guj.).

Undershrubs or shrubs up to c. 2 m high. Stem slender, tomentose by stellate and some simple hairs. Leaves 2-8 × 2.0-7.9 cm, orbicular to round cordate, apex acute, margin irregularly toothed, 5-9 nerved at the base, both the surface densely stellate hairy; petiole 1.5-6.0 cm, tomentose by stellate and simple hairs. Stipules 3-6 mm long, linear, hairy. Flowers solitary, axillary, sometimes in racemes by replacing the upper leaves; pedicel 1-4 cm long, slender, jointed towards the apex, pubescent by stellate and some simple hairs. Calyx campanulate, free up to the middle, lobes 0.8-1.5 × 0.5-0.8 cm, deltoid to ovate, outside densely stellate hairy, inside with simple hairs. Corolla yellow with deep brown centre, 1.5-2.0 cm across; petals 1-2 × 1.0-1.5 cm, obliquely triangular, glabrous. Staminal column 5-8 mm long, not exceeding the petals, antheriferous throughout, stellate pubescent. Schizocarp 0.5-1.0 cm high, 1-2 cm across, subglobose, depressed at the top, downy, mericarps 20-25, each 6-10 × 5 mm, reniform with awn, compressed in two sides, hairy on the dorsal margin. Seeds 2-3 per mericarp c. 1.5 mm across, minutely hairy or glabrous, brownish.

*Fts. & Frts.* : Oct.-Mar.

*Distrib.* : INDIA : Rajasthan, Gujarat, Punjab, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; PAKISTAN, AFGHANISTAN, SRI LANKA, EGYPT, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : Devikundsagar near Ridmalser (Bikaner dt.), 213 m, 19.3.1975, *G.P. Roy* 1734 (CAL); Uterai, 180 m, 21. 10. 1975, *Shetty* 2292 (CAL). Karnataka : Bellary, Feb. 1888, *Gamble* 20359 (CAL); Govt. Farm, Bellary, Dec. 1904, *Barber* 6557 (MH).

*Chr. No.* :  $2n=28$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23:195. 1941).

*Uses* : Stem yields fibre of lower quality. Leaves mucilaginous, used as pectoral.

*Pollen* : Average size 71  $\mu$  (range 70-74  $\mu$ ). Exine thickness 1  $\mu$  at interspinal region, and 5.6  $\mu$  at spine base. Spine tip slightly acute. Basal cushion pyramidal with a deep interspinal curve. (P.K.K. Nair in Bull. Nat. Bot. Gard. 63:7. 1962).

9. *Abutilon persicum* (Burm. f.) Merr. in Philip. Journ. Sc. 19:364. 1921; Borss. in Blumea 14:163. 1966. *Sida persica* Burm. f. Fl. Ind. 148 t. 47 f. 1. 1768. *S. polyandra* Roxb. (Hort. Beng. 50. 1814 *nom. nud.*) Fl. Ind. ed. Carey 3:173. 1832. *Abutilon polyandrum* (Roxb.) Wt. & Arn. ex Wight, Cat. 12. 1833 *non* G. Don 1831; Mast. in Hook. f., Fl. Brit. India 1:325. 1874; Cooke, Fl. Pres. Bombay 1:95. 1901 (Repr. ed. 1:101. 1958); Prain, Beng. Pl. 1:260. 1903 (Repr. ed. 1:176. 1963); Gamble, Fl. Pres. Madr. 1:91. 1915 (Repr. ed. 1:65. 1957); Haines, Bot. Bih. & Or. 1(2):61. 1921 (Repr. ed. 1:63. 1961).



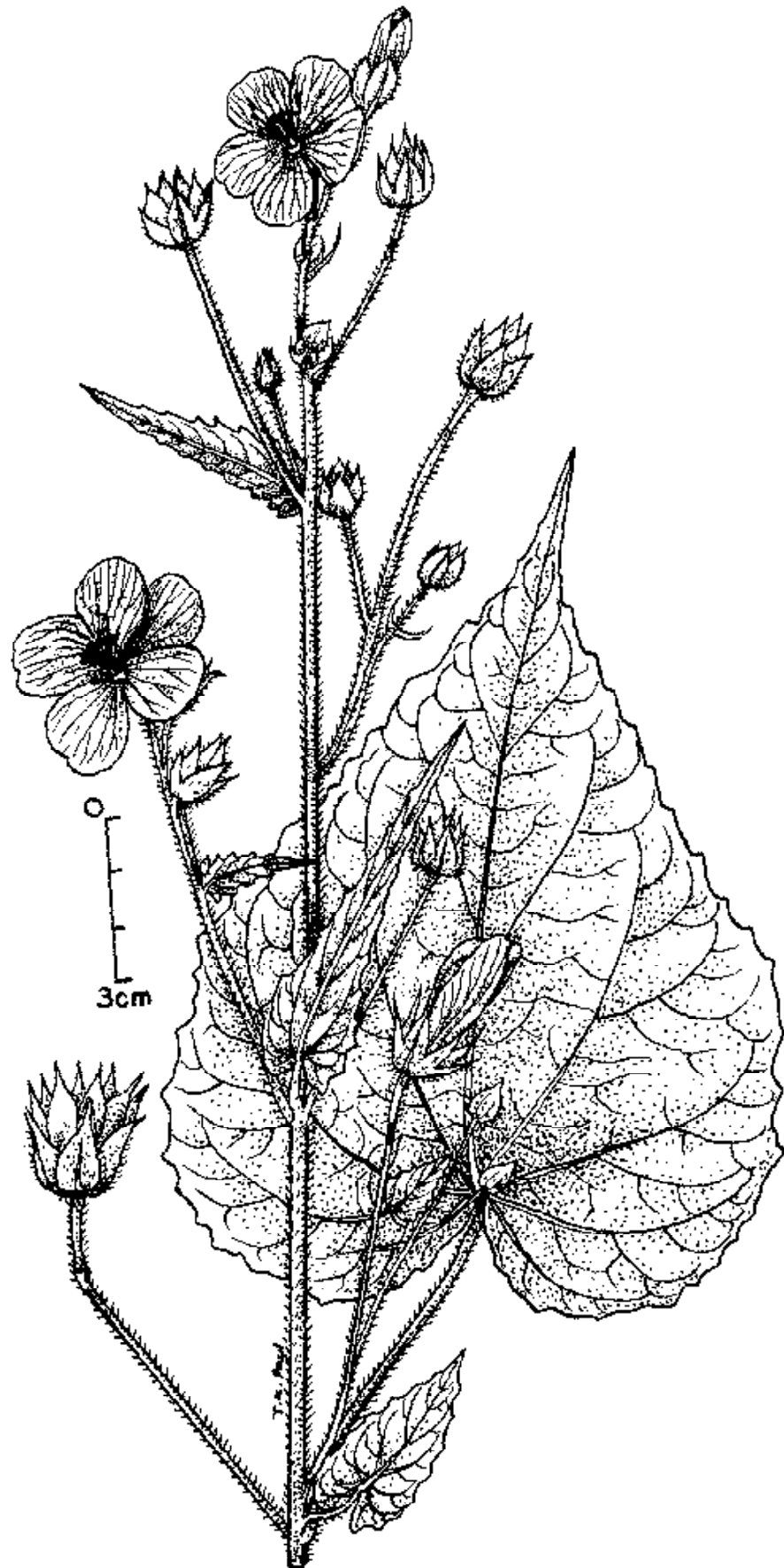


Fig. 19 *Abutilon pernicum* (Burm. f.) Merr.

Undershrubs or herbs, 1-3m high. Stem pubescent with minute stellate hairs and few patent simple and some gland hairs. Leaves 2-20 × 1-25 cm, lower leaves ovate-cordate, acute to acuminate, upper ones ovate to lanceolate, apex gradually long acuminate, crenate-dentate, 5-9 nerved at the base, upper surface densely stellate hairy or glabrescent, lower surface velutinous with minute stellate hairs and some scattered simple hairs on the nerves below; petiole 0.5-12.0 cm, pubescent with stellate and simple hairs. Stipules c. 6 mm, linear, subulate. Flowers solitary, axillary or partly in terminal panicles or racemes by replacing the upper leaves; pedicel 2.5-7.0 cm, accrescent upto 8 cm, jointed 1-2 cm below the flower, stellate pubescent. Calyx 4-6 mm across, cup-shaped, free below to the middle or towards the base, lobes 7-10 × 3-6 mm, ovate to lanceolate, acute to acuminate, outside densely hairy with minute stellate and some scattered simple hairs, inner surface velutinous with short simple hairs. Corolla yellow without purple centre; petals 2.0-3.5 × c. 1.5 cm, obovate, marginal portion in the outside hairy. Staminal column c. 5.5 mm long, lower portion glabrous, upper part stellate hairy, filaments c. 15 mm long. Schizocarp 12-20 mm across, more or less campanulate; mericarps 5, each c. 15 mm high and radially c. 5 mm with two stout erecto-patent awns, awns c. 3 mm long, outer surface stellate and simple hairy, inner surface glabrous. Seeds 4-6 per mericarp c. 2 mm across, reniform, glabrous or minutely punctate by stellate hairs, blackish-brown.

*Type* : Burmann f., Fl. Ind. t. 47 f. 1.

*Fls. & Frts.* : Nov.-April.

*Distrib.* : Throughout INDIA BURMA, CHINA, MALESIA.

*Exsicc.* : Uttar Pradesh : Malwal Tal (Nainital Div.), 909 m, 3.12.1926, *Osmaston* 1321 (DD). Madhya Pradesh: Pachmarhi (Hosangabad), 28.12.1962, *Panigrahi* 6665 (CAL). Maharashtra: On the way to Harishchandragad (Jhana Dt.), ±1000 m, 18.4.1968, *Billore s.n.* (CAL). Kerala : Thekkadi (Kottayam Dt.), 875 m, 27. 1.1965, *Vivekananthan* 23013 (MH).

*Uses* : Stem yields long silky fibres resembling hemp.

*Pollen* : Average size 71 μ (range 70-74 μ). Exine thickness 4.2 μ. Basal cushion of excrecence not formed [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 8. 1962].

*Notes* : This species is allied to *Abutilon auritum* (Wall. ex Link) Sweet but differs in having its linear to lanceolate stipules, arcuate type of venation in leaf and 5 mericarps in each schizocarp.

10. *Abutilon ramosum* (Cav.) Guill. et Perr. in Guill. et al., Fl. Senegamb. 1 : 68. 1830; Mast. in Hook. f., Fl. Brit. India 1 : 328. 1874; Cooke, Fl. Pres. Bombay 1 : 98. 1901 (Repr. ed. 1 : 103. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 83. 1903 (Repr. ed. 1 : 79. 1960); Gamble, Fl. Pres. Madr. 1 : 91. 1915

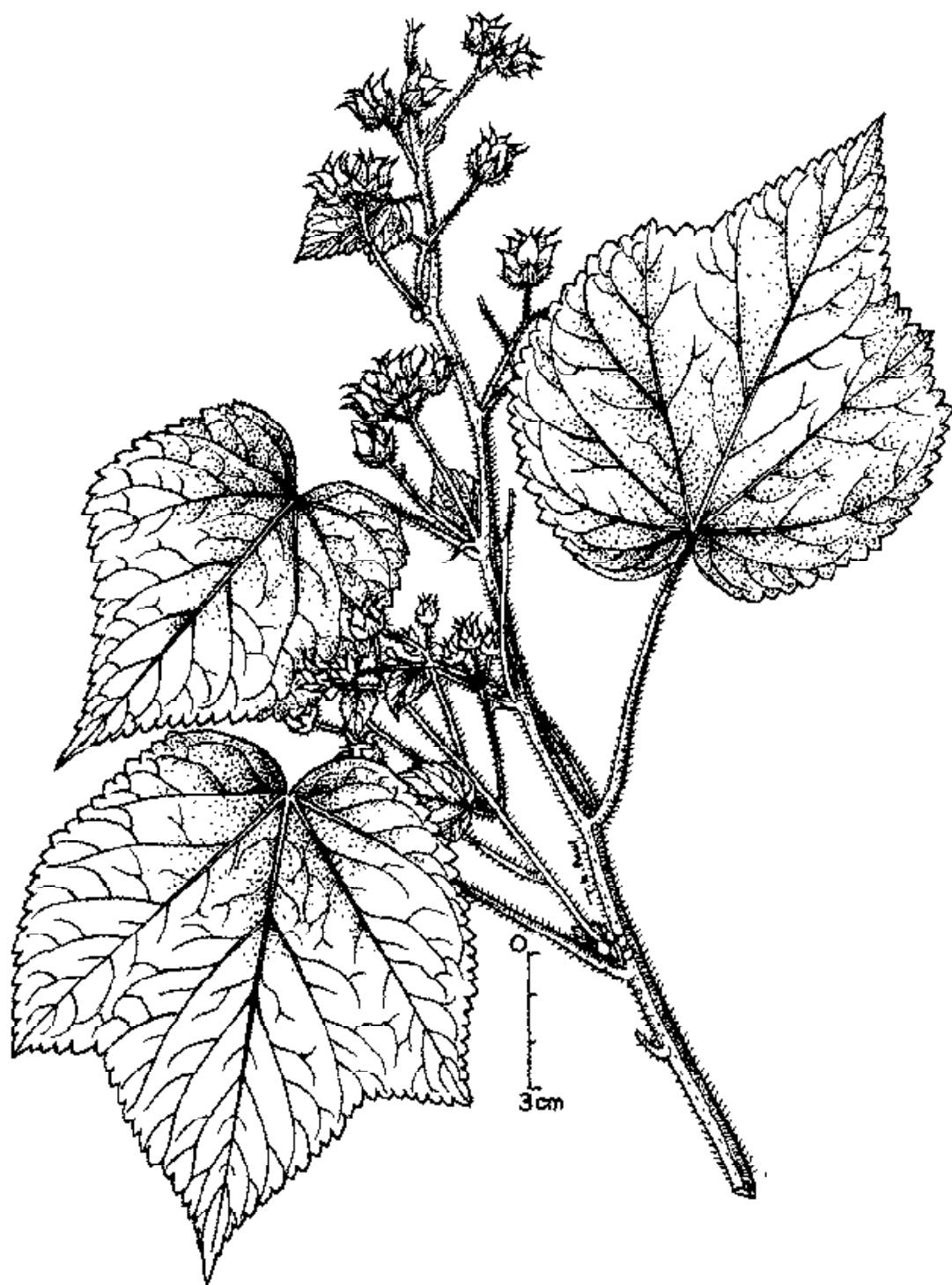


Fig. 20 *Abutilon ramosum* (Cav.) Guill. et Perr.

(Repr.ed.1: 65,1957); Abedin in Fl. W. Pak. 130 : 55. 1979. *Sida ramosa* Cav. Diss. 1 : 28. t. 6 f. 1. 1785. *Abutilon sidioides* Dalz. & Gibs. Bombay Fl. 18. 1861. Fig. 20

*Local Name* : Dholi kapat (Guj.)

Perennial herbs or undershrubs, 1.0-3.5 m high. Stems densely stellate and simple hairy, glabrescent. Leaves 2.5-12.0 × 2.5-11.0 cm, ovate, apex acute to acuminate, base cordate, sometimes 3-angled, margin crenate-serrate, palmately 5-7 nerved at the base, upper surface glabrescent or minutely stellate pubescent and lower surface densely stellate pubescent; petiole 2-12 cm long, stellate hairy. Stipules 5-10 mm long, linear, hairy. Flowers solitary or paired, or peduncle divided above dichotomously as in cyme, axillary or terminal; peduncle 1.5-4.5 cm long, tomentose; pedicel shorter than the petiole, jointed towards the apex, pubescent with stellate and simple hairs. Calyx campanulate, 3-5 mm across, free upto the middle, lobes 4-6 × 2.5-3.0 mm, accrescent up to c. 8 × 5 mm, ovate-acuminate, outside densely stellate pubescent, inside with minute stellate and some appressed simple hairs, middle portion of inside glabrescent. Corolla yellow, c. 1 cm across; petals c. 5 × 8 mm, glabrous. Staminal column c. 2.5 mm long, antheriferous towards the apical portion, stellate hairy. Schizocarp c. 1 × 1 cm; mericarps 8-10, each 6-10 × 3-5 mm, each with two long villose spreading or reflexed awns, mericarps splitting through the dorsal suture, 2-3 seeds per mericarp. Seeds c. 2 mm across, reniform, minutely puberulous with stellate hairs, glabrescent, brownish black.

*Type* : Senegal, *Adanson* (MA; Photo!).

*Fls.* : Aug.-Oct.; *Frts.* : Sept.-Mar.

*Distrib.* : INDIA : Kashmir, Rajasthan, Gujarat, Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Kerala; PAKISTAN, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : Bagor, 24.12. 64, *D.M. Verma* 6974 (CAL); Marwar, *G. King s. n.* (CAL); Shivbari Tank side, 236 m, 11.3.1975, *G.P. Roy* 1707 (CAL). Gujarat : Ahmedabad, 10.11.1890, *P.S. Kanethkar s.n.* (CAL). Madhya Pradesh : Kunnoo river bank (Gwalior), 16.11.62, *Panigrahi* 5951 (CAL).

*Pollen* : Average size 76 μ (range 74-81 μ). Spine height 5.6 μ tip, slightly acute. Basal cushions slightly apart from each other. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 77. 1962].

*Notes* : This species is allied to *Abutilon fruticosum* Guill. & Perr. but differs in having mericarps with two long spreading or reflexed awns and leaves glabrescent on the upper surface.

11. *Abutilon ranadei* Woodr. *et* Stapf. in Kew Bull. 99 . 1894; Cooke. Fl. Pres. Bombay 1 : 96. 1901 (Repr. ed. 1 : 101. 1958).

Undershrubs, c. 120 cm high. Young portion of the stem densely pubescent with minute stellate hairs, mature portion glabrous. Leaves 4-20 × 3-15 cm, ovate to round-ovate, apex acute to acuminate, base cordate, margin crenate to dentate, 7-11 nerved at the base, both surface stellate hairy, more denser in the lower surface, upper surfaces occasionally glabrescent; petiole 2-15 cm long, densely stellate pubescent. Stipules c. 5 mm long, linear, stellate pubescent, deciduous. Flowers solitary, axillary; pedicel 1.5-3.0 cm long, densely stellate pubescent. Calyx c. 1.5 cm across, campanulate, connate in the middle, lobes c. 2.0 × 0.5 cm, stellate hairy, each with 3 prominent veins. Corolla c. 2.5 cm across, campanulate, orange yellow; petals about two times longer than the calyx lobes, apex more or less rounded, out side towards the apex tomentose, inside glabrous. Staminal column c. 2 cm long, glabrous, filaments c. 3 mm long. Carpels 5, acuminate, mucronate, densely hairy throughout.

*Type* : India Ratnagiri, Ambaghat, N.B. Ranade s. n. (Holotype K; Isotypes CAL!, BLAT!).

*Fls. & Frts.* : Nov.-Jan.

*Distrib.* : INDIA : Maharashtra (Ambaghat). Endemic to the type locality.

*Pollen* : Average size 76 μ (range 74-77 μ). Exine 4.2 μ thick, spinulate. Basal cushion of spinules not formed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 8. 1962].

*Notes* : It is distinguished from its nearest species *Abutilon persicum* (Burm. f.) Merr. by its longer staminal column with shorter filaments.

12. *Abutilon striatum* Dickson ex Lindl. Bot. Reg. Misc. Not. 39. 1839; Dickson in Maund, Botanist 3, t. 144. 1839; Borss. in Blumea 14 : 162. 1966. *Sida striata* (Dickson ex Lindl.) Dietr. Synops. 4 : 852. 1847.

Erect shrubs, 1-2 m high. Leaves 2-12 × 1-10 cm, orbicular to broadly ovate, 3-5 lobed or parted; lobes deltoid, ovate or oblong, apex acute or acuminate, margin coarsely crenate to serrate; petiole 1-6 cm long. Stipules 3-6 mm, linear. Flower solitary, axillary; pedicel 3-10 cm long. Calyx campanulate, slightly inflated at base; lobes 5-10 × 5-8 mm, deltoid, acute or slightly acuminate. Petals 2.5-4.5 × 2-3 cm, obliquely obovate, red to orange. Staminal column as long as the petals. Schizocarp 1.5-2.0 cm across, globular; mericarps 8-11, c. 15 × 6 mm, reniform, apex rounded.

*Type* : Maund, Botanist 3, t. 144.

*Fls. & Frts.* : Jan.-Apr.

*Distrib.* : INDIA : Cultivated as an ornamental in the gardens, occasionally running wild in Cherrapunji hills (Meghalaya) and Nilgiri hills (Tamil Nadu). Native of Central America.

*Exsicc.* : Uttar Pradesh : Dobalwala (Dehra Dun), 20.10.58, *Raizada s. n.* (DD); Forest school garden (Dehra Dun), May 1899, *B. Birbal s. n.* (DD).

*Chr. No.* :  $2n = 16$  (Skovsted in Journ.Genetica 31:263.1935 ).

13. *Abutilon theophrasti* Medic. Malv. 28. 1787; Hu, Fl. China fam. 153, 31.t. 8.f. 1-4. 1955; Borss. in Blumea 14 : 166. 1966; Abedin in Fl. W. Pak. 130 : 61. 1979. *Sida abutilon* Linn. Sp. Pl. 685. 1753. *Abutilon avicennae* Gaertn. Fruct. 2 : 251. t. 135 f. 1. 1791; Mast. in Hook. f., Fl. Brit. India 1 : 327 1874; Prain, Beng. Pl. 1 : 260. 1903 (Repr. ed. 1 : 176. 1963).

*Local Name* : Nani kapat (Guj.)

Annual undershrubs upto c. 1 m high. Stems slender, bark fibrous at the mature part, densely velutinous with stellate hairs and some simple hairs. Leaves 3.5-16.0 × 4-13 cm, orbicular, apex shortly acuminate, base cordate, margin crenate to dentate or entire, 5-7 nerved at the base, both the surface densely stellate hairy, more denser on the lower surface; petiole 5-18 cm long, pubescent. Stipules 6-8 mm long, linear to filiform, acute. Flower solitary, axillary; pedicel 1.5-4.5 cm long, shorter than the petiole, jointed towards the apex, stellate pubescent. Calyx c. 1 cm across, campanulate, free to the middle or below, lobes 7-10 × 4-6 mm, slightly accrescent, spreading, ovate, acuminate, outside densely stellate hairy, inside with both simple and stellate hairs. Corolla 1.5-2.0 cm across, yellow; petals 1.5 × 0.6 cm, obovate to orbicular, apex rounded, glabrous. Staminal column 2-3 mm long, without tubular part, glabrous. Schizocarp 1-2 cm across, exceeding the persistent calyx; mericarps 10-16, each 10-15 × c. 7 mm, reniform, apex with 2 stout, sharp erecto-patent awns, awns 3-7 mm long, densely stellate hairy. Seeds 1-2 per mericarp, each 3-3.4 mm across, reniform, pubescent with minute stellate hairs particularly in hilum, brownish black.

*Type* : India, Hortus Cliffortianus (Lectotype : BM-Herb. Cliff.).

*Fls. & Frts.* : May-Aug.

*Distrib.* : INDIA : Jammu & Kashmir, Punjab, Rajasthan, Gujarat, Tamil Nadu; PAKISTAN, CHINA, IRAN, USSR, AFRICA, AUSTRALIA, NORTH AMERICA. Native to India.

*Exsicc.* : Jammu & Kashmir : Sumbal casem, 1515 m, June 1905, *Meebold* 3662 (CAL). Rajasthan : Khanpur-Aklara Road, 31.5.65, *Wadhwa* 9581 (CAL). Tamil Nadu : Valankulam, Coimbatore, 467 m, 3.6.1968, *Chandrabose* 29963 (MH).

*Uses* : Stem yields good fibre known as 'China Jute' or 'Tientsin jute'. The leaves are demulcent and the bark is astringent.

*Notes* : This species is allied to *A. pakistanicum* Jafri et Ali but differs in having cylindrical schizocarp, mericarps with two stout erecto-patent beaks and staminal column without any tubular part.

### 3. ALCEA

Linn. Sp. Pl. 687. 1753; Gen. Pl. ed. 5. 307. 1754; Boiss. Fl. Or. 1 : 826. 1867; Zohary in Bull. Res. Council. Israel 11 : 210. 1963.

Biennial or perennial herbs. Leaves entire to parted, densely stellate hairy. Flowers axillary, solitary or in terminal racemes by replacing the upper leaves. Epicalyx segments 6-9, connate at the base. Calyx 5-lobed. Corolla more than 3 cm long. Staminal column 5-angled, glabrous. Fruit schizocarp, mericarps 18-40, each incompletely 2-loculed by false septum, lower locule with 1-seed, upper one without seed, dorsally grooved, often winged. Seeds reniform.

*Distrib.* : c. 60 species mainly in E. Mediterranean region. 1 species in India.

*Alcea rosea* Linn. Sp. Pl. 687. 1753; Boiss. Fl. Or. 1 : 831. 1867; Zohary, *l.c.* 12 : Abedin in Fl. W. Pak. 130 : 49. 1979. *Althaea rosea* (Linn.) Cav. Diss. 2 : 91 t. 28. f. 1. 1786; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874; Duthie, Fl. Upper Gang. Pl. 1 : 78. 1903 (Repr. ed. 1 : 73. 1960); Borss. in Blumea 14 : 151. 1966.

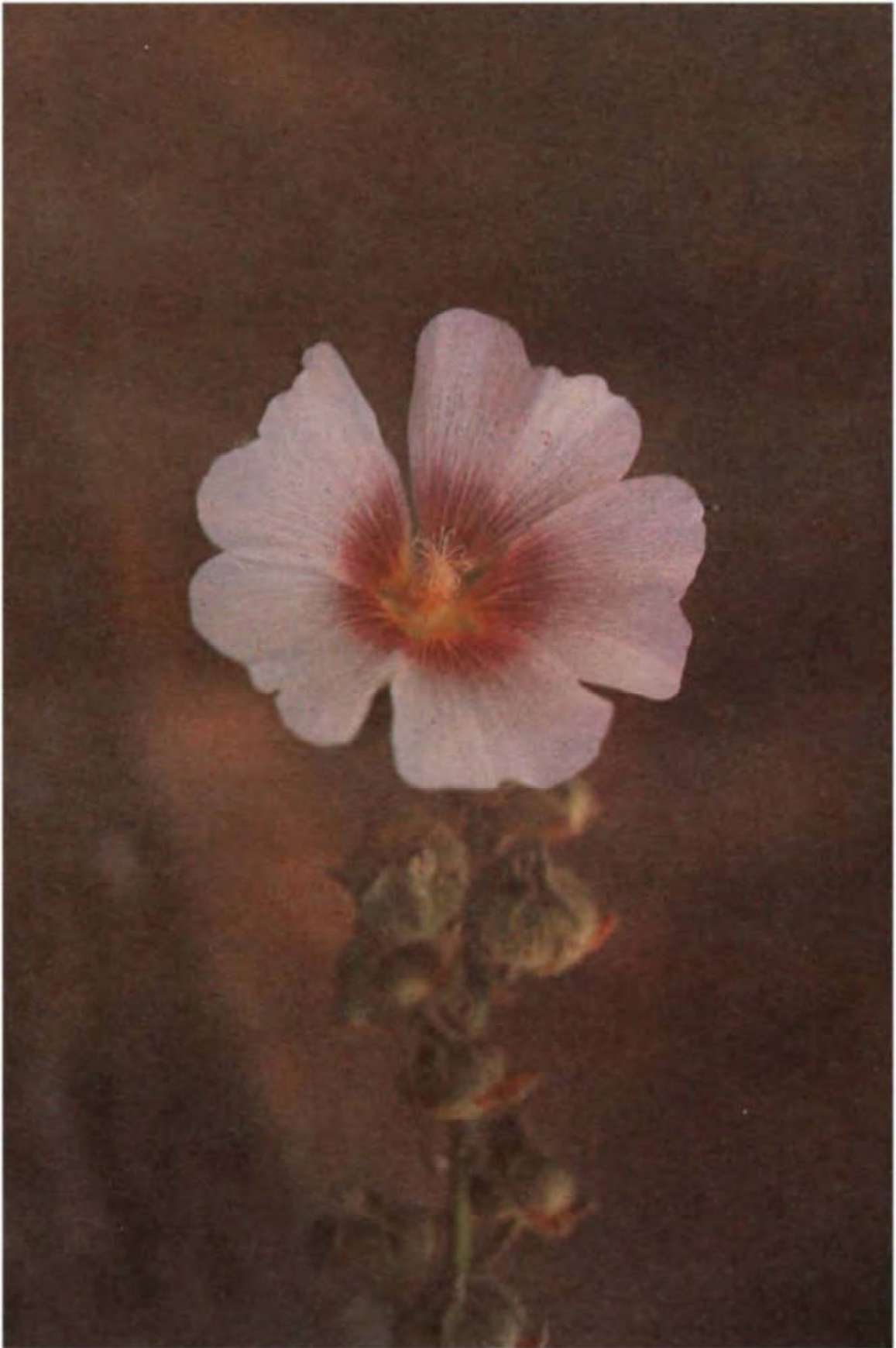
*Local Names* : Hollyhock (Eng.); Sudooposh (Kashmiri); Gulphaira (Hindi).

Annual erect herbs, 1.5-2.0 m high, stellate hairy or glabrescent. Leaves 3-13 × 3.5-12.0 cm, orbicular-cordate, deeply 3-7 lobed, upper leaves 3-lobed, lobes subrotundate or triangular apex acute, margin crenate to dentate; petiole 2-18 cm. Flowers solitary, axillary or in terminal raceme by replacing the upper leaves; pedicel 5-10 mm long, accrescent upto 15 mm in fruit. Epicalyx segments 6-7, each 1.0-1.5 × 0.3-0.5 cm, ovate, lanceolate. Calyx lobes, 1.5-2.0 × 5-10 mm, ovate to ovate-lanceolate. Petals 4-7 cm long, variously coloured, usually red. Staminal column 10-15 mm long. Schizocarp c. 2 cm across, depressed globose, pubescent, enclosed by the calyx; mericarps 20-40, c. 4 mm across, longitudinally sulcate.

*Type* : H.U. Linn. Herb. n. 869.1 (LINN; Photo!).

*Fls. & Frts.* : Mar.-Sept.

*Distrib.* : Cultivated throughout India for its showy flowers. According to Zohary (l. c.) "Wild *A. rosea* L. seems to be indigenous almost exclusively on the Aegean islands and the adjacent Balkan peninsula. The areas of its origin



*Alcea rosea* Linn.



are no doubt the north-eastern Mediterranean countries, but not China which is beyond the natural range of the genus".

*Exsicc.* : Jammu & Kashmir : Srinagar, 1000 m, 1.7.1891, *Gammie s. n.* (CAL). Uttar Pradesh : Dehra Dun, 1869, *King s. n.* (CAL). West Bengal : Around Burdwan, 30.4.65, *A.K. Dutt 752* (CAL); Botanic Garden, Calcutta, 27.3.1916, *P.M. Debbarman 3* (CAL).

*Chr. No.* :  $2n = 42$  (Skovsted in C.R.Lab. Carls. S. Physiol 23: 195. 1941).

*Uses* : Flowers and seeds are medicinal. The flowers yield a red dye (Anthocyanin) which may be used as indicators in acidimetry and alkalimetry (Sobyanin and Soakov in Chem. abstr., 1930; 24, 1962).

*Pollen* : Average size  $136 \mu$  (range  $130-140 \mu$ ). Interporal distance  $7 \mu$ . Spines dimorphic, one type being larger (height  $21 \mu$ ) and the other shorter (height  $5.6 \mu$ ). Ends of all spines pointed. Basal cushion not formed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 10. 1962.]

#### 4. ALTHAEA

Linn. Sp. Pl. 686. 1753; Gen. Pl. ed. 5 : 307. 1754; DC. Prod. 1 : 436. 1824; Benth. & Hook. f., Gen. Pl. 1 : 200. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. ed. 3, 6 : 40. 1890; Hutch. Gen. Fl. Pl. 2 : 552. 1967.

Annual or perennial herbs. erect or decumbent, pubescent or villous. Leaves suborbicular in outline, deeply lobed or partite or rarely entire. Flowers axillary, solitary or in fascicles or subracemose towards the end of the branches. Epicalyx cupular, segments 6-9, connate at the base, deltoid, densely lanate and bristly. Calyx campanulate, 5-lobed, densely hairy. Corolla infundibular, petals obovate-cuneate. Staminal column antheriferous almost to the base, hairy. Carpels numerous, 1-ovule in each carpel, style branches as many as the carpels, filiform; stigmas adaxial. Fruit schizocarp, mericarps arranged in a circle around the axis, indehiscent, ultimately separating at maturity.

*Distrib.* : c. 20 species in the subtropical and temperate regions of Europe and Asia. 2 species in India.

*Ecol.* : Grow in the waste places, road sides, sometimes in drier regions in the subtropical to temperate zone.

#### KEY TO THE SPECIES

- 1a. Prostrate or ascending herbs. Leaves 5-7 lobed. Petals white:  
     Schizocarp with 8-9 mericarps, glabrous. . . . . *A. ludwigii* 1
- 1b. Erect herbs. Leaves entire or slightly 3-lobed. Petals rosy. Schizocarp  
     with 10-15 mericarps, stellate pillose . . . . . *A. officinalis* 2

- 1 *Althaea ludwigii* Linn. Mant. 98. 1767; Cav. Diss. 2 : 96. t. 30, f. 3. 1786; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874; Cooke, Fl. Pres. Bombay 1 : 89. 1901 (Repr. ed. 1 : 95. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 78. 1903 (Repr. ed. 1 : 73. 1960); Bhandari, Fl. Ind. Des. 63. 1978.

*Local Name* : Golio (Raj.).

Prostrate or ascending herbs, branched from the base. Leaves 0.5-1.5 × 0.8-1.8 cm, lobed, lobes wedge-shaped, cuneate, each lobe 3-5 fid; petiole 2-10 cm long. Epicalyx segments 7-9, each 3-5 × c. 1 mm. Calyx as long as the epicalyx, accrescent. Petals white exceeding the sepals. Schizocarp 4-6 mm across; mericarps 8-9, wrinkled at the sides. Seeds 1 mm in diameter, brownish-black.

*Type* : Herb. Linn. n. 868.4 (LINN; Photo !)

*Fls. & Frts.* : Jan.-Mar.

*Distrib.* : INDIA : Maharashtra, Punjab, Rajasthan; WEST ASIA, PAKISTAN, MEDITERRANEAN REGION, SOUTH AFRICA.

*Exsicc.* : Punjab, Without precise locality, 303 m, Hook f. & Thomson s. n. (CAL). Maharashtra : Urned Roadside (Nagpur), 3.1.1960, s. l. 608 (CAL).

*Pollen* : Panporate, spheroidal (diameter 98-112 μ). Pores circular (diameter 2 μ). Interporal distance 21 μ. Exine thickness 7 μ, spinate. Columellate larger, ectine thinner than entine. Spines dimorphic, one type being longer (height 9.8 μ) and with pointed ends, while others being shorter (5.6 μ) and with rounded tips. Basal cushion of spines slightly formed. [ P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 9. 1962]

*Notes* : It is easily recognized from *A. officinalis* Linn. by its prostrate or ascending habit, white petals and glabrous schizocarp.

2. *Althaea officinalis* Linn. Sp. Pl. 686. 1753; Cav. Diss. 2 : 93. t. 30, f. 2. 1786; Boiss. Fl. Or. 1 : 825. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874.

*Local Names* : Khitmi-ka-jhar (Hind.); Marsh Mallow (Eng.); Shemaitutti tutti (Tam.).

Erect herbs, branched throughout. Leaves 2.5-7.0 × 1.5-6.0 cm, entire or slightly 3-lobed, apex acute, base scarcely cordate, margin irregularly dentate; petiole 1-4 cm long. Stipules 5-10 × 1-2 mm. Pedicel 0.5-1.5 cm. Epicalyx segments 6-8, each 2-3 × 1 mm. Calyx exceeding the epicalyx, lobes 4-6 × 3-4 mm. Petals 1.5-2.5 × 0.4-1.0 cm, rosy. Staminal column 0.5-1.0 cm long. Schizocarp 0.5-0.7 cm across, partly covered with persistent calyx; mericarps 10-15, wrinkled at the sides. Seeds 1.5-2.5 mm in diameter, brownish-black.

*Type* : Herb. Linn. n. 868. 1 (LINN : Photo !).

*Fls. & Frts.* : August-July.

*Distrib.* : INDIA : Kashmir, Punjab; CENTRAL & SOUTHERN EUROPE, NORTH AFRICA, AFGHANISTAN, TURKEY. Often cultivated in gardens.

*Exsicc.* : Kashmir, *Falconer* 281 (CAL).

*Chr. No.* :  $2n = 42$  (Skovsted in *Genetica* 31:263.1935).

*Uses* : The species is having good healing property and it is esteemed by Greeks and Latins. The leaves and flowers are mixed with oil and applied to burns and venomous bites. A decoction of the root with sugar is given in cough and irritation of the intestine and bladder. Seeds dissolved in vinegar are used generally to remove toothache. The plant is used as green vegetable.

*Notes* : Masters (1874) described a variety i.e. *A. officinalis* var. *tauriensis* Mast. characterised by not so densely downy as the type, flowers comparatively few. No specimen of the variety *tauriensis* is available for study.

## 5. ANODA

Cav. Diss. 1 : 38 t. 10 f. 3. 1785; Benth. & Hook. f., *Gen. Pl.* 1 : 202. 1862; K. Schumann in Engl. & Prantl, *Nat. Pflanzenfam.* 3, 6 : 44. 1890; Hutch. *Gen. Fl. Pl.* 2 : 563. 1967.

Herbs, hispid or glabrescent. Leaves hastate, rarely dissected or entire. Stipules filiform. Flowers axillary or interterminal racemes. Epicalyx absent. Calyx 5-lobed, spreading. Corolla violet or yellow, petals 5. Ovary many loculed; styles as many as the carpels, 1-ovule in each carpel. Fruit schizocarp, mericarps separating from the axis, 1-seeded.

*Distrib.* : c. 14 species in the subtropical and tropical regions of America. Only 2 or 3 species have been introduced in the Old World. 1 species rarely cultivated in India.

*Anoda hastata* Cav. Diss. 1 : 38 t. 11 f. 2. 1785; DC. *Prod.* 1 : 458. 1824; Mast. in Hook. f., *Fl. Brit. India* 1 : 321. 1874; Borss. in *Blumea* 14 : 149. 1966. *Sida hastata* (Cav.) Sims, in *Curtis Bot. Mag.* 37, t. 1541. 1831.

*Distrib.* : INDIA (rarely cultivated in Northwestern and Peninsular India). Native of tropical and subtropical America.

## 6. DECASCHISTIA

Wt. & Arn. *Prod. Fl. Pen. Ind. Or.* 1 : 52. 1834; Benth. & Hook. f., *Gen. Pl.* 1 : 206. 1862; Mast. in Hook. f., *Fl. Brit. India* 1 : 382. 1874; K. Schumann in Engl. & Prantl, *Nat. Pflanzenfam.* 3, 6 : 47. 1890; Hutch., *Gen. Fl. Pl.* 2 : 542. 1967.

Perennial shrubs or herbs, tomentose. Leaves coriaceous, entire or lobed, densely pubescent on both sides, middle nerve beneath with a nectary near its

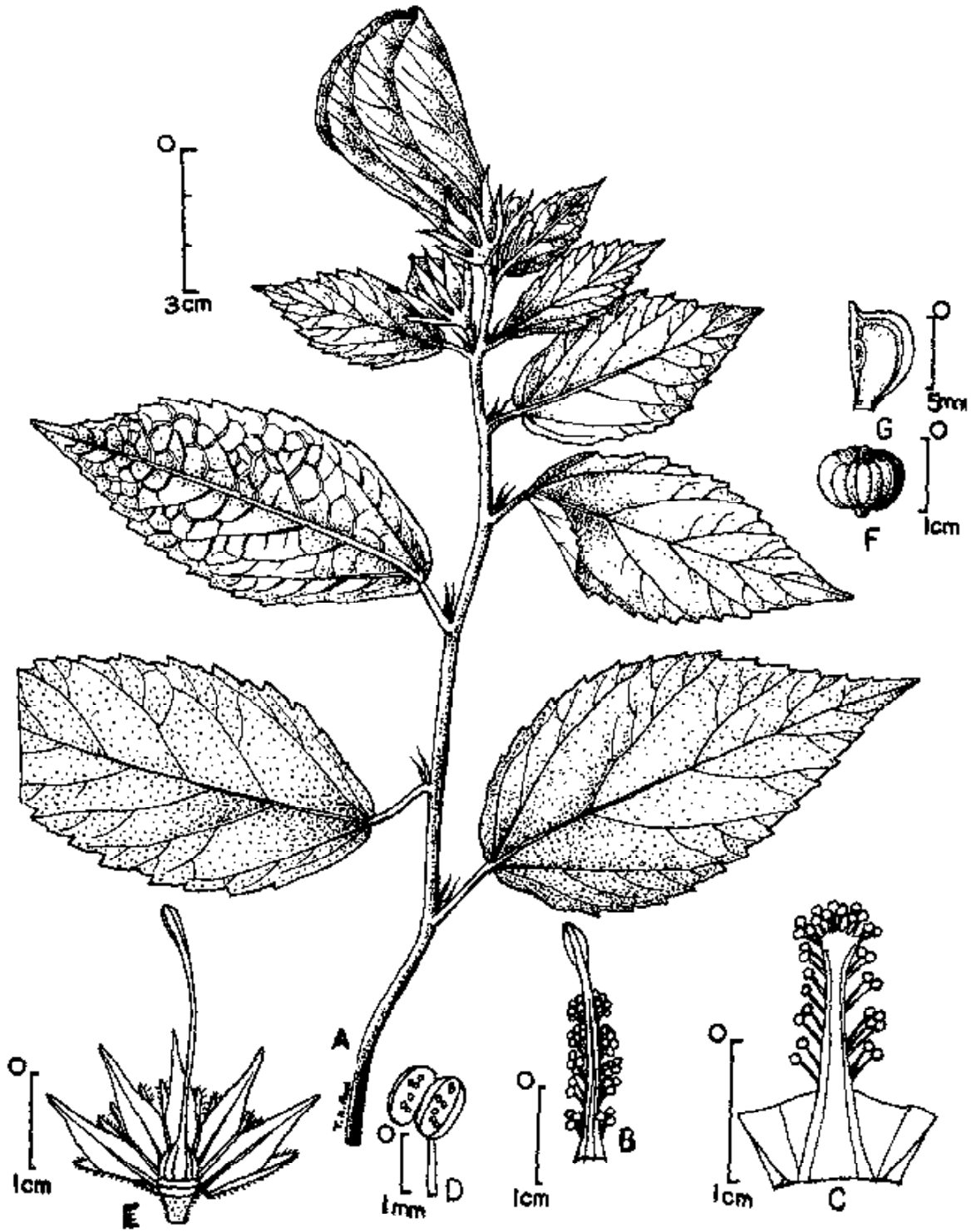


Fig. 21 *Decaschistia crotonifolia* Wt. & Arn. A. Habit. B. Staminal column with stigmas projecting. C. Staminal column showing its attachment to the corolla. D. Anther. E. Gynoecium encircled by calyx and epicalyx. F. Capsule. Seed within a capsule locule.

base. Flowers shortly pedicellate, axillary or clustered in the uppermost axils or at the top of the branches. Epicalyx segments 10, unequally connate below. Calyx 5-lobed, connate in the middle or below. Petals 5, not auricled. Staminal column antheriferous throughout. Ovary 10-loculed. Style branches 10, capitellate-stigmatose at the apex. Capsule loculicidally 10 valved, valves attached by the base to a short conical 10 angled central column. Seeds reniform, ascending.

*Distrib.* : c. 17 species. Most of the species are native to the Indo-China peninsula. 2 species occur in Australia. 4 species in India.

*Ecol.* : Grows in waste places, forest edges in the altitude between 100-1600 m.

### KEY TO THE SPECIES

- 1a. Middle and lower leaves not lobed :  
 2a. Leaves ovate lanceolate. Stem with dense white tomentum. Seeds glabrous. . . . . *D. crotonifolia* 1  
 2b. Leaves ovate or ovate-rounded. Stem with reddish-yellow tomentum. Seeds scarcely pubescent :  
 3a. Leaves almost rounded (3.5-7.5 × 4-7 cm), apex rounded. Petiole length about ½ to ⅓ of the lamina. Calyx lobes 1.0-1.2 cm long . . . . . *D. rufa* 3  
 3b. Leaves ovate (8-13 × 5-8 cm), Petiole length about ⅓-½ of the lamina. Calyx lobe 1.6-2.0 cm long. . . . . *D. cuddapahensis* 2  
 1b. Middle and lower leaves deeply trilobed . . . . . *D. trilobata* 4

1. *Decaschistia crotonifolia* Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1 : 52. 1834; Wt. Ic. 1: t. 42. 1840; Mast. in Hook. f., Fl. Brit. India 1 : 332. 1874; Duthie, Fl. Upper Gang. Pl. 1 : 86. 1901 (Repr. ed. 1 : 81. 1960); Gamble, Fl. Pres. Madr. 1 : 94. 1915 (Repr. ed. 1 : 68. 1957). *Hibiscus crotonifolius* Wall. Cat. no. 1901. 1828 *nom. nud.* Fig. 21

Shrubs c. 2 m high. Stems and branches densely whitish stellate pubescent. Leaves 3-4 × 1.5-8.0 cm, ovate-lanceolate, apex acute to obtuse, base cordate-rounded, margin coarsely dentate, stellate pubescent on both the surface, more densely on the lower surface; petiole 1-4 cm long, densely stellate pubescent. Stipules c. 1 cm long, linear, subulate. Flowers solitary, axillary or in terminal clusters of 2-5 by replacing the upper leaves; pedicel 3-15 mm long, densely stellate pubescent. Epicalyx segments 5-10 × 1.0-1.5 mm, linear, connate below, densely pubescent on both the surface. Calyx campanulate, free below to the middle; lobes 1.0-1.5 × 0.3-0.5 cm, deltoid-acuminate, persistent. Corolla 5-6 cm across, yellow with dark maroon centre; petals 3-4 × c. 2.5 cm, obovate, outer surface densely stellate pubescent, inner surface glabrous. Staminal column c. 2 cm long, antheriferous throughout. Ovary ovoid, carpels 10, attached by the base to a short conical 10-angled central column. Capsule 1.5-2.0 × 1.0-1.5 cm, enclosed within the calyx, outer surface densely stellate pubescent, dehisces into 10 valves, inner surface glossy, glabrous. Seeds c. 4.0 × 2.5 mm across reniform, glabrous, brownish-black.

*Type* : Wight Cat. No. 215 (Holotype : K; Isotype : CAL).

*Fls.* : Mar.-June; *Frts.* : May-Nov.

*Distrib.* : INDIA : Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala.

*Exsicc.* : Andhra Pradesh : Mamundur (Chittor Dt.), 363 m, 8.3.1918, *Fischer* 4268 (CAL); Ballipalle (Cuddpah Dt.), 363 m, Feb. 1883, *Gamble* 10997 (CAL). Tamil Nadu : Mudumalai R. F. (Nilgiri Dt.), 1000 m, 18.11.1958, *Sebastine* 7339 (CAL, MH); Sirumalai (Madurai Dt.), 1200 m, *Chandrabose* 54256 (MH).

*Uses* : The bark yields tough fibre.

*Pollen* : Panporate, spheroidal (average size 144  $\mu$ ; range 140-147  $\mu$ ). Ectoporiium circular (diameter 5.6  $\mu$ ), widening into an endoporiium (diameter 11.2  $\mu$ ). Interporal distance 16.8  $\mu$ . Exine 8.4  $\mu$  thick, being very slightly thicker at spine bases, spinate, (spine : height 31  $\mu$ ), tip acute. Interspinal distance 21  $\mu$ ; basal cushion poorly developed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 20. 1962].

*Notes* : This species is allied to *D. rufa* and *D. cuddapahensis* but differs in having ovate-lanceolate leaves, stem with whitish tomentum and glabrous seeds.

2. *Decaschistia cuddapahensis* T.K. Paul *et* Nayar in Geobios N. Reports 2 : 156. 1983.

Perennial shrubs. Young stems and branches pubescent with yellowish brown stellate hairs. Leaves 8-13  $\times$  5-8 cm, ovate, base subcordate, apex acute, margin crenato-serrate or denticulate, both the surface densely stellate velutinous, upper surface dark brown, lower surface yellowish-brown in colour, 5-7 nerved at the base, middle nerve with an elliptical gland at the base below; petiole 0.5-2.0 cm long, indumentum like stem. Stipules 4-8 mm long, entire or 2-3 parted, densely stellate pubescent, deciduous. Flowers solitary, axillary; pedicel 1.0-1.5 cm long, not jointed, stellate-tomentose. Epicalyx segments 8-12  $\times$  3-5 mm, connate at the base, lanceolate to ovate, acute, outside densely stellate hairy, inside with appressed stellate hairs. Calyx campanulate fused below to the middle, lobes 1.6-2.0  $\times$  4-6 mm, deltoid, acuminate with one prominent nerve, outside densely stellate hairy, inside sparsely appressed with stellate hairs, glabrescent except the margin and apical portion. Corolla 3-5 cm long, yellow with purple centre, outside densely stellate pubescent, inside glabrous. Staminal column 1.5-1.8 cm long, antheriferous throughout. Capsule c. 1  $\times$  1 cm, enclosed within the calyx, 10-valved, loculicidally dehiscent, outside densely stellate hairy, inside glabrous, shiny. Seeds 1 in each locule, c. 5  $\times$  3 mm, reniform, ascending, sparsely hairy.

*Type* : India : Swamipadhalu-Kodur (Cuddapah Dt.), Andhra Pradesh, 550 m, 23.7.1962, *J.L. Ellis* 14332 (Holotype : CAL; Isotype : MH).

*Fls. & Frts.* : July-Mar.

*Distrib.* : INDIA : Andhra Pradesh, Tamil Nadu.

*Exsicc.* : Andhra Pradesh : Beside the road to Thirumalai-Thirupathi hills (Chittoor Dt.), 660 m, *K. Subramanyam* 6878 (CAL); Ballipalle (Cuddapah Dt.), 150 m, *Gamble* 16561 (CAL) (in part). Tamil Nadu : Mamandur (N. Arcot Dt.), 2.3.1914, *s. l.* 10188 (MH).

*Notes* : It is allied to *D. rufa* Craib, but differs in having large (8-13 × 5-8 cm), ovate or oblong leaves, petiole length about one-eighth to one-tenth of the lamina and longer calyx lobes (1.6-2.0 cm).

3. *Decaschistia rufa* Craib in Kew Bull. 35. 1912; Gamble, Fl. Pres. Madr. 1 : 94. 1915 (Repr. ed. 1 : 67. 1957).

**Shurbs.** Young branches pubescent with reddish hairs and thereafter paler. Leaves 3.5-7.5 × 4.0-7. cm, almost rounded, base subcordate or rounded, apex shortly acuminate, acute or subobtuse, margin crenate-serrate or denticulate, both the surface densely stellate pubescent, more densely on the lower surface, 7-nerved at the base; petiole 2-4 cm long, densely pubescent. Stipules 4-8 mm long, linear, deciduous, 1 or 2-3 lobed, pubescent. Flowers solitary, axillary; pedicels 1.5-2.0 cm long, stout, densely stellate pubescent, reddish in colour. Epicalyx segments *c.* 10 × 4 mm, ovate-lanceolate, connate below, acuminate or subacute, both the surface densely stellate pubescent. Calyx campanulate, connate below the middle, lobes *c.* 1.0-1.2 × 0.5 cm, densely stellate pubescent on the outer surface, inner surface appressed with stellate hairs. Corolla *c.* 2.5-3.0 cm across; petals 2.0-2.5 × 1.0-1.5 cm, outside densely stellate hairy, inside glabrous. Staminal column *c.* 1.2 cm long, antheriferous throughout. Ovary ovoid, *c.* 3.0 × 2.2 mm.

*Type* : India : Pen. Ind. Or. without precise locality, Herb. Rottler *et* Wall. Cat. 1901 a (K Photo!).

*Distrib.* : INDIA : Andhra Pradesh, Tamil Nadu.

*Exsicc.* : Andhra Pradesh : Ballipalle (Cuddapah Dt.), 150 m, *Gamble* 16561 (CAL) in part; Without precise locality, *s. l.* 1260 (CAL).

*Pollen* : Size 140 μ. Pore diameter 5.6 μ. Exine slightly thinner around the pores for a width of 6 μ. Spines long (height 40 μ). [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 20. 1962].

4. *Decaschistia trilobata* Wt. Ic. 1: t. 88. 1840; Dalz. & Gibs. Bombay Fl. 21. 1861; Mast. in Hook. f., Fl. Brit. India 1 : 332. 1874; Cooke, Fl. Pres. Bombay 1 : 103. 1901 (Repr. ed. 1 : 109. 1958); Gamble, Fl. Pres. Madr. 1 : 94. 1915 (Repr. ed. 1 : 68. 1957). Fig. 22

**Shrubs** Stems and young branches densely tomentose. Upper leaves 3.0-6.5 × 1.5 cm, lanceolate or oblong-lanceolate, base and apex acute, margin serrate; lower leaves deeply trilobed, lobes 4-8 × 1.0-2.5 cm, lanceolate to

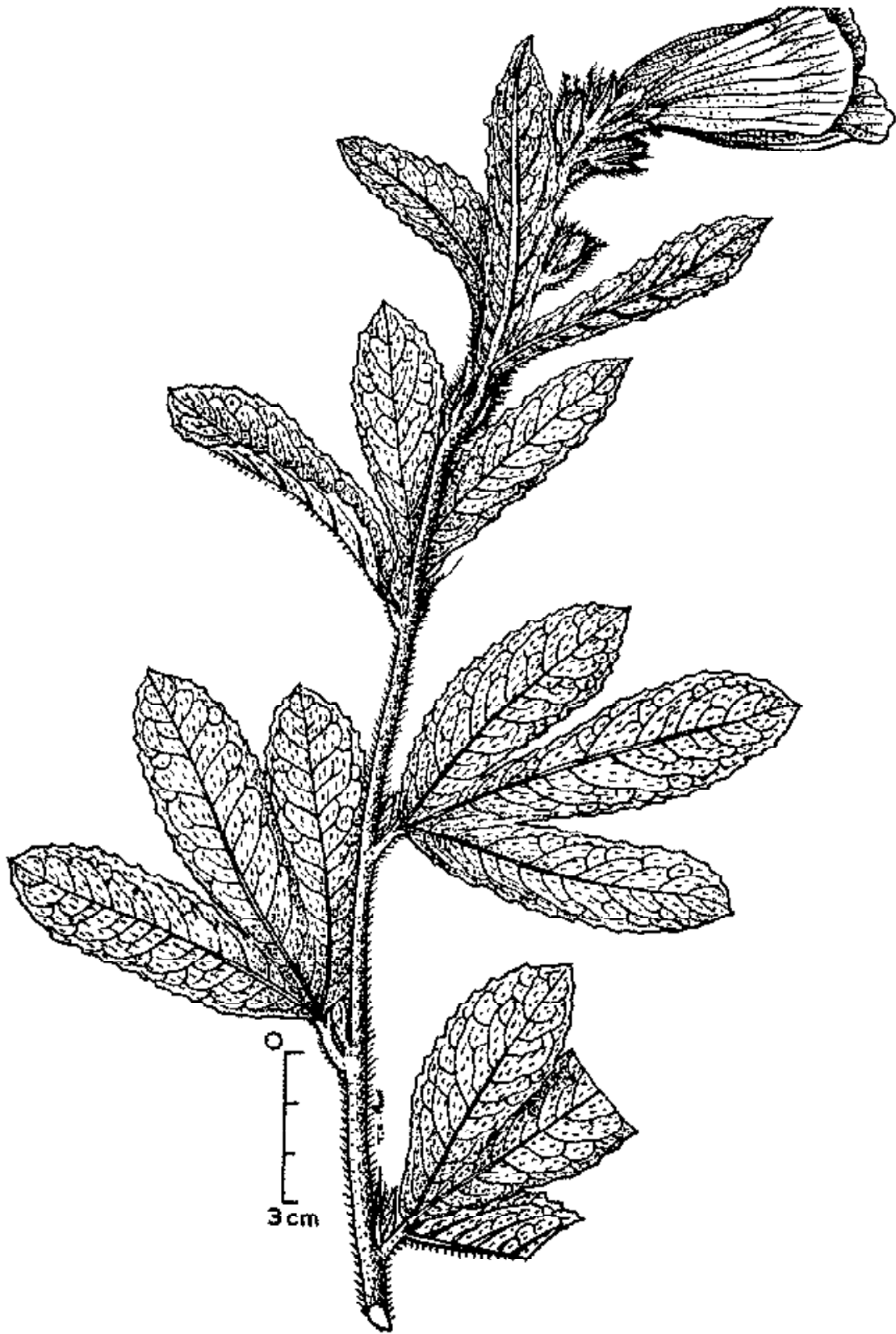


Fig. 22 Habit of *Decaschistia trilobata* Wt.



oblong-lanceolate, base rounded or acute, apex acute, 3 nerved at the base, middle nerve with an elliptical gland at the base below, both surfaces densely stellate pubescent, more densely on the lower surface; petiole 1-3 cm long, densely hispid or tomentose by stellate hairs. Stipules equal to or longer than the petioles, linear, simple or 2-3-lobed, hairy. Flowers solitary, axillary, densely towards the apex by replacing the leaves; pedicel c. 1 cm long, hairy. Epicalyx segments 5-8  $\times$  c. 1.5 mm, linear to lanceolate, connate below, both surfaces stellate pubescent. Calyx connate  $\pm$  in the middle, lobes 8-12  $\times$  5-7 mm, acute, distinctly 3 nerved, outer surface with long and short-simple hairs, inner surface with dense appressed 2-armed stellate hairs. Corolla c. 4 cm in diameter, petals c. 5  $\times$  3 cm, obovate, yellow, twisted, outer surface densely stellate hairy in covering portion, inner surface glabrous. Staminal column 2.0-2.5 cm long, antheriferous throughout. Ovary ovoid, 10-loculed; style arms 10, each arm c. 2 mm long; stigma capitate. Capsule 8-10  $\times$  10-15 mm, dense'y hairy, inner surface of the valves glossy. Seeds c. 5  $\times$  3 mm, reniform, stellate pubescent, brownish-black.

*Type* : India. "Belgaum, towards the foot of the gauts, flowering in October" *J. Law, Esq. Wight Ic. l. t. 88. 1840.*

*Fls. & Frts.* : Oct.-Dec.

*Distrib.* : INDIA : Maharashtra, Karnataka, Tamil Nadu, Kerala.

*Exsicc.* : Karnataka : Without precise locality, Nov. 27. 1883, *Talbot 825 (CAL)*; Gersoappa falls, Oct. 1908, *Meebold 9645 (CAL)*.

*Pollen* : Average size 150  $\mu$  (range 144-154  $\mu$ ). Pore diameter 9  $\mu$ ; columella of ectine layer free. Spine height 31  $\mu$ . [P.K.K. Nair in *Bull. Nat. Bot. Gard. 63 : 21. 1962*].

## 7. FIORIA

Mattei, *Bol. R. Orto. Bot. Palermo 2 : 71. 1916*; Kearney in *Leaff. West. Bot. 7(11) : 272. 1955*; Abedin in *Fl. W. Pak. 130 : 5. 1979*.

Perennial herbs or undershrubs, sparsely to densely pubescent. Leaves broadly ovate to orbicular, entire or 3-5 lobed, apex acute, base subcordate to rounded, margin serrate. Flowers solitary, axillary or seemingly in raceme by the reduction of the upper leaves. Epicalyx segments 7-12, linear, free. Calyx 5 lobed. Corolla yellow with purple centre; petals obovate. Staminal column shorter than the petals, antheriferous throughout or nearly so. Ovary ovoid, 5-angular, 5-loculed; stigmas clavate. Fruit a capsule, globular, shorter than the calyx, with 5 strongly veined wings. Seeds 2-4 per locule, reniform, verruculose, glabrous.

*Distrib.* : c. 4 species in the tropical and subtropical regions of the World. 1 species in India.

*Ecol.* : Mostly grow in waste places, forest edges, along the bushes, in hill tracts up to 1000 m from sea level.

***Fioria vitifolia*** (Linn.) Mattei, Bol. R. Orto. Bot. Palermo 2: 71, 1916; Abedin in Fl. W. Pak. 130: 5, 1979. *H. vitifolius* Linn. Sp. Pl. 696, 1753; Mast. in Hook. f., Fl. Brit. India 1: 338, 1874; Cooke, Fl. Pres. Bombay 1: 109, 1901 (Repr. ed. 1: 115, 1958); Duthie, Fl. Upper Gang. Pl. 1: 90, 1903 (Repr. ed. 1: 85, 1960); Prain, Beng. Pl. 1: 267, 1903 (Repr. ed. 1: 182, 1963); Gamble, Fl. Pres. Madr. 1: 98, 1915 (Repr. ed. 1: 70, 1957); Haines, Bot. Bih. & Or. 1(2): 68, 1921 (Repr. ed. 1: 70, 1961); Borss in Blumea 14: 82, 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12: 166 (1970) 1972. *Hibiscus obtusifolius* Willd. Sp. Pl. 3: 829, 1801. *H. heterotrichus* DC. Prod. 1: 450, 1824. *H. vitifolius* var. *heterotrichus* (DC.) Hochr. in Ann. Cons. Jard. Bot. Geneve 4: 170, 1900. *H. vitifolius* ssp. *vulgaris* Brenan & Exell in Bol. Soc. Brot. II, 32: 73, 1958.

*Local Names* : Ban-Kapas (Beng.); Bhar advaji, Vanakarpasa (Sans.); Karupatti (Tel.).

Herbs or undershrubs 1-2 m high. Leaves 2.5-15.0 × 2-12 cm, broadly ovate to orbicular, apex acute, base subcordate to rounded, margin crenate-serrate or toothed, entire or 3-5 lobed; petiole 2-13 cm long. Stipules 2-5 mm long, linear. Flowers solitary, axillary; pedicel 1.5-6.0 cm long. Epicalyx segments 7-12, each 6-12 × c. 0.5 mm, linear, erect in young stage, ultimately spreading or reflexed. Calyx lobes 0.5-1.5 × 0.6-1.0 cm, ovate to deltoid. Petals 2.5-5.0 × 1-3 cm, obovate, obtuse or rounded at apex, yellow with dark purple at the base. Capsule 1.5-2.0 cm across, shorter than the calyx, shortly beaked, beaks c. 3 mm long, globular, 5 winged, during dehiscence the wings briskly split laterally on the keels. Seeds 2-4 in each locule, 2-3 mm across, reniform, verruculose, glabrous, brownish-black.

*Type* : Herb. Hermann, Vol. IV, l.c., Fol. 39. Linn. 265 (Lectotype : BM).

*Fls. & Frts.* : April-Dec.

*Distrib* : Throughout INDIA, PAKISTAN, BURMA, SRI LANKA, MALESIA, AUSTRALIA, AFRICA.

*Exsicc.* : Punjab : Hoshiarpur, 500 m, 1.9.1969, *Bhattacharyya* 99489 (BSD). Uttar Pradesh : Moradabad, *Hook. f. & Thomson* s. n. (CAL). West Bengal : Daspur (Murshidabad Dt.), 23.5.1966, *Guha Bakshi* 457 (CAL). Andhra Pradesh : Ballipalle, 150 m, July 1885, *Gamble* 16560 (CAL).

*Notes* : This species was treated previously by most of the workers (Masters, 1874; Borssum Waalkes, 1966) under the genus *Hibiscus*. Mattei (1917) treated this species under the genus *Fioria* based mainly on having its conspicuous, scarious, strongly veined wings on the fruit, a unique character absent in the genus *Hibiscus*.

In this species the density of the indumentum and the leaf lobation are variable even in the same plant. The density of the indumentum depends on the habitat. In open places the hairs are usually denser than in the shade.



Fig. 23 *Fioria vitifolia* (Linn.) Mattei

## 8. GOSSYPIUM

Linn. Sp. Pl. 693. 1753; Gen. Pl. ed. 5. 309. 1754; Benth. & Hook. f., Gen. Pl. 1 : 209. 1862; K. Schum. in Engl. & Prantl Nat. Pflanzenfam. 3, 6 : 51. 1890; J.B. Hutchinson, Silow & Stephens, Evol. Goss. 14. 1947; Hutch Gen. Fl. Pl. 2 : 548. 1967.

Annual herbs, undershrubs or perennial shrubs or rarely small trees, all parts irregularly dotted with black oil glands. Leaves palmately lobed, sometimes entire, usually with nectaries on the midveins beneath. Flowers axillary, solitary, large, showy; pedicels not joined. Epicalyx segments 3, free or connate at base, foliaceous, entire or deeply parted. Calyx campanulate, shorter than epicalyx, truncate to 5-dentate or lobed, persistent. Corolla yellow to white, sometimes red or purple with a deep purple centre. Staminal column included, antheriferous throughout. Ovary 3-5 loculed, ovules many in each locule; style 1, short; stigma clavate, 5-sulcate. Capsule 3-5-loculed, ovoid to subglobular, rarely fusiform, acute or acuminate. Seeds numerous, ovoid to obovoid, covered by unicellular, convoluted hairs springing from the seed coat, two different types of hairs may be present: dense short hairs 'fuzz' and long hairs (10-65 mm) called the 'lint'.

*Distrib.* : c. 35 species in the tropics and subtropics of the World. 5 species in India.

*Notes* : India is the earliest country where cotton was first used for fabrics and this was evidenced by the discovery of cotton from excavation at Mahenjodaro, the date of which is estimated to be 2750-3000 B.C.

Cultivated cottons fall under 4 species of *Gossypium*, viz. *G. arboreum*, *G. herbaceum*, *G. barbadense* and *G. hirsutum*. Each of these species is having a large number of land races based on geographical distribution and associated genetical features. Although India grows a number of cotton types belonging to all the above species except *G. barbadense* which is only to be found as a homeyard plant in many states. Commercially the cotton belonging to *G. herbaceum* constitutes a larger percentage of medium staple cotton grown in this country. *G. stocksii* Mast. is the only wild species in India.

## KEY TO THE SPECIES

- 1a. Seeds with fuzz but no lint . *G. stocksii* 5
- 1b. Seeds linted:
- 2a. Epicalyx segments entire to serrate:
- 3a. Epicalyx segments connate at the base for 1 cm or more, entire or with 3-4 toothed near the apex, closely embracing the flower. Leaves with linear to lanceolate segments with an extra tooth in the sinus. Capsule ovoid . . . *G. arboreum* 1.
- 3b. Epicalyx segments connate at the very base only, 7-9 toothed or lobed at apex, flaring widely from the flower. Leaves with

- ovate to oblong or elliptic lobes without any extra tooth.  
Capsule rounded or oblong *G. herbaceum* 3
- 2b. Epicalyx segments laciniate :
- 4a. Leaves palmiparted, segments ovate to oblong. Staminal column 3.5-4.0 cm long with compact stamens, filaments of equal length. Seeds with floss and fuzz, fuzz only at the hilum *G. barbadense* 2
- 4b. Leaves palmilobed to fid, lobes deltoid to ovoid. Staminal column 1-2 cm long with loosely arranged stamens, filaments longer above than below. Seeds with floss and fuzz, fuzz throughout or only at the hilum *G. hirsutum* 4
1. *Gossypium arboreum* Linn., Sp. Pl. 693. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 347; Watt, Cott. Pl. 81, t. 7, 8. 1907; J.B. Hutchinson in Ind. Journ. Agri. Sci. 7 : 233. 1937. Borss. in Blumea 14 : 121. 1966; Abedin in Fl. W. Pak. 130 : 30. 1979.

*Local Names* : Kapas, rui, tula (Hindi, Beng., Guj., Mar., Punj.); Hathi (Kan.); Patti, Karpasamu (Tel.); Paruthi, Panji (Tam. & Mal.); Karpaso, Kopa (Or.).

Annual or perennial shrubs, 1-2 m tall. Young branches pubescent with stellate and few simple hairs, glabrescent, glabrous, purple. Leaves ovate to orbicular, base cordate, 3-5 or 7 lobed or parted with an extra tooth in the sinus; petiole 1.5-12.0 cm long. Stipules 0.5-1.5 cm long, linear to lanceolate, often falcate. Flowers solitary, axillary; pedicel 0.5-1.5 cm long. Epicalyx segments 1.5-3.0 × 1.0-2.5 cm, ovate, entire or toothed, base cordate, apex acute, accrescent. Calyx c. 5 mm long, cupular, apex somewhat 5-dentate. Corolla pale yellow, with or without purple centre or occasionally completely red or purple; petals 3-4 cm long, obovate. Staminal column 1.5-2.0 cm long. Capsule 1.5-3.0 cm across, more or less ovoid to globular with 3-4 mm long beak, 3-4 loculed. Seeds 5-17 per locule, each 5-7 mm across with floss and fuzz, floss white or rusty.

*Distrib.* : Tropical and subtropical regions of Old World. Cultivated in India.

*Notes* : J.B. Hutchinson and Ghose *l.c.* maintained 3 varieties of this species *viz.* i) var. *typicum* includes wild and primitive cultivated perennial types, (ii) var. *neglectum* covering recent cultivated annual types, (iii) var. *cernuum* comprising of annual big ecotypes of Assam and Bangladesh hill tracts. Again they divided each of the first two varieties into four forms *viz.* forma *bengalense*, forma *indica*, forma *burmanica* and forma *soudanense* according to their distribution.

Borssum Waalkes (1966) maintained two varieties of this species *viz.* var. *arboreum* and var. *obtusifolium* (Roxb.) Roberty, the first variety is mostly

used for experimental or ornamental purpose but the latter variety is cultivated for commercial purpose.

In the present survey besides the two varieties of this species [i.e. *arboreum* and *obtusifolium* (Roxb.) Roberty] var. *cernum* Hutchinson & Ghosh has been maintained. var. *cernum* differs from the other two varieties by having : stems, petioles and leaves almost glabrous, epicalyx accrescent and finally become as long as the capsule, capsule more than 5 cm long with 13 to 17 seeds per locule. It is also restricted to Assam, Meghalaya and Bangladesh hill tracts.

### KEY TO THE VARIETIES

- 1a. Leaves palmiparted with linear to lanceolate segments:  
 2a. Capsule less than 5 cm long with not more than eleven seeds per locule. Epicalyx segments slightly accrescent, shorter than capsule . . . . . var. *arboreum* 1  
 2b. Capsule more than 5 cm long with thirteen to seventeen seeds per locule. Epicalyx segments strongly accrescent, finally as long as the capsule . . . . . var. *cernum* 2  
 1b. Leaves palmilobed, lobes obovate, ovate or oblong . . . . . var. *obtusifolium* 3

var. *arboreum*—*G. arboreum* Linn. Sp. Pl. 693. 1753; Miq., Fl. Ind. Bat. 1, 2 : 163. 1858; Watt, Cott. Pl. 81 t. 7, 8. 1907; Borss. in Blumea 14 : 122. 1966. *G. neglectum* Todaro, Relaz. Cult. Cot. 169. 1878. *G. arboreum* var. *neglectum* (Todaro) Watt, Cott. Pl. 95, t. 10, 11, 12. 1907. *G. purpurascens* non Poir.; auct Miq. Fl. Ind. Bat. 1, 2 : 163. 1858.

*Type* : Herb. Linn. n. 874.3 (Holotype:LINN ; Photo!).

*Exsicc.* : Gujarat : Palitara (Kathiawar), 27.1.94, *Herb. P.R. Mehta* 1763 (CAL); Bhavanagar, 26.1.94, *Herb. P.R. Mehta* 1747 (CAL). Maharashtra : Kirkee farm (Poona), 24 Oct. 1902, *Reporter* 16414 (CAL); Manjri farm (Poona), 25-26 Oct. 1902, *Reporter* 16461 (CAL).

var. *cernum* (Todaro) J.B. Hutchinson & Ghosh in Ind. Journ. Agr. Sc. 7 : 248. 1937; Roberty in Candollea 13 : 47. 1950. *G. cernum* Todaro, Oss. Sp. Cot. 31. 1863. *G. arboreum* Linn. var. *assamica* Watt, Cott. Pl. 108. t. 13. 1907.

*Distrib.* : INDIA : Assam, Meghalaya, Nagaland (Naga Hills); BANGLADESH.

*Exsicc.* : Assam : Garo hills, s. l. 40 (CAL); Garo hills, 13. 2.1809, *Reporter* 12178 (CAL).

var. *obtusifolium* (Roxb.) Roberty in Candollea 13 : 38. 1950; Borss. in Blumea 14 : 122. 1966. *G. obtusifolium* Roxb. (Hort. Beng. 51. 1814, *nom. nud.*) Fl. Ind. ed. Carey 3 : 183. 1832; Watt, Cott. Pl. 139. t. 19, 20. 1907. *G. herbaceum* var. *obtusifolium* (Roxb.) Mast. in Hook. f., Fl. Brit. India 1 : 437. 1874. *G.*

*indicum* Lamk., Encycl. 2 : 134. 1786. *G. nangking* Meyen, Reise 2 : 323. 1836; Watt, Cott. Pl. 114, t. 15. 1907.

*Type* : India, *Roxburgh s. n.* (Lectotype: BR-Herb. Mart.; cf. Wouters, 245, t. 3. 1946).

*Exsicc.* : Gujarat : Arina on the way to Mangral, *Herb. P.R. Mehta* 1787 (CAL) (4 sheets); Wankaner, 6.2.1894, *Herb. P.R. Mehta* 1837 (CAL); Ahmedabad, 12.2.94, *s.l.* 1884 (CAL).

2. *Gossypium barbadense* Linn., Sp. Pl. 693. 1753; J. B. Hutchinson *et al.* *Evol. Goss.* 48. 1947; Borss. in *Blumea* 14 : 127. 1966.

*Local Names* : Sea island cotton, Egyptian cotton, Brazilian cotton, Peruvian cotton, Kidney cotton (Eng.).

Annual or perennial undershrubs, shrubs or small trees. Young branches stellate hairy, glabrescent later. Leaves orbicular to ovate, base cordate, deeply 3-5 lobed, lobes ovate-oblong, acuminate, sinuses usually thrown into folds; petiole as long as or slightly longer than the lamina. Stipules linear to lanceolate or ovate, auricled at base, Flowers solitary, axillary; pedicel shorter than the petioles. Epicalyx segments almost as long as broad, orbicular to ovate, base cordate, laciniate, teeth 10-15, triangular to linear. Calyx cupular, truncate or with 5-obtuse teeth. Corolla pale yellow with purple tinge; petals obovate. Staminal column shorter than the petals. Capsule ovoid, beaked. Seeds ovoid with long white floss and fuzz.

*Notes* : Occasionally cultivated in India. Sometimes it has been cultivated in gardens and homeyards, the lint is used for spinning the sacred thread used by some Hindus.

#### KEY TO THE VARIETIES

- 1a. Capsule 3-5 cm long, seeds free. Corolla yellow with purple centre var. *barbadense*  
 1b. Capsule 5-8 cm long, seeds adhering with each other firmly in a solid column. Corolla yellow with crimson centre var. *acuminatum*

var. *barbadense*-*G. barbadense* Linn., Sp. Pl. 693. 1753; Watt, Cott. Pl. 265, t. 46, 47, 48. 1907.

*Type* : Barbados (Lectotype : BM-SL, Vol. 100, Herb. Pluk., fol. 105).

*Distrib.* : Cultivated in tropical South America, South Carolina and Georgia (USA), Africa (Egypt), tropical Asia and Pacific islands. In India attempts had been made to grow the sea island types in Punjab but did not prove successful. Two types *viz.* St. Vincent and Montserrat have been tried in Malabar and South Kanara and they gave promising results.

var. *acuminatum* (Roxb.) Mast. in Hook. f., Fl. Brit. India 1 : 347. 1874; Borss. in *Blumea* 14 : 129. 1966. *G. acuminatum* Roxb. (Hort. Beng. 51. 1814 *nom. nud.*) Fl. Ind. ed. Carey 3 : 186. 1832; Wight. Ic. I: t. 27. 1838.

*Type* : Roxburgh, Ic. t. 1498(CAL, K).

*Distrib.* : It is cultivated mainly in eastern tropical South America, Central America, the Antilles and sporadic in Africa and India (J. B. Hutchinson *et al.*, 1947).

3. *Gossypium herbaceum* Linn., Sp. Pl. 693. 1753; Roxb. Fl. Ind. ed. Carey 3 : 184. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 346. 1874.

*Local Name* : Levant cotton (Eng.).

Annual herbs or undershrubs, 1.0-1.5 m tall. Young branches sparsely stellate tomentose, glabrescent later. Leaves ovate-rounded in outline, base cordate, palmately 3, 5 or 7 lobed, lobes ovate-rounded or oblong-elliptic, apex acute or apiculate; petiole 1.5-3.5 cm long. Stipules 0.5-1.0 cm long, linear to lanceolate. Flowers solitary, axillary; pedicel 0.6-1.5 cm long. Epicalyx segments 1-2 cm long and broad, ovate-cordate, slightly connate at the base, gashed across the top into 7-9 fairly long teeth, teeth lanceolate. Calyx 7-10 mm long, cup shaped, undulate or truncate. Corolla yellow with purple centre; petals 2.5-3.5 × 2.5-4.0 cm, obovate. Staminal column c. 1 cm long. Capsule 3-4 cm long and c. 2.5 cm across, oblong-obtuse, 4-loculed. Seeds 5-7 in each locule, 5-8 × 3-6 mm, ovoid with floss and fuzz; floss greyish-white, fuzz grey.

*Type* : H.U. Herb Linn. no. 874.1 (Holotype : LINN; Photo!).

*Distrib.* : Tropical and subtropical regions of the Old World. Cultivated in western India from Kutch to Madras.

*Notes* : J. B. Hutchinson (Emp. Cott. Gr. Rev. 27 : 123. 1950) recognised 5 races of this species based on geographical distribution. These land races are *persicum* in South Central Asia, *kuljianum* in Chinese Central Asia, *acerifolium* in N. Africa and Arabia, *wightianum* in Western India and *africanum* in S. Africa. The land race *wightianum* includes nearly all the types of *G. herbaceum* grown in India.

4. *Gossypium hirsutum* Linn., Sp. Pl. 975. 1753; J. B. Hutchinson *et al.* Evol. Goss. 40 t. 6. 1947; Borss. in *Blumea* 14 : 123. 1966; Abedin in Fl. W. Pak. 130 : 31. 1979.

*Local Names* : American cotton, Bourbon cotton, Upland cotton (Eng.).

Annual herbs or large perennial undershrubs, 1.0-3.5 m high. Stem much branched, greenish red, densely hairy to glabrous. Leaves 3-10 × 3-15 cm,



more or less orbicular in outline, base cordate, mostly 3-lobed, sometimes partially 5-lobed, lobes ovate to broadly triangular, apex acuminate, sinuses obtuse or rounded, not or only slightly thrown up in a fold, upper leaves sometimes ovate and entire; petioles 2-10 cm long. Stipules 6-12 × 2-5 mm, lanceolate to ovate-lanceolate, often falcate. Flowers axillary, solitary; pedicel 1-2 cm long. Epicalyx segments 2-4 × 1-3 cm, broadly ovate, cordate at base, lacinate, teeth 7-12, linear to lanceolate. Calyx cupular, 5-6 mm long and 4.5-5.5 mm across, usually toothed. Corolla 5-6 cm across, yellow to yellowish-white, rarely with purple centre; petals 4-6 × 3.5-4.5 mm, obovate. Staminal column 1-2 cm long. Capsule 3-4 cm long and 2-3 cm broad, ovoid or rarely globular, 3-5 loculed. Seeds 3-5 mm long, ovoid, with copious coat of floss, fuzzy.

*Type* : Miller in Gardner's dictionary, 6th edition, 1752 [Paul A. Fryxell in *Brittonia* 20 : 382. 1968].

*Distrib.* : Tropical North and Central America. Introduced in most tropical countries of the Old World including India. In India there is large scale cultivation of American cotton mainly in Punjab, Madhya Pradesh, Maharashtra, and Tamil Nadu.

*Notes* : J.B. Hutchinson (1951) divided this species into 7 geographical races. These are *morrilli*, *richmondii*, *palmeri*, *punctatum*, *yucatenense*, *marie-galante* and *latifolium*. In India the land race *latifolium* J.B. Hutchins on and the land race *marie-galante* J.B. Hutchins on are extensively cultivated. The race *latifolium* is agriculturally most important, as it comprises of upland cotton grown in America, Asia and Africa.

5. *Gossypium stocksii* Mast. in Hook. f., Fl. Brit. India 1 : 346. 1874; Cooke, Fl. Pres. Bombay 1 : 115. 1901 (Repr. ed. 1 : 123. 1958); J.B. Hutchinson *et al.* Evol. Goss. 30 t. 4. 1947; Abedin in Fl. W. Pak. 130 : 29. 1979. *G. obtusifolium* sensu Dalz. & Gibs Bombay Fl. 21. 1861 non Roxb. 1832.

Shrubs or prostrate undershrubs, stellate pubescent. Leaves 1.0-3.5 × 1.5-5.0 cm, base cordate, 3-5 lobed, palmately nerved, black dotted with oil glands, stellate pubescent to glabrescent; petioles 1-3 cm long, stellate tomentose, black dotted. Stipules 3-6 mm long, linear-lanceolate to ovate, entire or serrate. Flowers solitary, axillary; pedicel upto 1 cm long in fruit, stellate tomentose, black dotted. Epicalyx segments 1.0-2.5 × 0.5-1.5 cm, free at the base, foliaceous, broadly ovate, at base truncate or rounded, lacinate, segments 8-12, linear-lanceolate with rounded sinuses, black dotted, pubescent. Calyx 5-8 mm long, cupular, 5-dentate. Corolla campanulate, 1.5-2.0 cm across; petals 2-3 × 1.0-1.5 cm, yellow with purple centre Staminal column antheriferous throughout. Capsules 1-2 cm long, ± 1 cm across, ovoid, prominently gland dotted, usually 3 locular. Seeds 2 or 3 per locule, not much longer than broad, wedge shaped, hairs yellowish or brownish, without lint.

*Type* : PAKISTAN, Sind, *Stocks* 469 (K).

*Distrib.* : INDIA : Gujarat; PAKISTAN : Sind; SOUTHEAST ARABIA and SOMALILAND.

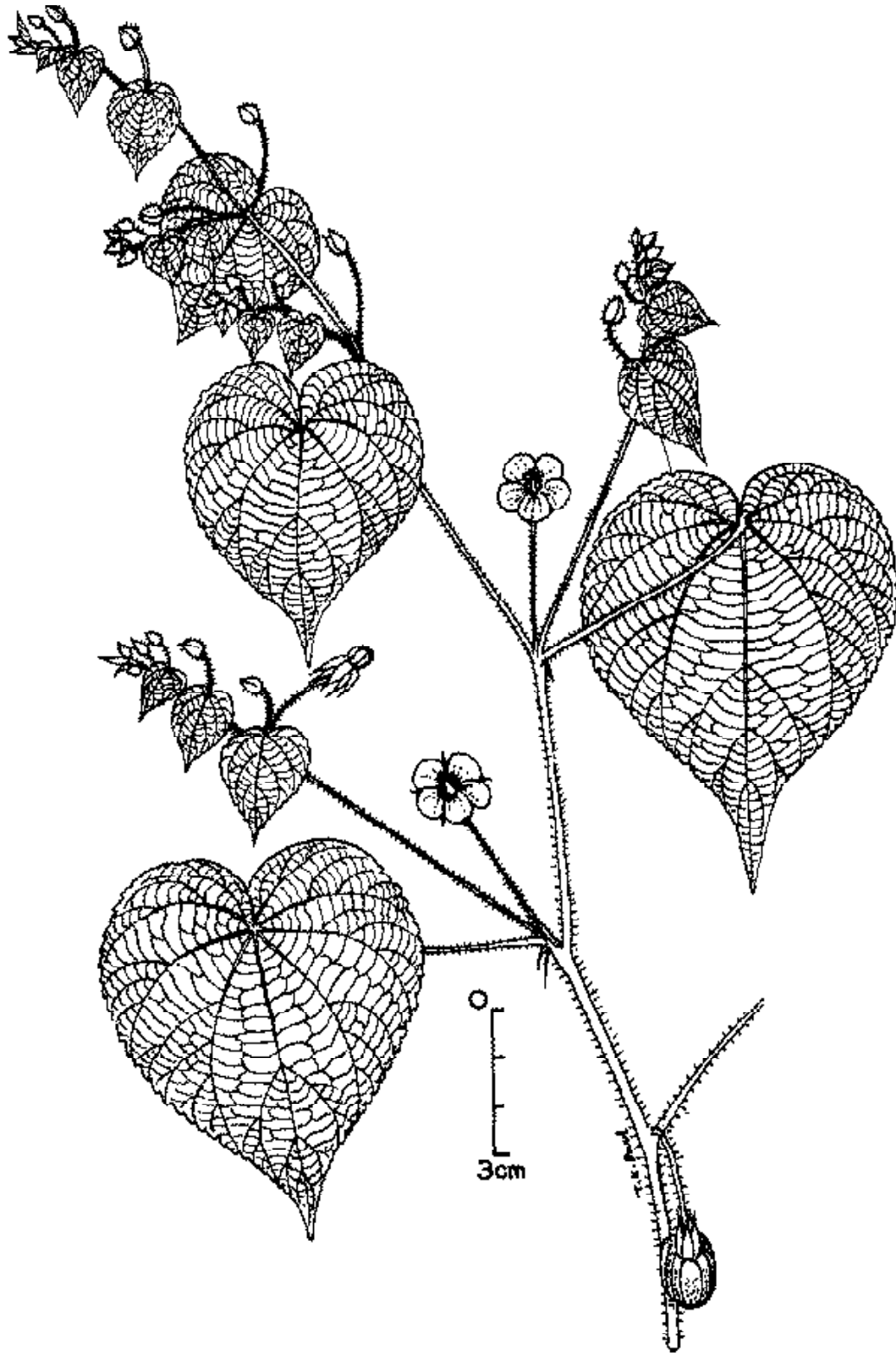


Fig. 24 : Habit of *Herissantia crisper* (Linn.) Brizicky.

*Notes* : Ansari (1958) after observing the ecology of this species, comments that the wild plants were singularly free of pests and diseases and speculates on the possible usefulness of this species in producing drought and disease resistant cultivated Asiatic cottons by hybridization (Pakistan cottons 2 : 27-32, 1958.)

## 9. HERISSANTIA

Medic, Vorles. Churfalz. Phys.-oekon, Ges. 4(1) : 244. 1788; Brizicky in Journ. Arn. Arb. 49-50. 1968 (notes). *Bastardia* HBK. b. *Gayoides* Enl. Gen. Pl. 986. 1840. *Bogenhardia* Reich. Repert. Herb. 1 : 200. 1841; Hu, Fl. China fam. 153. 27 t. vii. 1955; Hutch., Gen. Fl. Pl. 2 : 555. 1968.

Perennial herbs, often trailing, pubescent. Leaves ovate-cordate, acuminate, crenate. Flowers solitary, axillary; pedicel filiform, jointed, geniculate. Epicalyx absent. Calyx cupular, free upto the base. Corolla slightly exceeding the calyx, obovate. Staminal column short, glabrous. Schizocarp globular, indented at apex; mericarps 10-15, inflated, membranous, shining at maturity, rounded at apex. Seeds 2 or 3 in each mericarp, reniform.

*Distrib.* : c. 3 species in America, Australia, India and Hainan islands of China. 1 species in India.

*Ecol.* : Grows in waste places, roadsides and as secondary growth up to 800 m altitude from sea level, preferably in dry areas.

*Notes* : This genus is allied to the genus *Abutilon* Mill. but can be well distinguished by having its carpels inflated with rounded apex, thin chartaceous pericarp and vine like weak stem.

*Herissantia crispa* (Linn.) Brizicky in Journ. Arn. Arb. 49. 279. 1968. *Sida crispa* Linn. Sp. Pl. 685. 1753; Roxb. Fl. Ind. ed. Carey 3 : 177. 1832. *Abutilon crispum* (Linn.) Medic. Malv. 29. 1787; Mast. in Hook. f., Fl. Brit. India 1 : 327. 1874; Cooke, Fl. Pres. Bombay 1 : 97. 1901 (Repr. ed. 1 : 103. 1958); Gamble, Fl. Pres. Madr. 1 : 91. 1915 (Repr. ed. 1 : 66. 1957); Borss. in Blumea 14 : 161. 1966. Fig. 24

Perennial herbs, 1.0-1.5 m high, ascending or decumbent. Stem weak, slender with flaccid branches, pubescent. Leaves 2-10 × 1.5-8.0 cm, ovate, apex acuminate, base cordate, margin crenate; petiole 0.5-6.5 cm long. Stipules 3-6 mm long, filiform, both reflexed. Flower solitary, axillary; pedicel 1.5-3.0 cm, accrescent up to 4.5 cm long, filiform, jointed above the middle. Calyx lobes 4-7 × 2.0-2.5 mm, ovate to long triangular or lanceolate. Corolla as long as or slightly exceeding the calyx, 4.5 mm across, broadly obovate, white to pale yellow. Staminal column 2.0-2.5 mm long, glabrous. Schizocarp 10-15 mm across, globular, indented at apex; mericarps 10-15, 10-15 mm radially, elliptic, inflated, rounded at apex and base, awnless, dorsally with coarse simple hairs

and minute stellate hairs, lateral walls silvery, membranous and more or less transparent. Seeds 2-3 per mericarp 1.5-2.0 mm across, reniform, covered with appressed simple hairs, brownish-black.

*Type* : Dillenius, Hort. Elth. t. 5. f. 5.

*Fls. & Frts.* : July-Feb.

*Distrib.* : INDIA : Maharashtra, Andhra Pradesh, Tamil Nadu, Kerala; CHINA, AUSTRALIA, AMERICA. Native of tropical and subtropical America.

*Exsicc.* : Andhra Pradesh: Gudiband (Kistna Dt.), Feb. 1887, *Gamble* 18620 (CAL). Tamil Nadu : Mount, Nilghiri & Kurg, *Hook. f. & Thomson s. n.* (CAL); Kuridimalai (Coimbatore Dt.), 766 m, 21.12.1956, *Subramanyam* 1833 (CAL, MH).

*Chr. No.* :  $n = 7$  (Bates in *Gentes Herb.* 11 : 145 . 1976).

*Pollen* : Average size  $52 \mu$  (range 49-56  $\mu$ ). Spines bulbous at the base. Basal cushion not developed. [P.K.K. Nair in *Bull. Nat. Bot. Gard.* 63 : 8. 1962].

## 10. HIBISCUS

Linn. Sp. Pl. 693. 1753; Gen. Pl. ed. 5 : 310. 1754 *nom. cons. prop.*; Taxon 15 : 43 1966; Benth. & Hook. f., Gen. Pl. 1 : 207. 1862 *excl. sect. Abelmoschus*; Mast. in Hook. f., Fl. Brit. India 1 : 334. 1874; Schumann in Engl. & Prantl, nat. Pflanzenfam. 3, 6 : 48. 1890; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 56. 1900 *excl. sect. Abelmoschus*; Hutch., Gen. Fl. Pl. 2 : 544. 1967.

Annual or perennial herbs, shrubs or trees. Stems glabrate or with sparsely to densely pubescent or tomentose with simple hairs and sometimes scabrid or stellate hairs (tufted or appressed) and recurved simple hairs which are in one or two lines decurrent on the stems from the base of the stipules. Leaves simple, palmilobed to parted, rarely pennilobed, often with an obscure nectary or nectariferous zone on the midrib beneath. Stipules subulate to linear, ovate or foliaceous. Flowers solitary, axillary or in terminal lax raceme or panicles by reduction of the upper leaves. Epicalyx segments 3 to many or rarely absent. Calyx 5-lobed or 5-parted, sometimes with nectaries, persistent. Corolla mostly large and showy, rotate, campanulate or cylindrical. Staminal column shorter or as long as the petals, rarely longer, truncate or 5-toothed at the apex, antheriferous althrough or only in the upper half. Ovary 5-loculed or 10-loculed by 5 false dissepiments, with 3 or more ovules in each locule; style 1, distally 5 branched, spreading; stigma usually discoid, sometimes capitate or not distinct. Capsule loculicidally dehiscent, usually 5-loculed or 10-loculed by false dissepiments. Seeds 3 to many in each locule, reniform, subglobose or obovoid, glabrous or hairy.

*Distrib.* : c. 250 species in the tropical, subtropical regions of both the Old and New World with some species extending into the temperate zone. 28 species in India.

In India, the Malabar region represents about 50% of the total Indian *Hibiscus* species, the gangetic plain (eastern zone) represents about 43.75%. The subtropical and temperate zone of Eastern Himalaya represents more number of species as compared to the Western Himalaya. Indus plain represents comparatively less number of species than those of any warm region with more average rainfall.

*Ecol.* : Most of the species grow in low altitudes and found in the areas with comparatively more annual rainfall; usually grow in waste places and road sides etc.; tree species grow in secondary forests in hilly tracts.

#### KEY TO THE SECTIONS

- 1a. Capsule often 10 loculed by false dissepiments;  
Trees or woody climbers :
- 2a. Leaves unlobed or rarely 3-lobed (c. *H. scandens*). Stipules large, foliaceous, initially pair wise enveloping young sprouts. Epicalyx segments connate at the base. Seeds hairy. . . . . Sect. *Azanza* 1
- 2b. Leaves 3-5 palmilobed. Stipules linear, lanceolate. Epicalyx segments free. Seeds glabrous . . . . . Sect. *Spatula* 7
- 1b. Capsule 5 loculed. Herbs, undershrubs or shrubs :
- 3a. Epicalyx segments forked at the tip, linear or oblanceolate. Calyx lobes with prominent veins. Stems with prickles or bristles or both. Herbs or undershrubs. . . . . Sect. *Furcaria* 2
- 3b. Epicalyx segments not forked, Calyx lobes without prominent veins. Stems without any bristles or prickles. Undershrubs or shrubs :
- 4a. Staminal column longer than the corolla, antheriferous towards the apex. Fruits rarely formed. Leaves unlobed. Shrubs. . . . . Sect. *Lilibiscus* 5
- 4b. Staminal column shorter than the corolla, antheriferous throughout; Fruits well developed. Leaves lobed or entire. Herbs, undershrubs or shrubs :
- 5a. Segments of epicalyx very short, often caducous. . . . . Sect. *Solandra* 6
- 5b. Segments of epicalyx well developed, persistent.
- 6a. Seeds hairy :
- 7a. Seeds covered with long silky, ferruginous hairs . . . . . Sect. *Hibiscus* 3
- 7b. Seeds tomentose with shorter hairs . . . . . Sect. *Trichospermum* 8
- 6b. Seeds glabrous or tubercled :
- 8a. Calyx more or less inflated particularly in fruit, lobes many veined. Mostly shrubs . . . . . Sect. *Trionum* 9

- 8b. Calyx not inflated, lobes 3 veined. Herbs or undershrubs

Sect. *Ketmia* 4

1. SECTION : AZANZA

- 1a. Trees. stipules oblong, foliaceous. Epicalyx segments 7-14, lanceolate. Capsule not exceeding the calyx :
- 2a. Epicalyx 2-3 cm long, almost as long as the calyx. Leaves densely covered with stellate hairs, hairs 8-10 mm long, tufted from glandular base. Stipules 5-10 × 2-4 cm *H. macrophyllus* 10
- 2b. Epicalyx 0.5-1.0 cm long, shorter than the calyx lobes. Leaves densely stellate pubescent, hairs c. 0.5 mm long. Stipules 2 × 0.5-1.0 cm :
- 3a. Capsule spuriously 10 loculed. Seeds well developed *H. tiliaceus* 27
- 3b. Capsule 5 loculed. Seeds abortive *H. similis* 23
- 1b. Large shrubs or climbers. Stipules linear-lanceolate. Epicalyx segments 5. Capsule exceeding the calyx :
- 4a. Scandent shrubs. Leaves not lobed. Flowers fragrant; petals 2-4 × 2-3 cm *H. fragrans* 5
- 4b. Woody climbers. Leaves 3-lobed. Flowers not fragrant; petals c. 2.0 × 1.5 cm. *H. scandens* 21

2. SECTION : FURCARIA

- 1a Epicalyx segments with an appendage on the inner surface towards the apex :
- 2a. Stems, petioles and pedicels armed with prickles :
- 3a. Stipules foliaceous, auriculate at the base, semilunar *H. surattensis* 24
- 3b. Stipules not foliaceous :
- 4a Leaves entire or 3-5 lobed, lobation do not reach the base; Stipules ovate-lanceolate. Pedicel 1.5-7.0 cm long. Calyx lobes broadly lanceolate, apex acute to acuminate. Rambling or trailing undershrubs. *H. aculeatus* 1
- 4b. Leaves deeply palmately 3-5 lobed, or sometimes 6-7 lobed, lobation nearly reach the base. Stipules linear. Pedicel 2-4 mm long. Calyx lobes ovate to deltoid, apex long acuminate. Erect undershrubs. *H. radiatus* 18
- 2b. Stems, petioles and pedicels without any prickles :
- 5a. Leaves ovate, slightly 3 lobed, 5-9 × 5-10 cm, base cordate; petiole 2.5-5.5 cm. Calyx equal to the capsule *H. beddomei* 2
- 5b. Leaves lanceolate, unlobed, 5.5-10.0 × 1-4 cm, base cuneate; petiole 0.5-2.5 cm. Calyx longer than the capsule *H. hoshiarpurensis* 7
- 1b. Epicalyx segments without any appendage :
- 6a. Leaves deeply palmatilobed to parted, lobation upto the base of lamina. Epicalyx segments spreading or reflexed. Calyx lobes with white arachnoid tomentum, never fleshy. Seeds with scale like tufted hairs *H. cannabinus* 4.

- 6b. Leaves palmatifid to partite, lobation up to  $\frac{3}{4}$  th of the lamina. Epicalyx segments usually appressed. Calyx lobes without arachnoid tomentum, becoming fleshy after flowering. Seeds furfuraceous *H. sabdariffa* 20

### 3. SECTION : HIBISCUS

- 1a. Shrubs. Corolla large, more than 4 cm in diameter; pedicel equal to or shorter than the petiole *H. syriacus* 25
- 1b. Herbs or undershrubs. Corolla small, less than 3 cm in diameter; pedicel longer than the petiole :
- 2a. Leaves unlobed: Epicalyx segments filiform. Calyx divided upto the middle *H. micranthus* 11
- 2b. Leaves 3-lobed. Epicalyx segments lanceolate to linear. Calyx divided nearly to the base :
- 3a. Leaves with nectary; petiole 0.5-1.5 (-3) cm long. Calyx lobes 3-10 mm long *H. hirtus* 6
- 3b. Leaves without nectary; petiole 2-6 cm long. Calyx lobes 10-22 mm long *H. talbotii* 26

### 4. SECTION : KETMIA

- 1a. Pedicel as long as or longer than the petiole, articulate. Epicalyx segments 8-10
- 2a. Leaves deeply 3-5 lobed, lobation upto the base of the lamina. Stem with bristles and prickles. Epicalyx segments 2.0-3.5 cm long. *H. caestus* 3
- 2b. Leaves shallowly 3-lobed or unlobed, lobation upto the middle of the lamina. Stem with stellate hairs or glabrous. Epicalyx segments c. 5 mm long. *H. obtusilobus* 13
- 1b. Pedicel much shorter than the petiole, inarticulate. Epicalyx segments usually 5, sometimes 5-10 *H. lunariifolius* 9

### 5. SECTION : LILIBISCUS

- 1a. Petals entire; staminal column slightly longer than the petals *H. rosa-sinensis* 19
- 1b. Petals laciniate; staminal column twice as long as the petals *H. schizopetalous* 22

### 6. SECTION : SOLANDRA

- Flowers solitary or in terminal raceme by reduction of the upper leaves. Epicalyx segments very small or absent in mature flower; Seeds glabrous or tubercled *H. lobatus* 8

## 7. SECTION : SPATULA

Small trees or shrubs. Leaves palmately 3-5 lobed. Stipules linear-lanceolate. Epicalyx segments free, foliaceous. Capsules depressed globose. Seeds glabrous.

*H. platanifolius* 16

## 8. SECTION : TRICHOSPERMUM

1a. Leaves not lobed or slightly lobed or angled. Flowers 3.5 cm or more in diameter :

2a. Epicalyx segments 6-10, spatulate, shorter than the calyx. Capsule shorter than the calyx. Stipules c.

5 mm long

*H. panduraeformis* 15

2b. Epicalyx segments 5, linear-lanceolate, longer than the calyx.

Capsule two times longer than the calyx. Stipules 1.3-2.5 cm long

*H. purpureus* 17

1b. Leaves palmatilobed. Flowers c. 2.5 cm in diameter

*H. palmatus* 14

## 9. SECTION : TRIONUM

1a. Small herbs. Calyx lobes broadly ovate, inflated covering the capsule, sparsely stellate pubescent with dense stiff hairs on the nerves. Petals 5, 1.5-2.0 cm long. Capsule oblong. Seeds minutely tubercled or glabrate

*H. trionum* 28

1b. Shrubs. Calyx lobes ovate-lanceolate, enlarged in capsule, densely stellate pubescent with glandular hairs throughout. Petals 5 or multiple of 5, 6-8 cm long. Capsule subglobose; Seeds with long hairs

*H. mutabilis* 12

1. *Hibiscus aculeatus* Roxb. Fl. Ind. ed. Carey 3 : 206. 1832; Paul et Nayar in Bull. Bot. Surv. India 22 (1-4) : 194 (1980) 1982. *H. furcatus* Roxb. (Hort. Beng. 51. 1814 *nom. nud.*) ex DC. Prod. 1 : 449. 1824 *non* Willd. 1809; Roxb., Fl. Ind. ed. Carey 3 : 204. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 335. 1874; Prain, Beng. Pl. 1 : 267. 1903 (Repr. ed. 1 : 182. 1963); Gamble, Fl. Pres. Madr. 1 : 97. 1915 (Repr. ed. 1 : 70. 1957); Haines, Bot. Bih. & Or. 1 (2) : 67. 1921 (Repr. ed. 1 (2) : 70. 1961); *sensu* Rakshit et Kundu in Bull. Bot. Surv. India 12 : 161. (1970) 1972 (*non* Willd.) *H. surattensis* var. *furcatus* Hochr. in Ann. Cons. Jard. Bot. Geneva 4 : 112. 1900.

*Local Names* : Huligowri, Cumchi (Kan.); Naranam pupuli, Paccapuli (Mal.); Piri-Prirka (Or.); Adavi gogu, Konda gogu, Danasonigogu (Tel.).

Undershrubs, trailing or suberect, upto 1.5 m high. Stems, petioles and pedicels with stiff, sharp, recurved bristles c. 1 mm in length with small glandular base and also with long simple hairs. Leaves 2.5-10.0 × 3-8 cm,



entire or 3-5 lobed, lobation not reaching the base, apex acute, base cordate, margin crenate, dentate or crenate-serrate, 5-7 nerved at the base, stiff prickles on the main veins in the lower surface; petiole 2-8 cm. Stipules 5-14 × 2-3 mm, ovate-lanceolate, acute, hirsute, margin with long stiff hairs. Flowers 5-10 cm across, solitary, axillary, buds with a tuft of hairs at the apex; pedicel 1.5-7.0 cm long. Epicalyx 1-2 cm long, segments 8-12, divided at the apex into two leafy portions of which one part ovate, another part long projecting upwards, hairy. Calyx deeply 5-parted, lobes broadly lanceolate, acute or acuminate, 3-nerved, hispid by stiff bristles from glandular thick bases without, margin and apical portion of inner surface with soft hairs, accrescent, persistent. Corolla yellow with purple centre. Capsule c. 1.5 cm long, ovoid, acute, covered with rigid deciduous hairs enclosed by the enlarged calyx. Seeds 4-5 mm a cross, more or less reniform, surface sparsely covered with whitish scale like structures, brownish.

*Type* : Roxb. Icon. no. 356 (CAL, K).

*Fls.* : Sept.-Jan.; *Frts.* : Nov.-Feb.

*Distrib.* : INDIA : Assam, Meghalaya, West Bengal, Bihar, Orissa, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; BANGLADESH, BURMA, SRI LANKA, SOUTH AFRICA.

*Exsicc.* : Andhra Pradesh : Pelakonda, 757 m, 1.10.1920, *Narayanaswami* 387 (CAL). Tamil Nadu : Vellingiri hills, 667 m, 18.2.1957, *Sebastine* 2377 (CAL); Bautur, 1212 m, 27.11.06, *Fischer* 1273 (CAL). Kerala : Vicinity of Poringal Kuthu, 590 m, 23.1.53, *Fernandes* 161 (CAL).

*Uses* : The stem yields strong fibre suitable for cordage and rope. The leaves and roots are medicinal.

*Pollen* : Average size 144  $\mu$  (range 140-151  $\mu$ ). Pore diameter 7  $\mu$ . Interporal distance 11.2  $\mu$ . Spine height 24  $\mu$ , tip rounded, basal cushion slightly formed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 24. 1962].

*Notes* : The same name *Hibiscus furcatus* has been used for two different species first by Willdenow in 1809 (Enum. Hort. Berol. 736. 1809) and later with a detailed description by Roxburgh (Fl. Ind. 3 : 204. 1832). In the interval, De Candolle had validated Roxburgh's name, citing Hortus Bengalensis (Prodr. 1 : 448. 1824). He included Willdenow's name also with a question mark. The microfiche of Willdenow's type as also Roxburgh Icones No. 1582 (CAL) of his *H. furcatus* have been studied and found that the two are different. Willdenow's name is validly published with a description. Roxburgh's *H. furcatus* as a later homonym (Art. 64. ICBN. 1978) has been rejected. Incidentally Roxburgh also described (Fl. Ind. 3 : 206. 1832) *Hibiscus aculeatus* which is conspecific with his *H. furcatus*. The name *Hibiscus aculeatus* Roxb. has been adopted in place of *H. furcatus* Roxb. ex DC.

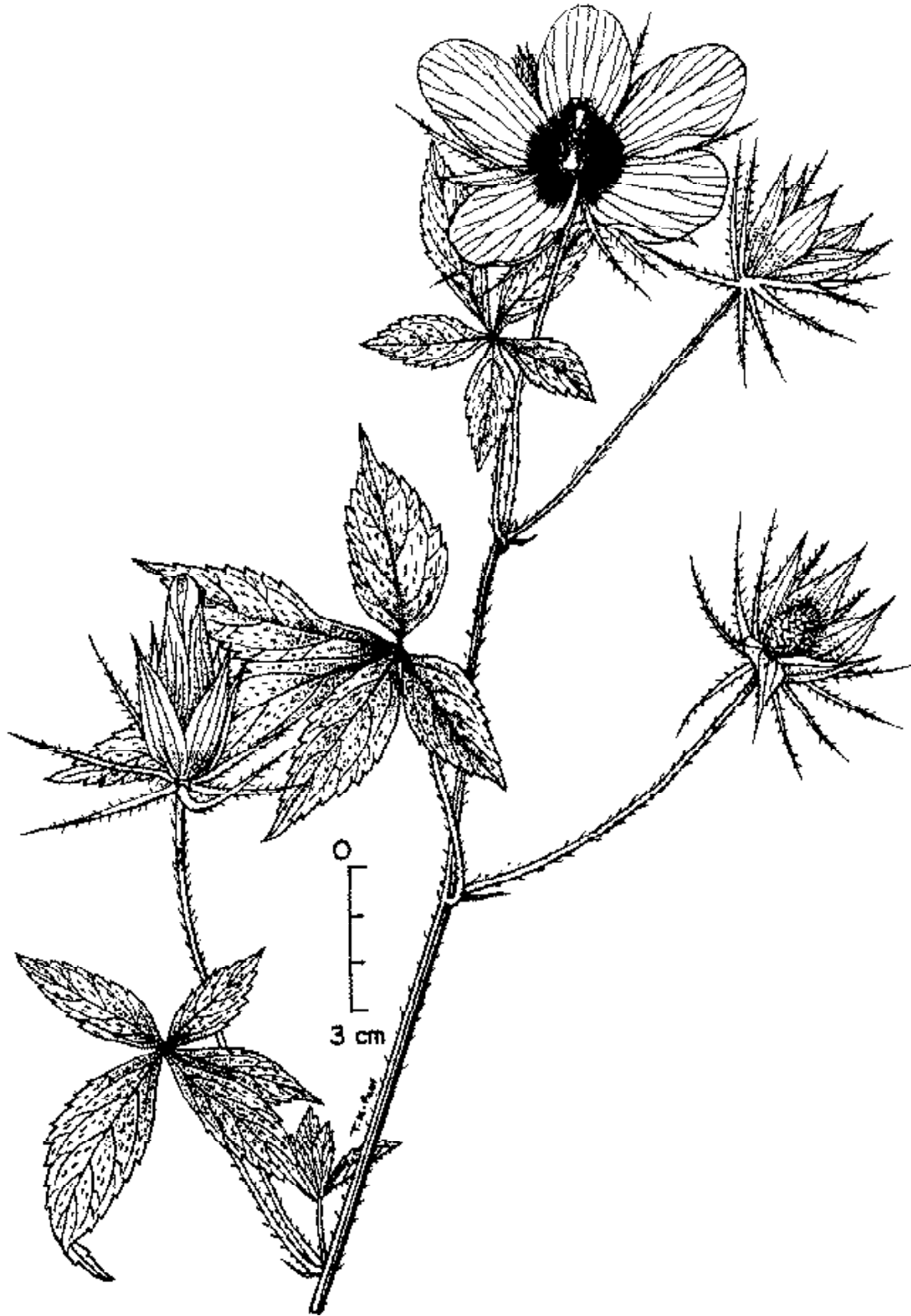


Fig. 25. *Hibiscus caesus* Garcke

2. *Hibiscus beddomei* Rakshit *et* Kundu in *Sci. & Cult.* 27 : 192. 1961 *et* in *Bull. Bot. Surv. India* 12 : 160 (1970) 1972.

Herbs. Stems covered with rigid stellate hairs. Leaves 5-9 × 5-10 cm, ovate, 3-angled or slightly 3-lobed, apex acute, base cordate, margin serrate, 5-7 nerved at the base, upper leaves lanceolate or narrowly ovate with prominent midvein, margin serrate-dentate, both surfaces stellate hairy; petiole 2.5-5.5 cm, pubescent with simple and stellate hairs. Stipules linear, hairy. Flowers solitary, axillary; pedicel 2-4 mm long. Epicalyx segments 9, c. 9 mm long, linear, shorter than the calyx, each segment with c. 3 mm long linear appendage from the base of the spatulate tip of epicalyx, pubescent throughout. Calyx campanulate, 1.0 cm long, 5-lobed, lobes connate up to the middle, triangular, acuminate, 3-nerved, membranous, hairy, persistent. Petals 5, pale purple, outside stellate hairy towards the apex. Staminal column laxly antheriferous throughout. Ovary ovoid-oblong, densely covered with white silky hairs; stigma 5, spreading above the staminal column. Capsule equal to the calyx, ovoid, beaked, hairy, dehiscent into 5 longitudinal valves.

*Type* : India, without precise locality, *Beddome* 92 (Holotype:CAL!).

*Fls. & Frts.* : Sept.-Nov.

*Distrib.* : INDIA : Rajasthan, Uttar Pradesh, Central and South India.

*Exsicc.* : Uttar Pradesh : Mirzapur, 300 m, 22.9.1961, *U.C. Bhattacharyya* 17710 (BSD); without precise locality, *Jerdon* s. n. (CAL).

*Notes* : This species is allied to *H. radiatus* Cav. but differs in having stem without any prickles, unlobed or shallowly 3-lobed leaves, smaller flowers and capsule equal to the calyx.

3. *Hibiscus caesius* Garcke, *Bot. Zeit.* 7 : 850. 1849; *Hochr.* in *Ann. Cons. Jard. Bot. Geneve* 4 : 160. 1900; *Cooke*, *Fl. Pres. Bombay* 1 : 109. 1901 (Repr. ed. 1 : 116. 1958); *Rakshit et Kundu* in *Bull. Bot. Surv. India* 12 : 173 (1970) 1972. *H. gibsoni* *Stocks ex Harv. & Sond.* *Fl. Cap.* 2 : 587. 1861-62; *Mast.* in *Hook. f., Fl. Brit. India* 1 : 339. 1874; *Duthie*, *Fl. Upper Gang. Pl.* 1 : 91. 1903 (Repr. ed. 1 : 86. 1960). *H. heterophyllus* *Dalz. & Gibs.*, *Bombay Fl.* 20. 1861. Fig. 25

Herbs, undershrubs or shrubs 1.2-2.0 m high. Stems erect, sparsely covered with bristles and prickles. Leaves deeply 3-5 lobed, lobation up to the base of the lamina, lobes 2.0-7.5 × 1-3 cm, oblong, lanceolate, attenuated at both the ends, margin serrate, upper surface simple hairy, lower surface stellate pubescent; petiole 1-7 cm long, sparsely covered with stellate bristles. Stipules 5-10 mm long, linear, subulate, hairy. Flowers solitary, axillary; pedicel upto c. 12 cm long, slender, jointed towards the apex, sparsely covered with prickly hairs, more densely above the joint. Epicalyx segments 8-10, usually 10, number varies even in a single plant, each 2.0-3.5 cm long, linear, become spinescent in

fruit, hairy, persistent, spreading like ray. Calyx fused below middle, lobes 1.5-3.0 × 0.5-1.0 cm, lanceolate, apex acute, outside glabrous or sparsely covered with simple hairs, inside pubescent with simple hairs particularly towards the apex, persistent. Corolla yellow with purple centre or purple throughout, twice the length of the calyx, outside stellate hairy, glabrous inside. Staminal column c. 2 cm long, antheriferous throughout, purple. Capsule ovoid, enclosed within the calyx, outer surface prickly hairy, inner surface glabrous, dehiscent into 5 valves, Seeds c. 3 mm across, reniform.

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : INDIA : Rajasthan, Punjab, Uttar Pradesh, Madhya Pradesh, Gujarat, Maharashtra; PAKISTAN, AFGHANISTAN, SOUTH AFRICA, NORTH AUSTRALIA.

*Exsicc.* : Rajasthan : Semalpura, 12.12.63, Verma 1635 (CAL). Madhya Pradesh: Gorna, Sept. 1867, King 41 (CAL). Maharashtra: Bijasan ghat-palsner, 23.9.68, R.D. Pataskar 117453 (CAL).

*Chr. No* :  $2n = 36$  (Das gupta, A. & R. P. Bhatt in Taxon 25 : 494. 1976).

*Pollen* : Average size 124  $\mu$  (range 119-130  $\mu$ ). Interpoal distance 28  $\mu$ . Exine 10  $\mu$  thick. Spine height 16.8  $\mu$ , tip pointed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 24. 1962].

*Notes* : This species is allied to *H. obtusilobus* Garcke but differs in having its long linear needle like spreading epicalyx segments and branches with bristles.

4. *Hibiscus cannabinus* Linn. Syst. Nat. ed. 10,2 : 1149. 1759; Roxb. Fl. Ind. ed. Carey 3 : 208. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 339. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 114. 1900; Cooke, Fl. Pres. Bombay 1 : 109. 1901 (Repr. ed. 1 : 116. 1958); Prain, Beng. Pl. 1 : 267. 1903 (Repr. ed. 1 : 182. 1963); Duthie, Fl. Upper Gang. Pl. 1 : 90. 1903 (Repr. ed. 1 : 90. 1960); Haines, Bot. Bib. & Or. 1 (2) : 67. 1921 (Repr. ed. 1(2) : 70. 1961); Borss. in Blumea 14 : 63 1966; Rakshit et Kundu in Bull. Bot. Surv. India 12 : 164. (1970) 1972. *H. cannabinus* Linn. var. *genuinus* Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 115. 1900.

*Local Names* : Ambari, Patsan, Pitwa (Hind.); Mestapat (Beng.); Ambari, Sheria (Guj.); Pundi (Kan.); Kanjaru (Mal.); Ambadi, Ambada (Mar.); Kanuriya (Or.); Nalita (Sans.); Pulichhai, Pulimanji (Tam.); Gogu, Gonkura, Gaynaru (Tel).

Annual or perennial herbs, 2.5-4.0 m high. Stems with prickles. Lower leaves undivided, upper ones palmatilobed to parted, 3-5 or 7 lobed, lobation upto the base of the lamina, leaflets 3-8 × 0.4-2.0 cm, linear, elliptic to lanceolate, acuminate, middle nerve with a nectary beneath, glabrous; petiole

3-15 cm. Stipules 3-5 mm, linear subulate. Flowers solitary, axillary or in raceme; pedicel 2-5 mm, with prickles. Epicalyx segments 7-8, spreading or reflexed, each up to c. 1.5 cm long, less than the length of the calyx, connate at the base or adnate to the calyx or both, sparsely covered with upturned stiff prickles. Calyx free upto the middle lobes somewhat deltoid, with 3 distinct nerves of which the middle one with a large nectary in outside, outer surface with prickles and white arachnoid tomentum, inner surface glabrous. Corolla yellow with a crimson centre; petals 4-6 × 1-3 cm, spreading, glabrous. Staminal column 1.0-2.5 cm long, antheriferous throughout. Capsule c. 2.0 × 1.5 cm, ovoid, beaked, dehisces into 5 parts, outer surface densely hairy, inner surface glossy. Seeds 4 mm across, reniform, dotted with minute brownish scale like tufted hairs, brownish.

*Type* : H. U. Herb. Linn. n. 875.27 (LINN., Photo!).

*Fls. & Frts.* : Aug.-Nov.

*Distrib.* : Throughout INDIA; cultivated in most tropical countries; growing wild throughout the tropical and subtropical regions of AFRICA.

*Exsicc.* : Uttar Pradesh : Lachinwala (Dehra Dun Dt.), 545 m, 6.10.1900, *Kanjilal* 889 (CAL); Banda, 23.2.1901, *Mrs. Bell* 75 (CAL). Maharashtra : Walhe, 30.9.56, *Jain* 6967 (CAL); Mumbra, 9.10.1954, *Shenoy* 4790 (BLAT).

*Uses* : Fibres extracted from stem barks is used for making coarse textiles; fishing lines and nets. Leaves, flowers and seeds are medicinal. Leaves are used in making pickles.

*Notes* : This species is much variable in its leaf form, pigmentation of stem and leaves and branching habit. The environmental factors such as soil moisture, temperature and day light can change the stature, branching habit and maturing time. 5 distinct varieties comprising 8 agricultural types have been isolated at Pusa, Bihar (Anonymous, *Wealth of India* 5 : 78. 1959) These are var. *simplex* (Type 1), var. *viridis* (Type 2), var. *ruber* (Type 3), var. *purpureus* (Type 4, 5), var. *vulgaris* (Type 6, 7, 8). Among these, type 3 and type 6 (Renamed N.P. 3 and N.P. 6) are best suited for fibre purposes.

This species can be distinguished from the related species *H. sabdariffa* Linn. and *H. radiatus* Cav. by having white arachnoid tomentum on the calyx.

5. **Hibiscus fragrans** Roxb. [Hort. Beng. 97. 1814 *nom. nud.*] Fl. Ind. ed. Carey 3 : 195. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 337. 1874; *Kanjilal et al.* Fl. Assam 1 : 143. 1934; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 61. 1900; *Rakshit et Kundu* in Bull. Bot. Surv. India 12 : 158 (1970) 1972.

**Fig. 26**

Scandent shrubs or rarely climbers on tall trees. Stems c. 20 cm in diameter. Young stems, petioles and pedicles stellate pubescent. Leaves 5-15 × 4-12 cm,



Fig. 26. *Hibiscus fragrans* Roxb.

ovate, unlobed, apex acute, cordate at base, margin dentate or repand, 5-7 nerved at the base, stellate hairy more in the lower surface, glabrescent, later chartaceous; petioles 5-7 cm long. Stipules c.  $10 \times 3$  mm, linear to lanceolate, both the surface stellate tomentose. Flowers in axillary or in terminal panicles, fragrant; pedicels 3-7 cm long, jointed 3-5 mm below the flower. Epicalyx segments 5, connate upto the middle, each  $4-14 \times 5-10$  mm, ovate, acuminate, stellate pubescent. Calyx fused upto the middle, lobes  $1-2 \times 0.3-1.0$  cm, acuminate, inner surface densely stellate tomentose, outer surface with stellate and club shaped hairs. Corolla c. 3 cm across, white to pinkish with pale yellow centre, fragrant; petals  $2-4 \times 2-3$  cm, apex somewhat rounded, veins parallel, outer surface with few long stellate hairs, inner surface glabrous. Staminal column c. 1 cm long, filaments 4-5 mm long, purplish. Capsule  $3-4 \times 1.5-2.0$  cm, ovoid, dehiscing into five parts, outer surface densely stellate-hairy, inner surface glossy.

*Type* : Sylhet, Wall. Cat. 1911A (Neotype CAL!).

*Fls.* : Nov.-Jan;      *Frts.* : Feb.-Apr.

*Distrib.* : INDIA : Sikkim, Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Manipur; BANGLADESH, BURMA, CHINA.

*Exsicc.* : Sikkim : Ritteoo, 1212 m, Nov. 1881, *Gamble* 10041 (CAL). Arunachal Pradesh : Between chowkham and Kharem (Lohit Dt.), 28.11.1969, *Joseph* 48385 (CAL). Assam : Kaddum R. F., 12.3.1962, *Panigrahi* 27802 (CAL); Garonga (Sibsagar), 90 m, 7.12.1913, *Kanjilal* 4260 (ASSAM).

*Uses* : Bark Yields Fibre.

*Notes* : This species is allied to *H. scandens* Roxb., but differs in having whitish-pink flower which is fragrant and calyx with club shaped hairs.

Roxburgh in Hort. Beng. (1814) listed *H. scandens* collected from Sylhet. In Flora Indica (1832) Roxburgh validated the name by giving a description. There is no available herbarium specimen of Roxburgh of this species at Kew, Geneva and Edinburgh and neither any illustration of this species is available in Roxburgh Icones. Hence a specimen from Sylhet is chosen as the neotype.

6. *Hibiscus hirtus* Linn., Sp. Pl. 694. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 335. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 86. 1900; Cooke, Fl. Pres. Bombay 1 : 106. 1901 (Repr. ed. 1 : 113. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 89. 1903 (Repr. ed. 1 : 89. 1960); Prain, Bengal Pl. 1 : 266. 1903 (Repr. ed. 1 : 181. 1963); Gamble, Fl. Pres. Madr. 1 : 97. 1915 (Repr. ed. 1 : 70. 1957); Haines, Bot. Bih. & Or. 1 (2) : 67. 1921 (Repr. ed. 1 (2) : 69. 1961); Borss. in Blumea 14 : 75. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 170. (1970) 1972. *H. phoeniceus* Cav. Diss. 3 : 157. t. 67. f. 2. 1787 *nom* Jacq; Roxb. Fl. Ind. ed. Carey 3 : 195. 1832.

*Local Names* : Lal-surgumini (Beng.).

Undershrubs, 1.0-1.5 m high. Stems pubescent with stiff minute stellate hairs, more denser in young twigs. Lower leaves 3.5-6.0 × 1.5-3.0 cm, ovate, unlobed or 3-lobed, upper leaves 2-3 × 0.5-2.0 cm, ovate-lanceolate, apex acute to acuminate, base rounded or more or less cuneate, margin crenate-serrate or irregularly toothed, 3-5 nerved at the base, often with an oblong nectary on midrib beneath, pubescent with minute stellate hairs, denser in lower surface; petiole 0.5-1.5 (-3) cm long with small stellate and simple hairs. Stipules 2-8 mm, linear, ciliate. Flowers solitary, axillary, seemingly in racemes or in panicles; pedicel longer than the petiole, 0.5-2.0 cm accrescent upto 5 cm, jointed below or above the middle, pubescent with minute stellate and appressed simple hairs. Epicalyx segments 6-9, free, each 3-8 × 0.5-1.0 mm, lanceolate to linear, acute, subulate. Calyx 5-fid or parted, divided nearly to the base, each 3-10 × 0.5-1.5 mm, linear-lanceolate, hairy, persistent. Corolla pink or white, rotate; petals 1.0-1.5 × 0.5-0.8 cm obovate apex rounded. Staminal column shorter or as long as the petals. Capsule shorter than the calyx, globose. Seeds c. 2 mm across, 2-3 per locule, reniform, densely covered with long woolly hairs.

*Type* : Herb. Linn. n. 875.18 (LINN; Photo!).

*Fls. & Frts.* : Nov.-June.

*Distrib.* : INDIA : Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Gujarat, Bihar, Orissa, West Bengal, Assam; MALESIA

*Exsicc.* : Uttar Pradesh : Banda, 14.5.1901, *Mrs. Bell* 207 (CAL); Moradabad, *Hook. f. & Thomson s. n.* (CAL). Maharashtra : Ambavane (Ponna Dt.), 6.3.1964, *Reddi* 95755 (CAL). Andhra Pradesh : Polavaram, 26.12.1902, *C.A. Barber* 4902 (CAL).

*Pollen* : Size 106 μ. Pore diameter 4.2 μ. Spine height 16.8 μ, tip acute, base mount-like and also shows a callose structure at the junction between the column and the mount. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 24. 1962].

7. *Hibiscus hoshiarpurensis* T.K. Paul *et* Nayar in Bull. Bot. Surv. India 25 : 188. (1983) 1985.

Perennial herbs up to c. 1.5 m high. Stems erect, densely covered with both stiff bristles and soft stellate hairs, without any prickles. Leaves 5.5-10.0 × 1.4 cm, lanceolate, unlobed, apex acute, base cuneate, margin irregularly serrate with a prominent midvein stellate pubescent on both surfaces; petiole 0.5-2.5 cm long, densely stellate pubescent, nearly hirsute. Stipules c. 5 mm long, linear, covered with simple and few stellate hairs. Flowers axillary, solitary; pedicel 1-4 mm long, not jointed, hairy. Epicalyx segments 10, free to the base, 0.8-1.3 cm long, linear-ob lanceolate with tip 3-5 mm long linear appendage arising from the base of the ob lanceolate tip, stiff hairs throughout. Calyx 1.6-1.8 cm long, campanulate, divided up to the middle, lobes 1.6-1.8 ×



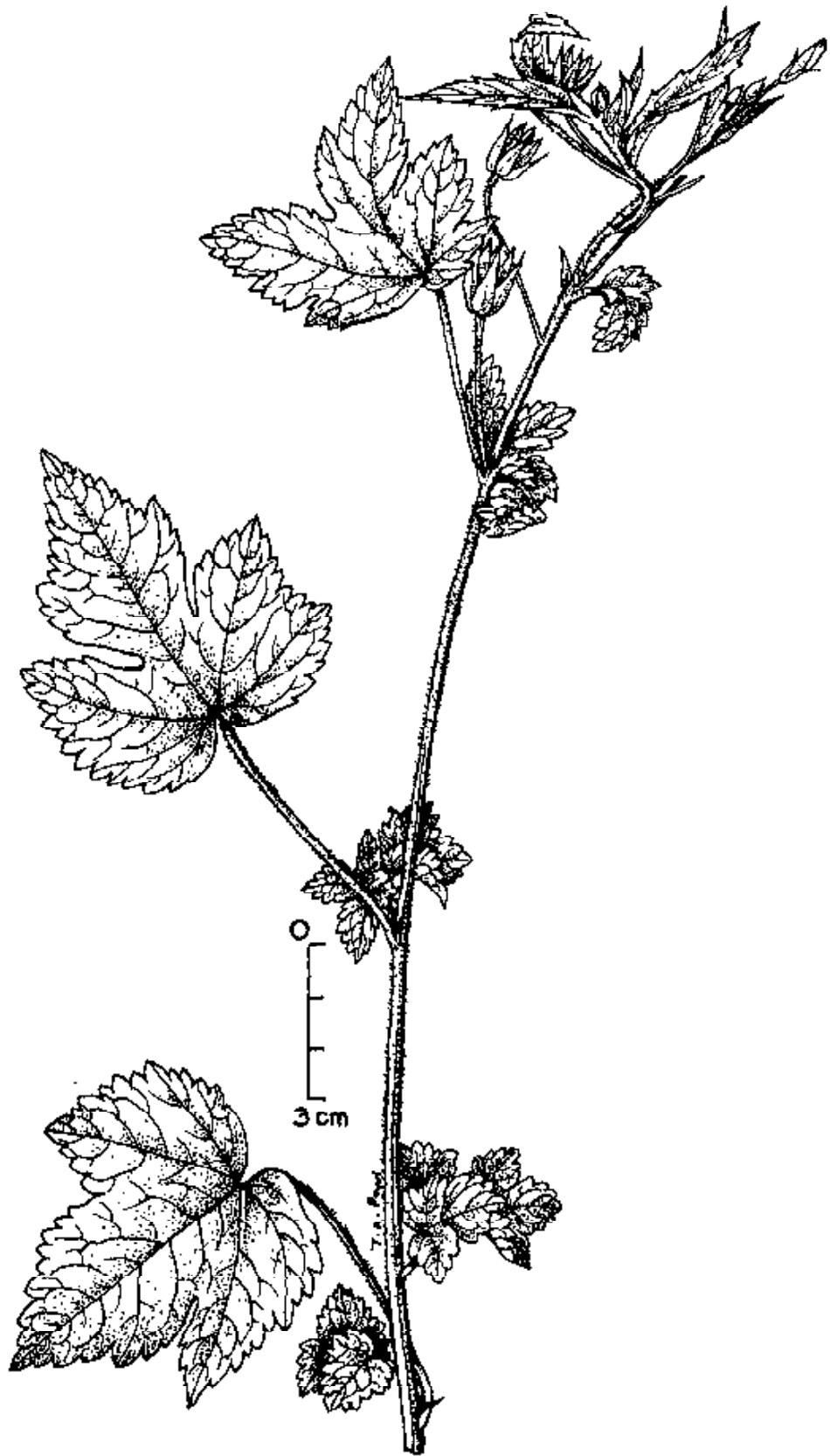


Fig. 27. *Hibiscus lobatus* (J.A. Murray) O. Kunth

0.3-0.5 cm, deltoid, acuminate, with a prominent vein outside with stiff simple and stellate hairs, inside glabrous, Corolla bright yellow; petals *c.* 2.5 cm long, outside sparsely stellate hairy. Staminal column *c.* 1.5 cm long, antheriferous throughout. Ovary ovoid-oblong, covered with white silky hairs, style *c.* 1.8 cm long; stigmas 5. Capsule *c.* 1.5 cm long, *c.* 1 cm across, shorter than the calyx, ovoid, shortly beaked, densely hairy, dehiscing longitudinally into 5 valves. Seeds *c.* 2 mm across, ovoid-reniform, dotted with white scaly structures.

*Type* : Punjab : Dholbah (Hoshiarpur Dist.), 22.9.1970, O.P. Misra 41888-A (Holotype : BSD; isotype : CAL).

*Fls.* : Aug.-Sept.; *Frts.* : Oct.-Nov.

*Distrib.* : INDIA : Punjab.

*Notes* : This species is allied to *H. beddomei* Rakshit *et* Kundu but differs in having leaves lanceolate, unlobed, base cuneate to acute, 5.5-10.0 cm long, 1-4 cm across, petioles shorter (0.5-2.5 cm) and calyx longer than the capsule.

8. *Hibiscus lobatus* (J.A. Murray) O. Kuntze Rev. Gen. Pl. 3, 2 : 19. 1898; Borss. in Blumea 14 : 77. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 169. (1970) 1972; Abedin in Fl. W. Pak. 130 : 18. 1978. *Solandra lobata* J.A. Murray, Comm. Soc. Reg. Sc. Goetting. 6 : 20, t. 1. 1785. *Hibiscus solandra* L. Herit, Strip. Nov. 1 : 103, t. 49. 1788 *nom. illeg.*; Mast. in Hook. f., Fl. Brit. India 1 : 336. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 128. 1900.

Fig. 27

*Local Names* : Atakanara (Tel.).

Annual erect herbs, 30-100 cm high. Stems pubescent with short simple hairs and rarely with stellate hairs. Leaves 2-9 × 1.5-7.5 cm, upper leaves lanceolate to linear occasionally lyrate, apex acute to acuminate, base cordate, rounded or truncate, lower leaves 3-lobed, lobes linear lanceolate, ovate, deltoid or obovate, apex obtuse, acute or acuminate; margin crenate or coarsely serrate, 3-5 nerved at base without any nectary, pubescent with short simple and tribrachiate stellate hairs; petiole 2.0-9.5 cm long, adpressed with short simple hairs, rarely with stellate hairs. Stipules 4-8 mm long, linear to filiform, simple hairy. Flowers solitary, axillary, rarely in racemes by reduction of the upper leaves; pedicel 0.5-1.0 cm, accrescent upto 6 cm with a joint below *c.* 1 cm of the flower. Epicalyx segments 6-8, *c.* 1 mm in bud, not found in mature flower. Calyx campanulate to rotate, 5-8 mm across, 5-fid to 5-parted, each lobe 5-10 × 1-2 mm, accrescent upto *c.* 1.2 × 0.3 cm, deltoid to lanceolate, acute, 3-nerved, outside densely hispid with simple and gland-hairs, inside glabrous or nearly so. Corolla 1.3-1.8 cm in diameter, white or yellow; petals obovate, 10-15 × 6-10 mm, glabrous or nearly so. Staminal column *c.* 6 mm long, antheriferous throughout, filaments *c.* 0.2 mm. Style arms *c.* 1-2 mm long, stigma discoid, hairy. Capsule 10-15 mm high with 1-2 mm long rostrum.

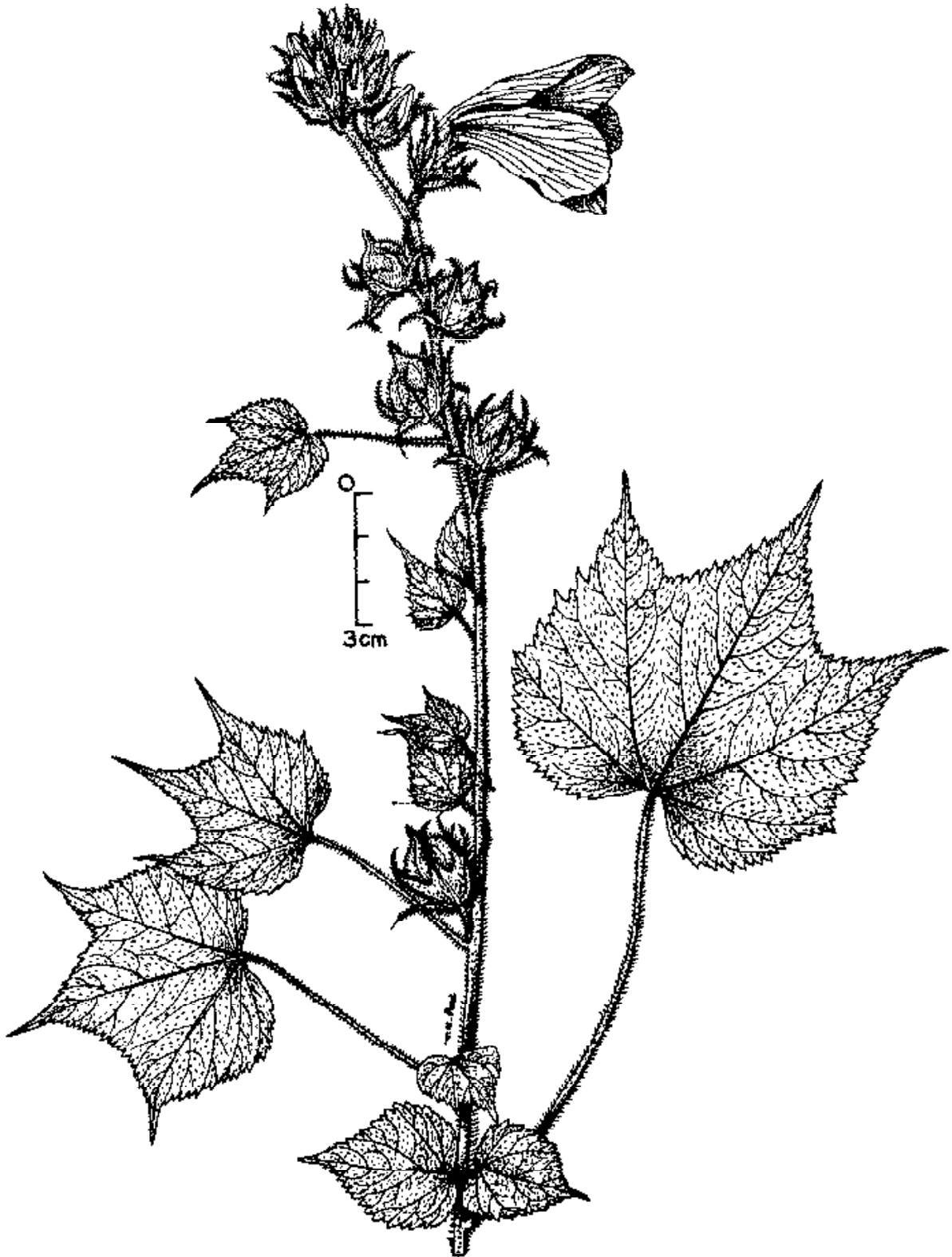


Fig. 28. *Hibiscus lunariifolius* Willd.

oblong-ovoid, outside with simple and tribrachiate stellate hairs, inner surface of the valves smooth. Seeds 1.3 mm across, 3-4 in each locule, irregularly prismatic, indistinctly tubercled or glabrous, black.

*Type* : J.A. Murray, Comm. Soc. Reg. Sc. Goetting. 6, t. 1

*Fls. & Frts.* : July-Jan.

*Distrib.* : Throughout INDIA; S., S. E. & CENTRAL ASIA; MADAGASCAR and adjacent islands, TROPICAL AFRICA.

*Exsicc.* : Uttar Pradesh: Lucknow, 28.9.1958, *Patil* 1267 (CAL); Kathgodam, Oct. 1905, *Meebold* 3701 (CAL). Sikkim: Teesta, 454 m, 23.8.1860, *Clarke* 10076 (CAL). Madhya Pradesh: Moharli reserve (Chanda Dt.), 14.12.1889, *Duthie* 9301 (CAL). Karnataka: Nellupore (N. Canara), Sept. 1881, *Talbot* 136 (CAL).

*Pollen* : Average size 112  $\mu$  (range 105-112  $\mu$ ). Interporal distance 14  $\mu$ . Spine height 25  $\mu$ , tip pointed, column placed on a mount like base. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 24. 1962].

*Chr. No.* :  $2n = 34$  (Skovsted in *Genetica* 31 : 263 1935.).

*Notes* : Hochreutiner (1900) mentioned two varieties of this species viz. var. *genuinus* and var. *sinuatus* (Hornem.) Hochr. The latter mentioned variety is endemic to Madagascar. It differs from the var. *genuinus* by its narrower leaves with deeper incision. The shape and size of the leaf is variable even in a single plant. Epicalyx segments are very short and only found in bud condition, early caducous.

9. *Hibiscus lunariifolius* Willd., Sp. Pl. 3 : 811. 1800; Mast in Hook. f., Fl. Brit. India 1 : 338. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 160. 1900; Gamble, Fl. Pres. Madr. 1 : 98. 1915 (Repr. ed. 1 : 115. 1958); Borss. in Blumea 14 : 80. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 173 (1970) 1972. *H. pruriens* Roxb. (Hort. Beng. 51. 1814 *nom. nud.*) *ex* Hornem. Hort. Hafn. 1 : 79. 1815; Roxb. Fl. Ind. ed. Carey 3 : 196. 1832. *H. sidoides* Wt. & Arn., Prod. Fl. Pen. Ind. Or. 1 : 494. 1834. *H. lunariifolius* Willd. var. *reemosus* (Lindl.) Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 160. 1900. Fig. 28

*Local Name* : Malankuruparetti (Mal.).

Herbs or undershrubs, 2-4 m high. Stems sparsely to densely stiff simple and tribrachiate stellate hairy, glabrescent. Leaves 1-15  $\times$  0.5-19.0 cm, orbicular to ovate, rarely lanceolate, lower leaves 3-5 lobed, apex acute to acuminate, base broadly cordate or rounded, margin coarsely serrate to dentate, both surfaces sparsely or densely simple and tribrachiate stellate hairy; petiole 1-15 cm long, sparsely covered with tribrachiate stellate and soft simple hairs. Stipules 1.5-1.7 cm long, subulate. Flowers solitary, axillary or in racemes by replacing the upper leaves; pedicel 5-10 mm long, inarticulate, stout, densely stellate-

pubescent. Epicalyx segments 5-10, usually 5, each 10-20 × 1-2 mm, linear to narrowly lanceolate, alternate with the calyx lobes, minutely hairy or glabrescent, persistent. Calyx campanulate, jointed below middle with wide round sinuses in between, lobes 7-10 × 2-3 mm, long triangular, acuminate, prominently 3-nerved, outside with tribrachiate stellate and short simple hairs, inside with short simple hairs, persistent, calyx not inflated. Corolla 6-10 cm across, yellow; petals 4-8 × 3-6 cm, obovate with rounded apex, convolute, outside densely stellate pubescent, inside glabrous. Staminal column 1.5-3.0 cm long, antheriferous nearly throughout. Ovary 5-7 mm long, ovoid, oblong, beaked, pubescent. Capsule 2.0-2.5 × 1.5-1.8 cm with a rostrum of 3-5 mm, obovoid, dehisces into 5-valves, outside densely stellate hairy, inside glabrous. Seeds 2.0-2.5 mm across, numerous, reniform, black.

*Type* : India, Tranquebar, *Klein s. n.* (Holotype : B-W n. 12866; Photo!).

*Fls. & Frts.* : Oct.-Jan.

*Distrib.* : INDIA : Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; BURMA, SRI LANKA, MALESIAN REGION, TROPICAL AFRICA.

*Exsicc.* : Andhra Pradesh : Araku Valley (Visakhapatnam Dt.), 800 m, 17.9.1961, *Balakrishnan* 642 (CAL). Tamil Nadu : Thekumalai (Tinnevalley Dt.), 667 m, 19.12.1957, *Subramanyam* 5011 (CAL); Conoor ghat (Nilgiri Dt.), 1212 m, 9.1.1910, *Fischer* 1566 (CAL). Karnataka : Supa (N. Kanara Dt.), 20.11.1887, *Talbot* 1586 (CAL).

*Notes* : Hochreutiner (Ann. Cons. Jard. Bot. Geneve 4 : 160. 1900) recognised two varieties of this species viz. var. *racemosus* and var. *dongolensis*, both distributed in India Orientalis. According to Hochreutiner the var. *racemosus* characterised by plant hairy or hirsute and inflorescence without leaves; but these characters are common in var. *typica*. For var. *dongolensis* Hochreutiner mentioned the following characters : "Plant glabrous or nearly so, leaf very frequently large, inflorescence leaved". The present authors could not locate any specimen matching with the above description.

This species is easily recognised by its pedicels much shorter than the petiole and indumentum of yellow, shiny, tribrachiate-stellate hairs.

10. **Hibiscus macrophyllus** Roxb. [Hort. Beng. 51. 1814 *nom. nud.*] ex Hornem. Hort. Hafn. Suppl. 149. 1819; Mast. in Hook. f., Fl. Brit. India 1 : 337. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 48. 1900; Prain, Beng. Pl. 1 : 268. 1903 (Repr. ed. 1 : 183. 1963); Kanjilal *et al.*, Fl. Assam 1 : 142. 1934; Hu, Fl. China, fam 153, 43. 1955; Borss. in Blumea 14 : 47. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 156 (1970) 1972. *H. setosus* Roxb. [Hort. Beng. 97. 1814 *nom. nud.*] Fl. Ind. ed. Carey 3 : 194. 1832. *H. vestitus* Griff. Notul. 4 : 519. 1854.

*Local Names* : Kashia udal, Kashia palla (Beng.); M̄o-merli (Garo); Tyllendkhar (Khasi); Baiza, raiza (Lushai); Pharna (Mikir).

Trees, 12-22 m high with c. 120-150 cm in diameter at the base with spreading branches. Young branches with tufted stiff yellowish brown filiform hairs with stellate pubescence, glabrescent later. Leaves 15-30 × 15-35 cm, apex abruptly acuminate, base cordate, margin entire or minutely crenulate; petioles 10-22 cm long. Stipules 5-10 × 2-4 cm, foliaceous. Flowers solitary, axillary or in terminal racemes; pedicels 2-4 cm long, accrescent upto 7 cm. Epicalyx segments 10-12, each 2-3 × 0.2-0.3 cm, lanceolate. Calyx fused below the middle; lobes 2.5-3.0 cm long, lanceolate. Corolla yellow with dark purple base often turning red; petals 5-7 × 3-5 cm, obovoid, apex rounded. Staminal column c. 4 cm long. Ovary c. 6 × 4 mm, conical; style arms 4-6 mm; stigma capitate. Capsule c. 3 × 2 cm, ovoid to obovoid with a beak of c. 5 mm. Seeds numerous in each locule, c. 4 mm across, reniform with long fulvous hairs in a line along the edge.

*Type* : Botanic garden, Calcutta from Chittagong? *Wallich s. n.* (Holotype : C).

*Fls.* : Jan.-Apr., *Frts.* Apr.-May.

*Distrib.* : INDIA : Throughout North-east India, Assam, Meghalaya, Nagaland; BANGLADESH, BURMA, MALAYA, JAVA, SOUTH EAST BORNEO, SOUTHERN CHINA. Cultivated in Indian Botanic Garden.

*Exsicc.* : Meghalaya : Khasia, 303 m, *Hooker s. n.* (CAL); Garo hills, 11.3.1915, *Kanjilal 72* (ASSAM). Assam : Halticherra (Cachar), April 1906, *Mann s. n.* (CAL).

*Uses* : The heart-wood is light and durable, used for house construction and rafters. The inner layer of the bark yields strong fibre used for rope and cordage. Fibre is also used for making of good quality paper.

11. *Hibiscus micranthus* Linn. f., *Suppl.* 308. 1781; *Mast.* in *Hook. f.*, *Fl. Brit. India* 1 : 335. 1874; *Hochr.* in *Ann. Cons. Jard. Bot. Geneve* 4 : 82. 1900; *Cooke*, *Fl. Pres. Bombay* 1 : 107. 1901 (*Repr. ed.* 1 : 113. 1958); *Duthie*, *Fl. Upper Gang. Pl.* 1 : 89. 1903 (*Repr. ed.* 1 : 84. 1960); *Gamble*, *Fl. Pres. Madr.* 1 : 97. 1915 (*Repr. ed.* 1 : 70. 1957); *Haines*, *Bot. Bih. & Or.* 1 (2) : 67. 1921 [ *Repr. ed.* 1 : 69. 1961 ]; *Rakshit et Kundu* in *Bull. Bot. Surv. India* 12 : 171 (1970) 1972; *Abedin* in *Fl. W. Pak*, 190 : 15. 1970.

*Local Name* : Bari Bariari (North West India).

Erect undershrubs up to c. 2.6 m high with slender branches terete, scabrid with scattered stellate hairs. Leaves 1.5-4.5 × 0.5-3.5 cm, ovate to oblong, acute to obtuse, margin serrate without any nectaries, both surfaces scabrid with stellate hairs; petiole 0.3 - 2.0 cm. Stipules 0.3-1.3 cm, filiform, hairy. Flowers solitary, axillary; pedicel longer than the petiole, up to c. 3.5 cm

long, slender, jointed above or below the middle, scabrid with stellate hairs. Epicalyx segments 6-8, each 1-2 mm long, free, filiform, hairy. Calyx lobes c. 5 mm long, divided upto the middle, lanceolate, outside stellate hairy, inner side of apical portion hairy. Corolla 0.6-1.2 cm across, purplish-white or pink; petals c. 1.2 × 0.4 cm, oblong, obtuse, often reflexed, outside stellate pubescent, inside glabrous. Capsule globose, dehisces into 5 parts, outside smooth, inside glossy. Seeds reniform, black, hirsute with long white silky hairs, hairs upto c. 8 mm long.

*Distrib.* : Throughout INDIA, PAKISTAN, BURMA, SRI LANKA, ARABIA, AFRICA.

#### KEY TO THE VARIETIES

- 1a. Pedicels 0.5-4 cm long. Branches straight. Stem, petiole, pedicel and leaves scabrous with appressed stellate hairs :  
 2a. Leaves ovate; petioles 5-20 mm long var. *micranthus*  
 2b. Leaves narrow to broadly elliptic; petioles subsessile to 6 mm long var. *rigidus*  
 1b. Pedicels 0.3-1.0 cm long. Branches entangled with each other. Stem, petiole, pedicel and leaves with raised stellate hairs, bristly to touch var. *alii*

var. *micranthus*-*H. micranthus* Linn. f., Suppl. 308. 1781. *H. micranthus* var. *genuinus* Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 83. 1900. *H. gossypinus* DC. Prod. 1 : 453. 1824. Fig. 29

*Type* : Herb. Linn. n. 875.2 (Holotype : LINN, Photo!).

*Distrib.* : NORTH INDIA and throughout SOUTH INDIA; PAKISTAN, BURMA, SRI LANKA, AFRICA.

*Exsicc.* : Punjab : Hissar, 30.7.1961, *Nair* 16202 (CAL). Uttar Pradesh : Mirzapur, 19.9.1961, *Bhattacharyya* 17619 (CAL); Burheipur (Khandau Dt.), 24.12.1888, *Duthie* 8190 (CAL). Karnataka : Dharwar, 30.8.1888, *Talbot* 1720 (CAL).

*Chr. No.* : n = 32 (Gill & Abubaker in Taxon 24 : 368. 1975).

var. *rigidus* (Linn. f.) Cuf. in Ann. Natur. Mus. W. 56 : 49. 1948. *H. rigidus* Linn. f., Suppl. 310. 1781. *H. suborbiculatus* Wall. Cat. no. 1906. 1828 *nom. nud.* *H. micranthus* var. *asper* Cuf. in Ann. Natur. Mus. W. 56 : 48. 1948.

Shrubs up to c. 1.5 m tall, branches with appressed stellate hairs. Leaves 0.5-2 × 0.2-1 cm, narrowly to broadly elliptic. Pedicels 0.5-3.5 cm.

*Type* : Herb. Linn. n. 875.6 (Holotype : LINN, Photo!).

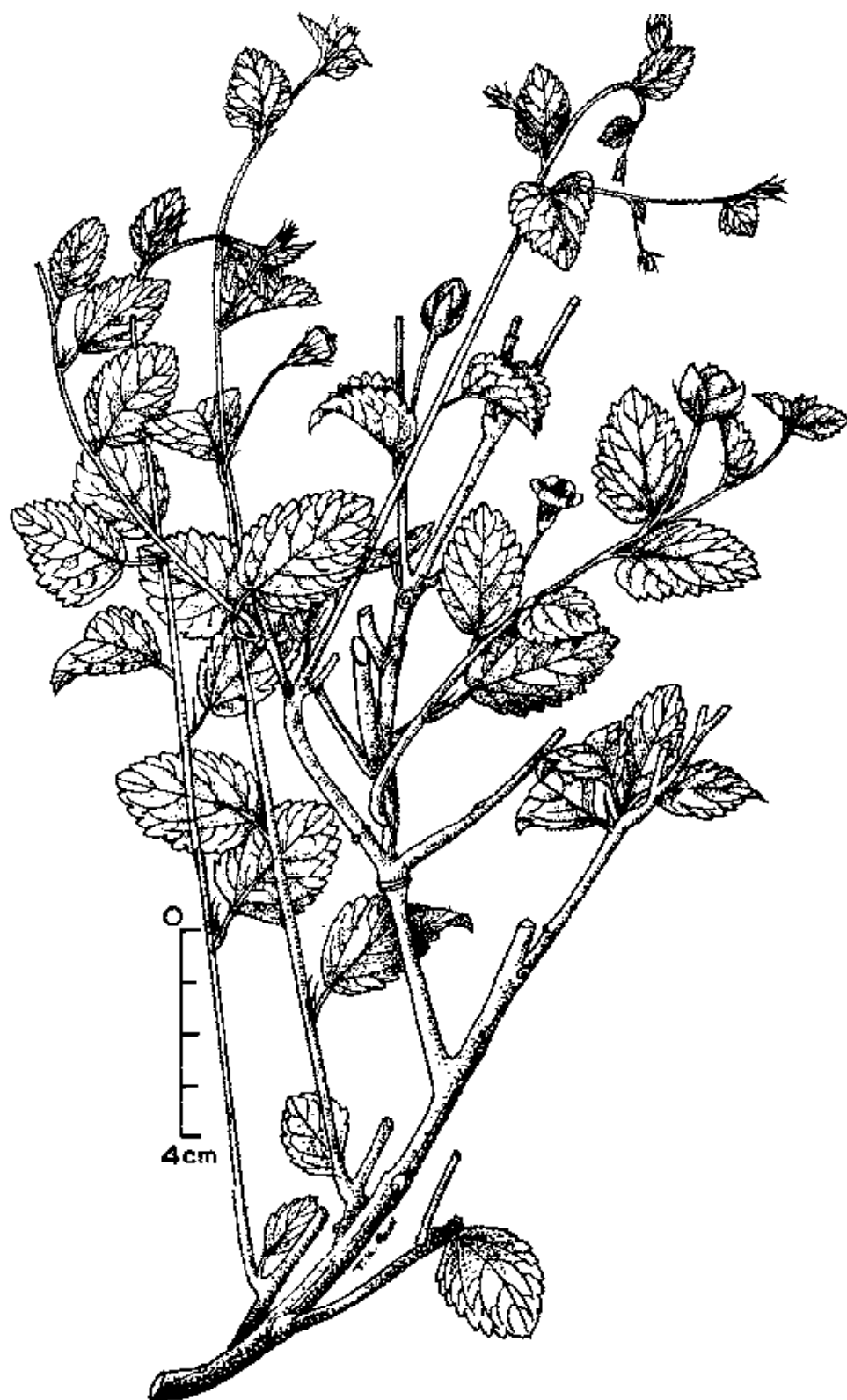


Fig. 29. *Hibiscus micranthus* L.f. var. *micranthus*



*Distrib.* : INDIA, PAKISTAN, ARABIA, TROPICAL AFRICA. It is confined to southern peninsular India.

*Exsicc.* : Tamil Nadu : Mavagarai (Coimbatore Dt.), 600 m, 9.5.1910, *Fischer* 1888 (CAL); Slope of Kuridimalai (Coimbatore Dt.), 766 m, 10.7.1956, *Subramanyam* 233 (CAL); Nidamangalam (Thanjavur Dt.), 50 m, 31.5.1976, *Nair* 57208 (CAL, MH).

var. *alii* S. Abedin in *Fl. W. Pak.* 130 : 18. 1979. *H. ovalifolius sensu* Boiss. *Fl. Or.* 1 : 839, 1867. *H. micranthus* var. *ovalifolius sensu* Hochr. in *Ann. Cons. Jard. Bot. Geneve* 4 : 83. 1900.

Erect undershrubs, profusely branched, branches entangled with each other with stiff, bristly stellate hairs. Leaves 8-30 × 7-24 mm. Flower solitary, axillary; pedicel 3-20 mm long.

*Type* : Habitat in rupestribus peninsulea sin aiticae *Aucher-Eloy* 855 (Holotype : G-Boiss.).

*Distrib.* : INDIA, PAKISTAN, ARABIA, TROPICAL AFRICA. It is confined to Rajasthan in India.

*Exsicc.* : Rajasthan : On the hills in Tordi R.F., Malpura (Tonk Dt.), 430 m, 21.9.1974, *Shetty* 1293 (CAL); Lodasar hills (Churu Dt.), 21.3.1976, *Roy* 2562 (CAL); Sohela plantation at the base of hills (Tonk Dt.), 200 m, 15.5.1977, *Pandey* 4739 (CAL).

12. *Hibiscus mutabilis* Linn. *Sp. Pl.* 694. 1753; *Roxb. Fl. Ind. ed. Carey* 3 : 201. 1832; *Mast. in Hook. f., Fl. Brit. India* 1 : 344. 1874; *Hochr. in Ann. Cons. Jard. Bot. Geneve* 4 : 147. 1900; *Cooke, Fl. Pres. Bombay* 1 : 113. 1901 (Repr. ed. 1 : 120. 1958); *Prain, Beng. Pl.* 1 : 268. 1903 (Repr. ed. 1 : 183. 1963); *Haines, Bot. Bih. & Or.* 1 (2) : 69. 1921 (Repr. ed. 1 (2) : 72. 1961); *Hu, Fl. China fam.* 153 : 59. t. 19 : f. 1. 1955; *Borss. in Blumea* 14 : 66. 1966; *Rakshit et Kundu in Bull. Bot. Surv. India* 12 : 167 (1970) 1972 ; *Abedin in Fl. W. Pak.* 130 : 10. 1979.

*Local Names* : Sthalkamal (Hindi); Sthal padma (Beng.); Changeable rose. Confederate rose (Eng.); Suryakanti (Kan.); Chinappratti (Mal.); Sthalpoadmo (Or.); Gul-i-ajaib (Punj.); Sembarattai (Tam.).

Shrubs upto c. 6 m high, bushy. Young portion densely stellate intermixed with copious simple glandular hairs. Leaves 10-22 cm in diameter, suborbicular, cordate, palmately 3-7 lobed, lobes triangular, apex acute or long acuminate, coarsely dentate or irregularly crenate, lower surface densely stellate pubescent, upper surface glabrate or sparsely stellate pubescent, 7-11 nerved at the base; petioles 5-15 cm long. Stipules linear, lanceolate, tomentose. Flowers solitary, axillary or subcorymbose at the tip; pedicels 6-12 cm long, jointed 1-2 cm below

the flower. Epicalyx segments 8-12, each 2.0-2.5 × 1-2 mm, linear-lanceolate, segments bend downwards and ultimately spreading. Calyx connate upto middle, lobes 3-4 × c. 1 cm, accrescent, ovate-lanceolate, acuminate, outside densely stellate pubescent with glandular hairs throughout, along margin inside densely stellate hairy, central and basal portion of the inner surface with long simple hairs, 5-nerved, yellowish green. Petals 5 or multiple of 5, 6-8 cm long, suborbicular, shortly clawed, outside with few stellate hairs, inside glabrous, base with long stellate hairs. Staminal column shorter than the corolla, white or yellowish white, antheriferous throughout. Ovary c. 6 mm long, roundish truncate with white silky hairs, 5-locular, many ovules in each locule. Capsule 2.0-2.5 cm long, subglobose, more or less emarginate, densely stellate pubescent and also with simple glandular and long setose hairs intermixed. Seeds 2 mm long, reniform, the dorsal and dorsolateral wall with radiating simple to 6-armed long hairs up to 2 mm, brownish.

*Type* : H.U. Herb. Linn. n. 875.20 (LINN, Photo!).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : Cultivated throughout INDIA; throughout the tropical regions of the WORLD, Native of CHINA.

*Exsicc.* : Bihar : Chota Nagpur, 606 m, 5.10.1873, *Clarke* 20726 (CAL). West Bengal : Hooghly, 27.3.68, *Subir Sen* 497 (CAL). Meghalaya : Khasia and Jaintia hills, 25.11.1956, *Panigrahi* 4603 (CAL). Tripura : Agartala, 180-240 m, 20.10.1915, *Debbarmann* 846 (CAL).

*Uses* : The stem yields a fibre of inferior quality. Leaves and flowers are having medicinal properties.

13. *Hibiscus obtusilobus* Garcke, Bot. Zeit. 7 : 837. 1849; Abedin in Fl. W. Pak. 130 : 22. 1979. *H. amblyocarpus* Hochst. ex Webb, Fragm. Fl. Aethiop. 45. 1854; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 159. 1900. *H. punctatus* Dalz. in Dalz. & Gibs. Bombay Fl. 20. 1861; Mast. in Hook. f., Fl. Brit. India 1 : 340. 1874; Cooke, Fl. Pres. Bombay 1 : 110. 1901 (Repr. ed. 1 : 116. 1958). *Hibiscus laguneoides* Edgew. in Journ. Linn. Soc. 6 : 199. 1862.

Annual erect undershrubs, c. 1 m high. Stems, petioles and pedicels stellate hairy, glutinous. Leaves rounded-ovate, unlobed or unequally 3-lobed, lobation upto the middle of the lamina, lobes 2.5-10.0 × 1.5-6.0 cm, middle lobe longer, apex, acute, base cordate, margin undulate-crenate, 5-7 nerved at the base, subscabrous with few stellate hairs on both surfaces; petioles 1.0-7.5 cm. Stipules 4-8 mm long, linear, lanceolate. Flowers solitary, axillary, subpanicled; pedicels 1.3-6.5 cm, jointed towards the apex. Epicalyx segments 8-10, each c. 5 mm long, connate at the base, linear acute. Calyx campanulate, connate below middle, lobes c. 1.0 × 0.3 cm, deltoid-lanceolate acuminate, densely stellate tomentose, persistent. Corolla scarcely exceeding the calyx, white or pale pink. Capsule c. 1 cm long, as long as or slightly longer than the calyx, beaked,

dehisces into 5-valves, outside densely stellate pubescent, inside glossy. Seeds 2 mm across, reniform, muricated, black.

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : Rajasthan, Punjab, Gujarat, Maharashtra; PAKISTAN, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : Sheofields (Bamber Dt.), 21.11.1973, *G.L. Tiwari* 916 (CAL). Maharashtra : Dhonel (Bombay), 25.11.56, *Jain* 9555 (CAL).

*Uses* : Leaves are used as vegetable in Punjab.

*Notes* : It is easily recognised by its stellate glutinous hairy stem, segments of epicalyx shorter than the calyx and muricated seeds.

14. *Hibiscus palmatus* Forssk. Fl. Aegypt.-Arab. 126t. 1775. *H. aristivalvis* Garcke, Bot. Zeit. 7 : 849. 1849; Abedin, in Fl. W. Pak. 130 : 19. 1979. *H. intermedius* A. Rich. Tent. Fl. Abyss. 1 : 58. 1847; Mast. in Hook. f., Fl. Brit. India 1 : 336. 1874; Cooke, Fl. Pres. Bombay 1 : 107. 1901 (repr. ed. 1 : 114. 1958).

Annual, diffuse or prostrate herbs. Stems pubescent with retrose simple and stellate hairs, also one line of small whitish shiny hairs althrough. Leaves polymorphic, 3-7 palmatilobed, lobes 2.5 × 0.3-0.8 cm, narrowly lanceolate or linear, each lobe toothed irregularly, base cordate or truncate, upper surface subglobose, lower surface with few simple hairs; petioles 1.5-5.0 cm long, pubescent. Flowers solitary, axillary; pedicels shorter than the petiole, jointed near the base. Epicalyx segments 10, shorter or slightly longer than the calyx, linear, strap-shaped, hairy. Calyx campanulate, connate at the base, lobes 8-12 × 3-5 mm, lanceolate, prominently 3-nerved, nerves and margin of the lobes hispid. Corolla yellow with purple centre, c. 2.5 cm across; petals two times longer than the calyx. Staminal column c. 5 mm long, antheriferous on the upper part. Capsule c. 1 cm long, enclosed within the calyx, beaked, beak c. 2.5 mm long, hispid, slightly winged at the edges. Seeds 2-3 mm, reniform with adpressed shiny hairs, black.

*Fls. & Frts.* : Aug.-Nov.

*Distrib.* : INDIA : Rajasthan, Gujarat; PAKISTAN, ARABIA, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : Barli (Jodhpur), 18.8.77, *A.N. Singh* 4321 (CAL).

15. *Hibiscus panduraeformis* Burm. f. Fl. Ind. 151. t. 47, f. 2. 1768; Mast. in Hook. f., Fl. Brit. India 1 : 338. 1874; Cooke, Fl. Pres. Bombay 1 : 108. 1901 (Repr. ed. 1 : 182. 1963); Gamble, Fl. Pres. Madr. 1 : 98. 1915 (Repr. ed. 1 : 70. 1957); Haines, Bot. Bih. & Or. 1 (2) : 68. 1921 [Repr. ed. 1 (2) : 71. 1961]; Borss. in Blumea 14 : 79. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 172. (1970) 1972. *H. tubulosus* Cav. Diss. 3 : 161. t. 68. f. 2. 1781; Roxb. Fl. Ind. ed. Carey 3 : 196. 1832. *H. panduraeformis* var. *tubulosus* (Cav.) Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 96. 1900. *H. setosus* Wall. Cat. 1902. 1829 *non* Roxb.

Annual or perennial herbs or undershrubs, 1-4 m high. Stems stout, stellate velutinous to tomentose, also with shiny prickly stellate hairs, hairs 3-5 mm long, often also with small thin simple hairs. Leaves 2-15 × 0.5-10.0 cm, lower ones ovate-cordate, palmilobed with deltoid-acuminate segments, upper leaves oblong-lanceolate, margin coarsely serrate, 5-9 nerved at the base, upper surface stellate velutinous, lower surface cinereously stellate-velutinous to tomentose; petioles 1-15 cm long, stellate hairy. Stipules c. 5 mm long, 2-3 parted with filiform segments, deciduous. Flowers solitary, axillary, often in terminal raceme by reduction of the upper leaves; pedicels 5-15 mm long stellate-velutinous to tomentose, jointed near the apex. Epicalyx segments 6-10, shorter than the calyx, segments shortly connate at the base, spatulate, stellate velutinous, persistent. Calyx campanulate, free up to the middle, lobes 15-20 × 3-5 mm, ovate, obtuse, 3-nerved, outside stellate-velutinous, inside sericeous, basal portion glabrescent. Corolla yellow with dark purple centre; petals 15-30 × 20-25 mm, rounded at apex, outside stellate tomentose, inside with white glandular hairs. Staminal column 10-15 mm long, dark purple, antheriferous throughout. Ovary 7-9 mm long, ovoid, hairy; style arms 3-5 mm, purple; stigma capitate. Capsule shorter than the calyx, ovoid, enclosed within the persistent calyx, outside densely hairy, inside glossy. Seeds 2.0-2.5 mm, reniform, brown, densely hairy or glabrous.

*Type* : Burm. f. Fl. Ind. t. 47. f. 2.

*Fls. & Frts.* : Oct.-Jan.

*Distrib.* : Throughout INDIA; BURMA, SRI LANKA, JAVA, AUSTRALIA, TROPICAL AFRICA.

*Exsicc.* : Rajasthan : Barodia village (Banswara Dt.), 150 m, 20.10.76, V. Singh 3745 (CAL). Maharashtra : Chanda Dt., 19.1.90, Duthie 9303 (CAL). Tamil Nadu : Araipalanam, 750 m, 14. 12. 1865, Fischer 677 (CAL) ; Agric. College (Coimbatore), 468 m, 21.11.1965, Chandrabose 18839 (MH).

*Pollen* : Average size 115  $\mu$  (range 105-116  $\mu$ ). Spine height 14  $\mu$ , base thick and constricted. Columella fused towards the tips to form a tagillum [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 24. 1962].

*Chr. No.* :  $2n = 24$  (Skovsted in C. R. Lab. Carls. S. Physiol 23 : 195. 1941)

*Notes* : The Wallich Cat no. 1902 identified as *H. setosus* Roxb. is synonymous to *H. macrophyllus* Roxb. ex Hornem. but the specimen on this sheet is *H. panduraeformis* Burm. f. in CAL. This species is allied to *H. purpureus* Cav. but differs in having epicalyx segments linear-spatulate which is shorter than the calyx and capsule enclosed within the calyx.

16. *Hibiscus platanifolius* (Willd.) Sweet, Hort. Brit. 2 : 51. 1827; Hoch. in Ann. Cons. Jard. Bot. Geneve 4 : 168. 1900; Gamble, Fl. Pres. Madr. 1 : 98. 1915 (Repr. ed. 1 : 70. 1957); Rakshit et Kundu in Bull. Bot. Surv. India 12 : 160.

(1970) 1972. *Pavonia platanifolia* Willd., Berol. Mag. Ges. Naturf. Fr. 4 : 220. 1810. *Hibiscus collinus* Roxb. [Hort. Beng. 51. 1814 *nom. nud.*] Fl. Ind. ed. Carey 3 : 199. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 338. 1874; Cooke, Fl. Pres. Bombay 1 : 108. 1903 (Repr. ed. 1 : 114. 1958); Haines, Bot. Bih. & Or. 1 (2) : 68. 1921 [Repr. ed. 1 (2) : 71. 1961].

*Local Name* : Kandagang (Tel.)

Small trees or shrubs up to c. 2 m high, much branched, branches ascending, young twigs pubescent, bark of mature part glabrous, greenish. Leaves 8-15 cm long and about as broad, cordate, palmately 3-5 lobed, semicircular furrow in between the lobes, lobes elliptical, apex acute or acuminate, margin entire or irregularly toothed, 5-7 nerved at the base, lower surface densely stellate pubescent particularly on the veins, upper surface sparsely stellate pilose; petioles 2.5-11 cm long, tomentose. Stipules 0.5-1.0 cm long, linear-lanceolate. Flowers solitary, axillary; pedicels 2-11 cm long, jointed near the apex, hairy. Epicalyx segments 5, 8 or 10, 12-18 mm long, segments free upto the base, foliaceous, acuminate, pubescent with stellate hairs. Calyx connate below middle, 2.0-3.2 × 0.6-0.9 cm, lobes ovate, oblong or lanceolate, acute with one prominent nerve, pubescent. Corolla pink with deep purple centre, occasionally yellow; petals 4.6 × 3.4 cm, outside hairy, inside glabrous, veins parallel. Staminal column 2.0-2.5 cm long, antheriferous throughout, filaments 2-4 mm long. Capsule 2.0-3.5 cm long and broad, depressed globose, shortly beaked, woody, yellow tomentose and densely setose, inner surface of the valves glossy. Seeds 4-5 mm long, subspherical, glabrous, brownish.

*Type* : *Pavonia platanifolia* Willd. : Herb Willd. 12833 (B; Photo CAL!).

*Fls. & Frts.* : Aug April.

*Distrib* : INDIA : West Bengal, Orissa, Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala; NEPAL, SRI LANKA.

*Exsicc.* : Orissa : Without precise locality, April 1917, *Haines* 4075 (CAL). Andhra Pradesh : Udaygiri Duyam (Nellore Dt.) 780 m, 29.8.17, *Fischer* 4150 (CAL); Cuddapah forest, *Beddome* 1880 (MH). Tamil Nadu : Balamore (Kanyakumari Dt.), 600 m, 25.8.1976, *Henry* 47516 (MH).

*Uses* : Cultivated as ornamental for its showy flowers. Bark yields strong fibre used for cordage.

*Notes* : This species can be easily recognised by its bushy tree habit, free foliaceous epicalyx and 5-angled capsule with glabrous seeds.

17. *Hibiscus purpureus* Forssk., Fl. Aegypt.-Arab 126. 1776; Abedin in Fl. W. Pak. 190 : 21. 1979. *H. calyphyllus* Cav. Diss. 5 : 283, t. 140. 1788; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 99. 1900; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 172. (1970) 1972. *H. calycinus* Willd. Sp. Pl. 3 : 817. 1801; Mast. in Oliver, Fl. Trop. Afr. 1 : 202. 1868. *H. canescens* Heyne ex Wall. Cat. no.



Fig. 90. *Hibiscus radiatus* Cav.

2698, 1828 *nom. nud.*; Mast in Hook. f., Fl. Brit. India 1 : 337. 1874; Gamble, Fl. Pres. Madr. 1 : 97. 1915 (Repr. ed. 1 : 70. 1957).

Shrubs stems without any prickles, glabrous. Leaves 6-15 × 4.5-11.0 cm, ovate, apex acute or acuminate, base cordate, margin irregularly toothed, 7-nerved at the base without any nectary, stellate pubescent on both surfaces usually more beneath; petioles stellate pubescent. Stipules 1.3-2.5 cm long, linear, setaceous, sparsely pubescent. Flowers solitary, axillary; pedicels 1.0-1.5 cm long, not jointed, pubescent. Epicalyx segments 5, longer than the calyx, each 2.0-2.5 cm long, linear-lanceolate, stellate pubescent on both sides. Calyx connate near the middle, equalling or shorter than the epicalyx, lobes ovate to triangular, long acuminate, 3-nerved, outside stellate pubescent except the margin, inside glabrous. Corolla c. 3-7 cm across, yellow with purple centre; petals downy outside, inside glabrous. Capsule 2.5-4.0 cm long, oblong, villous, aristate. Seeds c. 3 mm long, tomentose.

*Fls. & Frts.* : Jan.-Feb.

*Distrib.* : PENINSULAR INDIA, SRI LANKA, MADAGASCAR, AFRICA.

*Exsicc.* : Tamil Nadu : Gingee fort (N. Arcot Dt.), 250 m, *Sebastine* 12183 (CAL, MH); Chinnar bank (Hogainappal), 275 m, 14.7.1964, *Vajravelu* 20633 (MH); Girnigoudi, 330 m, 28.11.05, *Fischer* 791 (CAL); Khansapuram beat (Ramanathapuram Dt.), 275 m, 16.2.1979, *Nair* 60873 (MH).

*Chr. No.* : 2n=80 (Skovsted in C.R. Lab. Carls. S. Physiol. 23 : 195. 1941.)

*Notes.* : This species is allied to *H. pandurueformis* Burm. f. but differs in having linear-subulate epicalyx which is longer than the calyx and capsule twice as long as the calyx.

18. *Hibiscus radiatus* Cav. Diss. 3 : 150. t. 54. f. 2. 1787; Roxb. Fl. Ind. ed. Carey 3 : 209. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 335. 1874; Cooke, Fl. Pres. Bombay 1 : 106. 1901 (Repr. ed. 1 : 112. 1958); Borss. in Blumea 14 : 60. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 162. (1970) 1972. *H. lindleyi* Wall. Pl. As. Rar. 1 : 4. t. 4. 1830. *H. radiatus* var. *lindleyi* (Wall.) Kurz in Journ. Asiat. Soc. Beng. n. s. 43. 2 : 110. 1874. *H. heptaphyllus* Dalz. & Gibs. Bombay Fl. 20 : 1861. Fig. 30

Erect undershrubs up to c. 1.8 m high. Stems with some bulbous based retrose prickles along with some long simple hairs, glabrescent, later Leaves 2-12 × 1.5-12.0 cm, lower leaves broadly ovate to oblong, apex acute, base cuneate, entire, upper leaves orbicular in outline, deeply palmately 3-5 lobed, sometimes 6-7 lobation nearly up to the base, ovate to oblong, obovate, linear to lanceolate, apex acute to acuminate, base cuneate, rounded or shallowly cordate, margin coarsely or sharply serrate, glabrous, some thick hairs on the veins beneath, 3-5 nerved at base with nectaries, often tinged red;

petioles 2-15 cm, sparingly aculeate or unarmed, with a strip of short hairs above, upper surface coppery red in young condition. Stipules 5-8 mm, linear to lanceolate, bristly. Flowers solitary, axillary, large showy; pedicels 2-4 mm long, jointed, pubescent below the joint. Epicalyx segments 8 or 10, each 15-18 × 1.5-2.0 mm, linear, acute, spreading, bifurcates at  $\frac{1}{3}$  from the apex, both surfaces and margins with bulbous based bristles of c. 1-2 mm long. Calyx c. 20 mm long and c. 15 mm across, accrescent up to c. 25 mm, ultimately becoming hard and stiff; lobes c. 10 × 3-4 mm, ovate to deltoid, apex long acuminate, entire veins prominent without any nectaries, veins with bristles outside, glabrous inside. Corolla c. 6 cm across, yellow with dark purple centre; petals obovate, outside sparsely hairy, glabrous inside. Staminal column 1.5-2.2 cm long, anthers laxly arranged throughout the length. Ovary 5-7 mm long, globose, hirsute by white silky hairs; style 1.3-2.3 cm long, arms purple; stigma capitellate, dark purple. Capsule 2.0-2.5 × 1.5 cm, ovoid, with a short beak, densely hairy with long simple bristles, dehiscent into 5-loculicidal valves. Seeds 4 mm across, scabrous, brown.

*Type* : Paris, cultivated from seeds collected by Banks, *Cavanilles s. n.* (Holotype : P-Ju 12373; Photo CAL!).

*Fls.* : Aug.-Feb. : *Frts.* : Oct.-Feb.

*Distrib.* : INDIA : Meghalaya, Assam, West Bengal, Bihar, Rajasthan, Madhya Pradesh, Maharashtra; BANGLADESH, BURMA, MALESIA, AUSTRALIA.

*Exsicc.* : Bihar : S. Bihar, *K.C. Kanodia* 2131 (CAL), West Bengal: Barcheetra (Bankura Dt.), 26.9.65, *Sanyal* 800 (CAL). Assam : Kamrup, Nov. 1890, *King's Collector s.n.* (CAL). Meghalaya: without precise locality, *Fischer s. n.* (CAL).

*Uses* : Stem yields strong fibre.

*Notes* : This species is allied to *H. cannabinus* Linn. but differs by the absence of white woolly tomentum on the calyx, calyx without nectary and forked epicalyx segments.

19. *Hibiscus rosa-sinensis* Linn., Sp. Pl. 694. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 334. 1874; Borss. in Blumea 14 : 72. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 105 (1970) 1972; Abedin in Fl. W. Pak. 130 : 12. 1979.

*Local Names* : Jasut, Jasum (Hindi); Joba (Asm.); Joba (Beng.); Jasuva (Guj.); Dasavala (Kan.); Chembarathi (Mal.); Moondaro (Or.); Jasum (Punj.); Japa, Java, rudra pushpam (Sans.); Java pushpamu, dasana (Tel.).

Shrubs up to c. 4 m high. Stem woody, glabrous. Leaves 5-11 × 3-6 cm, ovate to ovate-lanceolate, acuminate, somewhat tapering at the base, margin serrate to dentate, crenate or entire and somewhat dentate towards the apex, 3-5 palmately nerved at the base, glabrous or few stellate hairs on the nerves



beneath; petioles 1.5-4.0 cm long with few simple hairs. Stipules 3-11 mm long, lanceolate, subulate, glabrous. Flowers solitary, axillary, pedicels mostly longer than the petioles, jointed above the middle, pubescent. Epicalyx segments 5-8, about half the length of the calyx, lanceolate, segments connate at base, sparsely stellate pubescent. Calyx campanulate, lobes 1.5-2.0 cm long, lanceolate, glandularly stellate pilose. Corolla 6-12 cm across, infundibular, blood red in colour; petals obovate, entire. Staminal column 4-9 cm long, slightly exerted beyond the corolla, upper  $\frac{1}{3}$  portion antheriferous. Capsule rounded, rarely formed.

### KEY TO THE VARIETIES

- 1a. Leaves not coriaceous, margin serrate to dentate or crenate throughout . . . . . var. *rosa-sinensis*  
 1b. Leaves coriaceous, margin entire excepting the dentate apex. . . . . var. *liliflorus*

var. *rosa-sinensis*

*Type* : Herb. Hermann, vol. 3, fol. 4, Linn. n. 260. (Lectotype : BM).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : Extensively cultivated throughout INDIA; tropical and subtropical regions of the World.

*Exsicc.* : Bihar: Bonsloi river, 21.12.1957, *Panigrahi* 12062 (CAL); Tripura: M.B.B. College ground (Agartala), 24.1.56, *Deb* 1 (CAL). Maharashtra: Bhuj (Umed Bhavan), 30.1.1957, *Jain* 11475 (CAL). Tamil Nadu: Without precise locality, *Wight* 188 (CAL).

*Uses* : Leaves, flowers and seeds have medicinal value. The flowers reported to possess contraceptive properties have been confirmed for their antifertility efficacy in rats. It is reported that the total 50% ethanolic and benzene extracts have also been reported to have significant antiestrogenic activity [Anand & Prakash in *Curr. Sci.* 48 (11) : 501.1979].

var. *liliflorus* (Griff. ex Mast.) Hochr. in *Ann. Cons. Jard. Bot. Geneve* 4 : 134. 1900; Borss. in *Blumea* 14 : 73. 1966; Rakshit *et* Kundu in *Bull. Bot. Surv. India* 12 : 166. (1970) 1972. *H. liliflorus* Griff. ex Mast. in *Hook. f., Fl. Brit. India* 1 : 344. 1874 *non* Cav. 1787.

*Type* : Bengal, *Griffith s.n.* (Lectotype : K ex Herb. Hook.).

*Distrib.* : Cultivated as ornamental in garden throughout India.

*Exsicc.* : West Bengal : H.B.C., *s. l., s. n.*, Acc. no. 55634 (CAL); Srirampur, *s. l., s. n.*, Acc. no. 55636 (CAL).

20. *Hibiscus sabdariffa* Linn., *Sp. Pl.* 695. 1753; Cav. *Diss.* 3 : 170. 1787; Mast. in *Hook. f., Fl. Brit. India* 1 : 340. 1874; Hochr. in *Ann. Cons. Jard. Bot.*

Geneve 4 : 116. 1900; Cooke, Fl. Pres. Bombay 1 : 110. 1901 (Repr. ed. 1 : 117. 1958); Prain, Beng. Pl. 1 : 267. 1903 (Repr. ed. 1 : 182. 1963); Haines, Bot. Bih. & Or. 1(2) : 67. 1921 [Repr. ed. 1 (2) : 70. 1961]; Borss. in Blumea 14 : 64. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 162. (1970) 1972; Abedin in Fl. W. Pak. 130 : 9. 1979.

*Local Name* : Lal Ambori (Hindi); Chukiar (Assam); Lalmista, Patwa, Chukar (Beng.); Pulachakiri, Pundibija (Kan.); Polechi, Pulichchai (Mal.); Lal-Ambadi, Patwa (Mar.); Pulichchai, Kerai, Gogu (Tam.); Yerragogu (Tel.).

Erect herbs, 1-2 m high, profusely or sparsely branched, unarmed. Stems green or reddish purple, glabrous or somewhat pubescent. Leaves 4-11 × 0.5-1.8 cm, polymorphic, entire or palmately 3-5 fid or partite or lobed, middle lobe longer, lobation up to ¾th of the lamina, apex acute, cuneate at base, lobes lanceolate, ovate or oblong, serrate, glabrous, midrib glandular beneath, colour of midrib reddish purple or green; petioles 2-8 cm, green or reddish purple. Stipules c. 1.3 cm long, linear. Flowers solitary, axillary or in raceme or panicles by reduction of the upper leaves; pedicels 1.5-2.0 cm long, jointed. Epicalyx segments 8-12, adnate to the base of the calyx, each 5-10 × 2-3 mm, shorter than the calyx, lanceolate to oblong-elliptic, green or purple, persistent, usually finely appressed. Calyx cup shaped, 1.5-4.0 cm long, ½ portion connate at the base, becoming fleshy after flowering, 3-nerved, usually smooth or with few bristles, green or purple, persistent. Corolla yellow with purple centre; petals 4-5 cm long. Staminal column shorter than the petals, 4-5 cm long; antheriferous throughout. Capsule 1.5 cm across, ovoid, densely strigose. Seeds reniform, furfuraceous.

*Type* : Comm. Hort. 1 : 35. t. 18. 1701.

*Distrib.* : Cultivated throughout INDIA, tropical regions of the World.

*Exsicc.* : Bihar : Deoghar (Santal Parganas Dt.), 20.12.1910, R.K. Das 34523 (CAL). West Bengal : Kardapara (Bankura Dt.), 24.12.1958, J.C. Sengupta 2020 (CAL). Tripura : Agartala, 30.12.1914, P. M. Debbarman 522 (CAL). Uttar Pradesh : Kakraiya (Gorakhpur Dt.), 600 m, 24.10.60, Maheswari 4125 (CAL).

*Uses* : The stem yields the Rozelle hemp of commerce which is strong and silky. The fibre is used generally for all purposes for which jute is used. The fleshy calyx is edible and used also for the preparation of jelly and drinks.

*Notes* : In India this species is cultivated. There are two varieties i.e. var. *sabdariffa* is much branched stem, without any hairs and prickles and with anthocyanins in the green parts. There are four land races of this form, i.e. *ruber*, *albus*, *intermedius* and *bhagalpuriensis* (Howard & Howard, 1911). The var. *altissima* differs from the var. *sabdariffa* by its height (3-4.5 m high), stem with less anthocyanin, hairs and bristles all over and fleshy calyx.

The agricultural races are classified mainly on the basis of stem pigmentation. var. *altissima* Wester is cultivated successfully in W. Bengal Bihar, Assam, Madras and Andhra Pradesh as a Jute substitute.

21. *Hibiscus scandens* Roxb. [Hort. Beng. 51. 1814 *nom. nud.*] Fl. Ind. ed. Carey 3 : 200. 1832 *non* Wall. ; Mast. in Hook. f., Fl. Brit. India 1 : 337. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 61. 1900; Prain, Beng. Pl. 1 : 267. 1903 (Repr. ed. 1 : 182. 1963); Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 159 (1970) 1972. Fig. 31

Woody climbers over lofty trees. Young stems, petioles and pedicels with stellate hairs. Leaves 5-14 × 4-13 cm, ovate-cordate, 3-lobed, lobes deltoid, apex acute or acuminate, margin entire or serrate 5-7 nerved at the base, both surfaces stellate pilose; petioles 2-9 cm long. Stipules upto 5 cm long, linear, lanceolate, caducous. Flowers in terminal panicles; pedicels 1-4 cm long, jointed above the middle. Epicalyx segments 5, connate near to the base, each c. 10 × 3 mm, segments lanceolate, stellate-pilose, persistent. Calyx connate below middle, equal or shorter than the epicalyx, outer surface densely stellate pilose, inner surface with long hairs, persistent. Corolla white or yellow with crimson centre; petals c. 2.0 × 1.5 cm, outer surface with stellate hairs, inner surface glabrous. Staminal column c. 1.5 cm long. Capsule 1-3 × 1.0-1.5 cm, ovoid-cylindric, densely covered with stellate hairs. Seeds c. 2 mm, reniform, densely covered with 1.5 cm long brownish white hairs.

*Type* : H.B.C., Wall. Cat. 1910 (Neotype: K, CAL !).

*Fls. & Frts.* : Oct.-Mar.

*Distrib.* : INDIA : Assam, Tripura, Sikkim, Andaman and Nicobar islands; BANGLADESH (Chittagong hill tracts), BURMA.

*Exsicc.* : Sikkim : Rithoo, Nov. 1881, *Gamble* 10041 (MH). Meghalaya : Duphla hills, 5.12.1874, *Lister s. n.* (CAL). Tripura : Dopada, 75 m, 30.3.1941, *K. Biswas* 4946 (CAL). Andaman & Nicobar Islands : Havelock island, 27.2.1916, *Parkinson* 1053 (CAL).

*Notes* : Roxburgh in Hort. Beng. (1814) enumerated *H. scandens* and mentioned that it was collected by Mr. J.R. in 1811 from Chittagong. In *Flora Indica* (1832) Roxburgh validated the name by giving a description. There is no available herbarium specimen of Roxburgh in the Herbarium at Kew, Geneva and Edinburgh nor any illustration of this species is available in Roxburgh *Icones*. Hence Wall Cat. no. 1910 is chosen here as the neotype.

22. *Hibiscus schizopetalous* (Mast.) Hook. f. Curtis. Bot. Mag. 3 : 36. t. 6524. 1880; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 131. 1900; Borss. in *Blumea* 14 : 73. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 166 (1970) 1972; Abedin in Fl. W. Pak. 130 : 12. 1979. *H. rosa-sinensis* var. *schizopetalous* Mast. in Gard. Chron. n. s. 12 : 272. f. 45. 1879.



Fig. 91. *Hibiscus scandens* Roxb.

*Local Names* : Lanthan jaba (Beng.); Coral Hibiscus (Eng.)

Shrubs up to 2-3 m high. Stem woody, mostly pendulous, glabrous. Leaves 2-8 × 1-4 cm, ovate-elliptic, apex acute, base more or less cuneate, margin of basal  $\frac{1}{2}$  portion entire,  $\frac{2}{3}$  portion coarsely serrate, 3-5 nerved at the base, glabrous. Stipules minute, subulate, caducous. Flowers solitary, axillary, pendulous, infundibular; pedicels 5-11 cm long, jointed near or above the middle, minutely ciliate. Epicalyx segments 6-7, 1-2 mm long, minutely ciliate, subulate. Calyx tubular, spathaceous, irregularly 2-4 lobed at the tip, c. 1.6 cm long, outside minutely ciliate, glabrous inside. Petals 4-7 cm long, scarlet or whitish red, deeply lacinate into many linear-oblong segments. Staminal column twice as long as the petals, flaccid, pendulous, widened towards the apex, antheriferous in upper  $\frac{1}{3}$ - $\frac{1}{4}$  part. Ovary pear shaped, minutely hairy; style 1.0-1.3 cm long, capsule 3-4 cm long, oblong, cylindrical; stigma capitate.

*Type* : Gard. Chorn. n. s. 12 : 272. f. 45. 1879.

*Fls. & Frts.* : Throughout the year.

*Distrib.* : Cultivated throughout the tropics and subtropics of the World. Indigenous to E. Tropical Africa.

*Exsicc.* : West Bengal : Chandannagar, Aug. 1902, *Abu Hosein s. n.* (CAL). Tripura : Agartala, 300 m, 26.9.14, *Debbarman 47* (CAL). Madhya Pradesh : Indore, 20.8.18, *Mukherjee 3* (CAL). Tamil Nadu : Near Y.M.C.A., Coimbatore, 468 m, 14.11.1965, *Chandrabose 28804* (MH).

*Notes* : This species is allied to *H. rosa-sinensis* Linn. but differs in having deeply incised petals, longer staminal column and shorter epicalyx segments. Fruit rarely formed.

23. *Hibiscus similis* Blume, Bijdr. 2 : 73, 105. 1825; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 158. (1970) 1972. *H. tiliaceus* Linn. var. *similis* (Blume) Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 244. 1900. *H. tiliaceus* Linn. ssp. *similis* (Blume) Borss. in Blumea 14 : 33. 1966. *H. prainii* Raizada *et* Chatterjee in Sci. & Cult. 1960. *H. tortuosus* Wall. ex Prain, Beng. Pl. 1 : 268. 1903 (Repr. ed. 1 : 183. 1963) *non* Roxb. 1832.

Trees, twigs glabrous or stellate tomentose. Leaves 10-21 × 9-20 cm, orbicular, ovate, apex cuspidate, base cordate, margin entire, 7-9 palminerved at the base, middle nerves beneath the leaf with linear nectary of 5-30 mm long petioles 5-15 cm long, stellate tomentose, glabrescent later. Stipules 3-5 × 1.5-2.0 cm, ovate-lanceolate, stellate tomentose, glabrescent later. Flowers solitary, axillary or in terminal panicle; pedicels 1.5-2.0 cm long, accrescent upto 10 cm, not jointed, densely stellate-tomentose. Epicalyx segments 8-11 fid, each segment 1.5-20.0 × 4-5 mm, linear-lanceolate, acuminate,

connate below middle, outer surface stellate hairy, middle portion of inside with long simple hairs, marginal portion with minute stellate hairs. Calyx lobes 2.0-2.5 × 0.5 × 0.7 cm, lanceolate, acuminate, lobes connate below middle, each with three distinct nerves, indumentum like epicalyx. Petals 6.5-7.0 cm long, hairy outside. Capsule c. 2.5 cm across, orbicular with a short beak, 5-loculed, hirsute, inner surface glossy. Seeds abortive.

*Type* : Java, *Blume s. n.* (P)

*Distrib.* : INDIA : West Bengal (Sundarban areas); MALAYA PENINSULA, SUMATRA, JAVA.

*Exsicc.* : West Bengal : East of Ganges, *Wallich* 1913 & 1913A (CAL).

*Notes* : This species is allied to *H. macrophyllus* Roxb. ex Hornem. but differs in having 5-loculed capsules, indumentum of much shorter hairs. Prain (1903) concluded that "*H. tortuosus* ripens its fruits regularly, but always has abortive seeds; it is with hardly a doubt a natural hybrid of *H. setosus* (*macrophyllus*) and *H. tiliaceus*."

24. *Hibiscus surattensis* Linn., Sp. Pl. 696. 1753; Roxb. Fl. Ind. ed. Carey 3 : 205. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 334. 1874; Hochr. in Ann. Cons. Gard. Bot. Geneve 4 : 110. 1900; Prain, Beng. Pl. 1 : 267. 1903 (Repr. ed. 1 : 182. 1963); Gamble, Fl. Pres. Madr. 1 : 97. 1915 (Repr. ed. 1 : 70. 1957); Hu, Fl. China fam. 153: 56, t. 22 f. 2. 1955; Borss. in Blumea 14 : 57. 1966; Rakshit et Kundu in Bull. Bot. Surv. India 12 : 161. (1970) 1972. Fig. 32

*Local Names* : Hansrong (Mikir); Kashlirirai (Tam.); Mullugogu (Tel.).

Undershrubs or herbs, initially erect becoming trailing. Stems, petioles, pedicels and the principal nerves of leaves with soft simple hairs and recurved prickles. Leaves 3-7 × 4-12 cm, suborbicular or ovate, lower ones 3-5 palmilobed, upper ones 5-palmiparted with linear or lanceolate segments, apex acute, base more or less truncate, margin crenate-serrate, 5-7 nerved at the base without any nectaries, both surfaces with simple and stellate hairs or glabrous; petioles 3-9 cm long. Stipules 5-25 × 6-15 mm, foliaceous, ovate, semilunar, auricled at base, apex acute, margin serrate to dentate, pubescent or glabrous, margins with long simple hairs. Flowers solitary, axillary; pedicels 3-7 cm long, jointed near the apex, the portion above the joint densely covered with stiff simple hairs. Epicalyx segments 10, each 15-20 × 2.5-3.0 mm, spatulate, spreading with an erect, filiform to linear appendage attached near the apex of each segment, segment 5-10 × 2.0-2.5 mm with scattered simple hairs. Calyx campanulate, deeply partite; lobes 10-25 × 5-10 mm, ovate to deltoid, acuminate, 3-nerved, outside hispid with recurved prickles and simple hairs, inside glabrous or nearly so, persistent. Corolla yellow with deep purple centre; petals 3-5 × 1.5-3.0 cm, obovate, margin sparsely stellate-pubescent outside. Staminal column 0.5-1.5 cm long, antheriferous throughout, filaments 1.5-2.0 mm long. Ovary 3-5 mm long, conical; style arms 2.0-2.5 mm long; stigma discoid, hairy. Capsule c. 1.2 × 1.0 cm, ovoid, acute, covered with bristle-like shining white or



Fig. 32. *Hibiscus surattensis* Linn.

yellow hairs, glabrous. Seeds 3-4 mm, surface with white scale like emergences, black brown.

*Type* : India, Surat, Herb. Linn. n. 875 (Holotype : LINN; Photo CAL!).

*Fls.* : Sept.-Oct.; *Frts.* : Dec.-Feb.

*Distrib.* : Throughout INDIA. Widely distributed in the tropical regions of ASIA, SOUTH AFRICA, AUSTRALIA.

*Exsicc.* : West Bengal : Jaldakar (Darjeeling Dt.), 12.2.1900, *Cave* 15 (CAL). Meghalaya : Shillong, 25.11.1956, *Panigrahi* 4675 (CAL); Theria ghaut (Khasia), 300 m, 9.10.1886, *Clarke* 44931A (CAL). Tamil Nadu : Mainfalls (Courtallam), 433 m, 16.12.1957, *Subramanyam* 4947 (CAL).

*Uses* : Stem yields a strong fibre of good quality. The leaves are acidic and used as salad. The decoction of leaves and stems are medicinal.

*Notes* : It differs from the other species of the section '*Furcaria*' by broad, leafy, semilunar stipules.

25. *Hibiscus syriacus* Linn., Sp. Pl. 695. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 344. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 76. 1900; Hu, Fl. China fam. 153 : 50, t. 10. 1955; Borss. in Blumea 14 : 75. 1966; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 170. (1970) 1972; Abedin in Fl. W. Pak. 130 : 13. 1979.

*Local Names* : Swet Jaba (Beng.); Gurhul (Bih. & Or.); Rose-of-sharon (Eng.); Gurhal (Punj.)

Erect shrubs, 3-6 m high, bushy. Young branches pubescent with stellate hairs, mature portion glabrous. Leaves 4-7 × 1.5-5.0 cm, deltoïd-ovate to rhombioid-ovate, often 3-lobed, apex acute, cuneate at base, margin coarsely toothed, young leaves stellate pubescent, glabrescent later; petioles 1.2-2.0 cm, puberulous. Stipules filiform. Flowers solitary, axillary; pedicels equal to or shorter than the petioles. Epicalyx segments 6-8, each 1.0-1.5 × c. 1 mm, linear, with one prominent nerve, sparsely stellate hairy. Calyx 12-20 mm long, connate upto the middle, lobes oblong or ovate-lanceolate, acute, sparsely stellate hairy. Corolla 4.0-7.5 cm across; petals obovate, ciliate. Staminal column 2-4 cm long, antheriferous towards the base, white or pale purple. Ovary pubescent; style filiform; stigma white. Capsule 1.4-2.5 cm high, obtuse or abruptly shortly beaked, sparsely hispid. Seeds pilose.

*Type* : H.U. Linn. n. 975. 24 (LINN; Photo!)

*Fls. & Frts.* : June-Oct.

*Distrib.* : INDIA, EASTERN ASIA. Indigenous to CHINA.

*Exsicc.* : Uttar Pradesh : Wazevgang (Bahraich), 17.11.64, *Panigrahi & Mishra* 6307 (CAL). West Bengal : Lloyd Bot. Gard., *Basu* 495 (CAL). Nagaland



: Imphal, 29.6.51, *Deb* 23 (CAL). Tamil Nadu : race course side, Coimbatore, 469 m, 14.6.1967, *Chandrabose* 29903 (MH).

*Uses* : Stem yields strong fibre. Barks, roots, leaves, decoction of flower and seeds are variously used in medicine.

*Notes* : This species is cultivated in the gardens for its showy flowers. There are several horticultural varieties classified mainly on the colour of the flower. Colour varies from blue purple to violet red, buff and white. Several horticultural types with single, semidouble and double flowers are known.

26. *Hibiscus talbotii* (Rakshit) T.K. Paul *et* Nayar in Bull. Bot. Surv. India 22 : 197 (1980) 1982. *H. hirtus* var. *talbotii* Rakshit in Sci. & Cult. 27 : 193. 1961; Billore & Hemadri in Bull. Bot. Surv. India 11 : 337. 1969; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 170 (1970) 1972.

Undershrubs, 1-2 m high. Stems with minute stellate hairs also with a line of simple hairs above each leaf axil extending over the node, glabrescent later. Lower leaves 8-14 × 3-8 cm, ovate-lanceolate, 3-lobed or deeply 3-parted, upper leaves 4-12 × 1-4 cm, lanceolate, unlobed or slightly lobed, apex acute to acuminate, base rounded or shallowly cordate or slightly cuneate, margin crenate-serrate or irregularly toothed, 3-5 nerved at the base, midrib without any nectary, minutely stellate-hairy, particularly on lower surface; petioles 2-6 cm long. Stipules upto c. 1.3 cm long, linear-subulate, hairy. Flowers solitary, axillary, seemingly in racemes or in panicles; pedicels 1-2 cm long, accrescent upto 5 cm jointed above the middle, pubescent with minute stellate and appressed simple hairs. Epicalyx segments 6-9, each 5-10 × 0.5-1.0 mm, free, erecto-patent to appressed, shorter than the calyx, lanceolate to linear, acute. Calyx free nearly to the base, lobes 10-22 × 1-3 mm, linear to lanceolate, acute, hairy. Petals 1.6-2.5 × 0.5-0.7 cm, hairy outside. Staminal column shorter or as long as the petals. Capsule globose, shorter than the calyx. Seeds c. 3 mm long, reniform, densely covered with whitish woolly hairs.

*Type* : India, N. Canara, *W. A. Talbot* 68 (Holotype : CAL!).

*Fls. & Frts.* : Nov.-June.

*Distrib.* : Endemic to Maharashtra and Karnataka.

*Exsicc.* : Maharashtra : Ghotge-25 miles from Kudal-Ratnagiri Dt., 10.2.66, *Ansari* 107808 (BSI); Manar range, 29.10.1967, *Billore* 113309 (CAL); Khandala tank, 9.3.62, *R. S. Rolla* 78916 (BSI); Matheran, 29.11.1958, *N. A. Irani* 2575 (BLAT).

*Notes* : This species is allied to *H. hirtus* Linn. but differs in having : Leaves large, ovate-lanceolate, 3-lobed, absence of nectary on the leaf midvein, pedicel jointed at the middle or below, longer petioles, longer calyx lobes and larger corolla.

27. *Hibiscus tiliaceus* Linn., Sp. Pl. 694. 1753; Hochr. in Ann. Cons. Jard. Bot. Geneve 4 : 62. 1900; Borss. in Blumea 14 : 29. 1966.

Trees up to c. 15 m high, trunk with tough fibrous bark. Leaves 3-20 × 1.5-20 cm, unlobed or 3-5 lobed, orbicular, apex acute to acuminate, base deeply cordate, rounded to truncate, margin entire or crenate. chartaceous to coriaceous, 1-5 linear nectaries on the nerves beneath the lamina; petioles 1.5-15.0 cm long. Stipules c. 2 × 0.5-1.0 cm, ovate to oblong, caducous. Flowers solitary, axillary or in terminal raceme by reduction of upper leaves; pedicels 1-3 cm long, not jointed. Epicalyx cupular, segments 7-10, each deltoid, usually shorter than the calyx, spreading and often splitting. Calyx campanulate; lobes 2-3 × 0.5-1 cm, with 3 prominent veins and a nectary on the midvein outside. Corolla campanulate; petals obovate, apex rounded, base fleshy, yellow with dark purple base, finally turning red. Staminal column shorter than the petals. Capsule 1-2 cm across, globose to ovoid with a short beak, sericeous or tomentose by simple and stellate hairs, pericarp thin, mesocarp fibrous, endocarp pergamentaceous. Seeds 5-8 per locule, reniform, blackish brown, papillose.

#### KEY TO THE SUBSPECIES

- 1a. Leaves unlobed, base cordate . . . . . ssp. *tiliaceus*  
 1b. Leaves 3-5 lobed, base rounded or truncate . . . . . ssp. *hastatus*

ssp. *tiliaceus*-*H. tiliaceus* Linn., Sp. Pl. 694. 1753; Roxb. Fl. Ind. ed. Carey 3 : 192. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 343. 1874; Cooke, Fl. Pres. Bombay 1 : 112. 1901 (Repr. ed. 1 : 119. 1958); Prain, Beng. Pl. 1 : 269. 1903 (Repr. ed. 1 : 183. 1963); Gamble, Fl. Pres. Madr. 1 : 98. 1915 (Repr. ed. 1 : 70. 1957); Haines, Bot. Bih. & Or. 1(2) : 69. 1921 [Repr. ed. 1(2) : 71. 1961]; Rakshit *et* Kundu in Bull. Bot. Surv. India 12 : 157. (1970) 1972 (var. *tiliaceus*); Abedin in Fl. W. Pak. 130 : 1979.

*Local Names* : Bola (Hindi & Beng.); Nirparathi (Mal.); Belapala (Mar.); Baria (Or.); Etagogu (Tel.).

*Type* : Herb. Hermann 3, fol. 51. Linn. n. 258 (BM).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : Tropical and subtropical regions of both Old and New World. In India it is mostly found all along the coastal regions.

*Exsicc.* : Andhra Pradesh : Coringa (River estuary), 3.10.1969, T.A. Rao 7288 (CAL). Karnataka : N. Kanara, Jan. 1882, Talbot 2689 (CAL). Andaman & Nicobar Islands : Port Blair, 12.1.59, Thothathri 9051 (CAL); Nicobars, Feb. 1875, Kurz 26116 (CAL).

*Chr. No.* : 2n = 92 [Skovsted in Journ. Genetics 31 : 286. 1935].

*Uses* : Bark yields dark fibre which is used locally for ropes and

cordages. The fibres are more resistant to water than jute and sunhemp. Bark, roots, leaves and flowers are having medicinal properties.

ssp. *hastatus* (Linn. f.) Borss. in *Blumea* 14 : 36. 1966. *Hibiscus hastatus* Linn. f. Suppl. 310. 1781 non cav. 1787; Bates in *Baileya* 13 : 73. f. 21B. 1965. *H. tiliaceus* var. *hastatus* (Linn. f.) Hochr. in *Ann. Cons. Jard. Bot. Geneve* 4 : 63. 1900; Rakshit *et* Kundu in *Bull. Bot. Surv. India* 12 : 158 (1970) 1972. *H. tricuspidis* Banks *ex* Cav. *Diss.* 3 : 152, t. 55. f. 2. 1787; Roxb., *Fl. Ind.* ed. Carey 3 : 202. 1832; Mast. in *Hook. f., Fl. Brit. India* 1 : 344. 1874.

*Type* : Tahiti, *Forster s. n.* (LINN).

*Distrib.* : INDIA : Andamans; Cultivated in gardens. PACIFIC ISLANDS, POLYNESIA.

*Exsicc.* : Uttar Pradesh : Botanic garden, Saharanpur, June 1869, *s.l., s.n.* (CAL). Karnataka : Bangalore, 1860, *Dr. Cleghorn s. n.* (MH).

28. *Hibiscus trionum* Linn., *Sp. Pl.* 697. 1753; Mast. in *Hook. f., Fl. Brit. India* 1 : 334. 1874; Hochr. in *Ann. Cons. Jard. Bot. Geneve* 4 : 144. 1900; Cooke, *Fl. Pres. Bombay* 1 : 105. 1901 (Repr. ed. 1 : 111. 1958); Gamble, *Fl. Pres. Madr.* 1 : 88. 1915 (Repr. ed. 1 : 70. 1957); Hu, *Fl. China fam.* 153: 57. 1955; Rakshit *et* Kundu in *Bull. Bot. Surv. India* 12 : 186. (1970) 1972; Abedin in *Fl. W. Pak.* 130 : 11. 1979. *H. trionum* Linn. var. *hispidus* DC. *Prodr.* 1 : 453. 1824. *H. trionum* Linn. var. *vasicarius* Hochr. in *Ann. Cons. Jard. Bot. Geneve* 4 : 144. 1900.

*Common Names* : Black-eyed susan, Trailing Hollyhock (Eng.)

Annual, erect or decumbent herbs, 30-60 cm high with simple and few stellate hairs. Leaves 2.5-7.5 cm long, lower leaves orbicular, lobe or unlobed, upper leaves palmately 3-5 lobed, middle lobe longer than the other two, lobes oblong, pinnatisect, punctate, both sides sparsely simple and stellate hairy, particularly in the lower surface, upper surface rarely glabrous; petioles 2-5 cm long, pubescent by simple and di- or tribrachiate stellate hairs. Stipules subulate, covered with long stiff hairs. Flowers solitary, axillary; pedicels 1-4 cm long, jointed above middle, pubescent. Epicalyx segments 8-12, each 10-15 × 1.0-1.5 mm, linear, 3 nerved, margin with long simple hairs, segments spreading upwards surrounding the capsules. Calyx campanulate, inflated covering the capsule, connate about  $\frac{1}{3}$  way down, lobes 1.0-2.5 cm long, broadly ovate, acute, membranous, 4-6 prominently nerved, nerves on the outside hispid with stiff simple hairs, inside with simple hairs, nerves green when young ultimately becoming purple. Corolla yellowish pink with dark purple centre, 1.0-2.5 cm across; petals 5, 1.5-2.0 × c. 0.5 cm, outside sparsely stellate hairy, inside glabrous. Staminal column 5-8 mm long, antheriferous towards the apical region. Ovary ovate, densely hairy; styles 5, united half way up. Capsule 0.5-2.0 × 1.0-1.5 cm, oblong, obtuse, dehisces longitudinally from tip, outside hairy, inside glossy. Seeds c. 2 mm across, reniform, minutely tuberculate or glabrate.

*Type* : Herb Linn. n. 875,40 (LINN; Photo!).

*Fls. & Frts.* : July-Jan.

*Distrib.* : Throughout INDIA, PAKISTAN, BURMA, CHINA, IRAN, AFGHANISTAN, USSR, EUROPE, AUSTRALIA, AFRICA.

*Exsicc.* : Jammu & Kashmir : Banihal mountains, 1850-3895 m, 13.9.1958, T.A. Rao 7528 (BSD). Uttar Pradesh : Bamru (Tehri-Garhwal), 1818 m, Oct. 1898, *Gamble* 27262 (CAL). Maharashtra : Pune, 8.8.1867, *King* 99 (CAL). Tamil Nadu : Near Valankular (Coimbatore), 467 m, 6.9.1964, *Chandrabose* 28494 (MH).

*Chr. no.* :  $2n = 28, 56$  (Skovsted in C. R. Lab. Carls. S. Physiol. 23 : 195. 1941).

*Uses* : An infusion of flowers is used for curing, itches rashes and skin diseases. The plant is used for round-worm in South Africa. It is reported to be poisonous to live stock particularly horses.

*Pollen* : Average size  $110\mu$  (range 133-140  $\mu$ ). Spine height 17.5  $\mu$ , tip pointed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 25. 1962].

## 11. KYDIA

Roxb. Hort. Beng. 50. 1814 *nom. nud. et* Pl. Corom. 3 : 11, t. 215. 216. 1819; Benth. & Hook. f. Gen. Pl. 1 : 204. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 348. 1874; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6 : 38. 1890; Hutch., Gen. Fl. Pl. 2 : 546. 1967.

Trees with mucilaginous bark, young branches stellate pubescent. Leaves lobed or angled, nectary on the veins beneath. Flowers axillary or in terminal panicles, white, polygamous. Epicalyx segments 4-6, spatulate-oblong, accrescent and spreading in fruit, persistent. Calyx 5-fid. Petals 5, obcordate, adnate to the staminal tube at the base. Staminal column branched distally into 5 arms, each tipped by a cluster of 4-6 connate anthers which are imperfect in female flower. Ovary abortive with a short style. In female flower branches of the staminal column short with imperfect anthers. Ovary tri-locular, 2-3 ovules in each locule; styles 3 with stigmatose arms, staminodes absent. Capsule loculicidally 3-valved, subglobose, depressed, muticous. Seeds reniform, furrowed, ascending.

*Distrib.* : c. 3 species in tropical and subtropical regions of India, Bhutan, China, Malaya. One species *viz.* *K. brasiliensis* Rodr. is only reported from Brazil. 2 species in India.

*Ecol.* : Grows mostly in semi-evergreen and wet deciduous forests usually from sea level to 1500 m.

## KEY TO THE SPECIES

- 1a. Leaves stellate pubescent beneath. Epicalyx segments oblong or obovate, stellate pubescent on both surfaces *K. calycina* 1  
 1b. Leaves glabrous beneath. Epicalyx segments oblanceolate, glabrous *K. glabrescens* 2

1. *Kydia calycina* Roxb. Hort. Beng. 50. 1814 *nom. nud. et* Pl. Corom. 3 : 11, t. 215. 1819 *et* in Fl. Ind. ed. Carey 3 : 188. 1832; Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1 : 70. 1834; Wt. Ic. 3(2) : 7. t. 879, 880. 1844; Mast. in Hook. f., Fl. Brit. India 1 : 348. 1874; Cooke, Fl. Pres. Bombay 1 : 94. 1901 (Repr. ed. 1 : 100. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 97. 1903 (Repr. ed. 1 : 92. 1960); Gamble, Fl. Pres. Madr. 1 : 93. 1915 (Repr. ed. 1 : 67. 1957); Haines, Bot. Bih. & Or. 1(2) : 73. 1921 [Repr. ed. 1(2) : 76. 1961]; Hu, Fl. China Fam. 153 : 71. t. 13. 1955. *K. fraterna* Roxb. Pl. Corom. 3 : 12, t. 216. 1819. *K. roxburghiana* Wt. Ic. iii. t. 881. 1844.

*Local Names* : Pula, Choupultea, Pathra, Polao (Hindi); Pola, Bonkopas (Beng.); Mhotihirwani, Nihotihirwani (Guj.); Warung, Bhoti, Potari (Mar.); Vendai (Tam.); Potri (Tel.); Bellaka (Kan.); Velukku (Mal.); Bankopasia (Or.).

Trees 15-20 m high, young stems and branches densely pubescent with minute greyish stellate hairs. Leaves 4-12 × 3.5-15.0 cm, suborbicular or ovate-rounded, apex acute or obtuse, base rounded or subcordate, margin entire or irregularly serrate, more or less tri or penta-cuspidate, uniformly stellate-hispid above, greyish stellate pubescent beneath, 5-9 nerved at the base; petioles 2-7 cm long, densely stellate pubescent. Stipules subulate. Flowers in close panicles, axillary or terminal, polygamous; pedicels 0.5-1.5 cm long, densely stellate-pubescent. Epicalyx segments 4-6, connate below, 0.4-1.5 × 0.5-0.7 cm, oblong or obovate, ultimately spreading, both surfaces minutely stellate-pubescent, persistent. Calyx cup shaped, connate below, lobes 0.5 × 4.0 mm, ovate-acute, stellate pubescent on both surfaces, persistent. Corolla c. 17 mm across, white or pink; petals longer than the calyx but shorter than the epicalyx, obcordate, obliquely adnate below to the staminal column, hairy at base. Staminal column c. 3 mm long, pistillode absent in male flower. Ovary ovoid, trilocular, ovules 2-3 in each locule. Capsule c. 5 mm across, subglobose, hard, depressed. Seeds c. 3 × 2 mm, more or less reniform-ellipsoid, glabrous, glandular striate, brown.

*Type* : Roxb. Pl. corom 3 : 11, t. 215. 1819.

*Fls.* : Sept.-Nov.; *Frts.* : Nov.-Feb.

*Distrib.* : Throughout INDIA, PAKISTAN, BURMA, CHINA.

*Exsicc.* : Maharashtra : North west of Ghatauf (Amroati Dt.), 6.10.1908, *Burkill* 31192 (CAL). Bihar : Rajmahal hills near Maharajpur, *Kurz s. n.* (CAL); Aurungaly (Palamau Dt.), Dec. 1880, *Gamble* 8704 (CAL). Orissa : Barheipani,

772 m, 20.2.1958, *Panigrahi* 12676 (CAL); Sambodala (Kalahandi), 22.9.56, S.K. Mukherjee 4341 (CAL).

*Uses* : Wood is used in building construction, making of match boxes, splints and light packing cases. Inner bark yields a fibre used locally for coarse ropes.

*Pollen* : 3-zonicolporate, prolate ( $47 \times 28 \mu$ ), amb circular. Apocolpium diameter  $7 \mu$ . Ectocolpium ends pointed, margin incrassate. Endocolpium lalongate ( $5.6 \times 16.8 \mu$ ). Exine  $2 \mu$  thick. Ectine almost as thick as endine, reticulate. Brochi more or less similar (homobrochate). [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 28. 1962].

*Chr. No.* :  $2n = 49$  (Mehra & Sareen, Cytology of Himalayan Hardwoods in *Silvae Genet.* 22.68.1973).

2. *Kydia glabrescens* Mast. in Hook f., *Fl. Brit. India* 1 : 348. 1874; Kanjilal *et al.* *Fl. Assam* 1(1) : 146. 1934; Hu, *Fl. China*, fam. 153 : 71 t. 16, f. 9. 1955.

*Local Names* : Kukuha (Asm.); Subi-asing (Miri).

Trees c. 30 m high with short spreading branches, trunk  $\pm 1.5$  m across, young stems stellate pubescent, glabrescent later. Leaves  $5-12 \times 4-10$  cm, suborbicular, ovate or obovate, apex obtuse, rounded or slightly acute to acuminate, base cuneate, rounded or shallowly cordate, margin semicrenate, sparsely stellate pubescent above, glabrous beneath, 7-9 nerved at the base, middle 1-3 nerves with elliptical nectary beneath; petioles 2-6 cm long, stellate pubescent. Stipules  $6-10 \times 5-7$  mm, foliaceous, deciduous, both surfaces stellate pilose. Flowers in axillary or terminal panicles; pedicels 0.5-1.5 cm long, stellate pubescent. Epicalyx segments 4  $5-7 \times 1.5-2.0$  mm, accrescent upto  $15 \times 5$  mm in fruit, oblanceolate, glabrous, persistent. Calyx cup-shaped; lobes ovate, acute, basal half connate with a distinct midvein, outer surface glabrous, inner surface with dense appressed stellate hairs. Corolla c. 1 cm across, white, deciduous; petals c.  $6 \times 5$  mm, ovoid, glabrous, margin ciliate. Capsule c. 6 mm across, globose, 3-loculed, 2 seeds in each locule. Seeds c.  $3 \times 2$  mm, reniform, glabrous, straited, brownish.

*Type* : Bootan (Bhutan), Griffith 1994 (K, Photo!).

*Fls.* : Sept.-Oct.; *Frts.* : Oct.-Jan.

*Distrib.* : INDIA : Assam, Meghalaya, Arunachal Pradesh, Tripura; BHUTAN, MALACCA, CHINA.

*Exsicc.* : Assam : Bhramputra plains, Kurz 44 (CAL); Pirola (Sibsagar), 1890, S.E. Peas 315 (CAL). Arunachal Pradesh : Shoelinoreyi (Lohit F.D.), 30.11.1957, Panigrahi 10898 (CAL). Tripura : Bettingshib, 909 m, Deb 27310 (CAL).

## 12. LAVATERA

Linn., Sp. Pl. 690. 1753; Gen. Pl. ed. 5. 308. 1754; Benth. & Hook. f., Gen. Pl. 1 : 200. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874; K. Schumann in Engl., Prantl Nat. Pflanzenfam. 3, 6 : 39. 1890; Hutch., Gen. Fl. Pl. 2 : 553. 1967.

Annual or perennial herbs or large shrubs, simple or stellate hairy. Leaves palmately lobed or angular. Stipules usually foliaceous, persistent. Flowers solitary, axillary or in terminal racemes. Epicalyx segments 3-6, connate at the base. Calyx 5-lobed, fused. Petals-5, usually emarginate. Staminal column branched at the apex. Carpels 6-many; ovary many loculed, 1-ovule in each locule; styles filiform, as many as the carpels. Fruit schizocarp, mericarps arranged in a depressed circle around a conical or dilated axis, finally separating, indehiscent. Seeds reniform, ascending.

*Distrib.* : c. 45 species in Mediterranean region, Canary islands, Australia, N.W. Himalaya, Central Asia, E. Siberia and Northwest America. 1 species in India.

*Lavatera cachemiriana* Camb. in Jacq. Voy. d. l'Inde 4 : 29. t. 32. 1844; Mast. in Hook. f., Fl. Brit. India 1 : 319. 1874; Blatt., Wild flowers of Kashmir ser. 1 : 27, t. 14. 1923; Abedin in Fl. W. Pak. 130 : 51. 1979.

Perennial herbs, 1.5-2.5 m high, young twigs densely stellate pubescent, ultimately glabrescent. Leaves 4-9 × 3-8 cm, orbicular cordate, lower leaves 5-lobed, upper ones 3-5 lobed, lobes ovate or deltoid, acute, margin crenate, 5-7 nerved at the base, upper surface sparsely stellate hairy, lower surface densely stellate-pubescent; petioles 1-4 cm long, densely stellate hairy. Stipules 2-5 × c. 1 mm, linear, lanceolate, stellate hairy. Flowers axillary, solitary. Epicalyx segments 3 connate below middle, segments 1.0-1.5 × 0.8-1.2 cm, ovate or round, acute, both the surfaces stellate hairy. Calyx connate to the middle; lobes 1.5-1.8 × 0.5-1.0 cm, extending beyond the epicalyx segments, lanceolate, outside densely stellate hairy, inner margin stellate-pubescent, middle portion glabrescent. Corolla 3-7 cm across, bright pink with dark coloured veins; petals free, 3-5 × 2-3 cm, obovate or oblong-obovate, deeply notched, hairy at base. Staminal column 1.0-1.5 cm long, antheriferous about  $\frac{3}{4}$  portion from the apex, hairy at base. Carpels glabrous; styles filiform, as many as the carpels. Schizocarp 1.0-1.5 cm in diameter, discoid; mericarps more than 20, each c. 3 mm in diameter, reniform, globose, shorter than the projecting torus. Seeds c. 2.5 mm in diameter, reniform, glabrous, brownish black.

*Type* : In frutibus herbon sylvarum montis western vor, Kashmir, Jacquement s. n. (K).

*Fls. & Frts.* : July-Oct.

*Distrib.* : INDIA : Jammu & Kashmir, Himachal Pradesh; PAKISTAN, NEPAL, USSR.

*Exsicc.* : Jammu & Kashmir : Sonamarg, 2727 m, *Clarke* 27204A (CAL); Near Gurikot (Kamari), 3030-3333 m, 28.8.92, *Duthie* 12570 (CAL); Lower Terai forest, 2272 m, 17.9.1897, *Lace* 1502 (CAL); Near Sonamarg, 8th Aug. 1982, *P.K. Hazra* 74003 (BSD). Himachal Pradesh : Kharsi, 2121 m, Oct. 1804, *Gamble* 15058 (CAL).

*Chr. no.* :  $2n = 42$  (Skovsted in Journ. Genetics 31:263. 1935).

*Pollen* : Panporate. Average size 150 m. (P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 10. 1962).

### 13. MALACHRA

Linn., Syst. Nat. ed. 12, 2 : 458. 1767 & Mant. 1 : 13. 1767; Benth. & Hook. f., Gen. Pl. 1 : 205. 1862; Hutch., Gen. Fl. Pl. 2 : 565. 1967.

Annual or perennial herb or undershrubs; hirsute or prickly hairy. Leaves undivided to angular, palmilobed to palmiparted. Flowers in large condensed racemes surrounded by large deeply cordate leafy bracts, axillary or terminal. Epicalyx segments absent, rarely present. Calyx cupular, 5 dentate. Petals 5, red, yellow or white. Staminal column as long as or shorter than the petals, 5-toothed, antheriferous throughout. Carpels 5; style branches 10; stigma capitate, papillose. Fruit schizocarp, globular; mericarps 5, reticulately veined, indehiscent. Seed 1 per mericarp.

*Distrib.* : c. 10 species, all are indigenous to tropical America. Only 2 or 3 species have been introduced in Old World. 1 species in India.

*Ecol.* : Grows mostly in waste places, roadsides, grass lands in tropical zone.

*Malachra capitata* (Linn.) Linn., Syst. Nat. ed. 12, 2 : 458. 1767; Mast. in Hook. f., Fl. Brit. India 1 : 329. 1874; Cooke, Fl. Pres. Bombay 1 : 99. 1901 (Repr. ed. 1 : 105. 1958); Duthie, Fl. Upper Gang. pl. 1 : 84. 1903 (Repr. ed. 1 : 79. 1960); Prain, Beng. Pl. 1 : 262. 1903 (Repr. ed. 1 : 178. 1969); Haines, Bot. Bih. & Or. 1(2) : 62. 1921 (Repr. ed. 1(2) : 64. 1961); Borss. in Blumea 14 : 146. 1966; Abedin, in Fl. W. Pak. 130 : 92. 1979. *Sida capitata* Linn., Sp. Pl. 685. 1753.

Fig. 33

Annual or perennial, erect herb or undershrubs up to c. 1.5 m high. Stems, petioles and floral axes pubescent by minute stellate hairs, simple hairs and also with long prickly stellate hairs. Leaves 3-14 × 4-20 cm, orbicular to suborbicular or ovate, angular or lobed, cordate at base, obtuse or rounded at apex, margin crenate to serrate, 5-nerved at the base, both the surfaces velutinous by stellate hairs, glabrescent later; petioles 2-8 cm long. Stipules 1-2 cm long, filiform, hispid. Inflorescence 0.5-1.5 cm, stout, bearing 3-7 pedicels with heads; pedicels 1.5-8.0 cm, each head with 2-5 flowers encircled by 3-4 leafy bracts, each 0.5-2.0 cm across, ovate to orbicular, at base cordate to rounded,



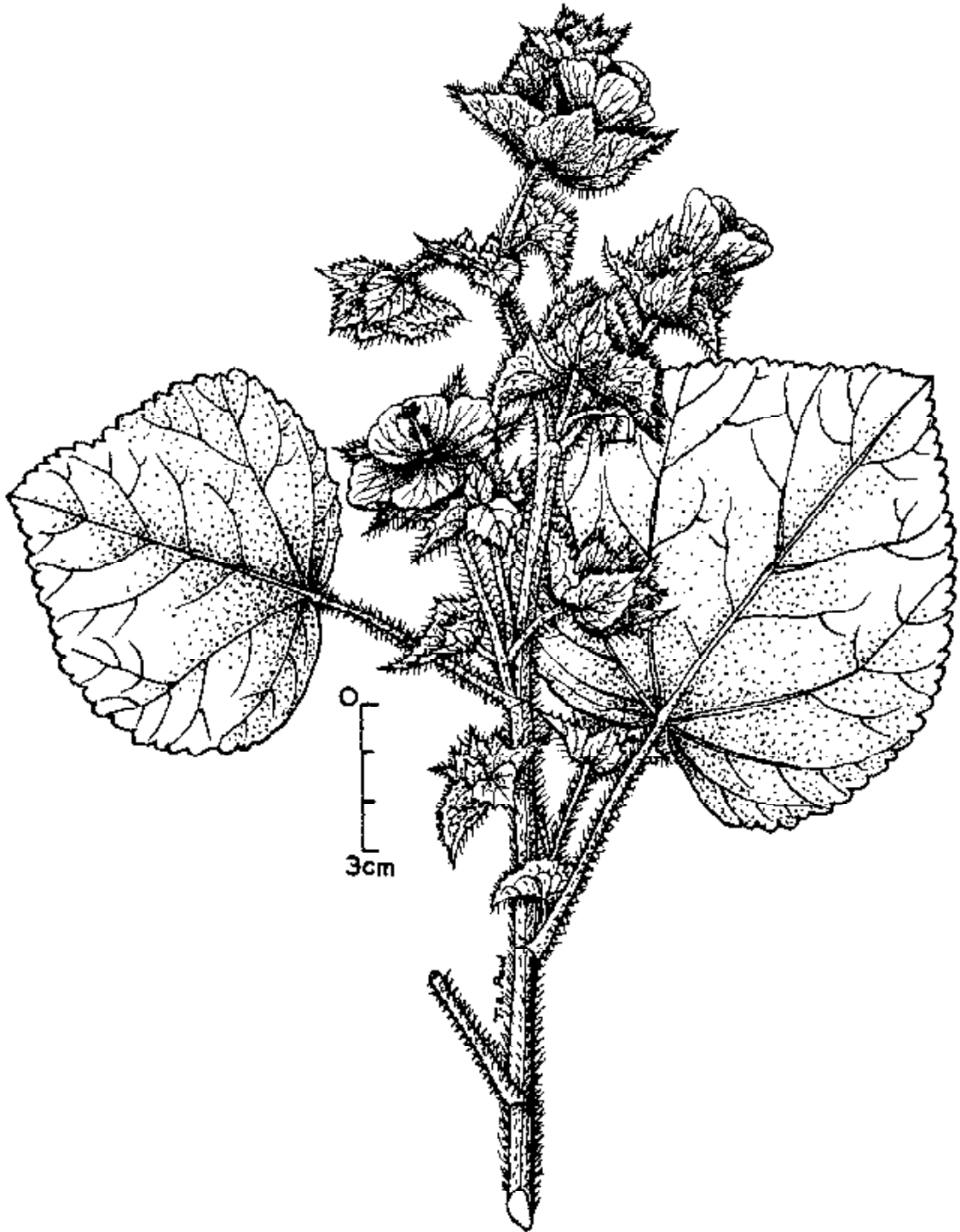


Fig. 33. *Malachra capitata* (Linn.) Linn.

apex acute with a slightly recurved tip, folded along the midrib, entire or crenate-serrate, stellate pubescent and also with stiff bristles on the margins and on the nerves beneath, usually with white patches on the intervenium accompanied by filiform stipules. Calyx cupular, lobes  $6.0 \times 1.5$  mm, oblong to deltoid, acuminate, 3-nerved, apex with few stiff simple hairs, rest portion glabrous. Corolla c. 1.5-2.5 cm across, bright yellow; petals 1.5-1.0 cm, obovate, outside densely stellate hairy, inside glabrous, base ciliate. Staminal column c. 1 cm long, antheriferous throughout with both stellate and simple hairs and few gland-hairs. Schizocarp 5-6 mm across, obpyriform; mericarps 5, each c.  $3 \times 2$  mm, trigonous, base acute, apex rounded, reticulated with brownish veins, whitish, glabrous. Seeds c. 2.5 mm long, trigonous, covered with minute stellate hairs, brownish black.

*Type* : H.U. Herb. Linn. n 867.1 (Lectotype : LINN).

*Fls. & Frts.* : Apr.-Dec.

*Distrib.* : Throughout the hotter parts of INDIA. Native of Tropical America, introduced in the Old World.

*Exsicc.* : West Bengal : Mutlach (Calcutta), 8.11.1894, *Clarke* 24724B (CAL). Shibpur, March 1867, *Kurz s. n.* (CAL); Andul, *Bennett* 460 (CAL). Andhra Pradesh : Thallareva (Godavari Dt.), 14.9.1907, *C.A. Barber* 8286 (CAL, MH).

*Chr. No.* :  $2n = 56$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23 : 195. 1941).

*Pollen* : Panporate, spheroidal (average size  $102 \mu$ ; range  $88-105 \mu$ ). Pores circular (diameter  $2 \mu$ ). Interporal distance  $10.5 \mu$ . Exine thickness  $10.5 \mu$ , being slightly thicker at spine base. Endine thicker than ectine excluding the excrescences. Exine spinate. Spine height  $14 \mu$ , tip acute. Basal cushion very slightly formed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 15. 1962].

*Notes* : This species is easily recognized by having its dense capitate inflorescence and white patches in the bracts.

#### 14. MALVA

Linn., Sp. Pl. 687. 1753; Gen. Pl. ed. 5 : 308. 1754; DC., Prodr. 1 : 430. 1824; Benth. & Hook. f., Gen. Pl. 1 : 200. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 320. 1874; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6 : 40. 1890; Hutch., Gen. Fl. Pl. 2 : 552. 1967.

Annual, biennial or perennial herbs or undershrubs, erect or procumbent, glabrous or hairy. Leaves reniform to suborbicular cordate, lobed or dissected, Flowers axillary, solitary or fasciculate, rarely in terminal raceme, pink or white. Epicalyx segments 3, distinct. Calyx cupular to rotate, 5-lobed, lobes deltoid, acute. Coroller longer than the calyx or scarcely exceeding; petals obcordate, cuneate, notched at the apex. Staminal column antheriferous towards the apex. Ovary 10-14 carpellate, carpels arranged in a ring around a central

axis, ovules 1 in each carpel; styles as many as the carpels, oblique clavate, united about half their length; stigmas decurrent on the adaxial surface. Fruits schizocarp enclosed in the persistent calyx, discoid; mericarps round-reniform, awnless, usually dorsally and laterally prominently veined, sometimes muricate, separating at maturity, indehiscent. Seeds reniform, ascending.

*Distrib.* : c. 100 species in temperate and subtropical regions of the Old World of which some species are naturalized in the New World. 7 species in India.

*Ecol.* : Grows in waste places, roadsides, forest edges upto c. 4000 m altitude.

### KEY TO THE SPECIES

- 1a. Epicalyx segments ovate or ovate-oblong :
  - 2a. Schizocarp glabrous. Petals 3-5 times the length of calyx :
  - 3a. Flowers more than 5 in each fascicle , rarely less than 5; petals 4-5 times the length of calyx, retuse. Stem glabrescent, thick *M. mauritiana* 2
  - 3b. Flowers 1-4 in each fascicle ; petals usually 3 times the length of calyx, emarginate. Stem pubescent to glabrescent, comparatively thin *M. sylvestris* 6
  - 2b. Schizocarp hairy . Petals less than 3 times the length of calyx *M. ambigua* 1
  - 1b. Epicalyx segments linear to lanceolate :
  - 4a. Dorsal surface of mericarps distinctly reticulate, angles of mericarps keeled *M. parviflora* 5
  - 4b. Dorsal surface of mericarps smooth or finely ridged, angles of mericarps not keeled :
  - 5a. Flowers in loose fascicles. Pedicels 1-3 cm long. Petals at least twice as long as sepals. Calyx slightly accrescent *M. neglecta* 4
  - 5b. Flowers in compact fascicles. Pedicels 0.3-0.5 (-1) cm long; Petals less than twice as long as sepals. Calyx strongly accrescent :
  - 6a. Plants glabrescent. Staminal column glabrous or simple hairy above. Fruiting calyx 10-15 mm long *M. verticillata* 7
  - 6b. Plants pubescent. Staminal column retrorse hairy throughout. Fruiting calyx less than 10 mm long *M. mohileviensis* 3
1. *Malva ambigua* Guss., Fl. Sic. Prodr. 2 : 331. 1828; Abedin in Fl. W. Pak. 130 : 37. 1979. *M. sylvestris* var. *eriocarpa* Boiss. Fl. Or. 1 : 819. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 320. 1874. *syn. nov.*

Small, weak herbs young parts stellate hairy. Leaves 1.5-3.0 × 2.5-4.0 cm, somewhat semicircular, upper ones 3 lobed, apex obtuse, base truncate, margin



Fig. 34. *Malva mauritiana* Linn.

serrate; petioles 2-7 cm long, pubescent with both stellate and simple hairs. Stipules 2-8 mm long, ovate-lanceolate, glabrous. Flowers 1-5 (-7) in each axil; pedicels 0.5-1.5 cm long. Epicalyx segments 2.5 × 1.3 mm long, ovate to oblong, stellate hairy. Calyx c. 5 mm across, free to the middle; lobes 3-6 × 2-3 mm, slightly accrescent, broadly ovate to deltoid, stellate pubescent. Petals 7-15 × 5-7 mm, oblong-obovate, claw hairy, dark pink. Staminal column 4-7 mm long, stellate hairy. Schizocarp c. 5 mm across, hairy; mericarps 10-12, each c. 2 mm long and broad, dorsally reticulated. Seeds c. 1.5 mm across, brown.

*Type* : Described from Sicily (MAP).

*Fls. & Frts.* : May-Aug.

*Distrib.* : INDIA : Jammu & Kashmir, Himachal Pradesh; PAKISTAN, USSR, W. & E. MEDITERRANEAN REGION.

*Exsicc.* : Jammu & Kashmir : Srinagar, 7.7.1891, *Gammie s. n.* (CAL). Himachal Pradesh : Lippa, 17.8.1890, *Lace* 531 (CAL); Shongtong (Kinnaur Dist.), 1957, *Janardhanan* 48335 (CAL).

*Notes* : Boisser (l.c.) described a variety, *Malva sylvestris* var. *eriocarpa* based on having its pubescent fruit but Guss. (l.c.) earlier considered this plant as *Malva ambigua* Guss. So. *M. sylvestris* var. *eriocarpa* Boiss. is considered here as synonym of *M. ambigua* Guss.

This species readily differs from *Malva sylvestris* Linn. by having its pubescent fruit and petals more or less 3 times the length of the calyx.

2. *Malva mauritiana* Linn., Sp. Pl. 689. 1753; Roxb. Fl. Ind. ed. Carey 3 : 181. 1832; Abedin in Fl. W. Pak. 130 : 38. 1979. *M. sylvestris* var. *mauritiana* (Linn) Boiss. Fl. Or. 1 : 819. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 320. 1874; Cooke, Fl. Pres. Bombay 1 : 90. 1901 (Repr. ed. 1 : 96. 1958). **Fig. 34**

Erect herbs or undershrubs, c. 2 m tall, glabrescent. Leaves 3.0-8.5 × 2-6 cm long, orbicular to suborbicular, shallowly 3-5 lobed, apex obtuse or rounded, base truncate to shallowly cordate, margin coarsely crenate; petioles 3.5-12.0 cm long. Stipules 3-6 × 2-3 mm, ovate-lanceolate. Flowers in axillary fascicles of 5-15; pedicels 1-2 cm long, in fruit up to 2.5 cm long. Epicalyx segments 3-4 × c. 2 mm, ovate to ovate-oblong. Calyx free upto the middle; lobes 5-6 × c. 3 mm, ovate-lanceolate to ovate or oblong, accrescent in fruit. Petals 1.5-2.5 × 1.5-2.0 cm, retuse, claw hairy, dark pink to purple. Schizocarp 5-7 mm across, glabrous; mericarps 10-14, 1.5-2.0 mm across, reticulate. Seeds 1.2-1.5 mm across, reniform, blackish-brown.

*Type* : Herb. Linn. n. 870.24 (Holotype : LINN; Photo!).

*Fls. & Frts.* : Oct.-May.

*Distrib.* : MEDITERRANEAN REGION, W. EUROPE, USSR, In India it is cultivated occasionally or running wild as an escape.

*Exsicc.* : Uttar Pradesh : Kheri (Oudh), 3.4.1898, *Inayat* 21600 (CAL).  
Madhya Pradesh : Sandurpur (Indore div.) 10.9.1964, *Arora* 5845 (CAL). Tamil  
Nadu : Nilghiris, *Schmid s. n.* (CAL).

*Notes.* : This species is allied to *Malva sylvestris* Linn. but differs in having thick glabrescent stem, flowers generally more than 5 in each fascicle and retuse petals.

3. *Malva mohileviensis* Downar in Bull. Soc. Mosc. 1 : 177. 1861; Abedin in Fl. W. Pak. 130 : 43. 1979; T.K. Paul in Bull. Bot. Surv. India 27 : 241 (1985) 1987.

Annual weak herbs upto c. 1.5 m high with somewhat purplish stem, younger parts pubescent. Leaves 1.5-4.5 × 2-7 cm, suborbicular, 5-7 lobed, apex rounded, base cordate, margin crenate, sparsely hairy, glabrescent later, petioles 1.5-14.0 cm long, with stellate and simple hairs, glabrescent later. Stipules 3-5 × 2-3 mm, ovate-lanceolate. Flowers 3-8 in axillary fascicles; pedicels 3-10 mm long. Epicalyx segments 3-4 × c. 1 mm, linear, margin ciliate. Calyx c. 5 × 3-4 mm, slightly accrescent, triangular. Petals about twice as long as the calyx, obovate, retuse, pinkish. Staminal column 3-4 mm long, retrose hairy. Schizocarp 5-7 mm across, glabrous; mericarps 11-12, c. 2 mm long and broad, dorsally faintly reticulate. Seeds 1 mm long and broad, brown.

*Type* : Described from Vicinity of Mogilen (LE).

*Fls. & Frts.* : Jan.-Mar.

*Distrib.* : INDIA : Rajasthan; PAKISTAN, JAPAN, USSR, EUROPE.

*Exsicc.* : Rajasthan : Jaipur, 3.3.66, *Sharma* 1460 (CAL).

*Notes* : Very similar to *M. verticillata* but differs in having pubescent stem, petioles of middle and lower leaves 3-5 times the length of lamina and fruiting calyx less than 10 mm long.

4. *Malva neglecta* Wallr. Syll. Pl. Nov. Ratisbon 1 : 140. 1824; Hu, Fl. China fam. 153: 6 t. 15. f. 2. 1955; Abedin in Fl. W. Pak. 130 : 38. 1979. *M. rotundifolia* Linn., Sp. Pl. 689. 1753. *p. p.* Fig. 35

Herbs, 15-60 cm long, erect or prostrate, stellate pubescent, lower portion of the stem woody, branched. Leaves 0.6-2.2 × 1.5-5.0 cm, reniform to suborbicular-cordate, shallowly 5-7 lobed, more or less rounded at apex, crenate, 5-7 nerved at the base, both the surfaces pubescent with stellate and simple hairs; petioles 2-11 cm long with stellate and simple hairs. Stipules 4-6 × 2-3 mm, obliquely-triangular, outside with simple hairs, inside glabrous, margin ciliate by simple hairs. Flowers 2-5 in axillary loose fascicles; pedicels 1-3 cm long, unequal in each fascicle densely pubescent with stellate and simple hairs. Epicalyx segments 2-4 × 1.0-1.5 mm, linear to lanceolate, both surfaces and margin with simple and stellate hairs, persistent. Calyx connate in the middle, lobes 4-6 ×



Fig. 35. *Malva neglecta* Wallr.

2-3 mm, slightly accrescent, deltoid, outside pubescent with simple and stellate hairs, inside portion glabrous, persistent. Corolla c. 1 cm across, pale lilac to whitish; petals 9-15 × 3-5 mm, twice the length of the calyx lobes, notched at the apex, the notch 1.0-1.5 mm from the tip, hairy, basal margins of petal hairy. Staminal column 4-6 mm long,  $\frac{2}{3}$  portion antheriferous towards the tip, stellate pubescent throughout. Mericarps 12-14, each c. 2 mm in diameter, reniform, faintly ridged, angles of mericarps not keeled, pubescent. Seeds c. 1.5 mm diameter, reniform, glabrous, brownish black.

*Type* : *sine loc.* (Presumably nr. Ratisbon [Regensburg] Germany), *Wallroth* (E) [Cullen, TURKEY. in Fl. Turkey 2 : 407. 1967]

*Fls. & Frts.* : Apr.-Sept.

*Distrib.* : INDIA : Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, West Bengal; PAKISTAN, BURMA, AFGHANISTAN, AUSTRALIA, EUROPE, TURKEY.

*Exsicc.* : Jammu & Kashmir : Sonamarg, 2440 m, 1.9.1876, *Clarke* 30881B (CAL). Himachal Pradesh : Kalpa 2990 m, 3.6.1972, *Janardhanan* 47637 (CAL). Punjab : Kothi, 2500 m, 31.7.1962, *N.P. Singh* 22964 (CAL). Uttar Pradesh : Musoorie, Cloud end, 2000 m, 7.11.1960, *Saxena* 1516 (DD).

5. *Malva parviflora* Linn in Hojer, *Demonstr. Pl. Hort. Ups.* 18. 1753 *et* *Amoen. Acad.* 3 : 146. 1756 *et* *Sp. Pl.* ed. 2. 969. 1763; Mast. in Hook. f., *Fl. Brit. India* 1 : 321. 1874; Cooke, *Fl. Pres. Bombay* 1 : 91. 1901 (Repr. ed. 1 : 96. 1958); Duthie, *Fl. Upper Gang. Pl.* 1 : 79. 1903 (Repr. ed. 1 : 74. 1960); Gamble, *Fl. Pres. Madr.* 1 : 88. 1915 (Repr. ed. 1 : 63. 1957); Borss. in *Blumea* 14 : 149. 1966; Abedin in *Fl. W. Pak.* 130 : 42. 1979.

*Local Names* : Panirak (Hindi); Gogisag, nanna, sonchal (Punj.)

Annual, semierect or prostrate spreading herbs 15-45 cm high. Stem 3-5 mm in diameter, branched at the base with scattered patent simple and stellate hairs, glabrescent later. Leaves 1.5-7.0 cm across, suborbicular base cordate, often slightly 3-7 lobed, rounded or obtuse at apex, margin crenate-serrate, 5-7 nerved at the base with scattered stellate hairs on both the surfaces; petioles 1-2.5 cm long with a line of stellate and simple hairs on the upper side. Stipules 1-3 mm, lanceolate to deltoid, acuminate, hairy. Flowers in axillary clusters of 2-6, bluish white; pedicels 3-8 mm long, accrescent upto 10 mm, stellate hairy or glabrous. Epicalyx segments upto c. 5 mm long, narrowly linear, ciliate by simple hairs, caducous. Calyx cupular, c. 5 × 3 mm, enclosing the schizocarp at maturity, free upto the middle, lobes c. 5 × 2 mm, ovate, acute, flattened upto c. 5 mm, outside with minute stellate and simple hairs, glabrous inside. Corolla bluish white, petals 3-7 × 2-3 mm, obovate, glabrous or occasionally with few simple hairs. Staminal column c. 3 mm long, antheriferous towards the apex, glabrous. Schizocarp 5-8 mm in diameter, 2-3 mm high; mericarps 10, reniform trigonous with sharp angles, margins





Fig. 36. *Malva parviflora* Linn. var. *parviflora*

on the back keeled, rarely slightly winged dorsally prominently, reticulately veined, glabrous, indehiscent. Seeds 1.5-2.0 mm in diameter, reniform, glabrous, brownish black.

### KEY TO THE VARIETIES

- 1a. Plants prostrate-procumbent, branched throughout. Flowers many in compact fascicles. Fruiting calyx accrescent. . var. *parviflora*  
 1b. Plants semierect, branched from the base. Flowers solitary or paired or rarely more, in loose fascicles. Fruiting Calyx less accrescent. . . . . var. *microcarpa*

var. *parviflora*

Fig. 36

*Type* : Linn. Herb. n. 870.17 (Holotype : LINN; Photo!).

*Fls. & Frts.* : Oct.-March.

*Distrib.* : INDIA : Jammu & Kashmir, Punjab, Uttar Pradesh, Karnataka, Madhya Pradesh; PAKISTAN, WEST ASIA, NORTH AFRICA, EUROPE.

*Exsicc.* : Uttar Pradesh : Nishangara, 12.2.65, O.P. Misra 7957 (CAL). Madhya Pradesh : Meghauli (Sidhi), 18.1.64, Panigrahi 2361 (CAL). Karnataka : Dharwar, 10.9.1888, Talbot 1703 (CAL).

*Chr. No.* :  $2n = 42$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23:195.1941).

*Uses* : Leaves used as vegetables. The green fruits are eaten during scarcity. This plant is considered emollient and pectoral. The seeds are demulcent and used in cough and ulcers in bladder. In Kumaon the root is said to be used for cleaning hairs and woolen clothes.

*Pollen* : Panporate, spheroidal (Average size  $93 \mu$ ; range  $90-98 \mu$ ). Exine  $6 \mu$  thick, spinate. Pollen dimorphic, each type being represented by spines with either pointed ends or with blunt (Baculate) ends. [P.K.K. Nair in Journ. Sci. Industr. Res. 17c(2) : 35-36. 1958].

var. *microcarpa* (Pers.) Loscos, Trat. Pl. Aragon 2 : 203. 1877; Borss. in Blumea 14 : 750. 1966; T.K. Paul in Bull. Bot. Surv. India 27 : 242 (1985) 1987. *M. microcarpa* Pers. Syn. 2 : 251. 1806; Abedin in Fl. W. Pak 130 : 41. 1979.

*Type* : Herb. Persoon s.n. (L).

*Fls. & Frts.* : Dec.-Feb.

*Distrib.* : INDIA : Rajasthan; PAKISTAN, MALESIA. Native to the Mediterranean region.

*Exsicc.* : Rajasthan : Bilar (Jodhpur), 22.2.77, *A.N. Singh* 3501 (CAL); Khejari (Bhilusra), 7.2.79, *A.N. Singh* 7027 (CAL).

6. *Malva sylvestris* Linn., Sp. Pl. 689. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 320. 1874; Duthie, Fl. Upp. Gang. Pl. 1 : 79. 1903 (Repr. ed. 1 : 74. 1960); Gamble, Fl. Pres. Madr. 1 : 88. 1915 (Repr. ed. 1 : 63. 1957); Abedin in Fl. W. Pak. 130 : 37. 1979; Hara & Williams, Enum. Fl. Pl. Nepal 2 : 68. 1979.

Fig. 37

Biennial or perennial herbs, upto c. 2 m high. Stems erect to decumbent younger parts pubescent with simple and stellate hairs, glabrescent later. Leaves 1.5-8.0 × 1-11 cm, reniform to suborbicular-cordate, 3-7 lobed, lobes semicircular to oblong, at apex obtuse, crenate, 3-7 nerved at the base, glabrous or few simple hairs in the lower surface; petiole 1.5-7.0 cm long with a line of simple and stellate hairs throughout. Stipules 4-6 × 2-3 mm, ovate, acute, ciliate by simple hairs, mostly deciduous. Flowers in axillary clusters of 1-4; pedicel 0.5-2.5 cm, unequal in length in each cluster, pubescent with simple and stellate hairs, glabrous later. Epicalyx segments 3-5 × 1.5-2.0 mm, ovate, ciliate by simple hairs or glabrous. Calyx free to the middle, lobes 3-7 × 2-4 mm, broadly triangular, acute, outside densely hirsute by stellate and few simple hairs, margin ciliate by small thin simple and stiff simple hairs, basal portion glabrous, margin of the inside densely hairy, middle portion sparsely stellate hairy or glabrous, basal portion glabrous, persistent. Corolla dark purple or violet; petals 1.5-2.5 × 0.5-1.0 cm, obovate, emarginate, glabrous, margins of the basal portion with tuft of simple hairs. Staminal column c. 4 mm long, densely stellate hairy, antheriferous towards the apex, filaments c. 2 mm long. Schizocarp 4-10 mm in diameter, 2-3 mm high, discoid, glabrous; mericarps 10, c. 2 mm in diameter, dorsally reticulately veined, laterally radially prominently veined, hairy, or glabrous. Seeds 1.5-2.0 mm long and broad, reniform, glabrous, brownish black.

*Type* : Herb. Linn. n. 870.22 (LINN; Photo!)

*Fls. & Frts.* : Aug.-Mar.

*Distrib.* INDIA : Jammu & Kashmir, Himachal Pradesh, Punjab, Delhi, Assam, Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu; Subtropical and temperate regions of ASIA, EUROPE.

*Exsicc.* : Jammu & Kashmir : Punge, *Stoliczka* s. n. (CAL). Himachal Pradesh : Kalpa near Forest rest house 2750 m, 2.10.1971, *Janardhanan* 46401 (BSD). Assam : Gauhati, March 1902, *Chatterjee* s. n. (CAL). Madhya Pradesh : Sawarpur (Indore), 10.9.64, *Arora* 5845 (CAL). Tamil Nadu ; Nilghiris, *Schmid* s. n. (CAL).

*Chr. No.* : 2n = 42 (Larter in Journ. Genetics 26;255. 1932.).

*Uses* : The leaves and seeds are used as vegetables. Young stems, leaves, flowers and immature fruits are medicinal.

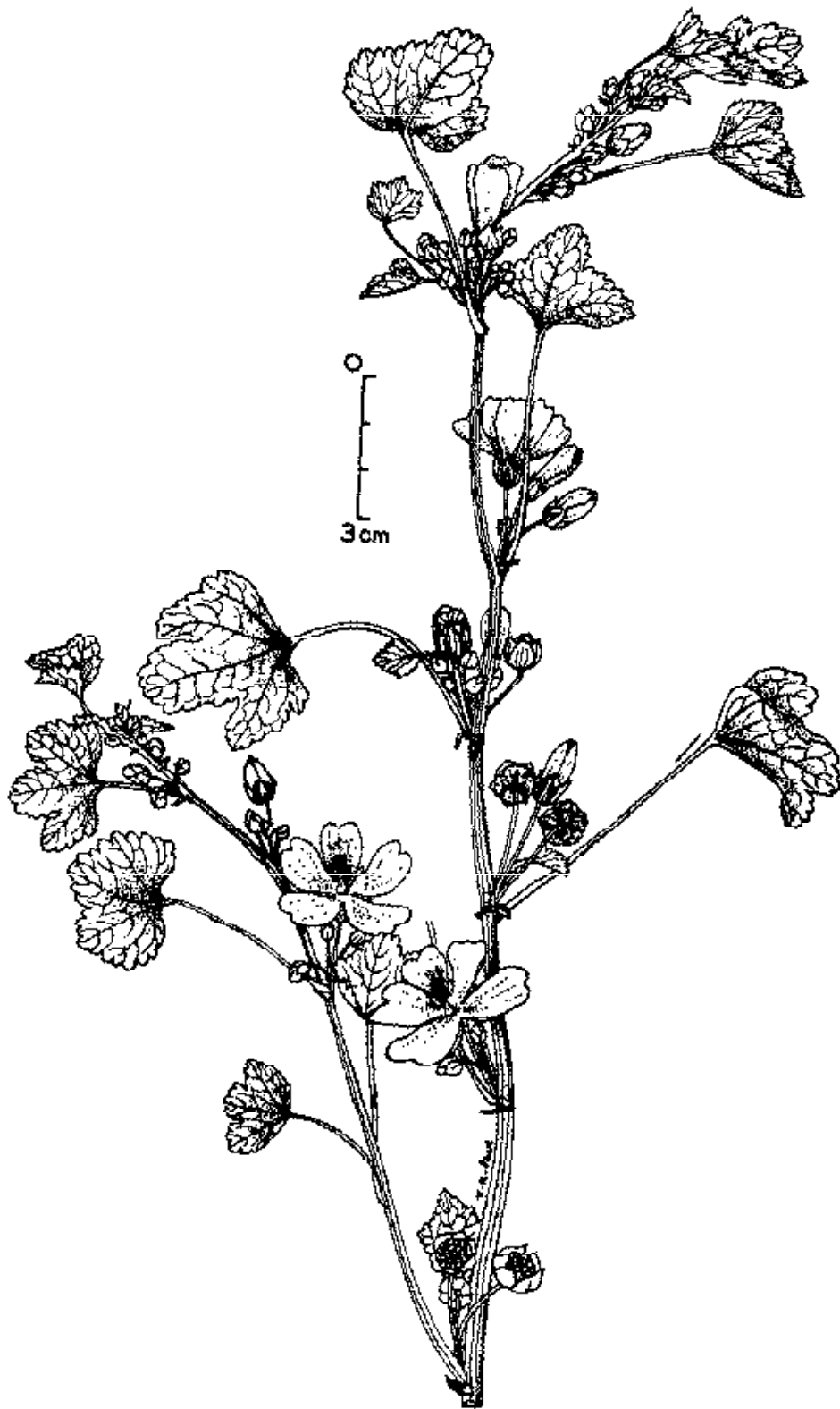


Fig. 97. *Malva sylvestris* Linn.

*Pollen* : Average size 113  $\mu$  (range 95-126  $\mu$ ), spine height 14  $\mu$ , base branched. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 12. 1962].

7. *Malva verticillata* Linn., Sp. Pl. 689. 1753; Cav. Diss. 2 : 78. t. 25, f. 3. 1786; DC., Prod. 1 : 433. 1824; Abedin in Fl. W. Pak. 130 : 43. 1979.

*Local names* : Laffa (Asm.); Lapha, napha (Beng.)

Annual or perennial herbs 30-120 cm high, glabrescent. Stem slender with simple and stellate hairs, glabrescent. Leaves 3-12  $\times$  2-10 cm, suborbicular, base cordate, 5-6 lobed, lobes roundish, acute or rounded at apex, margin crenate-serrate, 5-7 nerved at the base without any nectary, both the surface densely to sparsely simple and stellate hairy, glabrescent; petiole 2-15 cm long with a line of stellate hairs althrough and also with some scattered stellate hairs, glabrescent. Stipules 3-5  $\times$  2-4 mm, lanceolate to deltoid, acuminate, hairy. Flowers axillary, glomeratus or in loose fascicles, subsessile; pedicel 0.2-0.5(1.5) cm long, all hidden by the flowers and fruits, equal or unequal in length, stellate pubescent. Epicalyx segments 3-4 mm long, linear, simple hairy. Calyx twice the length of the epicalyx, accrescent upto 10-15 mm long, lobes deltoid-lanceolate, slightly inflated, acute, outside sparsely stellate and simple hairy, inside with simple hairs or glabrous. Corolla purplish, slightly exceeding to twice the length of the calyx; petals 7-8 mm long, less than twice the length of calyx lobes, oblong, lobed at apex, lobes rounded, glabrous or occasionally with few simple hairs. Staminal column 3-4 mm long, antheriferous towards the tip, glabrous or simple hairy above. Ovary discoid, carpels 10-12; styles free, acute; stigma decumbent on the adaxial side of the styles. Schizocarp c. 5 mm in diameter and c. 2 mm high, discoid; mericarps 10-12, each c. 2 mm across, reniform, laterally prominently radially veined, glabrous, indehiscent. Seeds c. 1.5 mm across, reniform, glabrous, brownish black.

#### KEY TO THE VARIETIES

- 1a. Flowers more than 5 in compact fascicles; pedicels 2-3 mm long,  
equal in each fascicles *var. verticillata*
- 1b. Flowers 2-4 in loose fascicles; pedicels 6-15 mm long,  
unequal in each fascicles *var. rafiqii*

*var. verticillata* *M. verticillata* Linn., Sp. Pl. 689. 1753; Mast. in Hook. f., Fl., Brit. India 1 : 320. 1874; Duthie, Fl. Upp. Gang. Pl. 1 : 78. 1903 (Repr. ed. 1 : 74. 1960); Prain, Beng. Pl. 1 : 256. 1908 (Repr. ed. 1 : 174. 1963); Gamble, Fl. Pres. Madr. 1 : 88. 1915 (Repr. ed. 1 : 63. 1957); Haines, Bot. Bih. & Or. 1(2) : 58. 1921 [Repr. ed. 1(2) : 60. 1961]; Hu, Fl. China, Fam. 153 : 5. 1955; Abedin in Fl. W. Pak. 130 : 45. 1979. *M. chinensis* Mill. Gard. Dict. ed. 8. 670. 1768. Fig. 38

*Type* : Herb. Linn. n. 870.26 (Holotype : LINN; Photo CAL!).

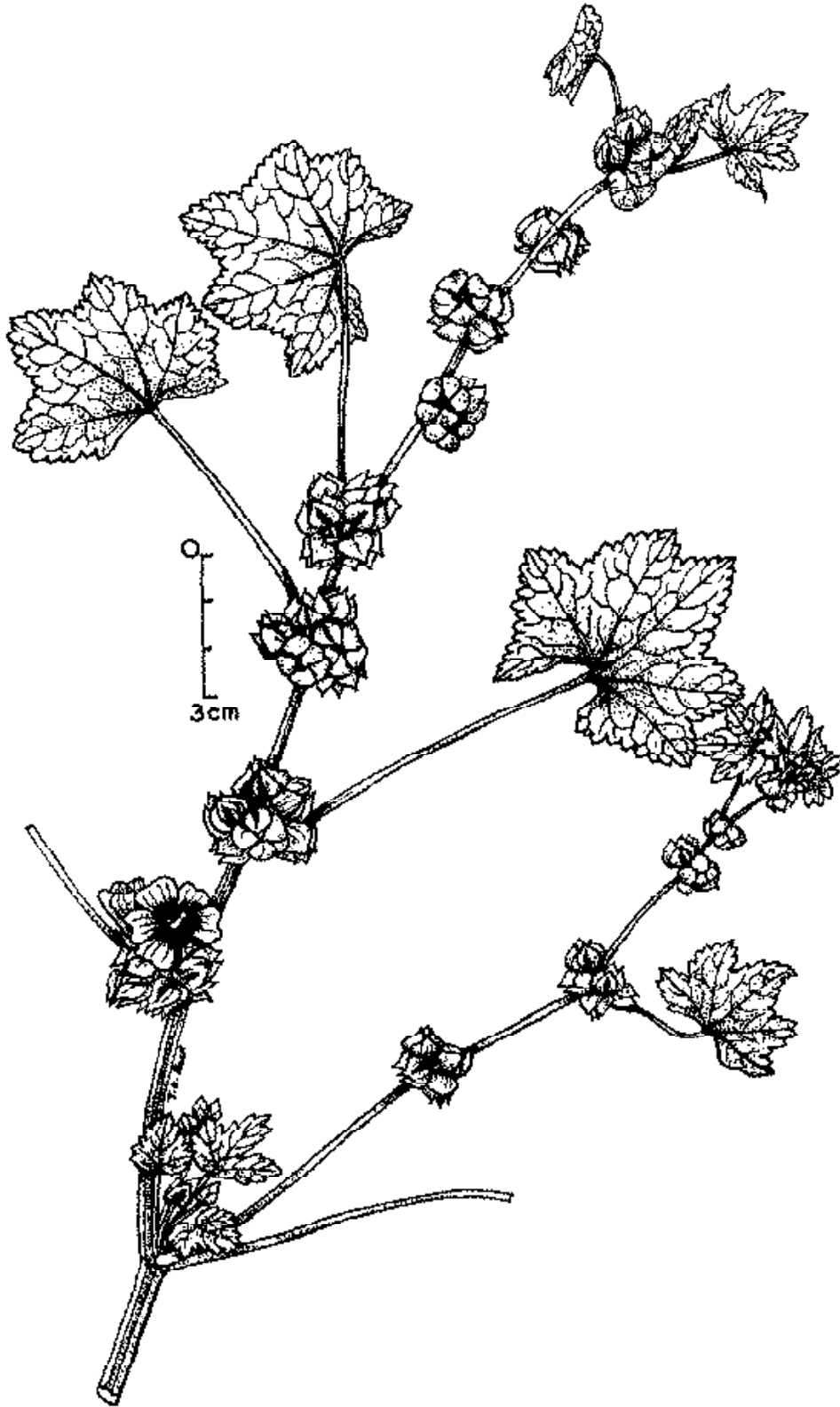


Fig. 98. *Malva verticillata* Linn. var. *verticillata*

*Distrib.* : INDIA (Cultivated in northern India, occasionally running wild as an escape); ASIA, EUROPE, ETHIOPIA, EGYPT.

*Exsicc.* : Uttar Pradesh : Near Mussorie, 1869, *King s. n.* (CAL); Dalhousie, 2121 m, 30.9.1874, *Clarke 23287A* (CAL); West Bengal : Sandakaphu (Darjeeling), 3333 m, 9.8.41, *Biswas 5658* (CAL). Sikkim : Lachen valley, 2575 m, 5.8.1891, *Gammie 639* (CAL).

*Chr. No.* :  $2n = 84$  (Skovsted in Journ. Genetics 31 : 263. 1935).

*Uses* : Leaves and young stems used as vegetable. The ash of the dried leaves and roots are medicinal.

var. *rafiqii* S. Abedin in Fl. W. Pak. 130 : 45. 1979; T.K. Paul in Bull. Bot. Surv. India 27 : 242 (1985) 1987. *M. verticillata* var. *chinensis* sensu Hu, Fl. China fam. 153 : 6, t. 15.f. 5. 1955 non *M. chinensis* Mill.

*Type* : Pakistan, Hazara dist., Kaghan valley, 20 miles from Gulnar farm on way to Babusar, 40 cm tall, flowers pinkish, *S. Abedin & M. Quiser 9101* (KUH).

*Distrib.* : INDIA : North West Himalaya; PAKISTAN, CHINA.

*Exsicc.* : Uttar Pradesh : Badrinath (Garhwal), 3200 m, 4.10.1959, *M.A. Rau 10432* (CAL, BSD); Kashmir, Phyang, Leh, 3500 m, 15.8.1975, *Viswanathan 54698* (BSD). Himachal Pradesh : Tehsil office (Baspa valley), 2750 m, *Janardhanan 46749* (BSD).

*Notes* : It differs from variety typica by having : flowers in loose fascicles of 2-4, pedicels 6-15 mm long, distinctly visible and comparatively thin stem.

#### DOUBTFUL SPECIES

*Malva pusilla* Sm. in Sowerby, Eng. Bot. 4 t. 241. 1803. *M. rotundifolia* Linn. var. *borealis* (Wallm. ex Boiss) Mast. in Hook. f., Fl. Brit. India 1 : 320. 1874. *M. borealis* Wallm. ex Boiss. Fl. Or. 1 : 820. 1867

Masters (1874) mentioned the occurrence of this taxa in Bengal and Mysore, But there is now no record and hence its occurrence is doubtful.

#### 15. MALVAVISCUS

Cav. in Diss. 3 : 131. 1787. Benth. & Hook. f. Gen. Pl. 1 : 206. 1862; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6 : 46. 1890; Schery, Ann. Miss. Bot. Gard. 29 : 203. 1942; Hutch., Gen. Fl. Pl. 2 : 565. 1967.

Perennial shrubs often climbing or suberect. Leaves entire or palmilobed or angular-lobate without any nectary on the veins. Flowers solitary, axillary;

pedicel not jointed. Epicalyx segments 5-10, shortly connate at the base, lanceolate to spatulate. Calyx campanulate, 5-fid. Corolla erect-connivent, not spreading. Staminal column usually longer than the corolla, antheriferous towards the apex. Carpels 5, 1 ovule in each carpel; style branches 10; stigmas capitate. Schizocarp subglobose, berry like, finally drying and separating into indehiscent mericarps.

*Distrib.* : c. 3 species (Schery 1942), one of them *M. arboreus* Cav. having several varieties, in tropical America. In India, 1 species with two varieties is cultivated.

**Malvaviscus arboreus** Cav. Diss. 3: 131, t. 48. f. 1. 1787; *ampl.* Schery in Ann. Miss. Bot. Gard. 29 : 209. 1942; Borss. in Blumea 14: 132. 1966; Abedin in Fl. W. Pak. 130 : 90. 1979.

#### KEY TO THE VARIETIES

- 1a. Leaves 3-5-lobed. Corolla less than 3 cm long var. *arboreus*  
 1b. Leaves entire to 3-lobed. Corolla more than 4 cm long var. *penduliflorus*

var. *arboreus*-*M. arboreus* Cav. Diss. 3 : 131, t. 48 f. 1. 1787; DC., Prod. 1 : 445. 1824. *Hibiscus malvaviscus* Linn., Sp. Pl. 694. 1753.

*Type* : Herb. cliff. (Lectotype : BM).

*Distrib.* : PERU and Northern BRAZIL to South TROPICAL AMERICA and WEST INDIES, cultivated throughout the World.

var. *penduliflorus* (DC.) Schery in Ann. Miss. Bot. Gard. 29 : 223. 1942. *M. penduliflorus* Mocino & Sesse ex DC., Prod. 1 : 445. 1824. *M. conzathii* Greenman, Publ. Field Mus. Nat. Hist. Bot. 2 : 333. 1912.

*Type* : Fl. Mex. t. 90

*Distrib.* : TROPICAL AMERICA from MEXICO to ECUADOR and VENEZUELA: cultivated in INDIA.

#### 16. MALVASTRUM

A. Gray, Mem. Amer. Acad. n. s. 4 : 21. 1849 (*nom. cons.*); Benth. & Hook. f. Gen. Pl. 1 : 201. 1862; K. Schumann in Engl. & Prantl. Nat. Pflanzenfam. 3, 6 : 41. 1890; Hutch., Gen. Fl. Pl. 2 : 563. 1967.

Herbs or undershrubs. Leaves entire, rarely shallowly or deeply lobed. Flowers axillary, solitary, terminal or in axillary spikes; pedicel short, not jointed. Epicalyx segments 3. Calyx campanulate, 5 parted. Corolla rotate, yellow. Staminal column shorter than the petals. Carpels 10-15; style branches as many as the carpels, filiform or clavate, truncate or capitate-stigmatose at



the apex. Schizocarp discoid; mericarps separating from the axis leaving a short columella, reniform, indehiscent, with or without awns. Seeds reniform.

*Distrib.* : 3 species indigenous to tropical and subtropical America, 2 of them naturalised in most tropical countries. 2 species in India, of which one is fully naturalized and other rarely cultivated in gardens.

*Ecol.* : Grows in waste lands, roadsides, fallow fields, forest edges and as secondary vegetation from sea level to 1100 m altitude.

### KEY TO THE SPECIES

- 1a. Mericarps with 3 awns. Flowers solitary, axillary or in axillary clusters without any bract like leaves. Stems, petioles and pedicels appressed with 4 armed stellate hairs of which two arms pointing upwards and two arms downwards *M. coromandelianum* 2
- 1b. Mericarps without awns. Flowers in dense spike subtended by bracts. Stems, petioles and pedicels appressed with 5-10 armed stellate hairs pointing in all directions . . . *M. americanum* 1

1. *Malvastrum americanum* (Linn.) Torr. Rep. U.S. Mex. Bound. Surv. 2 : 38. 1859; Borss. in Blumea 14 : 154. 1966. *Malva americana* Linn., Sp. Pl. 687. 1753. *M. spicata* Linn., Syst. Nat. ed. 10, 2. 389. 1759. *M. spicatum* (Linn.) A. Gray, Mem. Am. Acad. Sc. II. 4 (pl. Fendl.) 22. 1849; Mast. in Hook. f., Fl. Brit. India 1 : 321. 1874; Prain, Beng. Pl. 1 : 256. 1903 (Repr. ed. 1 : 174. 1963).

*Type* : Hortus Leydensis, A. van Royen s. n. (Lectotype : L. 908. 139-311).

*Distrib.* : Semi-arid regions of tropical and subtropical regions of both hemispheres. In India it is rare.

*Exsicc.* : West Bengal : H.B.C, s. l., s. n. (CAL); Shibpur area (Howrah), Kurz s. n. (CAL).

*Chr. No.* :  $2n = 24$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23 : 195. 1941).

2. *Malvastrum coromandelianum* (Linn.) Garcke, in Bonplandia 5 : 295. 1857; Gamble, Fl. Pres. Madr. 1 : 88. 1915 (Repr. ed. 1 : 64. 1957); Haines, Bot. Bih. & Or. 1(2) : 58. 1921 (Repr. ed. 1(2) : 60. 1961); Borss. in Blumea 14 : 152. 1966; Abedin, in Fl. W. Pak. 130 : 89. 1979. *Malva coromandeliana* Linn., Sp. Pl. 687. 1753. *M. tricuspidata* R. Br. in Ait. f., Hort. Kew. ed. 2. 4 : 210. 1812. *Malvastrum tricuspidatum* (R. Br.) A. Gray, Pl. Wright, 1 : 16. 1852; Mast. in Hook. f. Fl. Brit. India 1 : 321. 1874; Duthie, Fl. Upper Gang. Pl. 1 : 79. 1903 (Repr. ed. 1 : 75. 1960); Prain, Beng. Pl. 1 : 256. 1903 (Repr. ed. 1 : 174. 1963).

Fig. 39

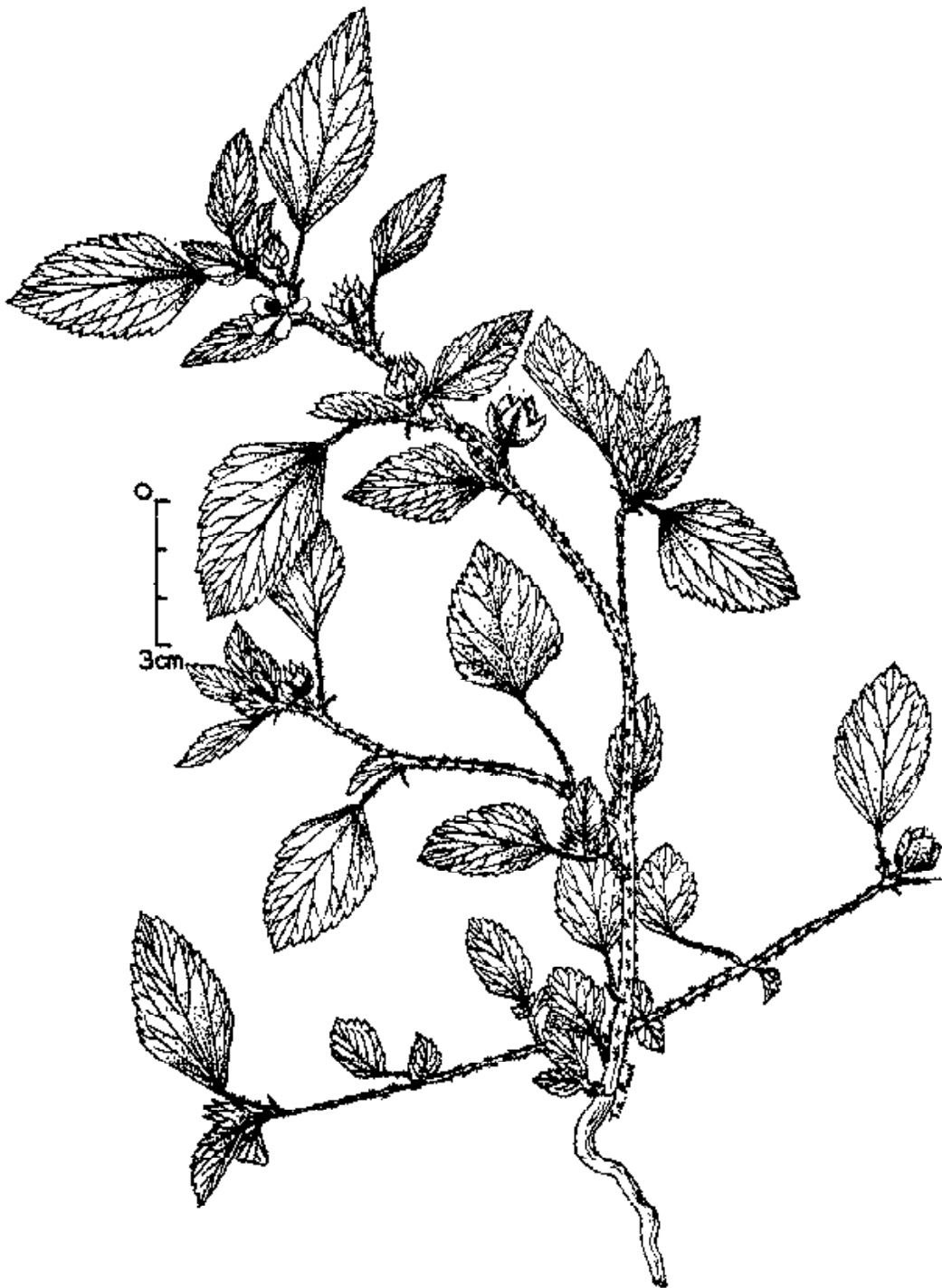


Fig. 39. *Malvastrum coromandelianum* (Linn.) Garcke

Annual, erect herbs or undershrubs up to c. 1 m high. Stems, petioles and pedicels with 4-armed appressed stellate hairs of which two arms pointing upwards and two arms downwards. Leaves 1.5-6.5 × 0.5-3.5 cm, ovate to oblong, sometimes lanceolate, apex obtuse to acute, base acute, obtuse or rounded, margin coarsely serrate or dentate, 5-nerved at the base, both the surfaces with appressed simple hairs, nerves densely covered with 4-armed stellate hairs beneath; petiole 0.5-4.0 cm long. Stipules 2-6 mm long, linear to lanceolate, entire or faintly serrated, hairy. Flowers solitary, axillary or in clusters of 2-4; pedicel 2-6 mm long, accrescent up to 10 mm. Epicalyx segments 4-7 × 0.5-1.0 mm, linear to lanceolate, acute, scattered with 4-armed stellate hairs. Calyx 6-8 mm high, 8-12 mm across, lobes 5-10 × 3-5 mm, slightly accrescent, deltoid to ovate, acuminate, outside with 4 armed stellate hairs, margin with stiff simple hairs, marginal and apical portion of the inside densely pubescent with minute stellate hairs, rest portion glabrous or nearly so. Corolla c. 1.5 cm across, yellow; petals obliquely obovate, at apex rounded or emarginate, base ciliate. Staminal column c. 2.5 mm long, conical, without tubular part, glabrous. Schizocarp globular, c. 2 mm high, 5-8 mm across; mericarps 10-14, each c. 2 mm high, radially 2.5 mm, curved, dorsally with sharp edges, apex with a awn of 0.5-1.0 mm middle of the dorsal region with 2 awns of c. 0.5 mm, pointing outwards, dorsally above the middle with erecto-patent simple hairs, below the middle with minute stellate hairs to glabrous, laterally with prominent radial veins. Seeds one in each mericarp, c. 1.5 mm across, glabrous, brownish black.

*Type* : H.U. Herb. Linn. n. 870.3 (Lectotype : LINN; Photo!).

*Fls. & Frts.* : June-Dec.

*Distrib.* : INDIA (Throughout tropics); tropical regions of both Old and New World.

*Exsicc.* : Uttar Pradesh : Saharanpur, 30.5.1945, *Sinclair* 4323 (CAL); Dehra Dun, 600 m, Sept. 1892, *Gamble* 23931 (CAL). West bengal : Kulgachia (Howrah Dt.) 22.5.1963, *Bennet* 294 (CAL). Tamil Naud : On the way to varapalayam (Coimbatore Dt.), 666 m, 25.7.1956, *K. Subramanyam* 401 (CAL, MH).

*Chr. No.* :  $2n = 24$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23 : 195. 1941).

*Pollen* : Panporate, spheroidal (average size 86  $\mu$ ; range 84-88  $\mu$ ). Pores circular (diameter 56  $\mu$ ). Interporal distance 21  $\mu$ . Exine 2.8  $\mu$  thick, becoming 7  $\mu$  thick at spine base. Ectine spinate, number of spines being 4-5 in the area between the pores. Spine height 7  $\mu$ , tip pointed, side straight. Basal cushion well developed, columella composing it being fused, and the adjacent cushions more or less adnate, leaving a deep interspinal depression. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 12. 1962].

*Notes* This species has apparently often been confused with the *Sida* species but can be easily distinguished from the latter by having its epicalyx in

the flower and characteristic strigose indumentum on the stems and petioles. It shows a wide range of variation in the shape and size of the leaves even on the same plant.

### 17. MODIOLA

Moench, Meth. Pl. 619. 1794; Benth. & Hook. f., Gen. Pl. 1 : 205. 1862; Hutch. Gen. Fl. Pl. 2 : 556. 1967.

Annual herbs, prostrate with tuberous root stock, stellate pubescent. Leaves digitately divided. Flowers axillary, solitary; pedicel jointed. Epicalyx segments 3, free, lanceolate. Calyx 5 lobed. Corolla red. Staminal column divided at the apex into numerous filaments. Carpels numerous, locule 3 or 2-ovulate; styles as many as carpels; stigmas capitate. Fruit a schizocarp; mericarps separating, each with 2 crests at the back, 3 valved, transversely septate between the seeds, setose-pilose. Seeds reniform.

*Distrib.* : 3-5 species in tropical and subtropical regions of America. 1 species in India.

*Modiola caroliniana* (Linn.) G. Don, Gen. Syst. 1 : 465. 1831; Fyson, Fl. Nilgiri & Pulney hill tops 1 : 45, t. 35. 1915; Borss. in Blumea 14 : 148. 1966.  
*Malva caroliniana* Linn., Sp. Pl. 689. 1753.

Herbs, stems and branches prostrate, densely stellate pubescent. Leaves 3 fid, each again dissected; petiole 0.5-3.5 cm long. Stipules c. 3 mm. Flowers solitary, axillary; pedicel jointed. Epicalyx segments 3, free, lanceolate. Calyx lobes triangular, 3-nerved. Petals 3-4 mm long, hardly longer than the calyx. Schizocarp with more than 20 mericarps, hairy. Seeds 2 per mericarp, glabrous.

*Type* : Herb. Linn. n. 870.15 (LINN; Photo †).

*Distrib.* : INDIA : Naturalised in India; Indigenous to AMERICA.

### 18. NAYARIOPHYTON

Pertinet ad Hibisceae Endl., affinisque *Kydiae* Roxb., a quatenus differt, floribus majoribus, solitariis, vel brevi paniculati (2 to 5 floribus), bisexualibus; staminibus numerosis, stylis 2, fructu indehiscenti.

Arbor. Folia ovata vel suborbicularia integra vel 3 lobata, infra dense stellato-pubescentia. Flores axillares, solitarii vel brevipaniculati; bracteolae 4-6, oblongo-lanceolatae ad basin sub-connatae, patentes, hirsutae. Calyx 4 lobatus, ad medium connatus. Petala 5, oblonga. Columna staminalis 8-10 mm longa, stamina numerosa; ovarium globosum, biloculare; stylus exertus, bifurcatus, stigmatibus rugoso-capitato. Capsula subglobosa, indehiscens, hirsuta. Semina solitaria, in quoque loculo.

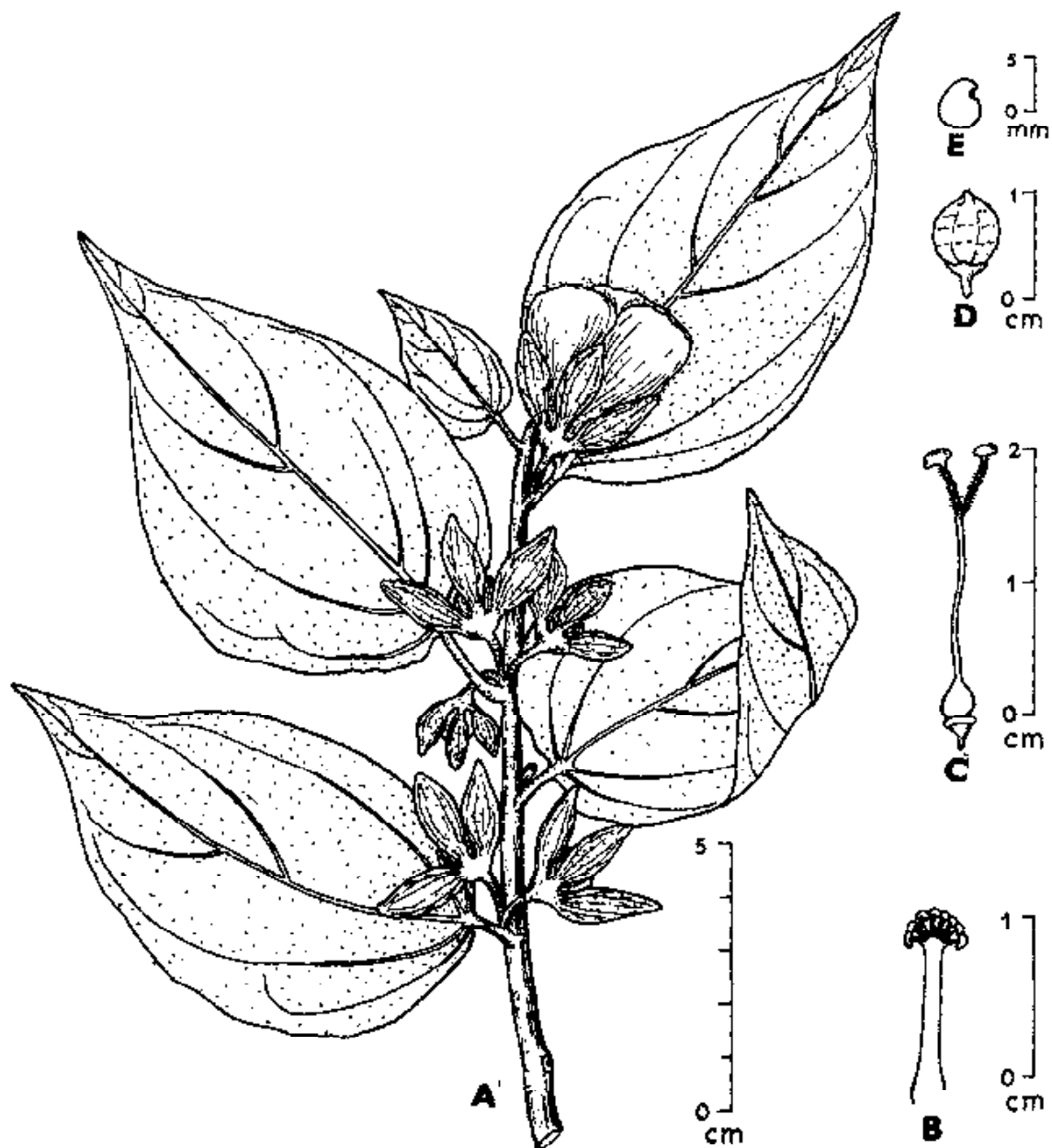


Fig. 40. *Nayariophyton jujubifolium* (Griff.) T.K. Paul.  
 A. Habit. B. Staminal column. C. Pistil. D. Fruit. E. Seed.

*Typus* : *Nayariophyton jujubifolium* (Griff.) T.K. Paul.

*Nayariophyton* T.K. Paul gen. nov. belongs to the Tribe Hibisceae Endl. and is related to the genus *Kydia* Roxb. but differs in having larger, solitary bisexual flowers or in short panicles of 2-5 flowers, numerous stamens, 2 styles and indehiscent fruits.

Trees. Leaves ovate or suborbicular, entire or shallowly 3-lobed, hairy. Flowers axillary, solitary or in short panicles. Bracteoles 4-6, oblong-lanceolate, subconnate at base, spreading, hairy. Calyx 5-lobed, connate in the middle. Petals 5, oblong. Staminal column 8-10 mm long, stamens numerous. Ovary globose, bilocular; style exerted, 2-branched; stigmas rugose, capitate. Capsule subglobose, indehiscent, hairy. Seed solitary in locul.

*Type* : *Nayariophyton jujubifolium* (Griff.) T.K. Paul.

*Nayariophyton jujubifolium* (Griff.) T.K. Paul comb. nov. *Kydia jujubifolia* Griff. Notul. 4 : 534. 1854; Ic. Pl. Asiat. 4, t. 595; Hu, Fl. China, fam. 159 72. f. 16 t. 11. 1955. *Dicellostyles jujubifolia* (Griff.) Benth. in Benth. & Hook. f., Gen. Pl. 1 : 207. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 333. 1874.

Fig. 40

Trees c. 5-8 m high, young stems and branches pubescent with greyish minute stellate hairs. Leaves 7-15 × 4-9 cm, ovate or suborbicular, base subcordate or rounded, apex acute to acuminate, entire or shallowly 3-lobed, upper surface sparsely stellate pubescent or glabrous, lower surface densely stellate pilose, 5-7 nerved at the base; petiole 1-3 cm long, stellate pubescent. Stipules subulate. Flowers axillary, solitary or in short panicles of 2-5 flowers; pedicel 0.5-1.5 cm long, stellate pubescent. Epicalyx segments 4-6, 1.0-1.5 × 0.5 cm, accrescent, oblong-lanceolate, rounded at the apex, conspicuously striate and reticulate, sparsely stellate pubescent above, densely stellate velutinous beneath, persistent. Calyx lobes 1.0 × 0.4-0.5 cm, triangular, connate in the middle, wide at the base, apex acute, stellate hairy. Corolla c. 2.5 cm across, white; petals 5, 1.0-2.5 × 1.0-1.5 cm, oblong, outer surface densely stellate pubescent, inner surface with thick simple hairs, stellate hairs at the base. Staminal column 8-10 mm long, hairy, stamens numerous, anthers reniform. Ovary globose, 2-locular; style c. 2.5 cm long, 2 branched, each branch c. 0.5 cm long, densely stellate hairy; stigmas rugose capitate. Capsule c. 8 mm across, subglobose, shortly rostellate, densely hairy, 2-loculed, indehiscent. Seed one in each locule, c. 4 × 3 mm, reniform, glabrous.

*Distrib.* : INDIA : Eastern Himalaya : West Bengal, Sikkim, Meghalaya, Manipur, Mizoram; BHUTAN, CHINA (Yunnan).

*Exsicc.* : India : West Bengal : Punkabari (Darjeeling Dt.), 454 m, 27 May 1884, Clarke 35062 G (CAL); Between Kursiong and Punkabari, 15.7.1862, Anderson 392 (CAL). Meghalaya : Khasia, Griffith 1270 (CAL). Manipur : Litan,



*Nayariophyton jujubifolium* (Griff.) T.K. Paul.

1212 m, 24.8.48, S. K. Mukherjee 3349 (CAL). Mizoram : Thaltak, Aijal (Lusha hills), 3.10.53, Godfrey 565 (CAL). Sikkim : Chungtong, 1818 m, 29.7.06, Cave 255 (CAL); Yoksam-Bakkim, 1700-2200 m, May 18, 1960, Hara 8156 (CAL); Chungtong, Oct. 1985, Ahmed 4930 (CAL). Bhutan : Sine loc., Griffith 120 (CAL) (Lectotype); Sine loc., Griffith 549/1 (CAL); Sinc loc., Griffith 549 (CAL).

*Notes* : In 1854, Griffith described a new species *Kydia jujubifolia* based on the collections from Bhutan mountains. Later Bentham (1862) placed this species under the genus *Dicellostyles* Benth. After examining the herbarium specimens mentioned by Griffith and protologue, it is found that the flower of this species has not been described. Masters (1874) considered this species as *Dicellostyles jujubifolia* with an incomplete description of flower. But Hu (1955) treated this species under the genus *Kydia* Roxb. and according to her "Griffith's binomial should be kept, until flowering material is available"

During the revisionary studies on the family Malvaceae of India it is noticed that a number of specimens of this species collected from Eastern Himalaya with well preserved flowers are deposited in CAL. Moreover some fresh collections of this species from Sikkim Himalaya are available for study. The specimens have been critically studied and compared with the species of the genera *Kydia* Roxb., *Dicellostyles* Benth. and *Julostylis* Thw .

In the genus *Dicellostyles* the flowers are solitary whereas in the genus *Kydia* the flowers are in dense panicles. But in the Himalayan species (*Kydia jujubifolia*) the flowers are solitary or on short panicles, a character common to both the genera *Kydia* and *Dicellostyles*.

However the Himalayan species (*Kydia jujubifolia*) distinctly differs from the genus *Kydia* in having : large bisexual flowers, staminal column with numerous stamens at the apex, whereas in the genus *Kydia* the flowers are smaller, dioecious, staminal column 5-armed and each arm with a cluster of 4-6 connate anthers. In the genus *Kydia* the fruit is loculicidally dehiscent but in the Himalayan species (*K. jujubifolia*) the fruit is indehiscent.

On the other hand, the Himalayan species (*K. jujubifolia*) which was considered under the genus *Dicellostyles* by Bentham is different from the typical *Dicellostyles* of Sri Lanka in having : palmately nerved leaves, four epicalyx segments, styler branches connate above the middle and 6-costate indehiscent fruit. But in *Dicellostyles axillaris* (Type of the genus *Dicellostyles*) described from Sri Lanka, the leaves are pinnately nerved, 4-6 epicalyx segments, styler branches connate below the middle, 8-costate fruit which dehisces into 2-cocci.

*Julostylis angustifolia* Thw a monotypic species of the genus *Julostylis*, endemic to Sri Lanka, differs from the Himalayan species (*K. jujubifolia*) by its pinnately nerved leaves, flowers in large panicles, stamens 10 in 2 whorls and fruit is enclosed with in accrescent calyx and bracteoles.



After a detailed study of this Himalayan species (*Kydia jujubifolia*) it is seen that this species could not be assigned to any known genera of this family and in the present study a new genus *Nayariophyton* is proposed for the above mentioned taxon.

## 19. PAVONIA

Cav. Diss. 2 app. 2. 1786 *et in* Diss. 3 : 132. 1787 *nom. cons.*; Benth. & Hook. f., Gen. Pl. 1 : 205. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 330. 1874; K. Schumann in Engl. & Prantl Nat. Pflanzenfam. 3, 6 : 46. 1890; Hutch., Gen. Fl. Pl. 2 : 566. 1967.

Annual or perennial herbs, undershrubs or shrubs. Leaves entire or lobed to parted, palminerved, rarely with nectaries on the midvein beneath. Flowers usually axillary, solitary or fascicled by reduction of the upper leaves; pedicel jointed above the middle. Epicalyx segments 5-12, free or connate in the middle or at base. Calyx campanulate or tubiform, 5-lobed or toothed. Corolla rotate, yellow, pink or pinkish white. Staminal column as long as or shorter than the corolla. Carpels 5, 1-ovule in each carpel, styles 10; stigmas capitate, papillose. Fruit schizocarp, discoid to globose; mericarps 5, indehiscent, echinate or not, with or without wings, glabrous or pubescent, reticulately veined. Seed 1 per mericarp, reniform, pubescent or glabrous.

*Distrib.* : c. 200 species in the tropical regions of both the New and Old World. 7 species in India.

### KEY TO THE SPECIES

- 1a. Leaves with nectaries on veins beneath. Flowers in axillary or terminal clusters. Pedicel 1-5 mm long *P. repanda* 6
  - 1b. Leaves without nectaries. Flowers axillary, solitary. Pedicel 10-60 mm long :
    - 2a. Epicalyx segments 5, shortly connate at the base :
      - 3a. Mericarps with distinct, serrulate crest and 3-4 prickles on each side. Epicalyx segments 5-10 mm long, ovate *P. procumbens* 5
      - 3b. Mericarps echinate all over. Epicalyx segments 16-18 mm long, lanceolate *P. glechomifolia* 2
    - 2b. Epicalyx segments 8-14, free :
      - 4a. Mericarps with 3 stout horns and 4 basal protuberances *P. greuioides* 3
      - 4b. Mericarps without any horns :
        - 5a. Mericarps winged, at angles *P. zeylanica* 7
        - 5b. Mericarps wingless
  - 6a. Leaves lobed or angular. Mericarps glabrous *P. odorata* 4
  - 6b. Leaves unlobed. Mericarps villous *P. arabica* 1
1. *Pavonia arabica* Hochst. & Steud. (in Steud. nom. ed. 2. 2 : 279. 1841 *nom. nud.*) ex Boiss. Fl. Or. 1 : 837. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 331. 1874.

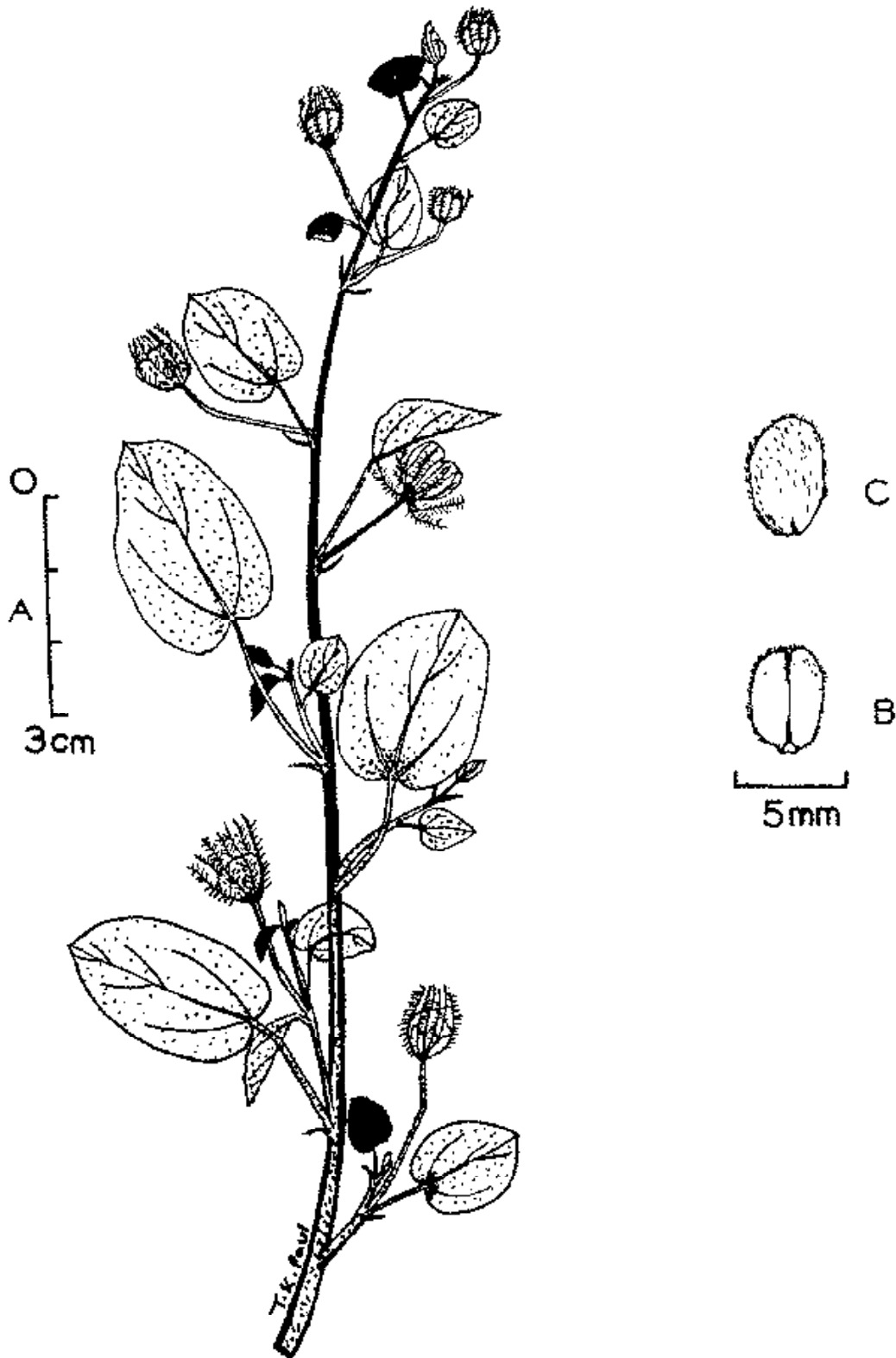


Fig. 41. *Pavonia arabica* Hochst. et Steud. var. *arabica*.

A. Habit. B. Ventral surface of mericarp. C. Dorsal surface of mericarp.

Perennial undershrubs. Stems, petioles and pedicels densely stellate hairy or viscous pubescent. Leaves 2.0-3.5 × 1.0-2.5 cm, ovate or oblong, rounded or truncate at base, obtuse or apiculate at apex, margin entire or denticulate, 5-7-nerved at the base, both the surfaces stellate pubescent; petiole 1.0-2.5 cm long. Stipules c. 4 mm long, linear, stellate hairy. Flowers solitary, axillary; pedicels 1.5-2.0 cm long, jointed near the apex. Epicalyx segments 10-12, free to the base, 10-14 mm long, linear with stellate and long simple hairs, enclosing the schizocarp, persistent. Calyx connate below the middle or sometimes to the middle, lobes 3-6 × c. 2 mm, ovate-lanceolate, both the surfaces stellate hairy, more densely on the outside. Corolla pink, petals entire or bilobed to the base, c. 7-12 × 5-7 mm, hairy at base. Staminal column c. 6 mm long, antheriferous throughout. Schizocarp 4-5 mm across, globose, obtuse; mericarps 5, each c. 5 × 3 mm, trigonous, villous. Seeds c. 2 mm long, pubescent with spirally coiled hairs and with short tubercles in longitudinal rows, brown.

#### KEY TO THE VARIETIES

- 1a. Petals unlobed :  
 2a. Plants densely pubescent, not viscous var. *arabica*  
 2b. Plants densely viscous pubescent. var. *glutinosa*  
 1b. Petals deeply bilobed to the base var. *massuriensis*

var. *arabica*-*P. arabica* Hochst. et Steud. ex Boiss. Fl. Or. 1: 837. 1867; Abedin in Fl. W. Pak. 130: 98. 1979. *Hibiscus flavus* Forssk. Fl. Aegypt.-Arab. 126. 1775 non *Pavonia flavus* Spring ex Marlius 1837. *Hibiscus microphyllus* Vahl, Symb. Bot. 50. 1790 non *Pavonia microphylla* Casar. 1842-45. Fig. 41

Type : Mount Aedder in Arabia (Wadi Fatme) Schimper 889 (G).

Fls. & Frts. : Aug.-Oct.

Distrib. : INDIA : Rajasthan, Gujarat, Karnataka; PAKISTAN, ARABIA, ETHIOPIA.

Exsicc. : Rajasthan : Mataji temple hills (Barmer), 4.10.60, S.R. Rolla 66877 (BSI); Kailana, 18.8.57, Puri 21876 (BSI). Gujarat : Dwarka, 27.9.52, Dhruna 82A (CAL); Kaladunjar (Kutch), 7.4.60, Jain 61850 (BSI).

var. *glutinosa* Blatt. & Hall. in Journ. Bomb. Nat. Hist. Soc. 26(1) : 227. 1918; Bhandari, Fl. Ind. Des. 69. 1978.

Type : Jodhpur, Oct. 1917, Blatter et Hallberg 5669 (Lectotype : BLAT!).

Fls. & Frts. : Sept.-Nov.

Distrib. : INDIA : Endemic to Rajasthan.

Exsicc. : Rajasthan : Jaisalmer, Bhandari 976 (BSJO); Barmer, 6.10.63, Bhandari 1878 (BSJO).

var. *massuriensis* Bhandari, Fl. Ind. Des. 69. 1978.

*Type* : Common on rocky plateau of Massuria, Jodhpur (Rajasthan), Aug. 10. 1959, *Bhandari* 4A (BSJO).

*Distrib.* : INDIA : Endemic to Rajasthan.

2. ***Pavonia glechomifolia*** (A. Rich.) Garcke ex Schweinf. Beitr. Fl. Aethiop. 1 : 54. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 390. 1874 *p.p.*; Abedin in Fl. W. Pak. 130 : 96. 1979. *Lebretonia glechomifolia* A. Rich. Tent. Fl. Abyss. 1 : 54. 1874. *Pavonia coxii* Tadulingam & Jacob in Journ. Ind. Bot. Soc. 5 : 11. 1926. Fig. 49

Erect undershrubs upto 1.5 m tall. Stems purple with scattered minute simple and stellate hairs, glabrescent. Leaves 1.5-3.5 × 1.4-3.0 cm, ovate-cordate, simple or 3 angled, acute, margin irregularly dentate, both the surfaces with stellate hairs, 7-nerved at the base; petiole 0.8-2.5 cm, stellate hairy. Stipules 1.5-6.0 mm long, linear, hairy. Flowers solitary, axillary; pedicel 1.5-4.0 cm, jointed towards the apex, stellate hairy. Epicalyx segments 5, connate at the base, spreading, each 16-18 × 3-4 mm, lanceolate, outer surface stellate hairy, margin with stellate and simple hairs, inner surface sparsely covered with simple and rarely with stellate hairs. Calyx 6-10 mm high; lobes 6-10 × 4-5 mm, connate below middle, deltoid-ovate, acute, outer surface with stellate hairs intermingled with gland hairs, margin with few simple hairs, inner surface sparsely pubescent. Corolla 1-2 cm across, yellow with dark purple centre; petals 12-15 × 7-10 mm, rhomboid-obovate, apex more or less rounded, base ciliate, outer surface with scattered stellate hairs and few gland hairs, margin with few simple hairs. Staminal column c. 1 cm long, antheriferous mainly towards the apex, 5-toothed. Carpels 1.0 × 1.5 mm, obovate; style branched, c. 10 mm long; stigmas 10, capitate, densely pubescent. Schizocarp 5-6 mm across; mericarps c. 4 mm long, pyriform, echinate all over, dorsally longitudinally carinate. Seeds c. 3 × 2 mm, pyriform, sparsely hairy towards the base and hilum, brown.

*Type* : Abyssinia, *Choha & Petit* s. n. (P)

*Fls. & Frts.* : Sept.-Feb.

*Distrib.* : INDIA : Rajasthan, Maharashtra, Tamil Nadu, Kerala; PAKISTAN, ETHIOPIA.

*Exsicc.* : Rajasthan : Junapatherasar, Barmer, 28.2.1974, *Tiwari* 1191 (CAL, BSJO); Harji, Jalor, 20.9.1978, *Vyas* 6651 (BSJO).

*Notes* : This species has generally been considered as a synonym of *Pavonia procumbens* (Wt. & Arn.) Walp. (Masters, 1874; Borss., 1966) but readily distinguished from it by having purple coloured stem, longer epicalyx segments, corolla yellow with dark purple centre and mericarps echinate all over.

3. ***Pavonia grewioides*** Hochst. ex Boiss. Fl. Or. 1 : 837. 1867; Abedin in Fl. W. Pak. 130 : 100. 1979. *Pavonia propinqua* Garcke in Schweinf. Beitr. Fl. Aethiop. 55. 1867; Cooke, Fl. Pres. Bombay 1 : 102. 1901 (Repr. ed. 1 : 109.

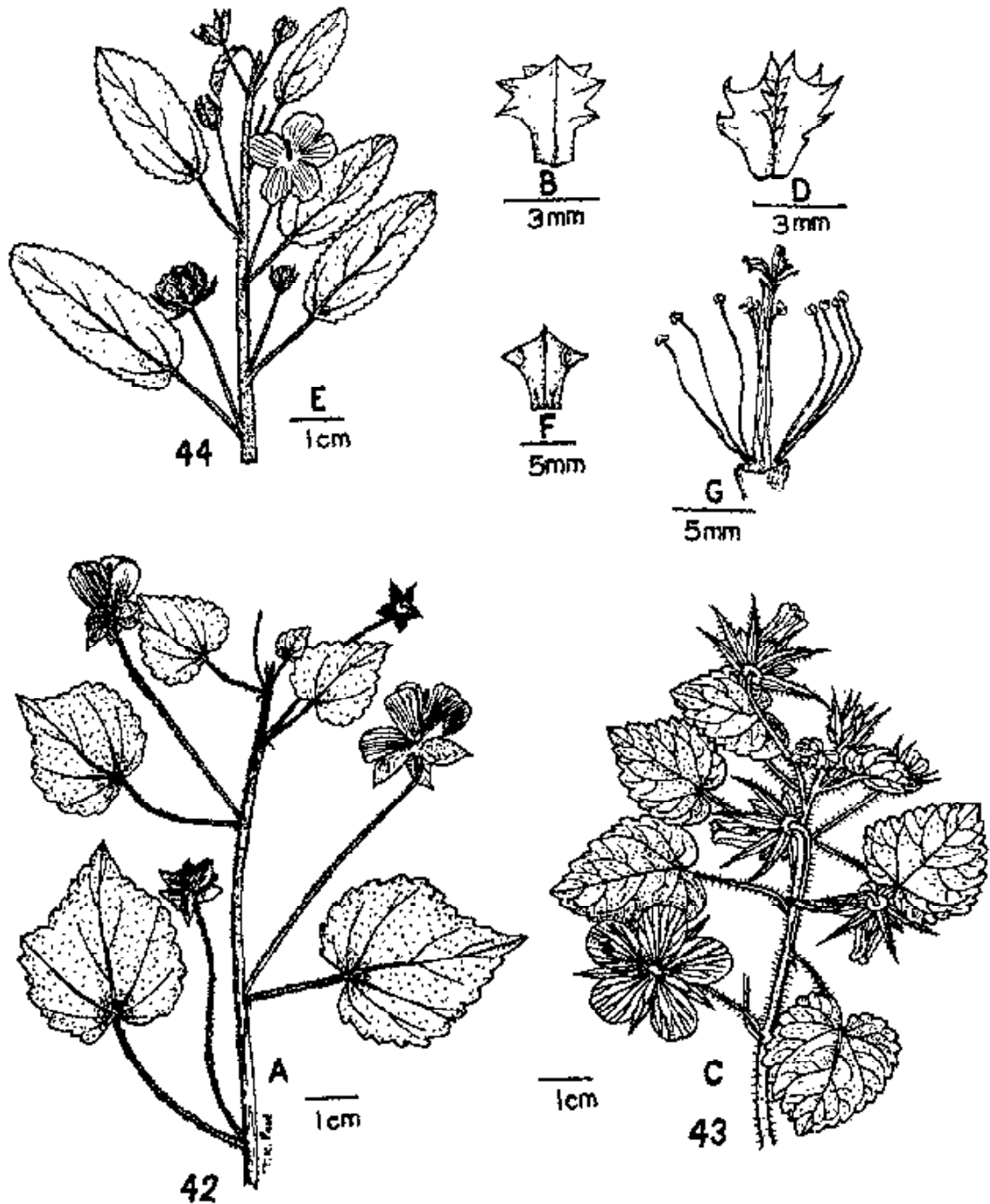


Fig. 42. *Pavonia procumbens* (Wt. & Arn.) Walp.

A. Habit. B. Mericarp.

Fig. 43. *Pavonia glechomifolia* (A. Rich.) Garcke ex Schweinf.

C. Habit. F. Mericarp.

Fig. 44. *Pavonia grewoides* Hochst. ex Boiss.

E. Habit. D. Mericarp. G. Staminal column with longer stamens.

1958). *P. ceratocarpa* Dalz. ex Mast. in Hook. f., Fl. Brit. India 1 : 331. 1874; Cooke, Fl. Pres. Bombay 1 : 102. 1901 (Repr. ed. 1 : 108. 1958). Fig. 44

*Local Names* : Karandiya, Khati-chhas (Guj.).

Erect undershrubs upto c. 45 cm high with woody stems and branches, branches purplish. Young portion of the stem, petioles and pedicels densely stellate pubescent, Leaves 2-6 × 1-2 cm, oblong, truncate or shallowly cordate at base, obtuse at apex, margin coarsely serrate, 5 nerved at the base, upper surface sparsely and lower surface densely stellate pubescent; petiole 1.0-2.5 cm long. Stipules c. 4 mm long, linear with stellate and few simple hairs. Flowers solitary, axillary or in clusters at the apex; pedicel 5-7 mm long, accrescent upto 2.5 cm, jointed above the middle. Epicalyx segments 8-10, free, 8-10 × 1 mm, linear, outside stellate hairy, glabrous inside. Calyx campanulate, connate more or less in the middle, lobes c. 8 × 5 mm, ovate-acute, prominently 5 nerved, outside densely stellate hairy, inside towards the apex and marginal portion densely appressed with simple and stellate hairs. Corolla yellow, turning red; petals c. 15 × 13 mm, more or less obovate, obtuse or truncate, outside towards the apex sparsely stellate hairy, inside glabrous. Staminal column c. 10 mm long, glabrous, antheriferous throughout, 5-toothed at apex, filaments of the basal anthers as long as the staminal column. Ovary c. 1.5 mm long, obovoid; style branched 10 mm long; stigmas capitate. Schizocarp depressed globose, 10-15 mm across; mericarps c. 5 mm high, pyriform, woody, muricated with 3 stout horns and 4 basal wing like appendages, glabrous, splitting through back. Seeds c. 1.5 mm across, reniform, glabrous, brownish.

*Type* : Abyssinia, alt. 4000', 24 Aug. 1854, Schimper s. n. (K).

*Fls. & Frts.* : Aug.-Nov.

*Distrib.* : INDIA : Gujarat, Maharashtra; PAKISTAN, ETHIOPIA. Rare occurrence.

*Exsicc.* : Gujarat : Porbandar, 7.1.10, R.K. Bhide s. n. (BSI); 3 miles south of Charopia; 18.10.59, Stower 66 a (BSI); Jamnagar-Rozibundar Rd., 25.9.1964, S.R. Rolla 102979 (BSI).

*Notes* : This species apparently looks like *Malvastrum coromandelianum* (Linn.) Garcke. It readily differs from other species of the genus *Pavonia* by its oblong to lanceolate leaves, mericarps with 3 horns and 4 basal wing like appendages.

4. *Pavonia odorata* Willd. Sp., Pl. 3 : 837. 1800; Roxb., Fl. Ind. ed. Carey 3 : 214. 1832; Mast. in Hook., f. Fl. Brit. India 1 : 331. 1874; Cooke, Fl. Pres. Bombay 1 : 102. 1901 (Repr. ed. 1 : 108. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 86. 1903 (Repr. ed. 1 : 81. 1960); Prain, Beng. Pl. 1 : 261. 1903 (Repr. ed. 1 : 177. 1963); Gamble, Fl. Pres. Madr. 1 : 93. 1915 [Repr. ed. 1(2) : 66. 1961]; Abedin in Fl. W. Pak. 130 : 101. 1979, *Hibiscus odoratus* Roxb. Hort.

Beng. 50. 1814 *nom. nud.* *Pavonia sidoides* Horn. in DC. Prod. 1 : 444. 1824.  
*P. rosea* Wall. Cat. n. 1887. 1828 *nom. nud.* *P. romborua* Wall. Cat. n. 2690.  
 1831 *nom. nud.* Fig. 47

Erect, odorous herbs upto c. 40 cm high. Stems, petioles and pedicels covered with sticky simple hairs. Leaves 2-10 × 1.5-4.0 cm, orbicular-ovate, occasionally upper ones lanceolate, obscurely 3-5 lobed, middle lobe longer, base cordate or more or less truncate, apex acute or slightly acuminate, margin irregularly dentate, 3-7 nerved at the base, both the surfaces with scattered stellate hairs, denser on the lower surface; petiole 1-8 cm. Stipules c. 2 mm long, linear, hairy, deciduous. Flowers solitary, axillary; pedicel 1.5-4.0 cm, accrescent upto 6 cm long, jointed above middle. Epicalyx segments 10-12, free, 0.5-1.5 cm, long, linear, ciliolate, persistent. Calyx c. 3 mm across, connate below middle, lobes c. 4.0 × 1.5 mm, ovate-lanceolate, both the surfaces with scattered simple hairs. Corolla pink, petals 1-2 cm long, glabrous. Staminal column shorter than the petals, glabrous. Ovary globose; stigma capitate. Mericarps 5, each c. 4 × 2 mm, more or less reniform, unarmed, wingless, glabrous. Seeds 2 mm long, reniform, minutely papillose, brownish black.

*Holotype* : B-W. 12829; Photo!

*Fls. & Frts.* : Aug.-Feb.

*Distrib.* : INDIA : Rajasthan, Punjab, Uttar Pradesh, West Bengal, Orissa, Bihar, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; PAKISTAN, BURMA, SRI LANKA, AFRICA.

*Exsicc.* : Orissa: Rambha (Ganjam Dt.), 12.8.1913, *Hooper* 39649 (CAL). Andhra Pradesh : Addatigala (E. Godavari Dt.), 28.5.1956, *Santapau* 20911 (BLAT); Kambakam hills (Chittoor Dt.), 350 m, 24.9.1974, *Chandrabose* 45075 (MH). Tamil Nadu : Kotagiri Ghat (Nilgiri hills), 31.8.1878, *King s. n.* (CAL).

*Pollen* : Panporate, spheroidal (average size 106 μ; range 105-109 μ). Pores circular (diameter 2 μ). Interporal distance 14 μ. Exine 9.8 μ thick, spinate. Ectine very thin, occurring as a thin membrane formed possibly by the fusion of the columella. Spine height 25 μ tip slightly rounded. Basal cushion not developed. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 16. 1962].

*Uses* : Occasionally cultivated in garden for its scented flowers. Leaves are edible. Roots are reported to be used in Indian perfume 'Hina'.

5. *Pavonia procumbens* (Wall. ex Wight. & Arn.) Walp. Rep. Bot. Syst. 1 : 301. 1842 *non* Casaretto 1842; Gamble, Fl. Pres. Madr. 1 : 93. 1915 (Repr. ed. 1 : 67. 1957); Borss. in Blumea 14 : 135. 1966; Abedin in Fl. W. Pak. 130 : 94. 1979. *Lebretonia procumbens* Wall. (Cat. no. 2688, 1831. *nom. nud.*) ex Wight. & Arn. Prod. Fl. Pen. Ind. Or. 47. 1834; Wight, l. c. 1 : t. 4. 1838. *L. flava* Wall. Cat. no. 1883. 1828. *nom. nud.* *L. cernua* Span. (in Hook. Comp. Bot. Mag. 1 : 344. 1836 *nom. nud.*) in Linnaea 15 : 168. 1841. *Pavonia cernua* (Span.) Walp. Rep. Bot. Syst. 2 : 790. 1843. Fig. 42

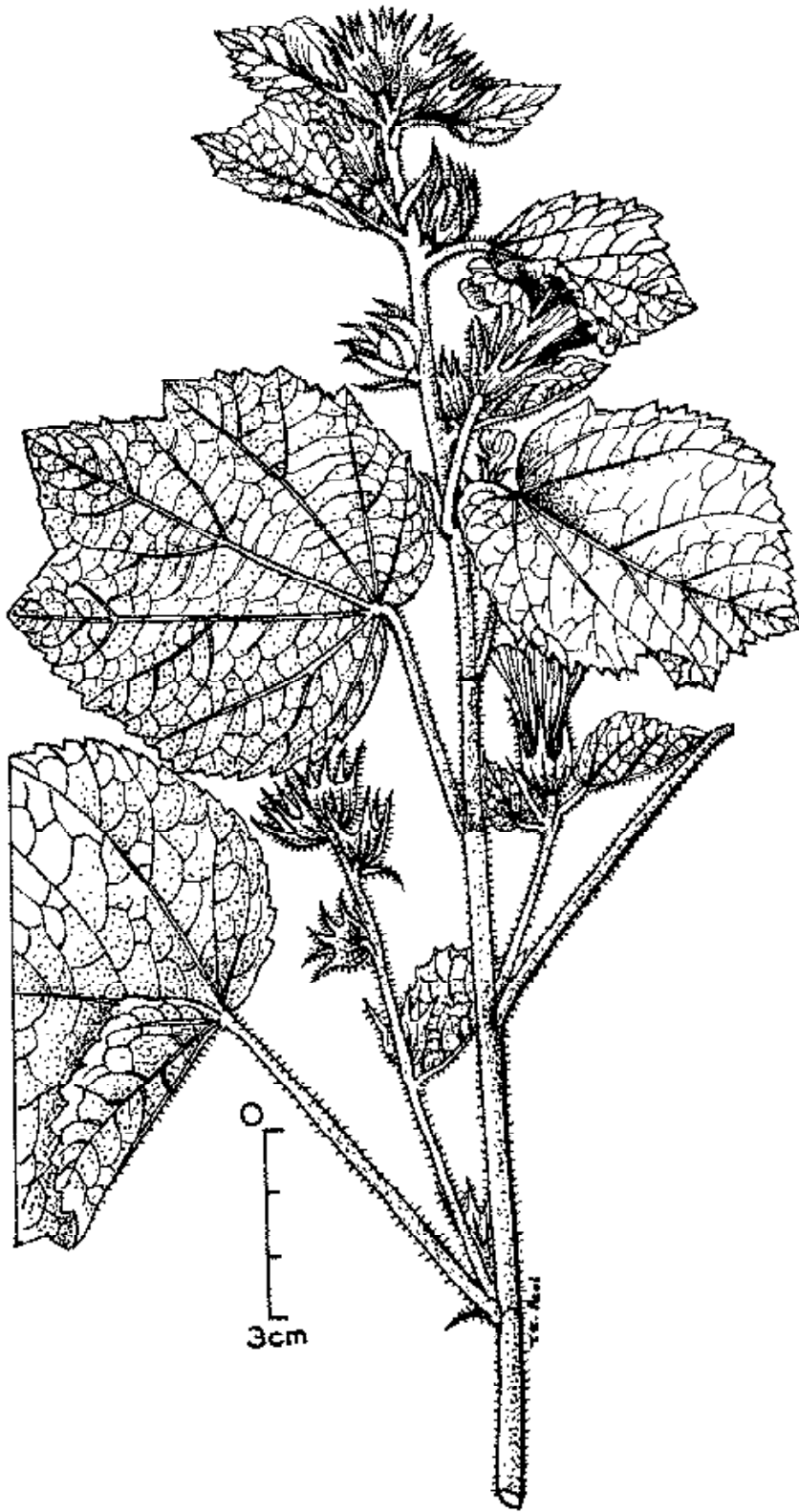


Fig. 45. *Pavonia repanda* (J.E. Sm.) Spreng.



Undershrubs or herbs procumbent or spreading. Stems, petioles and pedicels more or less covered with minute stellate, simple and some gland-hairs. Leaves 2-10 × 1.5-9.0 cm, orbicular ovate, often 3 lobed, base cordate, apex acuminate, margin coarsely crenate to serrate, 5-7 nerved at the base without any nectary, upper surface sparsely covered with minute stellate and some simple hairs, lower surface pubescent with minute stellate hairs, glabrescent later; petiole 0.5-9.0 cm. Stipules 3-5 mm, linear to filiform, hairy. Flowers solitary, axillary; pedicel 1.5-6.0 cm, jointed above the middle, densely hairy above the joint. Epicalyx rotate, segments 5, shortly connate at the base, each 5-10 × 3-6 mm, ovate, acute to acuminate, usually 3-nerved, both the surfaces with stellate hairs, margins with dense minute stellate hairs along with some long patent simple hairs. Calyx 9-12 mm across, campanulate, connate upto the middle, lobes 5-8 × 3-4 mm, ovate to lanceolate, acute to acuminate, outside densely covered with stellate hairs, inside glabrous. Corolla 1.5-2.0 cm across, yellow; petals c. 14 × 10 mm, obovate, apex rounded, base ciliate, outside with few scattered stellate hairs, inside glabrous. Staminal column c. 5 mm long, sparsely stellate hairy, antheriferous towards the apex. Mericarps 5, each c. 5 mm long and 3 mm across, obliquely triquetrous, obovoid, obtuse, each with a dorsal serrulate crest and 3-4 lateral stout-ridges on either side, sparsely stellate hairy, indehiscent. Seeds c. 2 mm across, reniform, angular, glabrous, brownish black.

*Type* : India, Wallich 2688 A (Lectotype : K-W; Isolectotype CAL!).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : INDIA : Rajasthan, Gujarat, Punjab, Maharashtra, Tamil Nadu, Kerala; PAKISTAN, BURMA, SRI LANKA, MALESIAN REGION, ARABIA, AFRICA.

*Exsicc.* : Rajasthan : Marwar, 1868, King s. n. (CAL). Gujarat : Dhinodhar (Cutch), 2.2.1957, Jain 11718 (BSI); Bileshwar on Barda Hill, 13.5.1952, Santapau 14297 (BLAT). Andhra Pradesh : Bukkapatam (Anatpur Dt.), 454, m, July 1889, Gamble 20949 (CAL). Tamil Nadu : Maruthamalai (Coimbatore Dt.), 653 m, 23.11.1956, Sebastine 1441 (CAL).

6. *Pavonia repanda* (J.E.Sm.) Spreng. Syst. iii. 98. 1828. *Urena repanda* Roxb. (Hort. Beng. 51. 1814 *nom. nud.*) ex J.E. Sm. in Rees, Cyclop. 37. n. 6. 1819; Roxb. Fl. Ind. ed. Carey 3 : 182. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 330. 1874; Duthie, Fl. Upper Gang. Pl. 1 : 85. 1903 (Repr. ed. 1 : 80. 1960); Prain, Beng. Pl. 1 : 261. 1903; Gamble, Fl. Pres. Madr. 1 : 92. 1915 (Repr. ed. 1 : 66. 1957); Haines, Bot. Bih. & Or. 1(2) : 63. 1921 [Repr. ed. 1(2) : 65. 1961]. *U. palmata* Roxb. Fl. Ind. ed. Carey 3 : 182. 1832. Fig. 45

Perennial erect much branched herbs. Stems, petioles and pedicels densely stellate hairy. Leaves 3-8 × 2.5-10.0 cm, ovate to ovate rounded, rarely 3-5 or 7 lobed, upper leaves sometimes lanceolate, base cordate, apex acute, margin repand-serrate, 5-7 nerved at the base, midveins with nectaries at the base

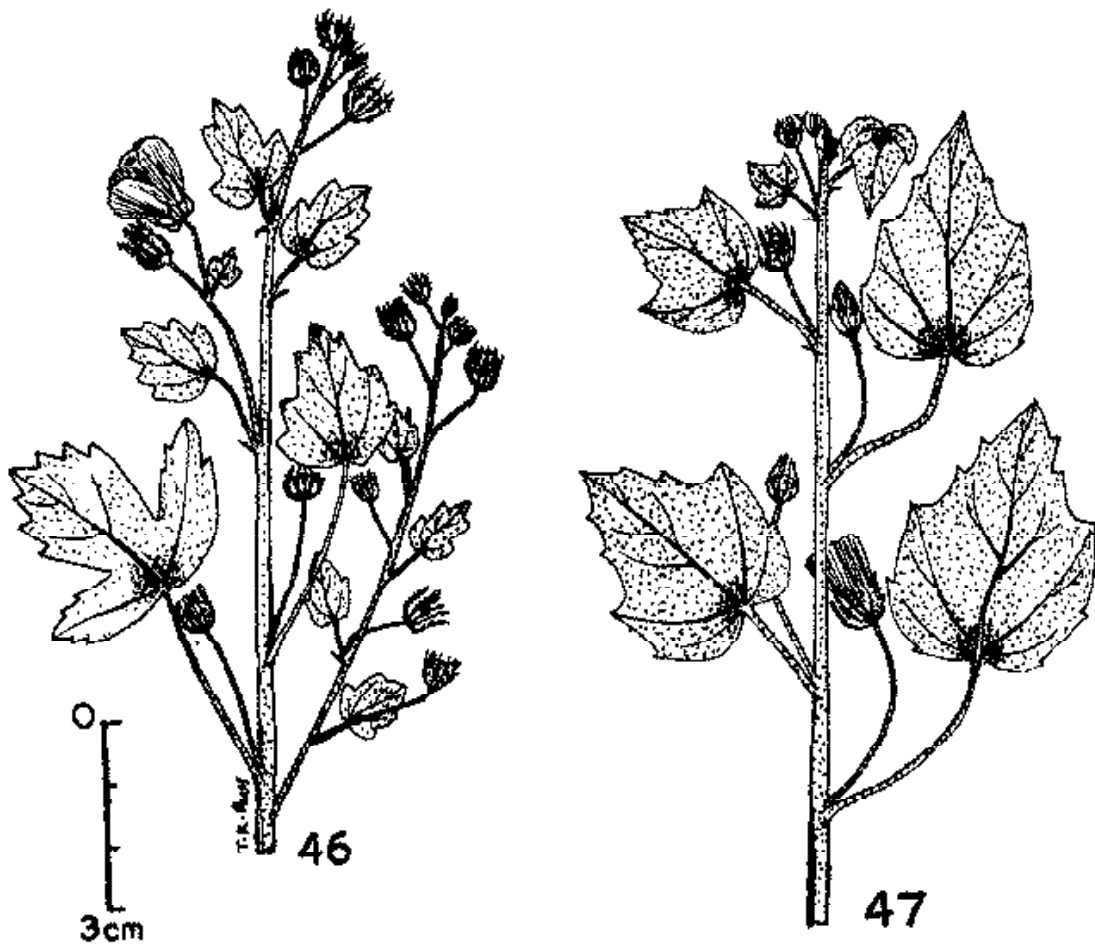


Fig. 46. *Pavonia zeylanica* (Linn.) Cav.

Fig. 47. *P. odorata* Willd.

below, both the surfaces stellate pubescent; petiole 1-6 cm. Stipules c. 5 mm long, linear, stellate hairy. Flowers solitary, axillary, ultimately in terminal clusters; pedicel 1-5 mm long. Epicalyx cup-shaped, subcoriaceous, segments 5, connate in the middle, 1.0-1.5 × 0.5-1.0 cm, outside strongly nerved and densely stellate hairy, inside sparsely stellate hairy. Calyx campanulate; lobes connate upto the middle, shorter than the epicalyx, more or less deltoid, acute to acuminate, outside densely stellate hairy, sparsely hairy towards the apex inside. Corolla twice the length of the epicalyx, pink with darker centre; petals oblong-ovate, outside densely stellate hairy towards the apical portion, inside glabrous. Staminal column 1.5-2.0 cm long. Mericarps c. 4.0 × 2.5 mm, oblong-ovoid, appressed in two sides, unarmed, glabrous. Seeds c. 3 × 2 mm, glabrous, brownish black.

*Type* : Roxb. Icon. no. 1882 (CAL).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : INDIA : Punjab, Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Tamil Nadu, Kerala; SOUTH EAST ASIA.

*Exsicc.* : Uttar Pradesh : Nishangara, 20.11.64, *Panigrahi* 6433 (CAL). Orissa Sambodala (Kalahandi Dt.), 22.9.56, *S.K. Mukherjee* 4958 (CAL). Bihar : Near Mazaria colony, 11.11.1963, *B.V. Shetty* 235 (CAL). West Bengal : Darjeeling, 2.12.1857, *Thomson s. n.* (CAL).

*Pollen* : Average size 109  $\mu$  (range 105-112  $\mu$ ). Tip of excrescences (bacula) rounded. [P.K.K. Nair in *Bull. Nat. Bot. Gard.* 63 : 18. 1962].

*Notes* : Guerke (*Bot. Jahrb.* 16 : 363. 1892) placed this species under the genus *Urena* L. inn. as this species has the leaves with nectaries on the nerves beneath. But Hochreutiner (*Ann. Cons. Jard. Bot. Geneve* 5 : 131. 1901) placed this species under the genus *Pavonia* Cav. as this species is lacking glochidia on the mericarps. After studying all the specimens of this species in CAL, it is seen that this species is somewhat allied to *Urena lobata* Linn. in having short pedicel, flowers in axillary or terminal clusters and also in the shape and size of leaves. But it readily differs from the latter by the following characters : Epicalyx segments free above or about in the middle and mericarps smooth, without any glochida.

7. *Pavonia zeylanica* (Linn.) Cav., *Diss.* 3 : 134, t. 48, f. 2. 1787; Roxb. *Fl. Ind.* ed. Carey 3 : 214. 1832; Mast. in Hook. f., *Fl. Brit. India* 1 : 331. 1874; Cooke, *Fl. Pres. Bombay* 1 : 102. 1901 (Repr. ed. 1 : 108. 1958); Gamble, *Fl. Pres. Madr.* 1 : 93. 1915 (Repr. ed. 1 : 67. 1957); Abedin in *Fl. W. Pak.* 130 : 98. 1979. *Hibiscus zeylanicus* Linn., *Sp. Pl.* 699. 1753. Fig. 46

Perennial undershrubs or herbs upto c. 1 m high. Stem with numerous decumbent branches towards the apex, basal portion of stem thick, woody. Stems, petioles and pedicels pubescent with stellate and some long patent

simple hairs. Leaves 1-4 × 0.8-3.5 cm, orbicular to obovoid-rounded, deeply 3-5 lobed, cordate at base, apex acute or rounded, margin dentate, both the surfaces sparsely stellate hairy; petiole 0.5-8.0 cm. Stipules c. 2 mm, linear, hairy, deciduous. Flowers solitary, axillary; pedicel 1-4 cm, jointed towards the apex. Epicalyx segments 10, 6-10 mm long, linear, ciliate, persistent. Calyx campanulate, free upto the middle, lobes 2-4 × c. 1.5 mm, ovate, lanceolate or deltoid, outside sparsely covered with simple hairs, inside glabrous. Corolla pale pink or pinkish white; petals c. 10 × 5 mm, glabrous. Staminal column c. 8 mm long, antheriferous throughout. Ovary 1.5 mm across, more or less ovoid, glabrous; style branches 10; stigmas capitate. Schizocarp globular, pubescent; mericarps 5, each c. 4 × 3 mm, oblong, obtuse, slightly winged at angles, awnless, glabrous, dehisces from the top. Seeds c. 3 mm × 1.5 mm, reniform, minutely pubescent.

*Type* : Herb. Herm. vol. IV. fol. 51. Linn. n. 286 (BM).

*Fls. & Frts.* : July-Dec.

*Distrib.* : INDIA : Rajasthan, Gujarat, Uttar Pradesh, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; PAKISTAN, SRI LANKA, ARABIA, MAURITIUS, AFRICA.

*Exsicc.* : Rajasthan : Baori (Jodhpur), 26.8.77, *A.N. Singh* 4388 (CAL). Uttar Pradesh : Mirzapur, 8.2.1961, *Bhattacharya* 13264 (BSD). Maharashtra : Poona, 1882, *Woodrow* 30 (CAL). Tamil Nadu : Foot of Kuridimalai (Coimbatore Dt.), 700 m, 10.7.1956, *K. Subramanyam* 218 (MH); Andhra Pradesh : Pyapati (Kurnool Dt.), 303 m, July 1885, *Gamble* 16344 (CAL).

*Pollen* : Average size 130 μ (range 126-140 μ). Interporal distance 17.5 μ. Spine height 15 μ. Exine thickness 5.6 μ excluding the spines. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 17. 1962].

## 20. SENRA

*Cav. Diss.* 2 : 104, t. 35. f. 3. 1786; *Benth. & Hook. f., Gen. Pl.* 1 : 207. 1862; *Mast. in Hook. f., Fl. Brit. India* 1 : 334. 1874; *K. Schumann in Engl. & Prantl, Nat. Pflanzenfam.* 3, 6 : 47. 1890; *Hutch., Gen. Fl. Pl.* 2 : 544. 1967.

Undershrubs or shrubs, soft brownish pubescent. rounded orbicular, Leaves cordate at base, 3-lobed. Flowers axillary, solitary, shortly pedicelled. Epicalyx segments 3, free, large, cordate, membranous at maturity. Calyx 5-fid. Corolla deep purple in colour, petals-5. Staminal column 5-toothed at the apex, antheriferous just below the apex. Ovary 5-locular, 2 ovules in each locule; style branches 5. Capsule 5-valved, loculicidally dehiscent, wrinkled. Seed 1 in each locule, reniform, pubescent or villous.

*Distrib.* : c. 3 species in AFRICA, ARABIA, PAKISTAN and INDIA. 1 species in INDIA.

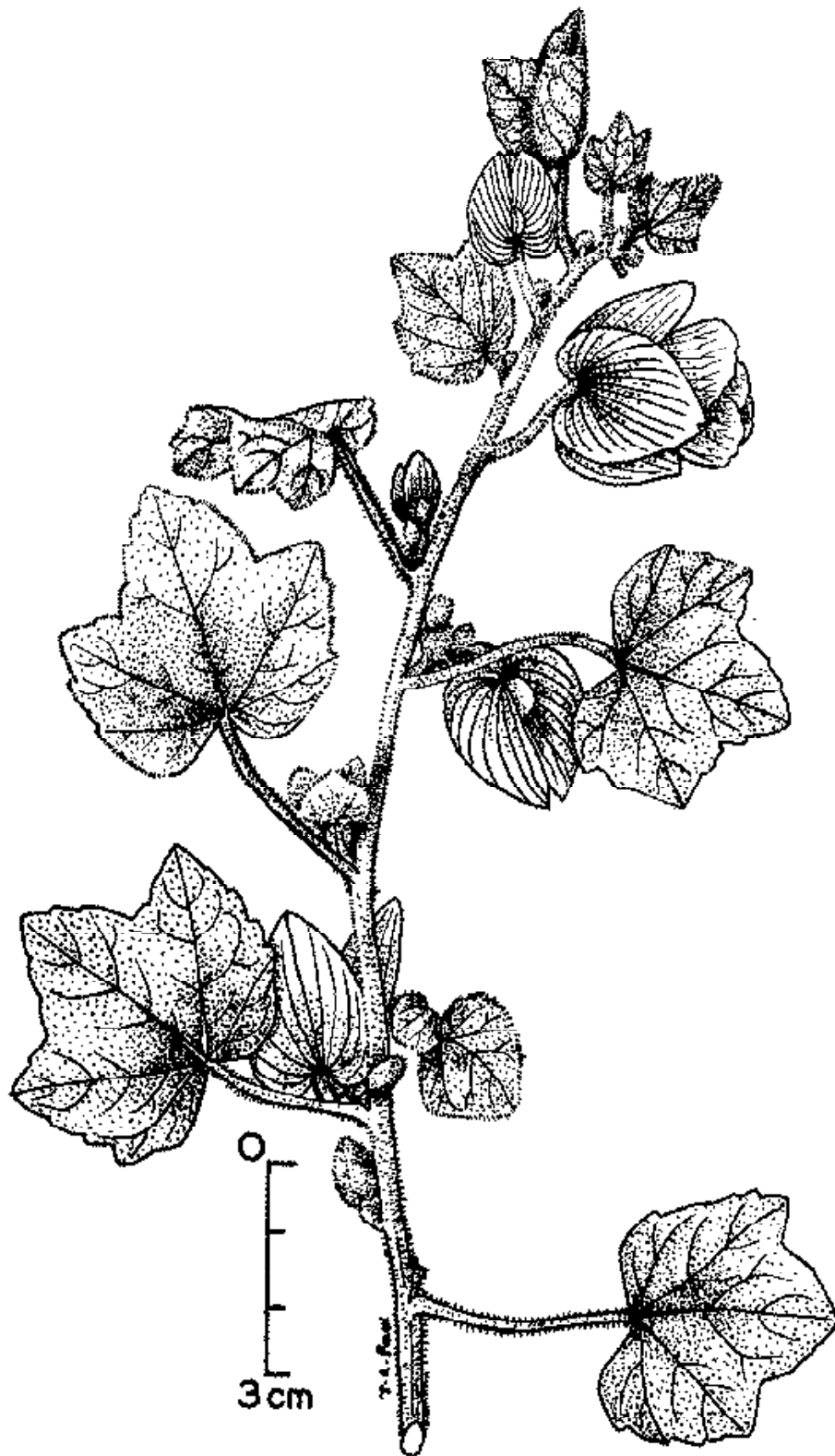


Fig. 48. *Senro incana* Cav.

*Senra incana* Cav. Diss. 2 : 83, t. 35, f. 3. 1786; Boiss. Fl. Or. 1 : 838. 1867; Mast. in Hook. f., Fl. Brit. India 1 : 334. 1874; Cooke, Fl. Pres. Bombay 1 : 103. 1901 (Repr. ed. 1 : 110. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 87. 1903 (Repr. ed. 1 : 82. 1960); Abedin in Fl. W. Pak. 130 : 4. 1979. *Dumreichera incana* Hochst. and Steud. in Flora 21 : 26. 1838. *Gossypium bakeri* Watt in Kew Bull. 210. 1926. Fig. 48

Erect or climbing herbs or undershrubs, pubescent. Leaves 1.5-3.5 × 2-3 cm, rounded, orbicular or more or less deeply 3-lobed, lobes deltoid, apex acute, base deeply cordate, margin entire, stellate pubescent on both surfaces; petiole 1.5-3.5 cm long. Stipules c. 2 mm long, filiform. Flowers solitary, axillary; pedicel 0.5-1.5 cm long. Epicalyx segments 1.5-2.5 × 1.5-2.5 cm. Calyx campanulate, c. 5 mm across, lobes 1.5-2.0 mm long and broad. Petals 1.5-3.0 × 1.0-1.5 cm, obovate. Staminal column about half the length of the petal. Capsule c. 5.5 × 4.5 mm, ovoid, reticulate, ribbed, valves slightly winged, papery. Seeds c. 2 × 1 mm, reniform, pubescent.

*Type* : Untraceable.

*Fls. & Frts.* : Oct.-Apr.

*Distrib.* : INDIA : Gujarat; PAKISTAN, ARABIA, EAST AFRICA

*Exsicc.* : Gujarat : Beyt Shankkodhar island, Saurashtra, 13.10.1953, *M.B. Raizada* 23862 (DD); Dwarka, Saurashtra, 12.10.1953, *M.B. Raizada* 23859 (DD); Shaukolai point, Beyt, Saurashtra coast, 17.11.1962, *T. A. Rao* 1295 (CAL); Dwarka North, Saurashtra Coast, 10.2.1963, *B. Safui* 2410 (CAL).

## 21. SIDA

Linn., Sp. Pl. 683. 1753; Gen. Pl. ed. 5. 306. 1754; Benth. & Hook. f., Gen. Pl. 1 : 203. 1862; K. Schumann in Engl. & Prantl Nat. Pflanzenfam. 3, 6 : 42. 1890; Borss. in Blumea 14 : 177. 1966; Hutch., Gen. Fl. Pl. 2 : 560. 1967.

Annual or perennial herbs or undershrubs. Leaves ovate, rhomboid, obovate or lanceolate, entire, rarely lobed or divided, palmi- or penni-nerved without any nectary. Flowers axillary, solitary or in axillary clusters by the development of axillary buds or in racemes or panicles by replacement of the upper leaves, Epicalyx absent. Calyx mostly campanulate, 5-lobed. Corolla rotate, connate below and also adnate to the staminal column, yellow or yellowish white. Staminal column shorter than the petals, hairy or glabrous. Carpels 5-14, uni-ovulate; styles as many as the carpels; stigmas capitate. Schizocarp globular to oblate, depressed. Mericarps more or less trigonous, apex mucous or with two beaks or biaristate, outer surface smooth or prominently reticulate, indehiscent or dehiscent along the mid-dorsal line, rarely along the inner margin or by breaking down of the lateral or basal walls. Seeds ovoid-oblong to reniform, glabrous or hairy.

*Distrib.* : c. 200 species in the tropics and subtropics of the World. About two-third species are restricted to the New World tropics. 12 species in India.

### KEY TO THE SPECIES

- 1a. Mericarps 5 :
- 2a. Mericarps smooth, mucronate. Seeds dispersed by withering of the wall. Leaves palmi-nerved :
- 3a. Erect herbs or undershrubs. Flowers in apparent racemes :
- 4a. Plants viscid. Staminal column glabrous . . . . . *S. mysorensis* 7
- 4b. Plants not viscid. Staminal column pubescent . . . . . *S. elongata* var. *balica* 5
- 3b. Prostrate or diffuse herbs. Flowers usually solitary :
- 5a. Pedicels jointed near the middle. Mericarps not awned, glabrous . . . . . *S. cordata* 9
- 5b. Pedicels jointed near the apex. Mericarps hairy . . . . . *S. javensis* ssp. *expilosa* 6
- 2b. Mericarps with prominent reticulation, awned. Seeds dispersed by dehiscing the mericarps at apex. Leaves penninerved.:
- 6a. Leaves wedge shaped, oblong, apex retuse with a small toothlet in the hollow middle. . . . . *S. schimperiana* 10
- 6b. Leaves ovate, oblong or lanceolate, apex acute :
- 7a. Stem with 1-2 spiny emergences at the base of petiole. Mericarps with 2 divergent apical awns . . . . . *S. spinosa* 11
- 7b. Stem without any spiny emergence. Mericarps with a pair of convergent apical awns . . . . . *S. alba* 2
- 1b. Mericarps 6-12 :
- 8a. Stipules of each pair different, one linear to lanceolate and other linear to filiform. Leaves sparsely hairy, soon glabrescent. . . *S. acuta* 1
- 8b. Stipules of each pair not different. Leaves pubescent :
- 9a. Mericarps dehiscent :
- 10a. Mericarps with 2 awns, awns retrose hairy . . . . . *S. cordifolia* 4
- 10b. Mericarps with or without awns, awns never retrose hairy . . . . . *S. rhombifolia* 9
- 9b. Mericarps indehiscent :
- 11a. Schizocarp completely enclosed by the calyx. Calyx lobes 8-9 × 5-7 mm. Mericarps with 2 outgrowth just below the awns . . . . . *S. tiagii* 12
- 11b. Schizocarp not completely enclosed by the calyx. Calyx lobes 5-7 × 3-5 mm. Mericarps without outgrowth below the awns . . . . . *S. ovata* 8
1. *Sida acuta* Burm. f. Fl. Ind. 147. 1768; Roxb. Fl. Ind. ed. Carey 9 : 171. 1832; Wt. & Arn., Prod. Fl. Pen. Or. 57. 1834; Cooke, Fl. Pres. Bombay 1 : 93. 1901 (Repr. ed. 1 : 98. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 81. 1903 (Repr. ed. 1 : 76. 1960); Gamble, Fl. Pres. Madr. 1 : 90. 1915 (Repr. ed. 1 : 64. 1957); Haines, Bot. Bih. & Or. 1(2) : 61. 1921 (Repr. ed. 1(2) : 63. 1961);

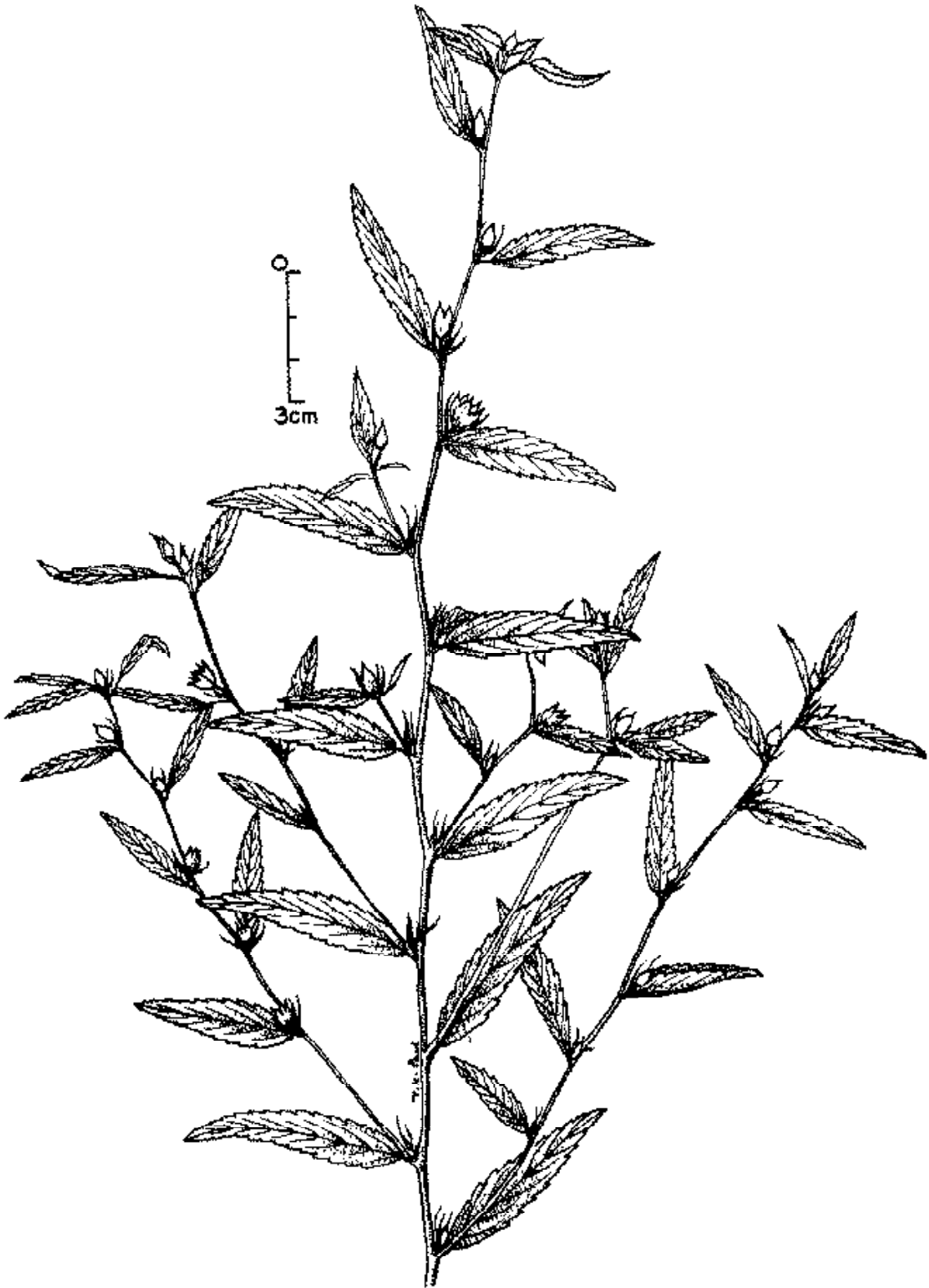


Fig. 49. *Sida acuta* Burm. f.



Borss. in Blumea 14 : 186. 1966. *S. carpinifolia* var. *acuta* (Burm. f.) Kurz in Journ. Asiat. Soc. Beng. 45 : 119. 1876. *S. orientalis* Cav. Diss. 1 : 21, t. 21, f. 1. 1785. *S. lanceolata* Retz. Obs. 4 : 28. 1786; Roxb. Hort. Beng. 50. 1814 *nom. nud. et* in Fl. Ind. ed. Carey 3 : 175. 1832. *S. carpinifolia* Mast. in Hook. f., Fl. Brit. India 1 : 323. 1874 *non* Linn. f. 1781. Fig. 49

-Annual undershrubs or herbs, 0.5-2.0 m high, erect or ascending. Stem pubescent with minute stellate hairs along with simple hairs, glabrescent later. Leaves 1.9 × 0.5-2.5 cm, lanceolate to linear, elliptic-lanceolate or ovate-oblong, base mostly acute, rarely obtuse or rounded, apex acute, margin coarsely or remotely serrate, 3-nerved at the base, both the surfaces sparsely hairy with few stellate and simple hairs, soon glabrescent; petiole 2-6 mm long, pubescent with minute stellate hairs. Stipules 6-12 × 1.0-1.5 mm, each pair different, one linear to lanceolate, 3-6 nerved and another linear to filiform, 1-4-nerved. Flowers solitary, axillary or in clusters of 2-3; pedicel 3-12 mm long, stellate pubescent. Calyx 5-6 mm across, campanulate, slightly accrescent, 5-lobed; lobes c. 7 × 3 mm, outside with stellate and simple hairs, inside glabrous. Corolla 8-10 mm across, light yellow; petals as long as the calyx lobes or slightly exceeding, outside sparsely covered with glandular hairs. Staminal column c. 4 mm long with simple and glandular hairs, antheriferous towards the apex. Ovary c. 1.5 mm long, ovoid. Mericarps 6-10, c. 4 mm long, tetrahedral, birostrate, awns 1.5 mm long with a groove in between the awns, glabrous, reticulately striate, one seeded. Seeds c. 2 mm long, triangularly-ovoid, glabrous except the short hairy hilum, dark brown.

*Type* : Java, *S. Coll.s. n.* (Lectotype : G).

*Fls. & Frts.* : Sept.-May.

*Distrib.* : INDIA : Throughout. Throughout the tropics of the World.

*Exsicc.* : Uttar Pradesh : Corbett National Park, 17.11.1972, *Janardanan* 50193 (BSD). West Bengal : Bambukabasthi, Kalimpong (Darjeeling Dt.), 1212, m, 6.11.60, *Thothathri* 9447 (CAL). Tamil Nadu : Chingliput Dt., Nov. 1883, *Gamble* 13503 (CAL). Karnataka : Kemmangundi, 20.10.1964, *Raghavan* 103663 (BSI).

*Pollen* : Panporate, spheroidal (average size 98 μ; range 98-105 μ). Pores circular (diameter 5-6 μ). Interporal distance 39 μ. Exine 4 μ thick, being 7 μ thick at spine base. Ectine spinate. Spine height 3.5 μ, tip acute, side bulbous at the base. Basal cushion low, the depression between adjacent cushions being shallow. Columella forming the ectine more or less free. [P.K.K. Nair in Bull. Not. Bot. Gard. 63 : 13. 1962].

*Chr. No.* : 2n = 28 (Udgorogho in Taxon 24 : 673. 1975).

*Notes* : This species can be easily recognised by having : Stipules of each pair different, one linear to lanceolate, 3-6-nerved, the other linear to filiform and leaves glabrescent.



Fig. 50. *Sida cordata* (Burm. f.) Borss.

2. *Sida alba* Linn., Sp. Pl. ed. 2. 960. 1763; Abedin in Fl. W. Pak. 190: 81. 1979. *S. alnifolia* var. *obovata* sensu Hu, Fl. China, fam. 153: 22. t. 16. f. 5. 1955 non *S. rhombifolia* var. *obovata* Wall. ex Mast. in Hook. f., Fl. Brit. India 1: 323. 1874.

Undershrubs or herbs upto c. 1 m tall, stellate pubescent. Leaves 1.0-2.5 × 0.5-2.0 cm, elliptic-obovate, apex acute, base cuneate or obtuse, margin crenate-serrate, upper surface glabrescent, lower surface minutely stellate pubescent; petiole 0.5-1.0 cm long. Stipules c. 5 mm long, filiform. Flowers axillary, solitary or paired; pedicel 3-6 mm long, fruiting pedicel 1-2 cm long. Calyx campanulate, 3-5 mm across, free above the middle; lobes 2-4 × 1-2 mm, deltoid, acute. Corolla slightly exceeding the calyx, yellow. Schizocarp depressed globose, 4-5 mm across; mericarps 5, c. 2 mm long, 1.5 mm broad, stellate pubescent, with 2 convergent apical awns, awns c. 0.8 mm long, hairy, dehisces at the base. Seeds 1.5 mm long, glabrous, brownish-black.

*Type* : H.U. Herb. Linn. n. 866.2 (LINN; Photo!).

*Fls. & Frts.* : Sept.-Dec.

*Distrib.* : INDIA : Throughout; PAKISTAN.

*Exsicc.* : West Bengal : Belgharia, 14.9.60, B. Gupta 500 (CAL); Belgharia, 5.11.59, A. Mukherjee 139 (CAL).

3. *Sida cordata* (Burm. f.) Borss. in Blumea 14: 182. 1966; Abedin in Fl. W. Pak. 190: 77. 1979. *Melochia cordata* Burm. f., Fl. Ind. 143. 1768. *Sida veronicifolia* Lamk. Encycl. 1: 5. 1783; Cooke, Fl. Pres. Bombay 1: 92. 1901 (Repr. ed. 1: 97. 1958); Duthie, Fl. Upper Gang. Pl. 1: 80. 1903 (Repr. ed. 1: 75. 1960); Gamble, Fl. Pres. Madr. 1: 89. 1915 (Repr. ed. 1: 64. 1957); Haines, Bot. Bih. & Or. 1(2): 59. 1921 (Repr. ed. 1(2): 61. 1961). *S. humilis* Cav. Diss. 5, t. 134 f., 2. 1788; Mast. in Hook. f., Fl. Brit. India 1: 322. 1874. *S. humilis* var. *veronicifolia* (Lamk.) Mast. in Hook. f., Fl. Brit. India 1: 322. 1874. *S. beddomei* K.C. Jacob in Journ. Bombay Nat. Hist. Soc. 47: 50. 1950. Fig. 50

Prostrate or semiprostrate herbs upto c. 1 m high, branched throughout or mostly towards the base, rarely rooting at the nodes in trailing condition. Stems, petioles and pedicels pubescent with scattered long patent simple and minute stellate hairs but without gland-hairs. Leaves 0.5-8.0 × 0.3-5.5 cm, ovate to orbicular, cordate, acute to acuminate, crenate-dentate or serrate, 5-7-nerved at the base, both the surfaces with appressed simple and stellate hairs, more simple hairs on the upper surface; petiole 1.5-30.0 mm long. Stipules 1-3 mm, linear, filiform, hairy. Flowers axillary, solitary, ultimately in few-flowered racemes either by development of accessory buds or by replacement of the upper leaves; pedicel 1.0-2.5 cm, slender, slightly accrescent, jointed above the middle. Calyx c. 3 mm across, campanulate, lobes connate above the middle, 4-6 × c. 2 mm, deltoid, acuminate, one prominent nerve in the middle, outside

hairy with simple and some stellate hairs, inner surface glabrous except the margin. Corolla c. 10 mm across, yellow to light yellow; petals c. 5 × 4 mm, obovate, ciliate at the base. Staminal column c. 3 mm long, basal portion conical, tubular part short, glabrous or with some short simple hairs. Schizocarp c. 4 × 5 mm, globose, enclosed within the persistent calyx, brownish black; mericarps 5, each c. 4 × 2 mm, slightly longitudinally keeled on the back, tetrahedral with rounded angles, awnless, dehiscent at the apex. Seeds c. 2 × 1 mm, brownish black, glabrous, dispersed by withering of the wall.

*Fld. & Frts.* : Throughout the year, mainly at the end of rainy season.

*Distrib.* : Throughout INDIA. Tropical and subtropical regions of the World.

*Essicc.* : Uttar Pradesh : Trisula (Garhwal), 1400 m, 23.10.1970, *Naithani* 42269 (CAL). Bihar : Udaipur forest (Champaran Dt.), 7.4.63, *Thothathri* 9918 (CAL). West Bengal : Tarpania, Ajodhya hills (Purulia Dt.), 600 m, 17.5.1963. *U. Chatterjee* 86 (CAL); Digha (Midnapur Dt.), 20.3.1960, *J.C. Sengupta* 1811 (CAL).

*Uses* : Stems, leaves and root barks are medicinal. Stem yields good fibre.

*Pollen* : Average size 73  $\mu$  (range 70-74  $\mu$ ). Pore diameter 2.8  $\mu$ . Interporal distance 2.8  $\mu$ . Ectine spinulate. Spinule height 2  $\mu$ . Basal cushion high, the columella composing it being fused. [ P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 14. 1962].

*Notes* : This species shows variation in indumentum and inflorescence. This species has the general appearance of *S. mysorensis* Wt. & Arn. but differs from the latter in having semiprostrate habit and absence of gland-hairs.

4. *Sida cordifolia* Linn. Sp., Pl. 684. 1753; Roxb., Fl. Ind. ed. Carey 3 : 177. 1832; Mast. in Hook. f., Fl. Brit. India 1 : 324. 1874; Cooke, Fl. Pres. Bombay 1 : 94. 1901 (Repr. ed. 1 : 99. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 82. 1903 (Repr. ed. 1 : 77. 1960); Gamble, Fl. Pres. Madr. 1 : 89. 1915 (Repr. ed. 1 : 64. 1957); Haines, Bot. Bih. & Or. 1(2) : 58. 1921 (Repr. ed. 1(2) : 61. 1961); Borss. in Blumea 14 : 199. 1966; Abedin in Fl. W. Pak. 130 : 83. 1979. *S. rotundifolia* Lamk., Encyl. 1 : 5. 1783.

*Local Names* : : Bariala, Berala (Hindi & Beng.); Batyulaka (Sans.).

Erect undershrubs upto c. 1 m high with an unpleasant smell. Stems, petioles and pedicels velutinous to tomentose or densely pubescent with minute stellate hairs intermingled with some patent simple hairs. Leaves 0.5-6.0 × 0.4-5.0 cm, ovate-oblong or orbicular, base shallowly cordate, occasionally rounded or truncate, apex obtuse to acute, margin crenate-serrate, 5-7-nerved at the base, both the surfaces densely velutinous with minute stellate hairs, occasionally with some patent simple hairs in the lower surface particularly on the veins; petiole 0.5-4.0 cm. Stipules 3-10 mm, filiform, densely stellate hairy

intermingled with some simple hairs. Flowers solitary, axillary or in axillary clusters of 2-5 flowers particularly towards the apical portion of the stem; pedicel 2-10 mm, accrescent upto *c.* 2 cm, jointed towards the apex. Calyx 5-9 mm across, somewhat accrescent, campanulate; lobes deltoid, acute to acuminate, outside densely pubescent with setulate hairs intermingled with some simple hairs, inside towards the apex sparsely stellate hairy, rest portion glabrous. Corolla *c.* 15 mm across, yellow or whitish yellow; petals obliquely obovate, apex truncate, base ciliate. Staminal column *c.* 2.5 mm long, simple hairy or glabrous. Ovary conical, stellate hairy. Mericarps 8-10, *c.* 3.5 mm long (excluding the awns), radially *c.* 2 mm, both the dorsal and ventral surface with prominent reticulation, dorsal and apical portion stellate hairy, apex of mericarp with a pair of awns, awns 3.0-4.5 mm long, retrose hairy. Seeds *c.* 2 mm across, flattened reniform, hilum with few short hairs, rest portion glabrous, dark brown or black.

*Type* : Herb. Linn. n. 866.12 (LINN; Photo!).

*Fls. & Frts.* : Throughout the year.

*Distrib.* : INDIA : Throughout; Tropics and subtropics of the World.

*Exsicc.* : Himachal Pradesh : Hamirpur Dt., 1200-1500 m, 16.8.1977, *Viswanathan* 61677 (BSD). Uttar Pradesh:Kisli (Mandla Dt.), 14.3.62, *J.K. Maheswari* 4910 (CAL). Andhra Pradesh:Uppada, 5.10.1969, *T.A. Rao* 7317 (CAL); Meelavagu (Guntur), 2.9.1956, *S.K. Wagh* 3596 (BLAT). Tamil Nadu : Maruthamalai (Coimbatore Dt.), 65 m, 31.7.1956, *Sebastine* 492 (CAL).

*Chr. No.* :  $2n = 28$  (Fernandez in *Bol. Soc. Argent Bot.* 15:403-410. 1974).

*Notes* : This species can be easily recognised by its schizocarp having 8-10 flattened-trigonous mericarps each with 2 long retrose hairy awns.

5. *Sida elongata* Blume var. *balica* (Miq.) Borss. in *Blumea* 14 : 182. 1966; *Matthew et al* in *Journ. Econ. Tax. Bot.* 4(2):617. 1983. *S. balica* Miq. *Fl. Ind. Bat.* 1,2 : 141. 1858; *Backer & Bakh. f.*, *Fl. Java* 1 : 427. 1963.

Erect herbs, *c.* 1.5 m tall. Stem terete, densely pubescent with stellate and simple hairs. Leaves 2.5-10 × 1-8 cm, ovate, apex acute to acuminate, cordate at base, margin irregularly crenate, densely pubescent with stellate and simple hairs; petiole 3-6 mm long, pubescent. Stipules 6-7 mm long, linear, hairy. Flowers axillary, initially solitary, ultimately in lax racemes or panicles by development of accessory buds, Pedicel 1-2 cm, accrescent upto 4 cm, thin, jointed in the middle. Calyx *c.* 3 mm long, campanulate, 5-fid; lobes as long as the tube, triangular, margins ciliate. Corolla *c.* 20 mm across, yellow; petals *c.* 10 mm long, obovate, rounded at apex, glabrous. Staminal column *c.* 5 mm long, hairy, base conical, antheriferous at apex. Mericarps 5, trigonous with blunt angles, *c.* 2.5 mm long, without awns, dorsally short hairy. Seeds *c.* 2.5 mm long, ovoid, slightly trigonous, glabrous, greyish.

*Type* : Timor, Zollinger 704z (Lectotype : P; Isotypes : P, U).

*Distrib* : INDIA : Kerala. Also occurs in East Java and Lesser Sunda Islands of Malesia.

6. *Sida javensis* Cav. ssp. *expilosa* Borss. in Blumea 14 : 185. 1966; Matthew *et al.* in Journ. Econ. Tax. Bot. 4 : 619. 1983. *S. pilosa* Cav. Diss. 1 : 9. t. 1, f. 2. 1785 non Mill. 1768, *nec* Retz, 1781, *nec* L'Herit., 1789, *nec* Vellozo, 1825; DC. Prod. 1 : 463. 1824; *S. veronicifolia* Backer, Fl. Bat. 1 : 98. 1907 *p.p.* non Lamk. 1789; Backer & Bakh. f., Fl. Java 1 : 427. 1963 *p.p.* *S. humilis* Miq. Fl. Ind. Bat. 1. 2 : 140. 1858 *p.p.* non Cav. 1788.

Herbs, prostrate with stems rooting at the nodes. Leaves 5 × 5 cm, orbicular, apex rounded or obtuse, rarely acute, above with appressed, short simple hairs, beneath with minute stellate hairs; petiole 1.5-5 cm, hairy. Flowers axillary, initially solitary, ultimately in few-flowered short axillary racemes by development of accessory buds; Pedicel 7-12 mm, accrescent upto 20 mm, hairy. Calyx c. 4 mm across; lobes 2-3 × 1.5-2 mm, outside with long simple hairs and minute stellate hairs, inside glabrous. Corolla c. 8 mm across; petals 7-8 × 4-5 mm. Staminal column c. 1.5 mm long, with patent simple hairs, basal part wide, conical, apical part short, tubular. Mericarps 5, tetrahedral with rounded angles, hairy with 2 awns. Seeds 2-2.5 mm long, ovoid, hilum short hairy, brown black.

*Type* : Santo Domingo, Desportes s. n. (Holotype : MA).

*Distrib* : INDIA : Kerala. Also in WEST INDIES and MALESIA.

7. *Sida mysorensis* Wight & Arn., Prod. Fl. Pen. Ind. Or. 59. 1834; Mast. in Hook. f., Fl. Brit. India 1 : 322. 1874; Hu, Fl. China, fam. 153 : 23, t. 16. f. 2. 1955; Borss. in Blumea 14 : 180. 1966; Abedin in Fl. W. Pak. 130 : 79. 1979. *S. hirta* Wall. Cat. 1855. 1828 non Lamk. 1783 *S. glutinosa* Roxb. Hort. Beng. 97. 1814 *nom. nud. et* in Fl. Ind. ed. Carey 3 : 172. 1832 non Cav. 1785; Cooke, Fl. Pres. Bombay 1 : 92. 1901 (Repr. ed. 1 : 97. 1958); Gamble, Fl. Pres. Madr. 1 : 89. 1915 (Repr. ed. 1 : 64. 1957); Haines, Bot. Bih. & Or. 1(2) : 58. 1921 [Repr. ed. 1(2) : 61. 1961]. Fig. 51

Annual or perennial, erect, much branched odorous herbs, upto c. 90 cm high. Stems, petioles and pedicels densely pubescent with minute stellate hairs, gland-hairs and some long patent simple hairs. Leaves 1.5-8.0 × 1-7 cm, ovate, occasionally the upper leaves oblong, apex acute to acuminate, serrate to crenate, 5-11 nerved at the base, both the surfaces pubescent with stellate hairs and gland-hairs, more denser on the lower surface; petiole 1-7 cm long. Stipules 3-6 mm long, filiform, hairy. Flowers axillary, solitary initially, ultimately in condensed racemes or panicles by the development of accessory buds; pedicel 3-20 mm long, slightly accrescent, thinner than the petiole, jointed towards the apex. Calyx 5-10 × 3-4 mm, accrescent up to c. 6 mm in diameter, campanulate, connate above the middle; lobes 2.5-5.0 × 2.0-2.5 mm,



Fig. 51. *Sida mysorensis* Wight & Arn.

deltoid, acute to acuminate, with one prominent midvein, outside pubescent with stellate and few long patent simple hairs, inside except for the marginal portion glabrous. Corolla 5-10 mm across, slightly exceeding the calyx, yellow; petals obtriangular, glabrous. Staminal column c. 4 mm long, antheriferous towards the apex, basal portion conical, upper portion tubular, glabrous. Ovary c. 1 mm high; brownish black; styles c. 4 mm long, connate up to the middle. Mericarps 5, 2.5-3.0 mm, tetrahedral with rounded angles, apex bicuspidate, apical portion hairy, rest portion glabrous. Seeds c. 2 mm long, ovoid to obtriangular, glabrous, brownish-black, dispersed by the withering of the wall.

*Type* : Mysore, *Wight* 183 (Lectotype ; K, Isolectotype : CAL!).

*Fls. & Frts.* : Oct.-Feb.

*Distrib.* : INDIA : Rajasthan, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Madhya Pradesh, Bihar, Orissa, West Bengal, Meghalaya; PAKISTAN, BURMA, CHINA, SRI LANKA, MALESIA.

*Exsicc.* : Bihar : Rajmahal hills near Chetowlea, 2.11.868, *S. Kurz* s. n. (CAL). West Bengal : Barasat, 29.11.897, *Gupta & Aziz* 83 (CAL). Meghalaya : Mungpo (Khasia), 454 m, 20.2.1885, *Clarke* 57208 (CAL). Andhra Pradesh : Balapalle (Cuddapah Dt.), 250 m, 21.2.1963, *Ellis* 15734 (BLAT). Tamil Nadu : Pallapatti (Coimbatore Dt.), 500 m, 27.9.1910, *Fischer* 2236 (CAL).

*Notes* : This species can be readily distinguished from *Sida glutinosa* Cav. (non Roxb. 1832) in having awnless bicuspidate mericarps.

Most of the authors like *Cooke* (1901), *Gamble* (1915), *Haines* (1921) etc. considered *Sida mysorensis* Wt. & Arn. as synonymous to *Sida glutinosa* Cav. *Borssum* (1966) placed *S. mysorensis* Wt. & Arn. and *S. glutinosa* Cav. in two different sections like 'Nelavaga' and 'Sida' respectively.

8. *Sida ovata* Forssk., Fl. Aegypt.-Arab. 124. 1775; G. Don, Gen. Syst. Gard. Bot. 1:492. 1831; Abedin, in Fl. W. Pak. 130 : 86. 1979. *S. grewioides* Guill. et Perr. in Guill. et al. Fl. Seneg. Tent. 1 : 71. 1830; Mast. in Hook. f., Fl. Brit. India 1 : 323. 1874; *Cooke*, Fl. Pres. Bombay 1 : 93. 1901 (Repr. ed. 1 : 98. 1958); *Duthie*, Fl. Upper Gang. Pl. 1 : 81. 1903 (Repr. ed. 1 : 77. 1960). Fig. 57

Erect undershrubs upto c. 30 cm high. Stems, petioles and pedicels pubescent with stellate hairs. Leaves 1.5-5.0 × 1-4 cm, ovate-oblong, rounded at base, apex obtuse, margin crenate, both the surfaces densely stellate velutinous; petiole 0.5-1.5 cm long. Stipules upto c. 1 cm long, linear to lanceolate, stellate pubescent. Flowers axillary, solitary or sometimes paired; pedicel 0.5-1.0 cm long, shorter than the petiole, jointed above middle. Calyx 5-8 mm across, accrescent upto 1.5 cm, campanulate; lobes 5-7 × 3-5 mm, ovate, accrescent up to c. 10 × 7 mm, outside densely stellate pubescent, marginal portion of the



inside towards the apex with stellate and few simple hairs, rest portion glabrous. Corolla yellow or yellowish white; petals c.  $1.0 \times 0.5$  cm, obliquely truncate, base acute, outside sparsely covered with bulbous based hairs, basal portion hairy, inside glabrous. Staminal column c. 7 mm long, simple and stellate hairy. Schizocarp c. 5 mm across, not completely enclosed by the calyx, indehiscent or nearly so, blackish; mericarps 8, 3-4 mm across, dorsal and ventral surface with prominent reticulation, sparsely hairy, 2-awns at the apex, compressed, each c. 1 mm long. Seeds 2 mm in diameter, round-reniform, glabrous, hilum with few short stellate hairs, blackish.

*Type* : Arabia, surdud (Holotype : C; Photo!).

*Fls. & Frts.* : July-Feb.

*Distrib.* : INDIA : Rajasthan, Gujarat, Punjab, Uttar Pradesh, Maharashtra, Andhra Pradesh; PAKISTAN, ARABIA, IRAN, AFRICA.

*Exsicc.* : Punjab: Hissar bir, 8.8.1885, *Duthie* 3876 (CAL). Rajasthan : Devikot (Jaisalmer Dt.), 18.11.1973, *Tiwari* 869 (CAL); Amarsagar (Jaisalmer Dt.), 350 m, 1.9.1976, *Shetty* 3439 (CAL); Jaipur Ajmer Road, 19.8.65, *Wadhwa* 4865 (CAL); Bilara (Jodhpur), 29.8.77, *A. N. Singh* 4434 (CAL).

*Pollen* : Average size  $80 \mu$  (range 77-98  $\mu$ ). Spines short (height 2.8  $\mu$ ). [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 14. 1962 as *S. grewoides* Guill and Perr.].

9. *Sida rhombifolia* Linn., Sp. Pl. 684. 1753; Mast. in Hook. f., Fl. Brit. India I : 323. 1874; Borss. in Blumea 14 : 193. 1966.

Annual or perennial herbs or undershrubs. Stems, petioles and pedicels covered by minute stellate hairs or led with rigid hairs, glabrescent. Leaves ovate to oblong, often more or less rhomboid, obovate or lanceolate, apically serrate to crenate, entire towards the base, both surfaces minutely stellate pubescent or tomentose by more or less stiff simple hairs. Stipules filiform. Flowers axillary, solitary or in clusters of 2-5 flowers. Calyx campanulate, free upto or above the middle, lobes triangular to ovate, acuminate. Corolla yellow to pale orange; petals oblique, cuneate at base. Staminal column shorter than the petals, hairy or glabrous. Mericarps (6) 7-12, apical portion with 2 short mucro or 2 awns. Seeds c. 2 mm across, flattened reniform, brown or black.

*Fls. & Frts.* : July-Dec.

*Distrib.* : INDIA : Throughout from sea-level to 1500 m; Pantropical.

#### KEY TO THE SUBSPECIES

- 1a. Erect herbs or undershrubs. Leaves ovate to oblong, rhomboid or lanceolate. Pedicels longer than the petioles. Corolla 1.0-1.8 cm across . . . . . *ssp. rhombifolia*

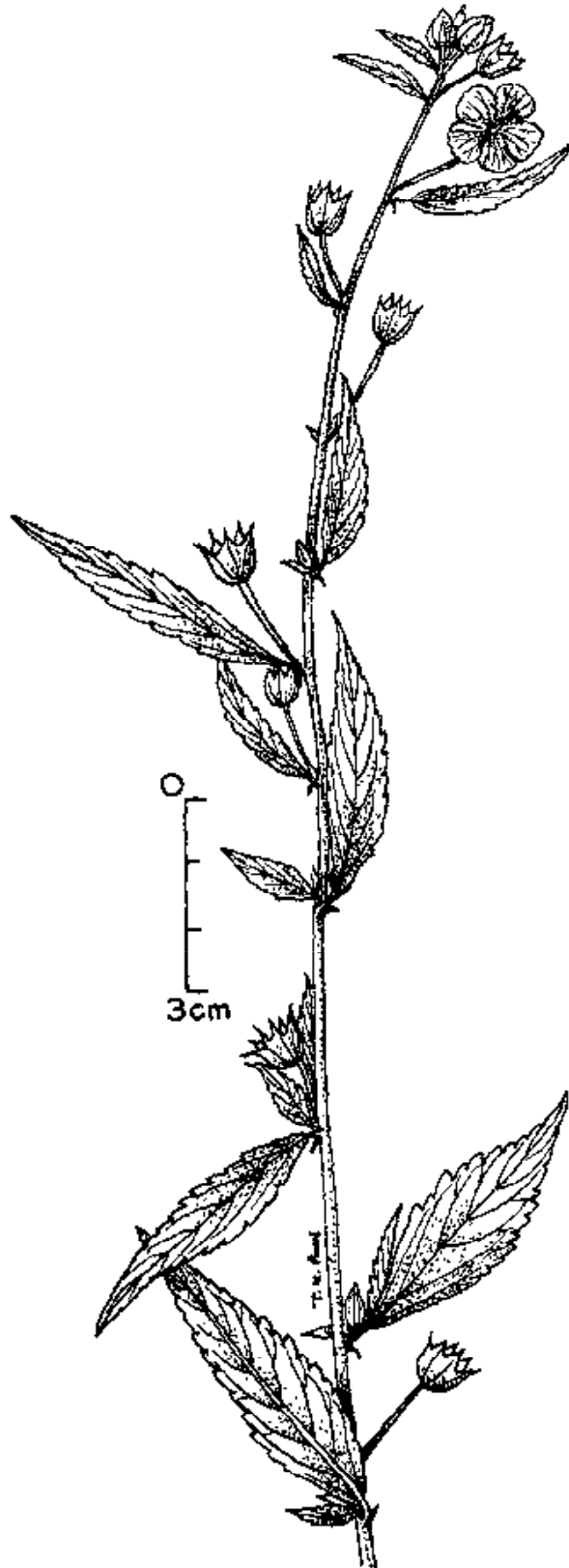


Fig. 52. *Sida rhombifolia* Linn. ssp. *rhombifolia* var. *rhombifolia*

- 1b. Prostrate or ascending undershrubs. Leaves obovate to orbicular. Pedicels as long as the petioles  
Corolla 2.0-2.5 cm across . . . . . ssp. *retusa*

ssp. *rhombifolia*

Undershrubs or herbs upto c.1.5 m high with erect and erecto-patent branches. Leaves 0.5-8.0 × 0.3-5.0 cm, ovate to oblong, elliptic, often more or less rhomboid, lanceolate or obovoid, covered with minute stellate or rigid hairs; petiole 2-15 mm long. Pedicel longer than the petiole, up to c. 4 cm long. Calyx lobes 4-6 × 3-5 mm, accrescent up to c. 8 mm long in fruit. Corolla c. 15 mm across. Mericarps mostly muticos or with 2 mucros, occasionally with 2 awns, 1.0-2.5 mm long. Seeds glabrous.

KEY TO THE VARIETIES

- 1a. Plants cinereous with minute stellate hairs, branches erect . . . . . var. *rhombifolia*  
1b. Plants covered with rigid simple and stellate hairs, branches suberect . . . . . var. *scabrida*

var. *rhombifolia*-*S. rhombifolia* Linn., Sp. Pl. 684. 1753; Roxb. Fl. Ind. ed. Carey 3 : 176. 1832; Duthie, Fl. Upper Gang. Pl. 1 : 81. 1903 (Repr. ed. 1 : 76. 1960); Gamble, Fl. Pres. Madr. 1 : 90. 1915 (Repr. ed. 1 : 65. 1957); Haines, Bot. Bih. & Or. 1(2) : 60. 1921 (Repr. ed. 1(2) : 62. 1961). *S. alba* Cav. Diss. 1 : 22, t. 3, f. 3. 1785 non. Linn. *S. rhomboidea* Roxb. ex Fleming in As. Res. 6 : 178. 1810; Roxb. Fl. Ind. 3 : 176. 1832 *S. rhombifolia* var. *rhomboidea* Mast. in Hook. f., Fl. Brit. India 1 : 324. 1874. *S. obovata* Wall. Cat. no. 1864. 1828. *nom nud.* *S. rhombifolia* var. *obovata* Wall. ex Mast. in Hook. f., Fl. Brit. India 1 : 324. 1874. *S. microphylla* Cav. Diss. 1 : 22, t. 12, f. 2. 1785. *S. rhombifolia* var. *microphylla* (Cav.) Mast. in Hook. f., Fl. Brit. India 1 : 324. 1874. *S. yunnanensis* Hu, Fl. China, fam 153 : 16, t. 16, f. 7. 1955.

Fig. 52

Herbs or undershrubs upto c. 1.5 m high. Leaves 0.5-8.0 × 0.3-5.0 cm, ovate to oblong, often more or less rhomboid, apex acute to acuminate or obtuse, rarely rounded, base mostly acute, sometimes rounded, truncate or slightly cordate; petiole 0.2-1.5 cm long. Pedicel longer than the petiole, upto 3.5 cm long. Calyx 4-6 mm long, accrescent upto 8 mm during fruiting. Corolla 1.0-1.8 cm across. Mericarps with 2 mucros or muticos, occasionally with 2 awns, awns 1.0-2.5 mm long.

Type : Herb. Clifford (Lectotype : BM).

Exsicc. : Uttar Pradesh : Dehra Dun, 700 m, Sept. 1892, Gamble 23911 (CAL); Near Mussourie, 1869, King s. n. (CAL). West Bengal : Mourigram

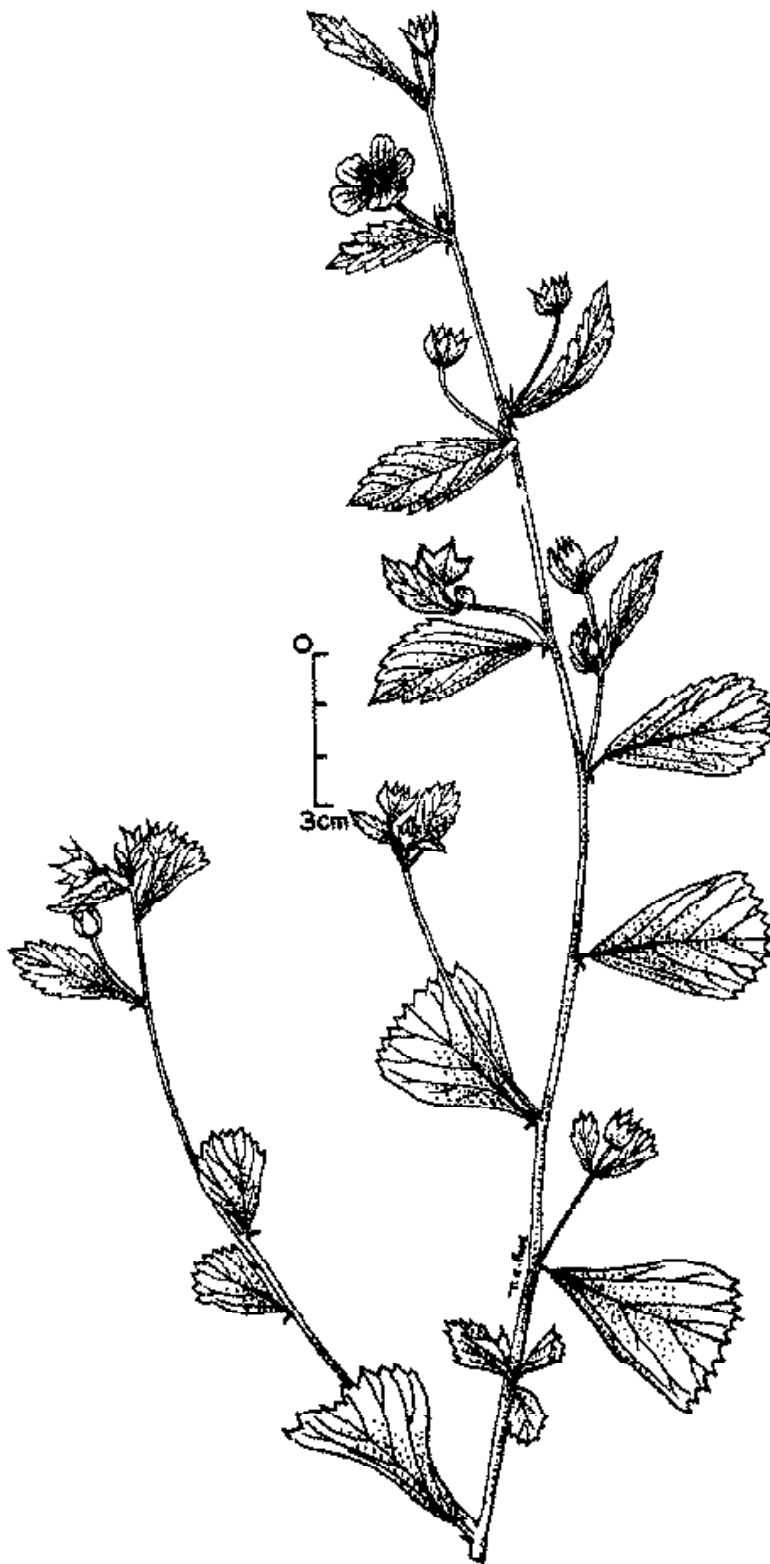


Fig. 53. *Sida rhombifolia* Linn. ssp. *retusa* (Linn.) Borss.

(Howrah Dt.), 19.4.1963, Bennet 116 (CAL). Sikkim: Tashiding, 4.11.1857, Thomson s. n. (CAL). Andaman: Without precise locality, 15.4.1889, Prain s. n. (CAL).

*Pollen*: Pore diameter 9.6  $\mu$ . Interporal distance 25  $\mu$ . Exine 2.8  $\mu$ . Columella of basal cushions fused. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63: 14. 1962].

*Notes*: *Sida yunnanensis* was described by Hu (1955). According to her its distribution is limited to Yunnan, North Western Kwangsi and South Western Szechuan of China. Judging from the description and type photograph (Forrest 11088) *S. yunnanensis* Hu should be considered a synonym of *S. rhombifolia* Linn. *S. microphylla* Cav. was considered by Masters as a variety of *S. rhombifolia* Linn. but after study of the type photograph (India orientalis, Sonnerat s. n. P. LA; Photo!) and description, it seems that it is nothing but a smaller form of *S. rhombifolia* Linn.

var. *scabrida* (Wight & Arn.) Mast. in Hook. f., Fl. Brit. India 1: 324. 1874. *S. scabrida* Wight & Arn. Prod. Fl. Pen. Ind. Or. 57. 1834.

Small herb upto c. 30 cm high, sprinkled with rigid simple and stellate hairs. Leaves 1.5-3.5  $\times$  0.6-1 cm, ovate-rhomboid or oblong, lanceolate, apex acute or obtuse, base cuneate, margin dentate, both surfaces with rigid simple and stellate hairs; petiole 3-6 mm long. Pedicel 0.5-2.0 cm long. Calyx c. 6 mm long. Mericarps 9-11, bicuspidate.

*Type*: Peninsular India, Herb. Wight 166 (K, CAL).

*Exsicc.*: Karnataka: Mysore, Hook. f. & Thomson s. n. (CAL). Tamil Nadu: Ootacamund (Nilgiri hills), 6th Aug. 1876, G. King s. n. (CAL); Kottai-combai (Nilgiri Dt.), 1933 m, 23.10.1956, K. Subramanyam 1080 (CAL); Bellaji, 1515 m, 27.8.05, Fischer 306 (CAL).

ssp. *retusa* (Linn.) Borss. in Blumea 14: 198. 1966. *S. retusa* Linn., Sp. Pl. ed. 2: 961. 1763; Roxb. Fl. Ind. 3: 175. 1832; Wight & Arn., Prod. Fl. Pen. Ind. Or. 58. 1834. *S. rhombifolia* var. *retusa* (Linn.) Mast. in Hook. f., Fl. Brit. India 1: 324. 1874. Fig. 53

Undershrubs, ascending or prostrate, upto c. 0.5 m high with erecto-patent to patent branches. Leaves 0.5-6.0  $\times$  0.5-4.0 cm, obovate to orbicular, upper leaves sometimes lanceolate, base acute to acuminate, apex mostly retuse, rounded or truncate. Pedicel  $\pm$  as long as the petiole, upto c. 3 cm long, jointed above or below middle. Calyx 5-6 mm high, accrescent upto 10 mm. Corolla 2.0-2.5 cm across. Mericarps with two short awns upto c. 1.5 mm long. Seeds glabrous, hilum with few stellate hairs.

*Type*: Herb. Linn. n. 866.7 (Holotype: LINN; Photo!).

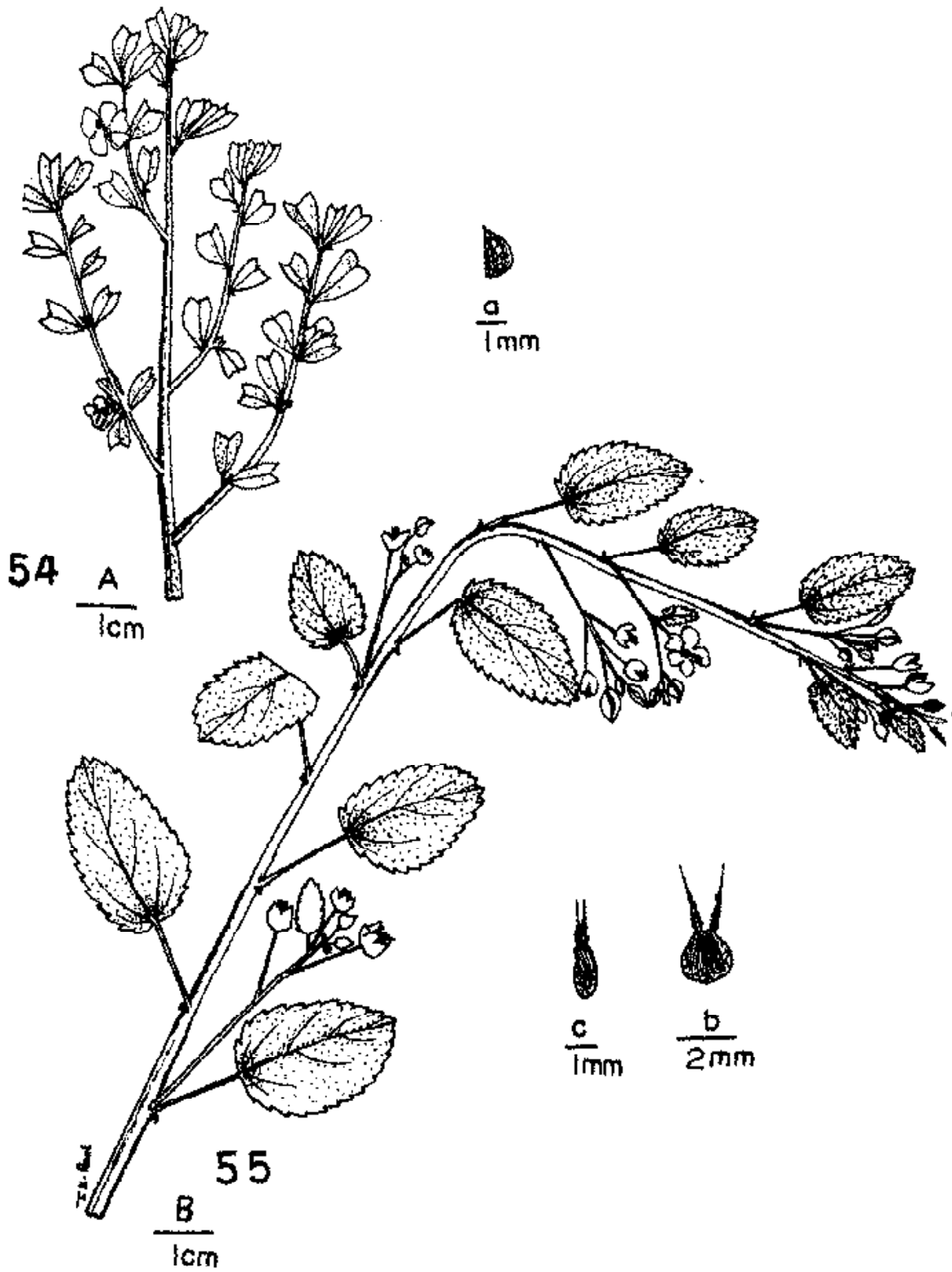


Fig. 54. *Sida schimperiana* Hochst.  
A. Habit. a. Mericarp.

Fig. 55. *Sida spinosa* Linn.  
B. Habit. b. Ventral surface of mericarp. c. Dorsal surface of mericarp.

*Exsicc.* : Uttar Pradesh : Garwa (Allahabad), 1.5.67, *Panigrahi* 11371 (CAL). Maharashtra : Chalani forest (Thana Dt.), 26.10.1967, *K.V. Billore* 119011 (CAL). Andhra Pradesh : Bison hill, Godavari agency, 4.12.1902, *C.A. Barber* 5104 (CAL, MH). Tamil Nadu : Maruthamalai (Coimbatore Dt.), 653 m, 3.12.1956, *Sebastine* 1585 (CAL).

10. *Sida schimperiana* Hochst. in Rich. Fl. Abyss. i : 66. 1847; Mast. in Hook. f., Fl. Brit. India 1 : 322. 1874; Gamble, Fl. Pres. Madr. 1 : 90. 1915 (Repr. ed. 1 : 64. 1957). *S. cuneifolia* Roxb. Fl. Ind. ed. Carey 3 : 170. 1832. Fig. 54

Perennial undershrubs or herbs upto c.90 cm high. Stem woody, erect or procumbent, bark scabrous. Stems, petioles and pedicels with appressed stellate hairs. Leaves 0.5-15.0 × 3-5 mm, wedge shaped, oblong, apex retuse with a small toothlet in the middle, cuneate at base, entire, upper surface glabrous, lower surface densely pubescent with appressed stellate hairs; petiole 1-3 mm. Stipules 1-2 mm, linear or subulate. Flowers solitary, axillary, sometimes crowded towards the end of the branches; pedicel c. 1 mm long. Calyx free more or less up to the middle; lobes 3-5 × 1-2 mm, ovate, acute, outside pubescent with appressed stellate hairs, margin with long simple hairs, inner surface towards the apex with some long simple and stellate hairs, Corolla yellow, petals c. 5 × 2 mm, glabrous. Staminal column c. 1.5 mm long, stellate hairy. Ovary ± 1 mm high, ovoid, glabrous. Schizocarp c. 5 mm across; mericarps 5, c. 3 mm, prominently reticulate, slightly beaked, beak bent inwards, sparsely pubescent with few appressed stellate hairs, dehiscing along the inner edge. Seeds c. 1.5 mm across, glabrous, brownish.

*Fls. & Frts.* : Nov.-Mar.

*Distrib.* : INDIA : Karnataka, Andhra Pradesh, Tamil Nadu, Kerala; AFRICA.

*Exsicc.* : Andhra Pradesh : Rudrakota (Nellore Dt.), 28 m, 21.12.17, *Fischer* 4244 (CAL); Varadayapalam (Chittoor Dt.), 125 m, 27.9.1974, *Chandrabose* 45152 (MH). Tamil Nadu : Karikili water fowl refuge (Chingleput Dt.), ± 120 m, 27.1.1976, *A.N. Henry* 47081 (CAL, MH); Madras, 11.1.1899, *C.A. Barber* 67 (MH).

11. *Sida spinosa* Linn., Sp. Pl. 683. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 323. 1874; Cooke, Fl. Pres. Bombay 1 : 92. 1901 (Repr. ed. 1 : 98. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 80. 1903 (Repr. ed. 1 : 76. 1960); Gamble, Fl. Pres. Madr. 1 : 89. 1915 (Repr. ed. 1 : 64. 1957); Haines, Bot. Bih. & Or. 1(2) : 59. 1921 (Repr. ed. 1(2) : 62. 1961); Borss. in Blumea 14 : 191. 1966; Abedin in Fl. W. Pak. 190 : 82. 1979. *Malvinda spinosa* (Linn.) Medic. Malv. 23. 1787. Fig. 55

Annual or perennial, erect or diffuse herbs or undershrubs upto c.60 cm high. Stem with 1-2 spiny emergences at the base of petiole. Stems, petioles and

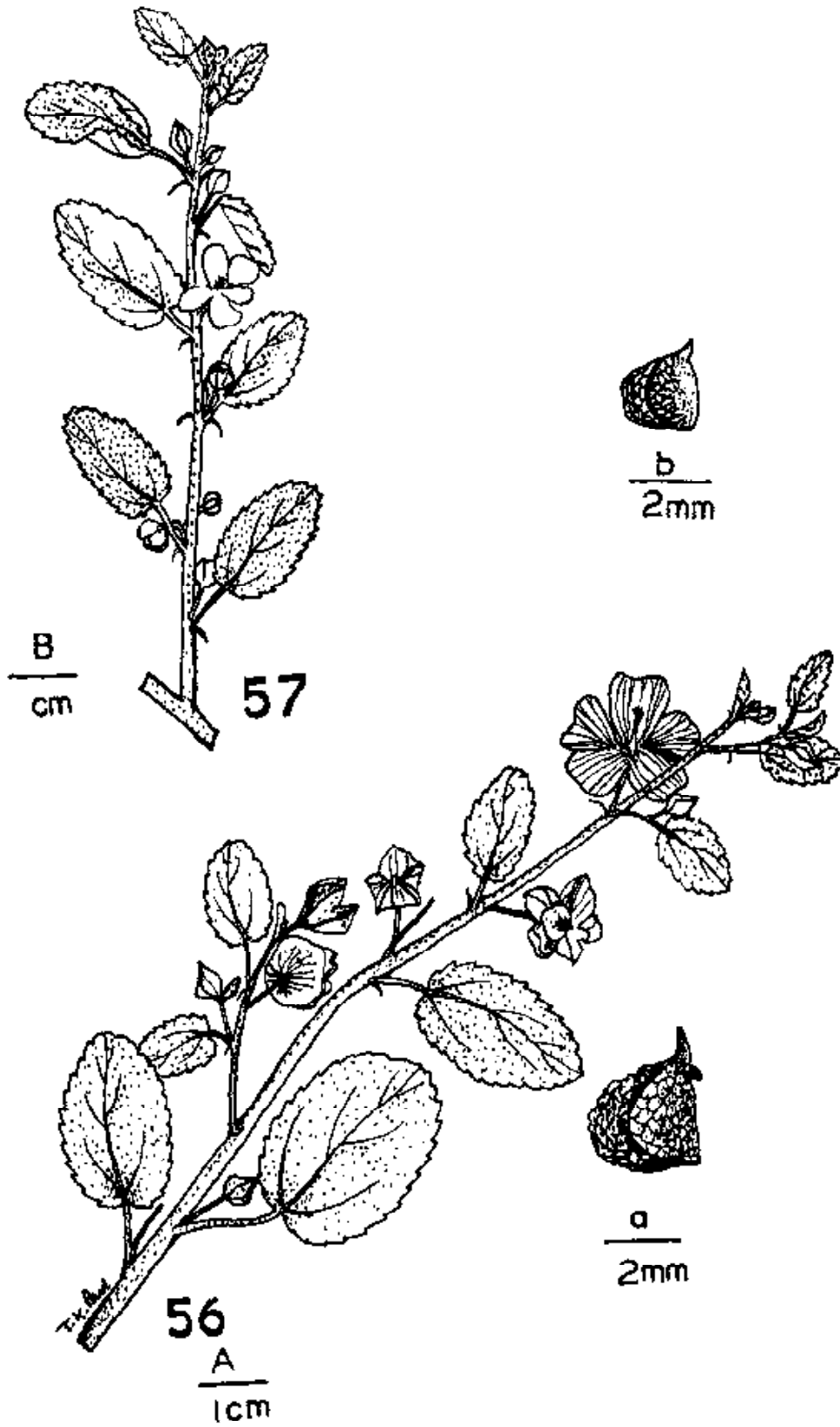


Fig. 56. *Sida tiagii* Bhandari  
 A. Habit. a. Mericarp.  
 Fig. 57. *Sida ovata* Forssk.  
 B. Habit. b. Mericarp.



pedicels cinereous with minute stellate hairs. Leaves 6-30 × 4-25 mm, oblong, ovate or lanceolate, acute at base and apex, rounded or truncate, serrate, 3-5 nerved at the base, both the surfaces stellate pubescent, sometimes glabrescent above; petiole 2-25 mm long. Stipules 1.0-2.5 mm long, linear, hairy. Flowers axillary, solitary or in clusters of 2-5 flowers; pedicel 2-8 mm long, accrescent upto 8 mm, jointed above the middle. Calyx 3-5 mm across, campanulate, free above the middle; lobes 1-2 × 1.5-2.0 mm, deltoid, acute to acuminate with a prominent midvein, outside cinereous with minute stellate hairs, also scattered with simple hairs, marginal portion of the inside towards the apex with some minute stellate hairs and scattered simple hairs, remaining portion glabrous. Corolla yellow or yellowish white. Schizocarp enclosed within the calyx; mericarps 5, trigonous with 2 divergent awns, 2-3 mm long except the awns, awns 1.0-1.5 mm long, apex of mericarps and awns stellate hairy, dorsal portion with prominent reticulation. Seeds 1.0-1.5 mm long, ovoid, slightly trigonous, glabrous, brownish black.

*Type* : Herb. Linn. n. 866.1 (Lectotype : LINN; Photo!).

*Fls. & Frts.* : Mar.-Dec.

*Distrib.* : INDIA ; Throught.Pantropical.

*Exsicc.* : Uttar Pradesh : Janakpur, 19.3.64, *Panigrahi* 2985 (CAL). Madhya Pradesh : Gorna, April 1867, *G. King*. 54 (CAL); Maharashtra : Chanda Dt. 3.1.90, *Duthie* 9288 (CAL); Mara-wian, 3.10.61, *Divakar* 2770 (BLAT). Tamil Nadu : Maruthalamalai (Coimbatore Dt.), 653 m, 23.11.1956, *Sebastine* 1448 (CAL, MH).

*Notes* : Very similar to *Sida alba* Linn. but differs in having 1-3 spiny structures on the stem at the base of the petiole and mericarps with a pair of divergent apical awns.

*Pollen* : Pore diameter 9.6 μ. Exine 5.6 μ thick. Columella fused in the basal cushion. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 14. 1962].

12. *Sida tiagii* Bhandari in Ann. Arid Zone 16 : 455. 1977; Bhandari, Fl. Ind. Des. 74. 1978. *S. pakistanica* Abedin in Pak. Journ. Bot. 11(1) : 55. 1979 et in Fl. W. Pak. 130 : 87. 1979. *S. greuioides* var. *microphylla* Hochr. in Ann. Cons. Jard. Bot. Geneve 6 : 37. 1902. Fig. 56

Perennial suberect herbs upto c. 40 cm high, lower branches prostrate, stellate pubescent. Leaves 1.5-4.5 × 1-3 cm, ovate, ovate-oblong to obovate, apex obtuse, base rounded, margin crenate-serrate; petiole 1.0-1.5 cm long. Stipules 0.5-1.0 cm long, linear. Flowers axillary, solitary; pedicel 0.2-1.0 cm long, c. 2 cm long in fruit, jointed above middle. Calyx 6-10 mm across, cyathiform, free up to the middle; lobes 8-9 × 5-7 mm, deltoid, stellate pubescent, accrescent in fruit. Corolla c. 1.8 cm across, pale yellow; petals 8-12 × 5-7 mm, obliquely obovoid. Staminal column hirsute. Schizocarp c. 9 mm across, pentangular-globose, enclosed within the calyx; mericarps 7-8, c. 3 × 2 mm (excluding the awns), reticulated radially, dorsally strongly rugose, studded

with minute glandular hairs, apex with 2 awns, each c. 1 mm long, hairy, 2 outgrowths just below the awns. Seeds c. 2 mm long, reniform, glabrous except the stellate hairy hilum, blackish.

*Type* : Common on open sandy ground, near Mungari, Barmer Dist, Rajasthan, August 28, 1962, *Bhandari* 1570 (Holotype :CAL!; Isotypes K, BSI!, BSJO!).

*Fls. & Frts.* : Sept.-Nov.

*Distrib.* : INDIA : Rajasthan; PAKISTAN.

*Exsicc.* : Rajasthan : Devikot (Jaisalmer Dt.), 18.11.1973, *Tiwari* 869 (BSJO); Amar Sagar (Jaisalmer Dt.), 350 m, 1.9.1976, *Shetty* 3439 (BSJO); Kailana-camp. v. near big hillock (Jodhpur Dt.), 12.9.1972, *Shetty* 88 (BSJO).

*Notes* : This species is allied to *S. ovata* Forssk. but differs in having: calyx completely enclosing the schizocarp, prominent reticulation on the radial surface of the mericarp and mericarps having two prominent outgrowths just below the awns.

## 22. THESPESIA

Sol. ex Corr. in Ann. Mus. Hist. Nat. Paris 9 : 290, 291, t. 8, f. 1. 1807, *nom. cons.*; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6 : 50. 1890; J. B. Hutch. New Phytol. 46 : 134. 1947; Borss. in Blumea 14 : 105. 1966; Hutch. Gen. Fl. Pl. 2 : 548. 1967. *Bupariti* Duhamel, Semis Pl. Arb. Add. 5. 1860. *Azanza* Alef. Bot. Zeit. 19 : 298. 1861.

Trees or shrubs with dense crown of leaves. Leaves simple or palmilobed, often with extra floral nectaries, palmately veined. Stipules early caducous. Flowers solitary, axillary or in racemes by replacing the upper leaves. Epicalyx segments 3 or 5, free, caducous. Calyx cyathiform, nearly truncate, remotely denticulate, persistent. Corolla large, showy, yellow. Staminal column shorter than the petals, cylindrical, antheriferous throughout. Ovary 5-loculed or 10 by 5 false dissepiments; style unbranched; stigma clavate, coherent. Capsule globose or pyriform, indehiscent or partly dehiscent or loculicidal. Seeds 3 to several in each locule, obovoid, pubescent or tomentose, glabrous.

*Distrib.* : c. 18 species in tropical and subtropical regions of the World. 4 species in India.

### KEY TO THE SPECIES

- 1a. Leaves with a linear nectary on the midrib beneath, 3-5 lobed, densely covered with stellate hairs. Seeds 8-15 in each locule. Shrubs upto 2.5 m high . . . . . *T. lampas* 2

- 1b. Leaves without nectary on the midrib beneath, not lobed, covered with lepidots. Seeds 2-4 per locule;  
Shrubs or trees, 3-10 m high :
- 2a. Epicalyx segments early caducous. Capsule without any acumen :
- 3a. Leaves deeply cordate, green. Pedicel 2-5 cm long, jointed near the base. Capsule indehiscent. Seeds with simple hairs . . . . *T. populnea* 3
- 3b. Leaves shallowly cordate or sub-truncate, copper coloured. Pedicel 8-12 cm long, without any joint. Outer layer of capsule dehiscent. Seeds with short clavate or bulbous hairs . . . *T. populneoides* 4
- 2b. Epicalyx segments persistent. Capsule with a short acumen . . . *T. danis* 1
1. *Thespesia danis* Oliver in Hook. Icon. Pl. t. 1336. 1881; J. B. Hutch. in New Phytol. 46 : 123. 1947; Paul *et* Nayar in Journ. Econ. Tax. Bot. 3 : 655. 1982.

Large shrubs or trees, young stems and branches densely covered with lepidots. Leaves 3.5 × 4.5-7.0 cm, almost roundish or ovate, base broadly cordate, apex obtuse or sub-acute, margin entire, 5-7 nerved at the base, both surfaces sparsely covered with lepidots; petiole 3-5 cm long, densely covered with lepidots. Flowers solitary, axillary; pedicel 1.5-2.0 cm long, slightly thickened at base, densely covered with lepidots. Epicalyx segments 3, 3-7 × 1.5-2.0 mm, lanceolate, covered with lepidots, persistent. Calyx 6-10 × 8-10 mm, cupular, apex with 5 minute teeth or entire, outside with dense lepidots. Corolla campanulate; petals 5, c. 2.0 × 1.5 cm, obliquely obovate, apex rounded, base cuneate, outside with dense lepidots, inside glabrous. Staminal column included, antheriferous throughout. Ovary globose to ovoid, stigma clavate. Capsule c. 1.5 × 1.2 cm, globose with a short acumen at the tip.

*Type* : Hook. Icon. Pl. t. 1336. 1881.

*Fls. & Frts.* : May-June.

*Distrib.* : INDIA : Tamil Nadu; Tropical AFRICA. A native of coastal tropical Africa.

*Exsicc.* : Tamil Nadu : Nagore, 26.4.72, Sastry, A.R.K. 9178 (CAL).

*Chr. No.* : n = 12 (Gill in Taxon 27: 223. 1978).

2. *Thespesia lampas* (Cav.) Dalz. & Gibs., Bombay Fl. 19. 1861; Mast. in Hook. f., Fl. Brit. India 1 : 345. 1874; Brandis, Ind. Trees 76. 1906; Hu, Fl. China, fam. 153. P. 69. t. 12. 1955; Borss. in Blumea 14 : 116. 1966. *Hibiscus lampas* Cav. Diss 3 : 154, t. 56, f. 2. 1787; DC., Prod. 1 : 447. 1824; Roxb. Fl. Ind. ed. Carey 3: 197. 1832; Gamble, Fl. Pres. Madr. 1 : 98. 1915 (Repr. ed. 1 : 71. 1957). *Azanza lampas* (Cav.) Alef. Bot. Zeit. 19 : 298. 1861. Fig. 58

*Local names* : Jangli-bhendi, Bankapasi (Hindi); Bon kapas (Asm.); Bankapas (Beng.); Jangliparaspiplo (Guj.); Turuve (Kan.); Kattuparatti, Katupa varasu (Mal.); Ranbhendi (Mar.); Adavipratti, Kondapratti (Tel.).

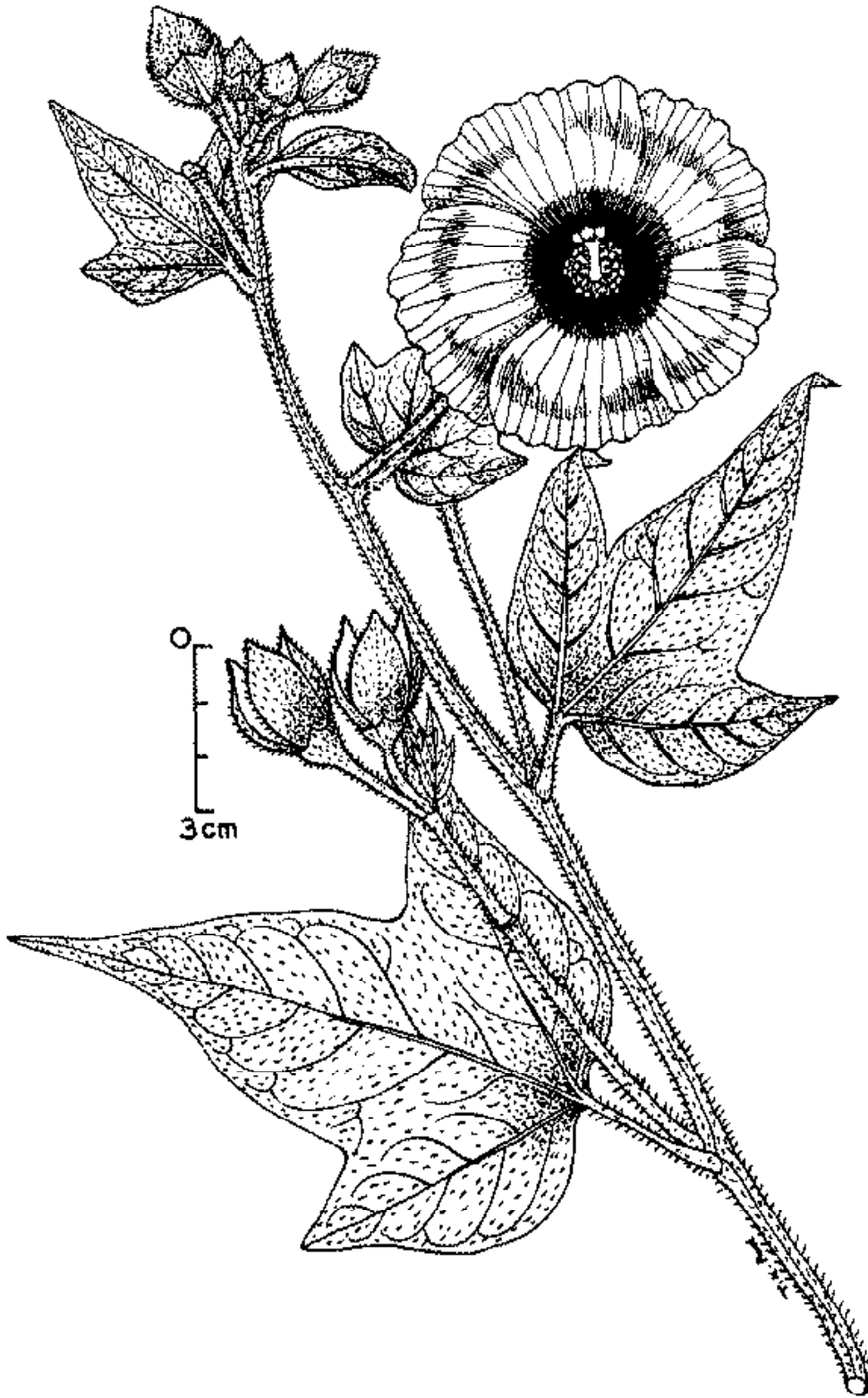


Fig. 58. *Thespesia lampas* (cav.) Dalz. & Gibs.

Shrubs. arborescent, 0.5-2.5 m high, twigs densely stellate tomentose, glabrescent later. Lower leaves 6-12 cm across, orbicular, 3-5 lobed, lobes deltoid, apex acuminate, acute or rarely obtuse, base cordate; upper leaves 5-20 × 2-22 cm, ovate to oblong, unlobed, apex acuminate to acute, base shallowly cordate to rounded, 5-7 nerved at the base, 3-5 mm long, linear nectary at the base of the midrib beneath, lower surface densely stellate tomentose, upper surface sparsely covered with stellate and short simple hairs; petioles 1-12 cm long, densely stellate hairy. Stipules 5-8 mm, lanceolate to subulate, stellate hairy. Flowers solitary, axillary or in long stalked raceme of 1-5 flowers in each by replacing the upper leaves; pedicel 3-7 mm, slightly accrescent, hypanthium 2.0-6.5 × 4-6 mm, obconical, jointed above the middle. Epicalyx segments 5, 2-3 × c. 0.5 mm, free, usually subulate, minutely stellate hairy, caducous. Calyx c. 5 mm long with 5 small subulate to deltoid segments, cyathiform, outside densely stellate hairy, glabrescent, inside with stellate hairs on the segments, lower portion sericeous. Corolla yellow with dark purple centre, campanulate; petals c. 6 × 4 cm, obovate, rounded at apex, outside with scattered stellate and gland-hairs, inside glabrous. Staminal column 1-2 cm long, glabrous. Ovary c. 8 mm in diameter, densely hairy. Capsule c. 2-3 × 1.5-2.0 cm, ovoid to globose, minutely stellate hairy, glabrescent, later, dehiscent into 5 valves. Seeds 8-15 per locule, each c. 5 mm long, obovoid, angular, densely appressed with short simple hairs, glabrescent later, black.

*Type* : Philippines, 7 March 86, *Sonnerat* C.N. 46 ( Holotype: P-Ju 12356 A, photo!).

*Fls. & Frts.* : Aug.-Dec.

*Distrib.* : Throughout INDIA; South to Southeast ASIA, East AFRICA.

*Exsicc.* : Uttar Pradesh : *Parasnath*, 22.11.91, *Prain* s. n. (CAL). West Bengal : *Malandighi* (Durgapur belt), 22.11.1972, *Mukherjee* 8664 (CAL). Sikkim : *Punkabunul*, 30.8.1857, *Thomson* s. n. (CAL). Manipur : *Sugnu*, 12.9.54, *Deb* 2628 (CAL).

*Chr. No.* :  $2n = 26$  (Ford. in *Genetica* 20 : 431. 1938)

*Ecol.* : Grows both in everwet and dry areas, bushwoods, teak forests, as young secondary forests up to 1000 m altitude from sea-level.

*Uses* : Stem yields good fibre useful for fabrics, cordage and fishing nets.

The roots and fruits are reported to be used for treating gonorrhoea.

*Notes* : It can be easily distinguished from *T. populnea* (Linn.) Sol. ex Corr. by its shrubby habit, 3-lobed leaves with nectary on midrib beneath and dehiscent capsule.

## KEY TO THE VARIETIES

- 1a. Calyx lobes 1-3 mm long, subulate to triangular var. *lampas*  
 1b. Calyx lobes 8-15 mm long, triangular to sub-linear var. *longisepala*

var. *longisepala* Borss. in Blumea 14 : 118. 1966.

*Type* : Borneo, Martapura, bb. 629 (Holotype : BO).

*Distrib.* : INDIA : Uttar Pradesh, Orissa, Assam, Meghalaya; MALESIAN REGION.

*Exsicc.* : Uttar Pradesh : Mirzapur, 11.10.1969, *Panigrahi* 12434 (CAL).  
 Assam : Lakhimpur, June 1902, *Chatterjee* 574 (CAL).

3. *Thespesia populnea* (Linn.) Sol. ex Corr. in Ann.Mus.Herb.Paris 9: 290, t. 8. f. 1. 1807; DC. Prod. 1 : 456. 1824; Wight & Arn., Prod. Fl. Pen. Ind. Or. 1 : 32. 1834; Mast. in Hook. f., Fl. Brit. India 1 : 345. 1874; Cooke, Fl. Pres. Bombay 1 : 114. 1901 (Repr. ed. 1 : 121. 1958); Prain, Beng. Pl. 1 : 270. 1903 (Repr. ed. 1 : 184. 1963); Haines, Bot. Bih. & Or. 1(2) : 70. 1921 (Repr. ed. 1(2) : 72. 1961). *Hibiscus populneus* Linn., Sp. Pl. 694. 1753; Roxb. Fl. Ind. ed. Carey 3 : 150. 1832. *T. macrophylla* Blume, Bijdr. 2 : 73. 1825; Cooke, Fl. Pres. Bombay 1 : 114. 1901 (Repr. ed. 1 : 121. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 93. 1903 (Repr. ed. 1 : 88. 1960); Kanjilal *et al.* Fl. Assam 1 : 145. 1934.

*Local Names* : Parsipu, Porush, Paras-pipal, Gaja danda (Hindi); Dumbala, Parespipal, Palaopipal, Gajashuni (Beng.); Parasapupala (Guj.); Hoovarase, Kandarola, Adavibendi, Jogiyarale (Kan.); Poovarasu (Mal.); Parsachajhada, Bendike Jhar (Mar.); Gunjausto, Porosopippoli (Or.); Pararspipal (Punj.); Gardha-bhanda (Sans.); Poovarasam kallal, Cheelanthi (Tam.); Gangaraavi, Muni gangaraavi, Gangareenu (Tel.).

Small to moderate size trees 5-10 m high, twigs densely covered with minute scales, glabrescent. Leaves 5-20 × 5.5-15.0 cm, orbicular, deltoid, ovate or oblong, apex acute to acuminate, base deeply cordate, entire, 7 nerved at the base, in between the bases of the main veins beneath domatia present, densely covered with scales, glabrescent; petiole 5-15 cm long, scaly. Stipules 4-10 mm long, lanceolate to linear, caducous. Flowers solitary, axillary; pedicel 2-5 cm long, slightly accrescent, erect or ascending, jointed near the base, glabrescent. Epicalyx segments 3, 5-15 × 2-3 mm, oblong to lanceolate, acute, subcoriaceous, densely scaly, caducous. Calyx 8-12 mm long and c. 18 mm across accrescent and flattened in fruit, hemispheric, campanulate with 5 minute teeth, outside densely scaly, inside densely hirsute by simple hairs. Corolla broadly campanulate, light yellow with dark purple centre, ultimately reddish; petals 5.0-7.5 × 4-6 cm, obliquely obovate, apex rounded, base fleshy, outside densely scaly, inside glabrous, at base ciliate. Staminal column 1.5-

2.5 cm long. Ovary 6-8 mm in across, globose to ovoid, scaly; style c. 3 cm long; stigmas connate to a clavate 5-sulcate body. Capsule 2.0-3.5 cm across, globose, apex without acumen, obtuse or slightly depressed, irregularly crumpled at maturity, indehiscent, 4 or 5 loculed. Seeds 6-10 × 5-8 mm, obovoid, angular, acute to shortly acuminate at the base, rounded at apex, densely covered with yellowish brown long simple hairs, more vigorous in the angles.

*Type* : Ceylon, Herb. Hermann. Vol. 4 IV, fol. 34, Linn. n. 258 (Lectotype : BM).

*Fls. & Frts.* : Aug.-Jan.

*Distrib.* : Throughout INDIA; ASIA, PACIFIC ISLANDS, AFRICA. Cultivated in roadsides as an avenue plant. Guppy (Observ. natur. Pacif. 2 : 5-47. 1906) stated that the fruits can float for months and thus dispersion of fruits takes place quickly.

*Exsicc.* : West Bengal : Gangasagar island, 28.4.67, *Mukherjee* 5928 (CAL). Orissa : Hukitola P.F., 28.1.1961, *Panigrahi* 23437 (CAL). Maharashtra : Lohagad, 20.3.56, *Jain* 872 (CAL). Karnataka : North Canara, Dec. 1884, *Talbot* 1113 (CAL).

*Chr. No.* :  $2n = 26$  (Skovsted in *Genetica* 31 : 263. 1935).

*Pollen* : Panporate, spheroidal (average size 86  $\mu$ ; range 85-95  $\mu$ ). Pores circular (diameter 7  $\mu$ ). Interporal distance 39  $\mu$ . Exine 4.2  $\mu$  thick, thickness at spine base being 7  $\mu$ . Ectine spinate. (Spine : height 7  $\mu$ . tip pointed; basal cushion : hemispherical, adjacent cushions lying in sweeping curves) [P.K.K. Nair in *Bull. Nat. Bot. Gard.* 63 : 25. 1962].

4. *Thespesia populneoides* (Roxb.) Kostel., *Allg. Med. Pharm. Fl.* 5 : 1861. 1836; Fosberg & Sachet in *Smith. Contrib. Bot. No.* 7: 10. f. 3, 4, 6. 1972. *T. populnea* sensu Blume, *Bijdr.* 2 : 73. 1825 [*non* (Linn.) *Sol. ex Corr.*]. *Hibiscus populneoides* Roxb. (*Hort. Beng.* 51. 1814. *nom nud.*) *Fl. Ind. ed. Carey* 3 : 190. 1832. *T. populnea* var. *populneoides* (Roxb.) Pierre, *Fl. Forest. Cochinch.* 3 : 173. 1888. *T. howii* Hu, *Fl. China, fam.* 153 : 69, t. 22. f. 3. 1955.

Small trees c. 3-8 m high, twigs densely covered with brownish lepidots giving coppery appearance. Leaves 5-20 × 5.5-15.0 cm, deltoid to subcordate, base shallowly cordate or subtruncate with broad sinus, apex acute to acuminate, entire, 7 nerved at the base, prominent domatia in the axils of main veins beneath, densely covered with brownish lepidots; petiole 5-8 cm, covered with brownish lepidots. Stipules subulate to lanceolate, early caducous. Flowers solitary, axillary; pedicel 8-12 cm long, not jointed, curving downwards, densely covered with brownish lepidots. Epicalyx segments 3, 1-2 mm long, triangular-ovate, very early caducous. Calyx 8-10 mm high, c. 15 mm across, accrescent and flattened in fruit, cupular with 5 minute teeth or truncate,

outside densely covered with lepidotes, inside brownish densely covered with simple hairs. Corolla 5-6 cm long, campanulate, light yellow with dark purple centre; petals obliquely obovate, apex rounded, outside with dense lepidotes, inside glabrous. Staminal column included. Capsule globose, at apex obtuse or slightly depressed, smooth exocarp separated from the tough endocarp by mesocarp consisting of loose fibrous-spongy tissue, dehiscent into 5 valves. Seeds c.  $10 \times 6$  mm, obovoid, angular, densely covered with short clavate or bulbous hairs.

*Type* : India, Wallich 1888 F (Lectotype : K-W; Photo !).

*Fls. & Frts.* : May-Jan.

*Distrib.* : INDIA (Coastal regions of Indian ocean and its islands); MALAYSIA, INDO-CHINA, AUSTRALIA, AFRICA.

*Notes* : It is allied to *T. populnea* (Linn.) Sol. ex Corr. but differs in having its copper coloured leaves with shallowly cordate to subtruncate base, longer pedicel without any articulation, outer layer of fruit dehiscent and seeds with short clavate or bulbous hairs.

*Exsicc.* : West Bengal : Dhablad (Sagar island), 4.9.1968, Mukherjee 7014 (CAL). Orissa : Hukitola P.F., 29.1.61, Panigrahi 23437 (CAL). Maharashtra : Near Panju island, 22.1.1968, Billore 113768 (CAL). Kerala : Varkala (Quilon), 20.10.1971, T.A. Rao 8129 (CAL).

### 23. URENA

Linn., Sp. Pl. 692. 1753; Gen. Pl. ed. 5. 309. 1754; Benth. & Hook. f. Gen. Pl. 1 : 205. 1862; Mast. in Hook. f., Fl. Brit. India 1 : 329. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 5 : 134. 1901; Borss. in Blumea 14 : 138. 1966; Hutch., Gen. Fl. Pl. 2 : 566. 1967.

Annual or perennial undershrubs or shrubs, young parts densely covered with minute stellate hairs. Leaves variable in shape and size, palmilobed to parted or undivided, angular, palminerved with nectaries on the nerves beneath; petiole shorter than the lamina. Flowers solitary, axillary or in axillary clusters; pedicel not jointed. Epicalyx campanulate, segments 5, connate at the base. Calyx campanulate, 5 parted, lobes ovate or ovate-lanceolate, 1-nerved. Corolla rotate, purplish red, stellate pilose outside, petals 5. Staminal column equal to the corolla, truncate or denticulate at the apex, antheriferous in the upper half, anthers sessile. Ovary depressed globose, 5-loculed, one ovule in each locule; style above the middle divided into 10 arms, reflexed; stigmas discoid, papillose. Schizocarp subglobose; mericarps 5, mature mericarps separating, triangularly obovoid, indehiscent, dorsally convexed, covered with glochidiate spines.

*Distrib.* : Throughout tropical and subtropical regions of the World.

*Ecol.* : Grow on roadsides, waste places and as secondary growths.



*Notes* : Linnaeus (1753) in his *Species Plantarum* mentioned 3 species i.e. *Urena lobata*, *U. Sinuata* and *U. procumbens*. Guerke (1892) maintained 2 species i.e. *U. lobata* and *U. sinuata* with 9 varieties in former and 2 varieties in latter species. Hochreutiner (1901) kept one species *U. lobata* with 14 varieties, later adding 3 more. Most of the authors (Masters 1874, Cooke 1901, Gamble 1915 etc.) dealing Indian *Urena* maintained 2 species i.e. *U. lobata* Linn. and *U. sinuata* Linn. Borssum Waalkes (1966) maintained only *U. lobata* with 2 subspecies i.e. ssp. *lobata* and ssp. *sinuata* based mainly on epicalyx characters. Each subspecies is having 2 varieties. All are present in India. After studying in the field and herbarium, Borssum's view has been admitted.

*Urena lobata* Linn., Sp. Pl. 692. 1753 *sens. lat.*; Miq. Fl. Ind. Bat. 1, 2 : 148. 1858; Mast. in Hook. f., Fl. Brit. India 1 : 329. 1874; Hochr. in Ann. Cons. Jard. Bot. Geneve 5 : 134. 1901; Borss. in Blumea 14 : 138. 1966.

Annual or perennial erect undershrubs 0.5-2.0 m high. Leaves 1-12 × 0.5-12.5 cm, ovate to orbicular, unlobed, angular or shallowly lobed or deeply irregularly incised below the middle, lobes 3-5 or more, dilated upwards with rounded sinuses, apex obtuse to acute or rounded, base shallowly cordate, rounded, obtuse to acute, margin serrate to crenate or entire, both surfaces densely stellate hairy, glabrescent; petiole 0.5-12.0 cm long. Stipules 2-4 mm long, linear to lanceolate. Flowers axillary, solitary or in clusters of 2-3; pedicel 1-5 mm long. Epicalyx segments 3-10 × 1-3 mm, linear to lanceolate, appressed or spreading at maturity. Calyx tubular to campanulate, free to the base; lobes 4-6 × 1.5-2.0 mm, ovate to deltoid, acute to acuminate. Corolla 2-3 cm across, pink with a purple centre; petals 1.0-1.5 × c. 0.5 cm, obovate. Schizocarp 5-8 mm across, globular, covered with glochidia (Spine with 4-5 retrose, short, sharp hooks at the top); mericarps 4-5 mm high, radially c. 4 mm, tangentially c. 3 mm, dorsally and laterally stellate hairy and reticulately veined. Seeds 2-3 mm across, reniform, minutely hairy, glabrescent.

#### KEY TO THE SUBSPECIES AND VARIETIES

- 1a. Leaves angled or shallowly lobed. Epicalyx cupular in fruit, appressed to the mericarps, segments long triangular ssp. *lobata*  
 1b. Leaves palmatilobed or -fid. Epicalyx spreading or reflexed in fruit, segments linear to lanceolate ssp. *sinuata*

#### ssp. *lobata*

- Stems and leaves more or less densely tomentose var. *lobata*  
 Stems and leaves more or less pubescent, often slightly scabrous var. *viminea*

var. *lobata* - *U. lobata* Linn. Sp. Pl. 692. 1753; Cooke, Fl. Pres. Bombay 1 : 100. 1901 (Repr. ed. 1 : 106. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 85. 1903

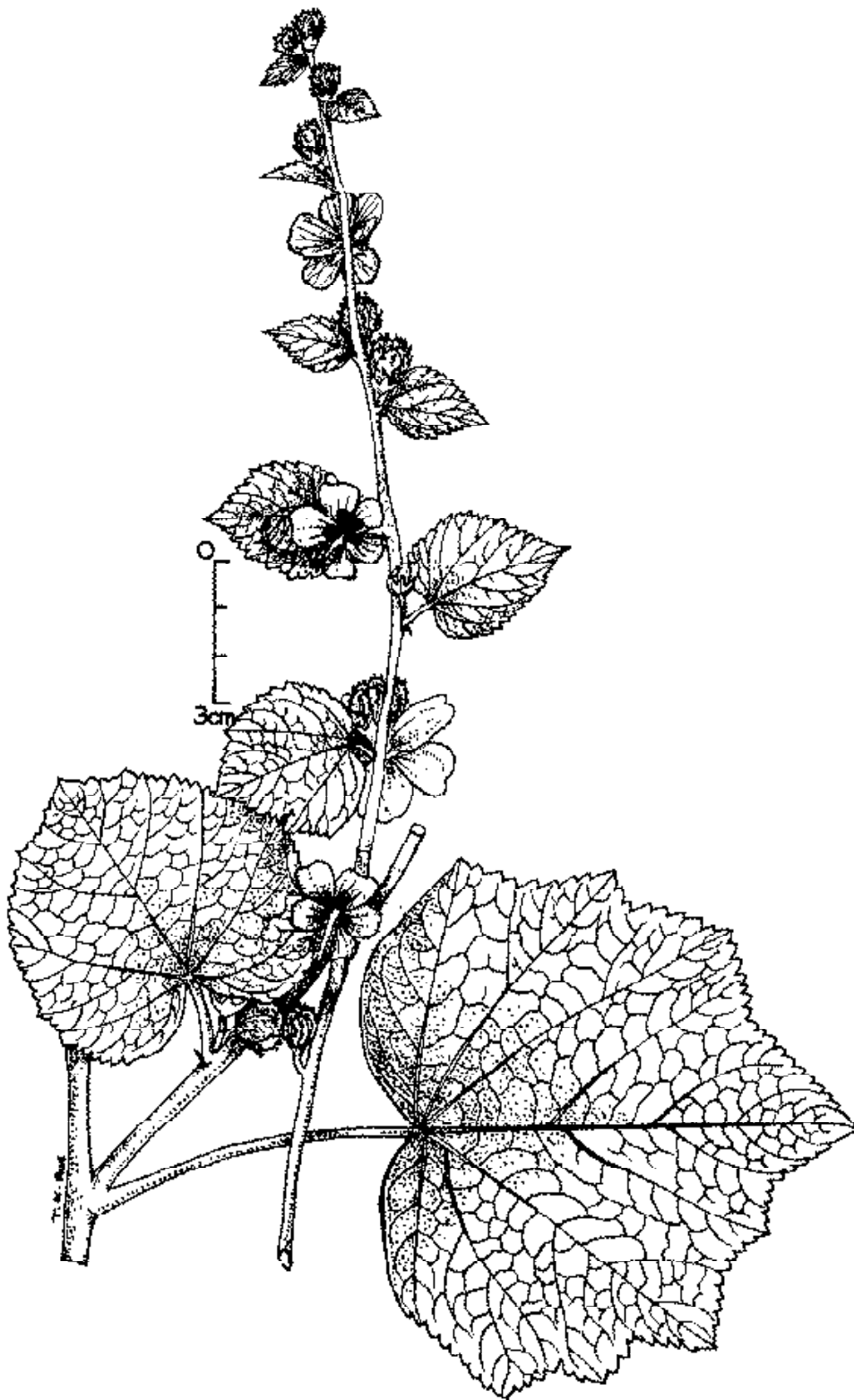


Fig. 59. *Urena lobata* Linn. ssp. *lobata* var. *lobata*

(Repr. ed. 1 : 66. 1957); Haines, Bot. Bih. & Or. 1(2) : 62. 1921 (Repr. ed. 1(2) : 65. 1921); Hara & Williams, Enum. Fl. Pl. Nepal 2 : 69. 1979; Abedin in Fl. W. Pak. 130 : 92. 1979. *U. callifera* Clarke in Journ. Linn. Soc. Bot. 25 : 7, t. 3. 1889.

Fig. 59

*Type* : Herb. Linn. n. 873.1 (Lectotype : LINN; Photo!).

*Exsicc.* : Bihar : Naurangia (Champaran Dt. ), 12.9.1965, B. Pramanik 434 (CAL); Udaipur forest (Champaran Dt.), 9.11.1963, Shetty 149 (CAL); Chota Nagpur, S.K. Mukerjee s. n. (CAL).

*Pollen* : Panporate, spheroidal (average size 113  $\mu$ ; range 112-116  $\mu$ ). Pores circular (diameter 4.2  $\mu$ ). Interporal distance 14  $\mu$ . Exine 7  $\mu$  thick, ectine (columellate layer) being very thin, spinate (Spines : height 17.5  $\mu$ ; side straight, tip acute, base not branches; basal cushion : non developed). [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 17. 1962].

*Chr. No.* :  $2n = 28$  (Dasgupta, A K. & R.P. Bhatt in Taxon 25:485 1976).

var. *viminea* (Cav.) Guerke in Bot. Jahrb. 16 : 375. 1892; Borss. in Blumea 14 : 141. 1966. *U. viminea* Cav. Diss. 6 : 335, t.184 f. 1. 1788. *U. scabriuscula* Wight & Arn. Prod. Fl. Pen. Ind. Or. 46. 1834. (non DC.). *U. lobata* (non Linn.) DC., Prod. 1: 442. 1824. *quod specim.*; Roxb., Fl. Ind. ed. Carey 3: 182. 1832.

*Type* : Brazil, Commerson s. n. (Holotype : P-JU 12331).

*Exsicc.* : Manipur : Pushing, 5000', 21.6.48, S.K. Mukherjee 3099 (CAL). Karnataka : Agumbe-Koppa Road (Mysore), 23.5.1960, Raghavan 62849 (CAL).

ssp. *sinuata* (Linn.) Borss. in Blumea 14 : 142. 1966. *U. sinuata* Linn. Sp. Pl. 692. 1753.

#### KEY TO THE VARIETIES

- |                                    |                     |
|------------------------------------|---------------------|
| 1a. Leaves palmifid to palmiparted | var. <i>sinuata</i> |
| 1b. Leaves angular to palmilobed   | var. <i>glauca</i>  |

var. *sinuata*-*U. sinuata* Linn. Sp. Pl. 692. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 329. 1874; Cooke, Fl. Pres. Bombay 1 : 100. 1901 (Repr. ed. 1 : 106. 1958); Gamble, Fl. Pres. Madr. 1 : 92. 1915 (Repr. ed. 1 : 66. 1957); Haines, Bot. Bih. & Or. 1(2) : 63. 1921 [Repr. ed. 1(2) : 65. 1961].

Fig. 60

*Type* : Ceylon, Herb. Hermann, vol. IV, Fol. 34, Linn. 257 (Lectotype : BM).

*Exsicc.* : Madhya Pradesh : Keskai (Bastar Dt.), 667 m, 16.11.1958, K. Subramanyam 7112 (CAL). Maharashtra : Shaharanpur Forest Research Garden (Thana Dt.), 14.10.1967, Billore 111791 (CAL). Bihar : Manbhum, Campbell 88 (CAL); Muramkala, Ramgarh (Hazaribagh Dt.), 29.2.1976, Banerjee 3239 (CAL).

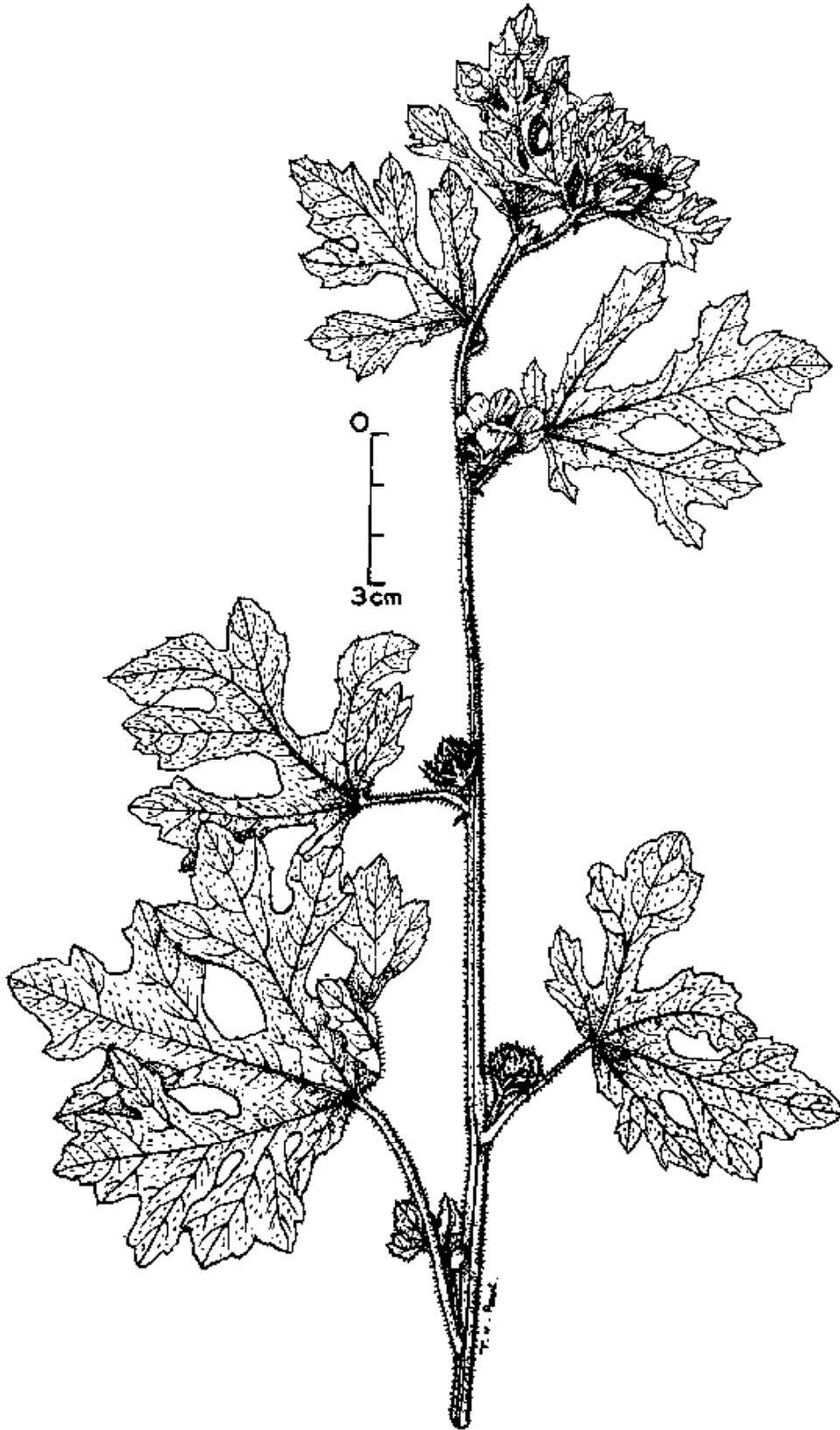


Fig. 60. *Urena lobata* Linn. ssp. *sinuata* (Linn.) Borss. var. *sinuata*

*Pollen* : Average size 109  $\mu$  (range 105-112  $\mu$ ). Tip of excrescences (bacula) mended. [P.K.K. Nair in Bull. Nat. Bot. Gard. 63 : 18, 1962].

var. *glauca* (Bl.) Borss. in Blumea 14 : 144, 1966. *U. lappago* var. *glauca* Blume, Bijdr. 2 : 65, 1825. *U. scabriuscula* DC. Prod. 1 : 441, 1824. *U. lobata* var. *scabriuscula* (DC.) Mast. in Hook. f., Fl. Brit. India 1 : 329, 1874.

*Type* : Java, Djakarta, Blume s.n. (Holotype : L 905-353-99).

*Exsicc.* : Sikkim : Gangtok, T.K. Paul & M.P. Nayar 9001 (CAL)

## 24. WISSADULA

Medic. Malv. 24, 1787; Benth. & Hook. f., Gen. Pl. 1 : 204, 1862; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam. 3, 6 : 39, 1890; Hutch., Gen. Fl. Pl. 2 : 555, 1967.

Annual or perennial herbs, undershrubs or shrubs. Leaves ovate, ovate-oblong to long triangular or lanceolate, palminerved. Flowers solitary, axillary or in loose or condensed terminal panicles. Epicalyx absent. Calyx cupular, 5-fid. Corolla small, rotate, yellow. Staminal column too short. Ovary 5 carpellate, each carpel with 3, 2 or rarely 1-ovulate; styles 5, capitate-stigmatose at apex. Schizocarp globular to obconical; mericarps beaked, dehiscent, usually with a transverse constriction, thus seemingly bilocular. Seeds 3 in each mericarps, two in upper part in collateral position and one in the lower part, sometimes 2 or 1, reniform.

*Distrib.* : c. 60 species in America, Africa and Asia, native of tropical America. 2 species are rarely cultivated or grown as an escape in India.

### KEY TO THE SPECIES

- 1a. Leaves long triangular with subcordate or truncate base;  
Flowers solitary or in lax panicles, corolla pale yellow;  
Mericarps with a distinct transverse  
constriction *W. periplocifolia* 2
- 1b. Leaves broadly ovate, deeply cordate at the base. Flowers in  
dense panicles, corolla white. Mericarps with or without  
slight transverse constriction .. *W. contracta* 1
- 1 *Wissadula contracta* (Link) R.E. Fries, K. Svensk Vet. Ak. Hansl. n. s. 43, 4 : 60, 1908; Borss. in Blumea 14 : 159, 1966. *Sida contracta* Link, En. Hort. Berol. 2 : 204, 1822. *S. leschenaultiana* DC. Prod. 1 : 468, 1824. *Wissadula leschenaultiana* (DC.) Mast. in Hook. f., Fl. Brit. India 1 : 325, 1874.

*Distrib.* : INDIA (rarely cultivated in gardens); SRI LANKA, MALAYASIAN REGION, AMERICA.

2. *Wissadula periplocifolia* (Linn.) Presl. ex Thw. En. Pl. Zeyl. 27. 1858; Hochr. in Ann. Cons. Jard. Bot. Geneve 20 : 109. 1917; Hu, Fl. China, Fam. 153 p. 26 t. 6. 1955; Borss. in Blumea 14 : 156. 1966. *Sida periplocifolia* Linn. Sp. Pl. 684. 1753; Roxb. Fl. Ind. ed. Carey 3 : 172. 1832. *Abutilon periplocifolia* (Linn.) Sweet. Hort. Brit. 53. 1826; Wt. & Arn. Prod. Fl. Pen. Ind. Or. 1 : 55. 1834. *Wissadula zeylanica* Medic. Malv. 25. 1787. *W. rostrata* Planch. in Hook. Niger Fl. 229. 1849; Mast. in Hook. f., Fl. Brit. India 1 : 325. 1874. *W. rostrata* var. *zeylanica* (Medic.) Mast. in Hook. f., Fl. Brit. India 1 : 325. 1874.

*Local Names* : Banvasma, Sahasravedi (Beng.).

Annual or perennial undershrubs 1.5-2.0 m high, pubescent. Leaves 4-11 × 1.0-4.5 cm, long triangular, apex long acuminate, base shallowly cordate to truncate, margin entire; petiole 0.5-4.0 cm. Stipules 1.5-4.0 mm long, filiform. Lower flowers solitary, axillary, mostly accompanied by a bud finally sprouting into a side branch; upper flowers in long terminal lax panicles 20-40 cm long with thin axes; pedicel 1-4 cm long, accrescent upto c. 10 cm. Calyx lobes c. 2.0 × 1.5 mm, ovate to triangular, acute. Corolla 8-12 mm across, pale yellow or rarely white. Staminal column very short, glabrous. Schizocarp 6-10 mm across; mericarps with a short mucro c. 0.5 mm long, dorsally rounded. Seeds 3 per mericarp, upper 2 seeds 2.0-2.5 mm across, tetrahedral to globular, sparsely covered with stellate and short simple hairs, lower seed 2.5-3.0 mm across, obconic to globose, at apex truncate, basal region pointed, densely hirsute with long simple hairs specially on the hilum.

*Type* : Ceylon, Herb. Hermann vol. III, fol. II. Linn. n. 251 (Lectotype : BM).

*Fls. & Frts.* : Nov.-Mar.

*Distrib.* : INDIA (Rarely cultivated, sometimes grow as an escape from cultivation); SRILANKA, MALESIAN REGION, tropical AFRICA, AMERICA.

*Exsicc.* : West Bengal : Bhedia (Burdwan Dt.), 15.3.1965, Dutt 653 (CAL); Lower Bengal, 16.11.1896, Mokim s. n. (CAL); Cossipore near Calcutta, 10.11.98, s. l. 64 (CAL).

*Chr. No.* :  $2n = 14$  (Skovsted in C.R. Lab. Carls. S. Physiol. 23 : 195. 1941).

## NYSSACEAE

Dumortier, Anal. Fam. Pl. 13. 1829.

K.M. Matthew\*

Dioecious trees or shrubs. Leaves simple, coriaceous. Flowers in axillary capitula, subtended by 1 bract and 2 bracteoles. Staminate flowers : Calyx 5-toothed. Petals 5, imbricate. Stamens 10, in two alternating whorls. Style rudimentary. Disc pulvinate. Pistillate flowers : solitary, axillary or in 2-10-flowered capitula. Petals 5, minute. Stamens of inner whorl partly sterile. Ovary inferior, connate with the entire calyx, 1-locular; ovule 1, pendulous; style brittle, with 2 appressed, later divergent, torulose branches, stigmatose on the inside. Drupes ovoid to oblong, crowned by calyx lobes and disc.

*Distrib.* : 3 genera, 2 of which are endemic to Central Asia. 1 genus (*Nyssa* Linn.) in India.

## NYSSA

Linn., Sp. Pl. 1058. 1753 & Gen. Pl. 478. 1754; Benth. & Hook. f., Gen. Pl. 1 : 952. 1867; C.B. Clarke in Hook. f., Fl. Brit. India 2 : 747. 1879; Wasscher in Blumea 1 : 343. 1935 & Fl. Males. I, 4 : 29. 1951; Hutch. Gen. Fl. Pl. 2 : 51. 1967. *Agathisanthes* & *Ceratostachys* Blume, Bijdr. 644. 1825. *Agathidantes* Hassk. Cat. Hort. Bog. 254. 1844. *Daphniphylopsis* Kurz in Journ. Asiat. Soc. Beng. 44 : 201. 1875.

### *Characters of the Family :*

*Distrib.* : 6 species : 4 in North America, 1 in China, 1 from India to Malaysia.

*Nyssa javanica* (Blume) Wangerin in Engl., Pflanzenr. IV, 220a, Heft. 41 : 15. 1909; Wasscher in Blumea 1 : 344. 1935 & Fl. Males. I, 4 : 29. 1951. *Agathisanthes javanica* Blume, Bijdr. 644. 1825. *Nyssa sessiliflora* Hook. f. & Thoms. in Benth. & Hook. f., Gen. Pl. 1 : 952. 1867; C.B. Clarke in Hook. f., Fl. Brit. India 2 : 747. 1879; Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, 8 : 258. 1898; Ridley, Fl. Mal. Pen. 1 : 895. 1922; Matthew, Enum. Fl. Pl. Kurseong 41. 1981.

*Local Names* : Gahomia sopa (Asm.); Ding-lasse (Khasi).

Dioecious trees upto 40 m tall. Leaves oblong-lanceolate to obovate, 9-17 × 3-8 cm, crowded-apically, base acute, apex abruptly acuminate; petioles upto 5 cm, slightly sulcate. Flowers in axillary capitula; peduncle upto 5 cm, bract 1 mm, bracteoles 2 × 1 mm, connate half way, broadly ovate, sericeous, ciliate. Receptacle globose to ellipsoid, flattened. Staminate flowers : Calyx 5-toothed.

\* Rapinat Herbarium, St. Joseph's College, Thiruchirapalli-620002

**Petals** 5,  $2 \times 1$  mm, free, broadly ovate, reflexed, imbricate. **Stamens** 10, those of outer whorl 2 mm, those of inner whorl 1 mm; anthers elliptic. **Disc** pulvinate, 8-10-lobed. **Pistillate flowers** : Calyx campanulate, appressed sericeous, 4-5, lobed irregular or absent **Petals** 4-5. **Stamens** 8-10, the inner whorl at least sterile. **Style** with 2 divergent or curled branches, upto 2 mm. **Drupe** ellipsoid,  $1.0 \times 0.5$  cm, greenish-yellow when young, purple when ripe.

*Fls.* : April-July;      *Frts.* : July-Dec.

*Distrib.* : **INDIA** : Central & Eastern Himalayas upto 2400 m; **Assam**  
**Meghalaya**; **MALAYSIA**, **JAVA**, **SUMATRA**, **BORNEO**

*Chr. No.* :  $n = 22$  (Mehra & Bawainin. *Evolution* 23 : 466-481. 1969).

*Notes* : **Petals** and **stamens** only 10 in the Indian materials, early caducous. **Flowers** brittle.



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CORIARIACEAE	1	Oct.	1978
PAEONIACEAE	1	Oct.	1978
DILLENiaceae	2	May	1979
POACEAE (TRIBE GARNOTIEAE)	3	Nov.	1979
SIMAROUBACEAE	4	April	1980
BALANITACEAE	4	April	1980
ORCHIDACEAE			
(GENUS COELOGYNE)	5	June	1980
PITTOSPORACEAE	6	Nov.	1980
LILIACEAE (TRIBE SCILLEAE)	7	Feb.	1981
LEGUMINOSAE (GENUS DERRIS)	8	July	1982
ACERACEAE	9	Aug.	1982
ANNONACEAE (TRIBE UVARIEAE)	10	Sept.	1982
CUCURBITACEAE	11	Dec.	1982
VIOLACEAE	12	Aug.	1983
LINACEAE	13	Sept.	1983
IXONANTHACEAE	13	Sept.	1983
POACEAE (TRIBE ISACHNEAE)	14	Mar.	1984
POACEAE			
(TRIBE ANDROPOGONEAE)	15	Mar.	1984
ASCLEPIADACEAE			
(GENUS CEROPEGIA)	16	May	1984
PAPAVERACEAE	17	July	1984
HYPECOACEAE	17	July	1984
ROSACEAE (GENUS PRUNUS)	18	July	1984