

TAXONOMIC REVISION OF THE FAMILY STERCULIACEAE FROM PAKISTAN

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Abstract

Ten genera and 19 species of Sterculiaceae, mostly cultivated, are discussed. Keys to the taxa and descriptions are provided. Following Hutchinson several species have been transferred to *Brachychiton*, *Ferniana* and *Pterygota* from *Sterculia*. Correct nomenclature and authority have been adopted in addition to a few new records from the area.

Introduction

The family Sterculiaceae consists of 68 genera and over 1000 species, mainly distributed in the tropical countries. In Pakistan it is represented by 10 genera and 19 species, of these only one genus and two species are indigenous to our area.

Some members of the family are important economically. Cocoa is obtained from the seeds of *Theobroma cacao* Linn. and some of the species like *Guazuma ulmifolia* Lam. and *Pterospermum acerifolium* (Linn.) Willd. etc. are reputed to have medicinal properties also. Many plants are cultivated for their aesthetic and ornamental value.

Most of the works applicable to our area, e.g., Masters (1874), Beissier (1867), Cooke (1958), Jafri (1966), Qurzishi & Khan (1971) are confined to the indigenous taxa only with the exception of Parker (1953) who has discussed some cultivated plants also. Furthermore, considerable taxonomic and nomenclatural changes have taken place over the years and a thorough revision of all the taxa found in Pakistan is called for. Hence, an attempt is made here to provide a taxonomic account of the family, including both wild and cultivated plants.

FAMILY CHARACTERS

Trees, shrubs or usually perennial herbs, sometimes climbing, generally with soft wood and stellate hairs at least on young parts. Leaves usually stipulate, petiolate, alternate or infrequently opposite, simple or digitately compound, entire, toothed or lobed. Inflorescence of various types, axillary rarely terminal, cymes, racemes or panicles, sometimes 1-flowered. Flowers bisexual, sometimes unisexual or both, actinomorphic, rarely zygomorphic, hypogynous. Sepals (3-) 5 (-7), fused or free, valvate, generally persistent. Petals 5 or absent, free or basally adnate to the staminal column, twisted, imbricate or valvate. Stamens 5-many, in 2 whorls, the outer with or without staminodes, usually monadelphous or free; anthers variously arranged, ditheous, longitudinally dehiscent. Carpels (1-) 5 (-12), syncarpous, sometimes apocarpous; ovary superior, sessile or stipitate, as many loculed as the number of carpel; ovules (1-) 2-many in each locule, anatropous, ascending or horizontal; placentation axile; style simple, lobed or free into as many branches as carpels. Fruit a capsule, a schizocarp or a follicle, very rarely baccate, dehiscent or indehiscent. Seeds usually endospermic; embryo straight or curved; cotyledons usually foliaceous, flat or folded.

KEY TO THE GENERA

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|---|------------------------|
| 1. +Flowers bisexual. Petals present. Carpels generally united. | 2 |
| —Flowers uni and bisexual on the same plant or only unisexual. Petals absent. Carpels free or becoming free in fruit. | 7 |
| 2. +Ovary sessile or subsessile. Androgynophore usually absent. | 3 |
| —Ovary stipitate or supported on an androgynophore. | 5 |
| 3. +Petals flat, obtuse or slightly notched, never cucullate. | 4 |
| —Petals cucullate, deeply bifid. | 3. Guazuma |
| 4. +Trees or shrubs. Bracteole absent (in ours). Sepals reflexed. Petals persistent. Stamens 10-20. | 1. Dombeya |
| —Shrubs undershrubs or herbs. Bracteole present. Sepals not reflexed. Petals marcescent. Stamens 5. | 2. Melhania |
| 5. +Anther locules parallel. Fruit terete, or angular. Seeds winged in the upper part. | 4. Pterospermum |
| —Anther locules divaricate. Fruit inflated or twisted. Seeds not winged. | 6 |
| 6. +Flowers axillary, solitary, fascicled or few in cymes. Ovules numerous in each locule. Fruit woody, not inflated. | 5. Helecteris |
| —Flowers in large terminal panicle. Ovules c. 4 in each locule. Fruit membranous, inflated. | 6. Kleinhovia |
| 7. +Seeds winged. | 10. Pterygota |
| —Seeds not winged. | 8 |
| 8. +Fruit woody, not reticulately veined. Seeds many, not adhering to the margins. | 9 |
| —Fruit membranous, reticulately veined. Seeds 1-few, adhering to the margins. | 9. Fermiana |
| 9. +Seeds not enveloped by honeycomb like cells of endocarp. | 7. Sterculia |
| —Seeds enveloped by honeycomb-like cells of endocarp. | 8. Brachychiton |

I. **DOMBEYA**

Cav., Diss. 3: 121 tt 38-41.1787 (nom. cons.); Mast. in Oliver, Fl. Trop. Africa 1:226. 1868; Parker, For. Fl. Punj. ed. 3.46.1956; Hutch., Gen. Fl. Pl. 2:504.1967.

Trees or shrubs. Leaves usually lobed, palminerved, cordate. Inflorescence a much branched axillary or terminal, pedunculate cyme. Flowers bisexual, actinomorphic. Sepals 5, fused at the base, finally reflexed. Petals 5, imbricate, persistent. Stamens 10-20 fertile, 5 sterile strap shaped, all united below into a shallow cup or a ring; anthers extrorse, lobes parallel. Carpels 2-5, syncarpous; ovary sessile, 2-5 loculed, each 2-3 ovuled; style filiform, with 2-5, shortly radiating stigmas. Fruit a loculicidally dehiscent capsule. Seeds 1-2 in each cell, endospermic; cotyledons foliaceous and 2-parted.

A large genus with c. 350 species, mostly distributed in Africa and Madagascar. Cultivated in other countries. In Pakistan it is represented by 4 cultivated species.

KEY TO THE SPECIES

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|---|--------------------------|
| 1. +Peduncle 20 cm long. Fruiting style c. 2 cm long. Stigma exserted. | 1. D. wallichii |
| —Peduncle 3-10 cm long. Fruiting style c. 1 cm long. Stigma usually included. | 2 |
| 2. +Leaf bases shallowly cordate, lower surface with prominent, rusty pubescent veins. Fruit globose. | 2. D. spectabilis |
| —Leaf bases deeply cordate, lower surface velvety, veins neither much prominent nor rusty pubescent. Fruit oblong. | 3 |
| 3. +Leaves 3-5 lobed. Inflorescence a branched cyme. Flowers commonly pinkish. Bracts ovate. | 3. D. acutangula |
| —Leaves not or obscurely lobed. Inflorescence umbellate cyme. Flowers commonly white. Bracts linear. | 4. D. mastersii |
| 1. Dombeya wallichii (Lindl.) L.H. Bailey, Stand. Cyclo. Hort. 1:1066.1947; E.A. Menninger, Fl. Tr. World 268.1962. (Fig. 1, G). | |

Astrapaca wallichii Lindl., Collec. Bot. t. 14. 1822.

A shrub or small tree. Leaves cordate, serrate. Inflorescence axillary, umbellate, drooping, 12-15 cm broad; peduncle more than 20 cm long, many flowered. Flowers pink, c.3 cm across, pedicel c. 4 cm long. Sepals c. 1.5 cm × 3 mm, with rusty, spreading hairs outside. Petals 2-2.5 × 1-1.5 cm, obloque, obovate. Stamens fused below, fertile stamens c. 1 cm and sterile c. 1.5 cm long. Carpels 5; ovary ovate-oblong, densely villous. Fruit 5 angled, ovate-oblong with dense rusty hairs and c.2 cm long persistent style; Seeds 2 in each cell.

F-5 Khairpur Dist.: Khairpur, 10 ft. tall shrub, cultivated in the garden, *S.M.H. Jafri* 1472 (KU11).

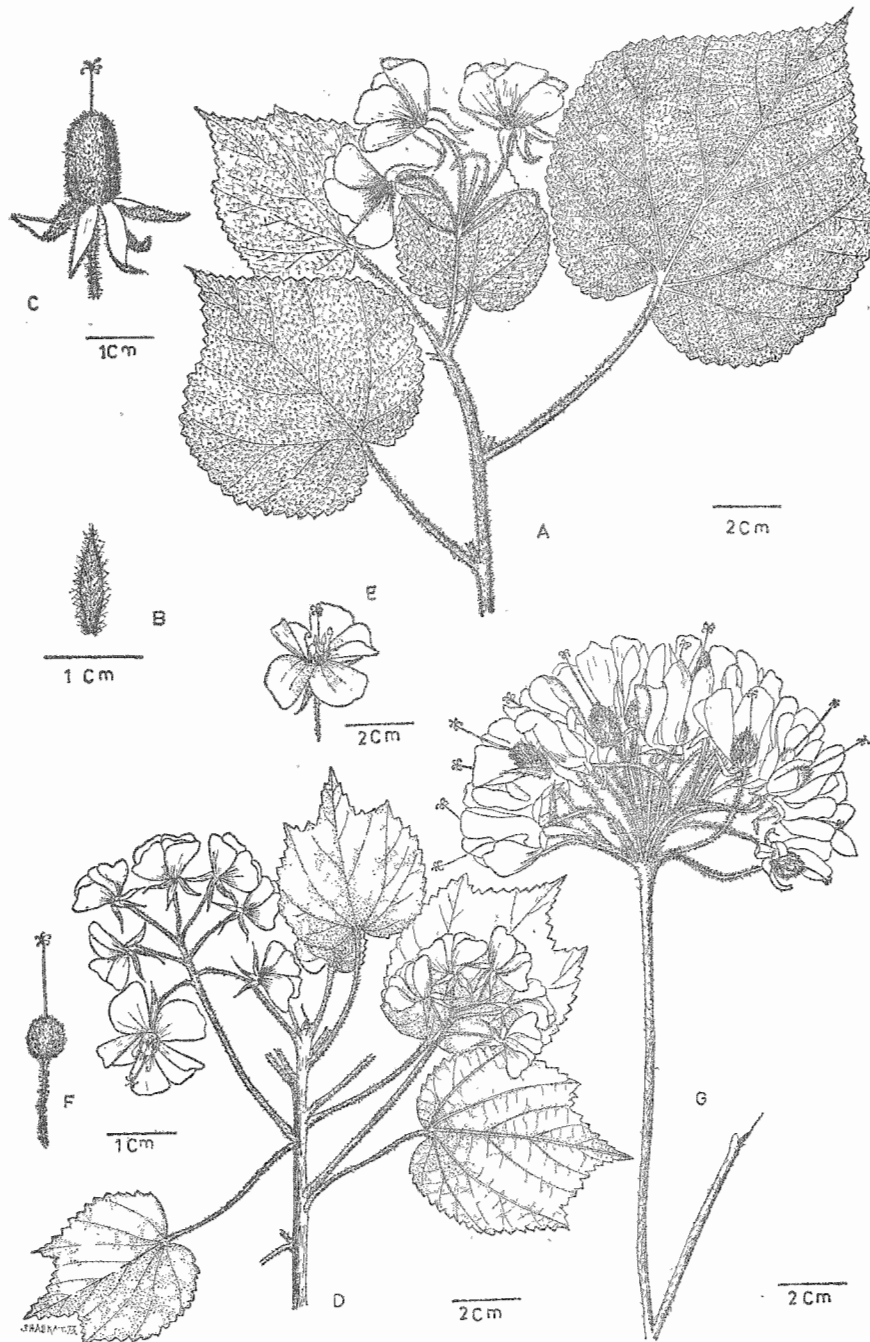


Fig. 1. *Dombeya mastersii*, A, Flowering twig; B, Bract; C, Fruit with calyx. *Dombeya spectabilis*, D, flowering twig; E, flower; F, Fruit. *Dombeya wallichii*, G, Inflorescence.

Distribution: Indigenous to Madagascar.

A beautiful shrub with showy clustered flowers, occasionally cultivated in gardens of Sind.

Fl. Per. April-May.

2. ***Dombeya spectabilis*** Bojer., Ann. Sc. Nat. Ser. 2. 18:191. 1842; Mast. in Oliver, l. c. 227; Bailey, l.c. 1065; (Fig. 1, D-F).

A small tree. Leaves rounded cordate, blade 2-7 cm in diameter, subsabrous on both the surfaces, serrate; veins prominent beneath with rusty pubescence, petiole 2-5 cm long, downy. Inflorescence axillary cyme with peduncle 3-7 cm long, downy. Flowers pinkish, 2-2.5 cm across; pedicel 1.5-2 cm, downy. Sepals 1 cm \times 2 mm, linear lanceolate, pubescent outside. Petals c. 1.5 cm long and almost equally broad, oblique, obovate, reflex. Stamens fused at the base. Carpels 5; ovary globose, 2-3 mm in diameter, villose. Fruit globose 5-angled, villose, 5 mm in diameter.

G-5 Hyderabad Dist.: Hyderabad, 28.12.1957. *Mushtaq Husain* s.n. (KUH).

Distribution: Madagascar. Occasionally cultivated in Pakistan, Malaya and U.S.A. etc.

Fl. Per. Almost round the year.

3. ***Dombeya acutangula*** Cav., Diss. 3:t. 38. f. 2. 123. 1786; Bailey, l.c. 1065; (Fig. 2, D - G).

A shrub or small tree. Leaves deeply cordate; blade 6-16 cm long and equally broad, serrate, 3-5 lobed, stellately tomentose on both surfaces, glabrescent, lobes acute-acuminate; petiole 4-18 cm long. Inflorescence axillary cyme, peduncle 5-8 cm long, tomentose. Flowers pinkish, 2-3 cm across; pedicel 1.5-2.5 cm long tomentose; bracts 3, ovate acuminate, c. 1 cm \times 5 mm, caducous. Sepals 1-1.5 cm \times 3-4 mm, narrowly lanceolate, pubescent outside, persistent. Petals free, 1.5-2 \times 1-1.5 cm, oblique, obovate. Stamens 8-10 mm long, staminodes 1-1.5 cm long; all fused below into 3-4 mm long cup. Carpels 5; ovary oblong, densely villous, 3-4 mm long; style equalling the staminodes; stigmas 5, recurved-coiled. Fruit oblong, 5 angular, 5-8 \times 3-4 mm, densely villous.

D-4 Karachi Dist.: Zool. Garden, Karachi, flowers pink, 8 ft. tall, cultivated, 20.1.1966. *Saida Qureshi* s.n. (KUH); D.J. Science College, Karachi, flowers pinkish, 2.5 m tall shrub, cultivated *Sultanul Abedin* 9804, 9805 (KUH).

Distribution: Indigenous to Mascarene Islands, cultivated in Pakistan, India and U.S.A. etc.

A beautiful ornamental shrub of the gardens. *Fl. Per.* November-January.

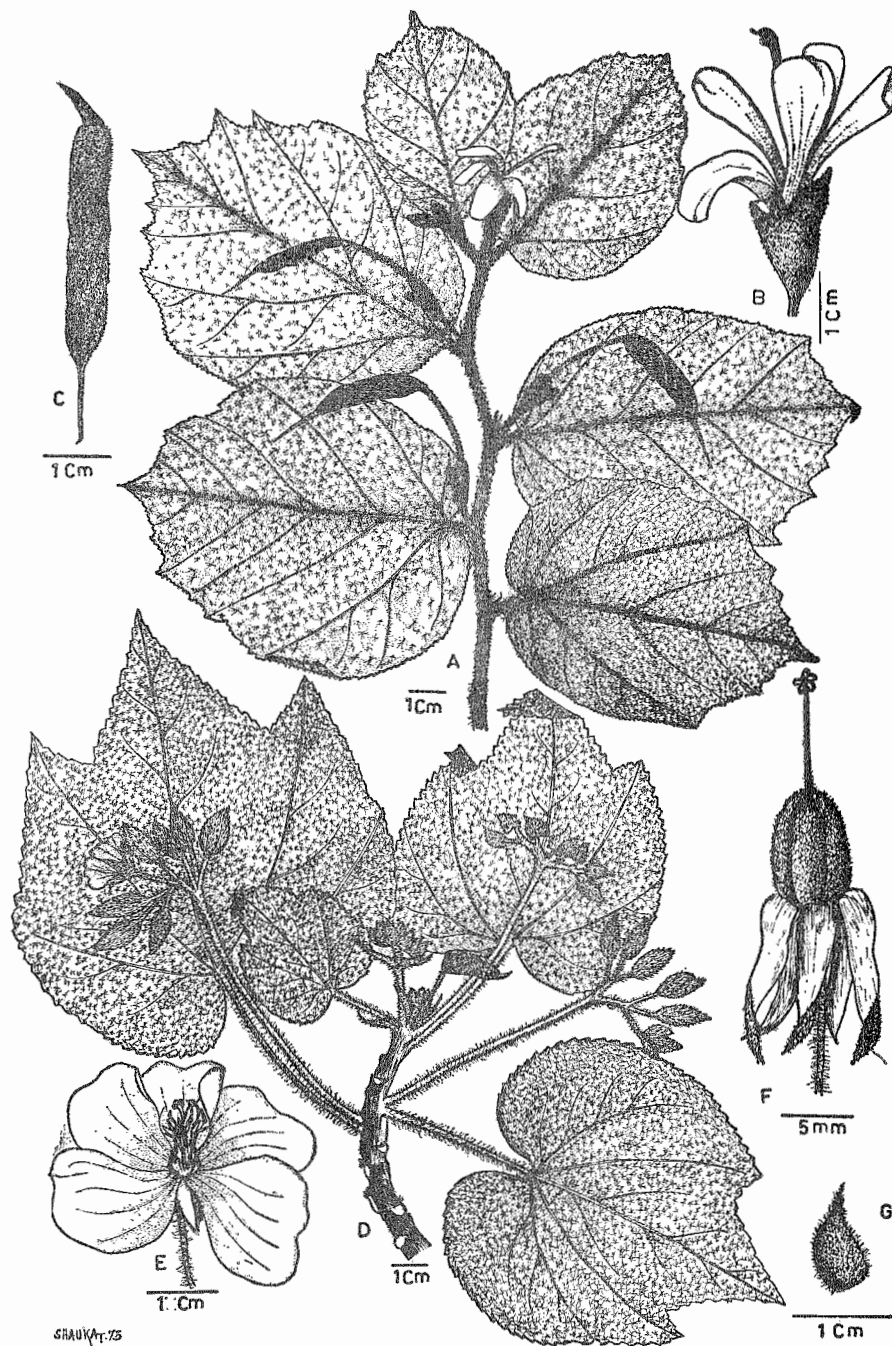


Fig. 2. *Helicteris isora*. A, Flowering twig; B, Flower; C, Fruit. *Dombeya acutangula*, D, Flowering twig; E, Flower; F, Fruit with calyx; G, Bract.

4. ***Dombeya mastersii*** Hook. f., Bot. Mag. t. 5639. 1867; Mast. in Oliver, l.c. 228; Parker, l.c. 47 (Fig. 1, A-C).

D. angulata auct. non Cav., Mast. in Card. Chron. 74. 1867.

A small shrub or tree; young parts tomentose with spreading hairs. Petiole 2-10 cm long, hairy; blade 5-7 cm long and broad, deeply cordate-ovate, acute or acuminate, serrate, sometimes obscurely 3-lobed, upper surface somewhat scabrous, lower velvety. Inflorescence axillary, many flowered, umbellate cyme; peduncle 2-5 cm long with dense spreading hairs. Flowers commonly white; bracts 3, linear c. 1 cm × c. 2 mm; pedicel 1.5-4 cm long with dense spreading hairs. In rest of the parts it resembles *D. acutangula* except in the size of petals which are usually smaller.

C-8 Sialkot Dist.: Cultivated, Sialkot, March 1954 *R.R. Stewart* s.n. (RAW); **D-8** Lahore Dist.: Lahore Cultivated shrub, 2 m tall, Bagh-i-Jinnah, 9.3.1973 *Rafiq Ahmad* s.n. (KUH); **G 4** Karachi Dist.: University Campus, Chemistry Dept., 6 ft. tall, Flowers light pink, 20.2.1970 *Abrar Husain* s.n. (KUH); **G 5** Dadu Dist.: Sind University Campus, 30.12.1958 *M. J. Husain* s.n. (KUH).

Distribution: Indigenous to tropical Africa; Cultivated in Pakistan and India etc. as an ornamental.

Fl. Per. December-March.

2. MELHANIA

Forssk., Fl. Aeg.-Arab. 64. 1775; Mast. in Hook. f., Fl. Brit. Ind. 1:372. 1874; Cooke, Fl. Bomb. Pres. Repr. ed. 1:141. 1958; Parker, For. Fl. Punj. ed. 3.45. 1956; Hutch. Gen. Fl. Pl. 2:550. 1967.

Herbs, undershrubs or shrubs, usually covered with stellate tomentum. Leaves simple, variable in shape, dentate-crenate. Inflorescence usually axillary, solitary, cyme or umbellate. Flowers bisexual, actinomorphic, yellow, rarely unfolding; bracts 3, cordate, reniform, ovate, lanceolate or linear, often longer than sepals. Sepals 5, basally connate. Petals 5, large, marcescent round the ovary. Stamens 5, alternating with 5 staminodes, all shortly united below; anthers extrorse, locules parallel. Carpels 5, syncarpous; ovary sessile, 5-loculed, each 1-many ovuled; style short, 5-branched above, spreading, subulate, stigmatose on the inner side. Fruit loculicidal capsule. Seeds 1-numerous, endospermic with plicate and bipartite cotyledons.

A genus of about 60 species, of Africa, Madagascar, Asia and Australia; only 3 are known from Pakistan.

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| 1. + Bracts linear. | 1. <i>M. ovata</i> |
| —Bracts ovate, cordate or reniform. | 2 |
| 2. + Bracts cordate-reniform, broader than long, larger than sepals, glabrescent, membranous and much enlarged in fruit. | 2. <i>M. denhamii</i> |
| —Bracts ovate, longer than broad, smaller than sepals; tomentose, not membranous, nor much enlarged in fruit. | 3. <i>M. futteyporensis</i> |

1. *Melhania ovata* (Cav.) Spreng. Syst. Veg. 3:32. 1826; Boiss., Fl. Orient. 1:841. 1867. (Fig. 3, J).

Brotera ovata Cav., Ic. 5:20. t. 433. 1789; *Melhania abyssinica* A.Rich., Tent. Fl. Abyss. 1:76. t. 18. 1847; Mast. in Hook. f., l. c. 372; Cooke, l.c. 141.

A low growing, much branched, downy undershrub. Leaves broadly elliptic, ovate or oval, hairy on both sides, paler beneath, crenate-dentate, obtuse; blade 2-2.5 × 1.5-1.7 cm; petiole 7-12 mm long; stipule filiform, 6 mm long. Flowers axillary, solitary or in fascicles of 2-4; pedicel ± 1 cm long; bracts 3, linear c. 6 mm long, persistent. Sepals c. 8 × 2-3 mm, lanceolate, acuminate, pubescent, persistent. Petals yellow, obovate, shorter than sepals. Fruit c. 8 mm across, ovoid or somewhat pyramidal, slightly pointed, villose.

Baluchistan: without locality: *Stocks* 618 (G; KUH).

Distribution: Africa: Ethiopia, Cape de Verde Islands and probably introduced in Pakistan (Baluchistan).

It is a rare species in Pakistan. It was collected by *Stocks* in 1850 from Baluchistan and since then it has not been recorded.

2. *Melhania denhamii* R. Br. in Denham & Clapp., Voy. App. 231. 1826; Mast. in Oliver, Fl. Trop. Afr. 1:230. 1868; in Hook. f., l.c. 373; Cooke, l.c. 142; Jafri, Fl. Kar. 231. 1966. (Fig. 3, C).

Brotera bracteosa Guill. et Perr., Fl. Seneg. Tent. 1:t. 17.80 1831; *Melhania bracteosa* (Guill. & Perr.) Boiss., Fl. Orient. 1:841. 1867.

Undershrub, up to 60 cm tall with stellate-tomentum and spreading branches. Leaves ovate, elliptic, ovate-elliptic or oblong-elliptic, crenate-serrate, obtuse, apiculate or somewhat truncate, blade 2-4 × 1-2 cm, velvety on both surfaces; petiole 1-2 cm long, tomentose; stipule 2-3 mm long, subulate filiform, hairy. Inflorescence commonly 2-5 flowered pseudo-umbellate, or solitary; peduncle 0.5-1 cm long; pedicel 3-5 (—10) mm long, with stellate hairs; bracts free, cordate-reniform, 5-8 × 7-10 mm, in fruit becoming glabrous, membranous wing like, much enlarged, 1-1.5 × 1.5-2 cm, reticulate-ly veined. Sepals 4-7 × 1-3 mm, enlarged in fruit, lanceolate or ovate-lanceolate, densely hairy outside, less inside. Petals 7-10 × 4 mm, oblique obovate. Stamens c. 3 mm long; filaments flat, c. 1 mm broad; anthers basifixed. Ovary c. 2 mm long, densely hairy. Capsule subglobose, c. 4 mm long and c. as broad, villose. Seeds 1-2 in each locule, glabrous, c. 2 × 1 mm, obovate, brown-black.

G-3 Bela Dist.: near Hub River, common in hillocks, 30-60 cm tall, flowers yellow, *S.M.H. Jafri* 2632 (KUH); Pub range, 4 miles from Hub Chawki, undershrub, on rocky place, with fruits, *Khadija Axis & Abrar Husain* s.n. 3.4.1968 (KUH); Near Bela, *S.I. Ali et al* s.n. 25.7.1968 (KUH); Sonmiani, undershrub, sandy soil, flowers yellow, 15 cm tall, *S.I. Ali & Sultanul Abedin* 709, 1192 and 1301 (KUH); c. 2 miles from Sonmiani, on way to Uthal, with fruits, erect herb, sandy soil, *M. Qaiser, Asad Raza & Abrar Husain* 707 (KUH); Sonmiani, herb c. 30 cm tall, flowers yellow, sandy soil, *Sultanul Abedin* 3691, 5543 and 5864 (KUH); G-4 Karachi Dist.: Near Paradise Point, with

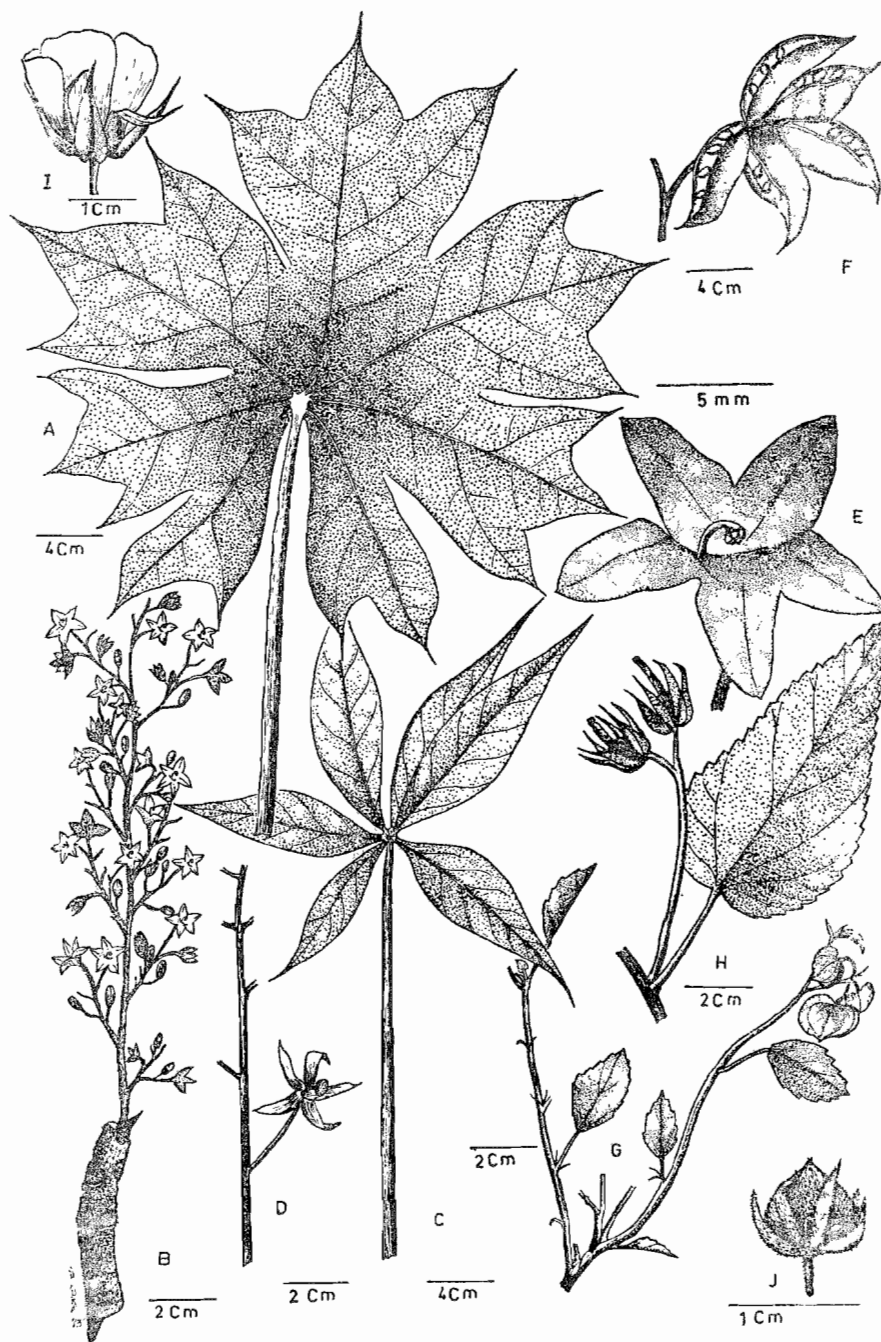


Fig. 3. *Sterculia villosa*, A, Leaf; B, Branch with inflorescence; E, Flower. *Sterculia foetida*, C, Leaf; D, Flowering twig; F, Fruit. *Melhania denhami*, G, Flowering twig. *Melhania futteyporensis*, H, Flowering Twig. *Melhania ovata*, J, Fruit with calyx and bract.

fruits, on hillocks, *S.I. Ali* s.n. Aug. 1968 (KUH); Near Bund Murad, with fruits, 30 cm tall herb; *S.I. Ali et al* s.n. Aug. 1968 (KUH); G-5 Tharparkar Dist.: Diplo, Rangers Post, erect shrub, c. 60 cm tall, flowers yellow, epicalyx persistent, sandy soil, *M. Qaiser*, *A. Ghafoor* & *Abrar Husain* 3850 (KUH); Thatta Dist.: 39 miles from Karachi on way to Thatta, with fruits, 20 cm tall, *Sultanul Abedin* 5215 (KUH); Sanghar Dist.: Between Gidro and Khinsar, 2.10.1956, *M.B. Zaman* & *S.M. Husain* s.n. (PFI-M).

Distribution: Pakistan, Sind and Baluchistan; Tropical Africa and Arabia.

Flowers and leaves are said to be used for blood purification and cooling.

Fl. Per.: Throughout the year.

3. *Melhania futteyporensis* Munro ex Mast. in Hook. f., *Fl. Brit. Ind.* 1:373. 1874; Parker, l. c. 46; (Fig. 3, H).

M. tomentosa Stocks ex Mast. in Hook. f., l.c. 373.

Undershrub, 40-70 cm tall, canescent. Leaves lanceolate, elliptic-lanceolate, ovate or ovate-lanceolate, serrate-crenate, sometimes obscurely 3-lobed; blade 2.9 x 1.6 cm, 5-7 nerved, velvety on both surfaces, more beneath, upper surface darker. Petiole pubescent, 1-3 cm long; stipule 4-8 mm long, brown, filiform. Inflorescence axillary cyme; peduncle 1-5 cm long, pubescent, 2-4 flowered. Flowers 1.5-2 cm across; pedicel 0.5-1 cm long, pubescent, up to 1.5 cm long in fruit; bracts 0.8-1.6 x 0.5-1 cm, pubescent, commonly ovate, cuspidate, recurved or not, slightly shorter than or equaling the calyx, persistent. Sepals 0.8-1.8 cm x 3-4 mm linear lanceolate, acuminate or cuspidate, pubescent outside, persistent. Petals c. 1.6 cm x 6-8 mm, obovate, oblique. Fertile stemens 0.8-1 cm long, anthers longer than filaments; staminodes c. 1.5 cm x 1 mm. Capsule 0.6-1.5 cm x 3.5-8 mm, oblong or somewhat globose obtuse or rarely minutely beaked, villous. Seeds 2 in each locule, 2 mm — 1-1.5 mm, angular, black, muricate.

Zir Chitral Dist.: Chitral, *Hassan Din* 197 (RAW); Btr Malakand Dist.: South of Malakand, Steep rocky slopes, flowers orange, 1" across, 5.10.1958 *B.L. Burt* 1506 (PFI-B); Zir Campbellpur Dist.: Kala Chitta Forest, 2.9.1955, *R. D. Ahmed* s.n. (PFI-B); Jhelum Dist.: near Mogi, 1500', *R. R.* & *I. D. Stewart* 799 (RAW); Near Khewra, among rocks, *E. Nasir* & *M. A. Siddiqi* 3638 (RAW); Rawalpindi Dist.: Topi Park, 1700, *R. R. Stewart* 15093 (RAW); flowers yellow, 70 cm tall, Saidpur, *Sultanul Abein* & *M. Qaiser* 8557 (KUH); Sargodha Dist.: 4½ miles from Sakesar on way to Nawshara, 45 cm tall, erect, flowers yellow, *M. Qaiser* 2643 (KUH); c. 2 miles from Sakesar on way to Nawshara, 60 cm tall, erect, flowers yellow, *M. Qaiser* 2678 (KUH); G-3 Bela Dist.: c. 3 miles from Hub Chawki on way to Bela, c. 300', gravel sandy clay, 40 cm. tall, flowers yellow, not open, bracts 3, broad, *Sultanul Abedin* 3727 (KUH); Sind: G 6 Tharparkar dist.: Nagar parker, seeds 2 in each locule, *Mohd. Shariff T 33* (KUH).

Distribution: India and Pakistan.

Fl. Per. August-December.

3. GUAZUMA

Mill., *Gard. Dict. Abridg.* ed. 4.2: 1754; Mast. in Hook. f., *Fl. Brit. Ind.* 1:375. 1874; Hutch., *Gen. Fl. Pl.* 2:514. 1967.

Trees or shrubs with stellate hairs. Leaves alternate, simple, dentate-serrate, often oblique. Inflorescence axillary pedunculate cyme. Flowers white, pink or yellow,

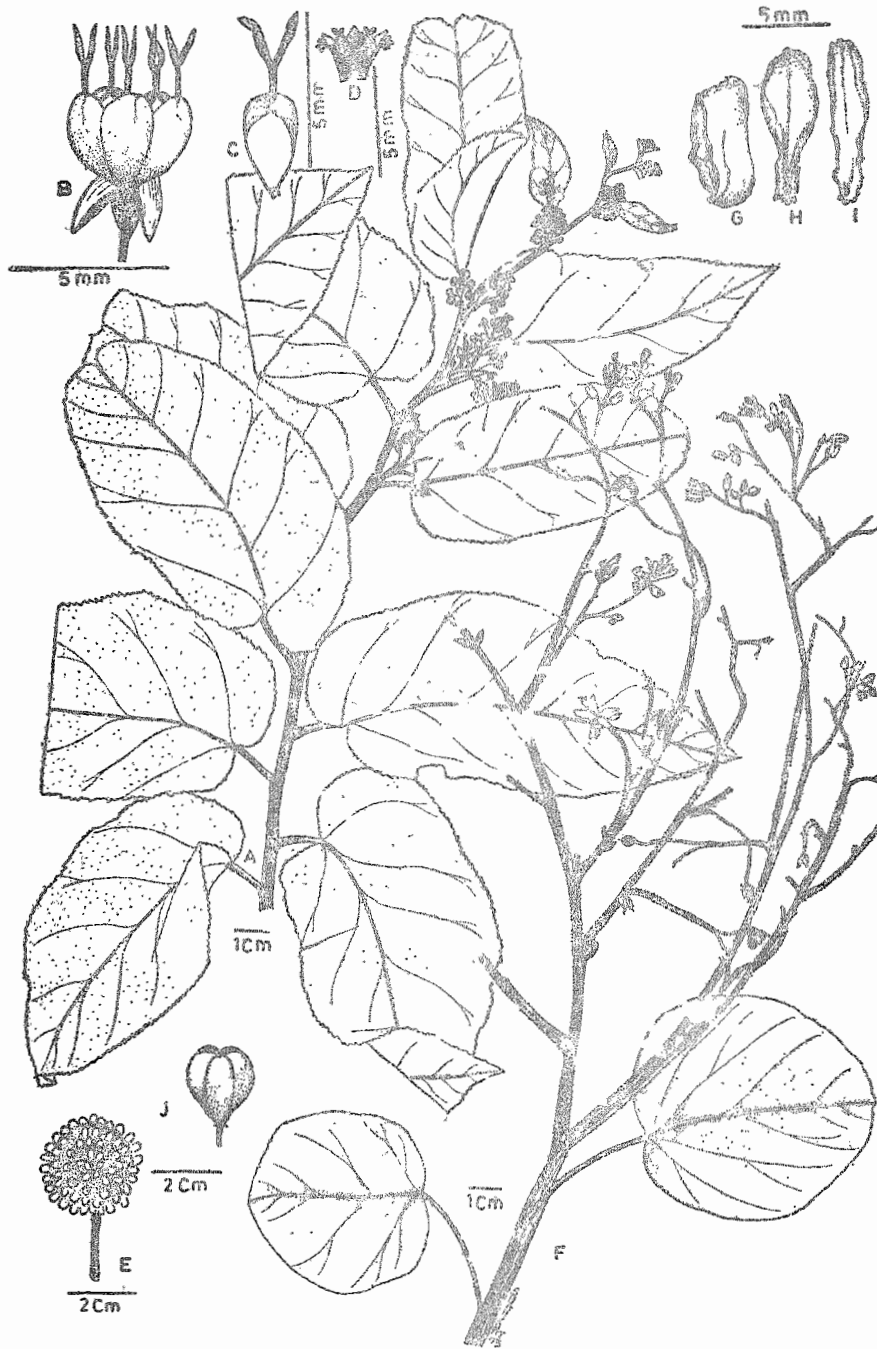


Fig. 4. *Guazuma ulmifolia*, A, Flowering twig; B, Flower; C, Pistil; D, Stamens; E, Fruit. *Kleinhovia hospita*, F, Flowering twig; G-I, Petals; I, Fruit.

bracteate, bisexual, actinomorphic. Calyx 2-5 lobed or partite, lobes reflexed. Petals 5, cucullate, apex with a long, deeply bifid, liguliform appendage, valvate. Stamens 15, monadelphous, staminal column divided above into triangular or lanceolate staminal nodes and 5 filaments, each with 3 functional anthers, opposite the petals. Carpels 5, syncarpous; ovary ellipsoid-globose, 5-loculed, ovules numerous, biseriate; style connate, filiform. Fruit a woody capsule, muricate, bristly or with filiform appendages. Seeds small, endospermic; embryo erect or slightly curved; cotyledons foliaceous, folded.

A genus of 4 species, chiefly distributed in tropical America; only 1 cultivated species found in Pakistan.

Guazuma ulmifolia Lam., *Encycl. Meth. Bot.* 3:52. 1789; Bailey, l.c. 1415; A. Robyrs, *Ann. Miss. Bot. Gard.* 51:102. 1964; (Fig. 4, A-E).
Theobroma guazuma Linn., *Sp. Pl.* 782. 1753; *G. tomentosa* H.B. & K., *Nov. Gen. Sp. Pl.* 5:320. 1823; Mast. in Hook. f., l.c.; Parker, l.c.

A tree. Leaves ovate, ovate-oblong, or lanceolate, oblique, acuminate, somewhat scabrous above and velvety below, blade 5-10 X 2-6 cm; petiole; 0.5-2 cm long, Inflorescence terminal, axillary, many flowered thyriform. Flowers small, c. 1 cm across, yellow; pedicel 3-6 mm long. Sepals 3-5, basally connate, 2-3 X c. 1.5 mm, elliptic-lanceolate or ovate, tomentose outside, nearly glabrous inside, reflexed. Petals obovate, c. 3 X 2 mm, appendage 3-4 mm long, puberulous outside. Stamens 2-2.5 mm long, concealed in the cucullate petals; anthers orange or reddish. Ovary c. 1 mm long. Capsule globose or oblong-ellipsoid, 1-2 X 1-1.5 cm, black at maturity, obtuse, tubercled, woody.

G-4 Karachi Dist.: Zool. Garden, 8 m tall tree, petals yellow, hooded, appendages becoming purple, cultivated, *Sultanul Abedin & Haroon Usmani* 9791, 9792 (KUH);
G 5 Hyderabad Dist.: Botanical Garden, Tandojam, cultivated as an ornamental, *A. Jalees* s.n. 7.10.1959 (RAW)

Distribution: A native of Tropical America and Java. Frequently cultivated in India, Burma and Pakistan.

The fruit resembling a black mulberry contains a small quantity of sweet edible pulp, and is also said to be highly valued for fattening cattles. The mucilaginous sap from the inner bark is used for clearing sugar in the W. Indies. In W. Indies and Mauritius the inner bark is reported to be used as a remedy for elephantiasis, and old bark for skin troubles and chest diseases. Bark also yields a strong fibre.
Fl. Per. March-May, Sept.-Dec.

4. PTEROSPERMUM

Schreb., *Gen.* 2:461.1791 (*nom. cons.*); Roxb., *Fl. Ind.* ed. Carey 3:158. 1832; Mast. in Hook. f., *Fl. Brit. Ind.* 1:366. 1874, Cooke, *Fl. Bomb. Pres. Rep.* ed. 1:136. 1958; Brandis, *Ind. Tr.* 90. 1906; Talbot, *For. Fl. Bomb. Press & Sind* 1:147. 1911; Hutch., *Gen. Fl. Pl.* 2:516. 1967.

Trees or shrubs covered with scales or stellate tomentum. Leaves alternate simple, often lobed, entire, angular or toothed above, usually obliquely cordate, coriaceous, coppery, rusty or silvery below. Inflorescence axillary or terminal, 1-3 flowered. Flowers bisexual, actinomorphic; bracts generally 3, entire or lacinate. Calyx tubular, 5-toothed or partite, splitting along one side, coriaceous, deciduous. Petals 5, imbricate, white or yellow, deciduous. Stamens 15, united below, column adnate to gynophore,

divided above into 5 lobes each with 3 anthers alternating with 5 ligulate antipetalous staminodes; anthers apiculate, erect, linear, loculi parallel. Carpels 3-5, syncarpous; ovary on an androgynophore, 3-5 loculed; each locule many ovuled; style entire, clavate; stigma 3-5 lobed. Fruit a large woody or leathery loculicidal capsule, ovoid or oblong, terete or angular, 3-5-valved. Seeds numerous, in 2 rows, winged above; endosperm thin or absent; cotyledons wrinkled or folded.

About 40 species, distributed in East Himalaya, South East Asia and W. Malaysia. In Pakistan it is represented by 1 species.

Pterospermum acerifolium (Linn.) Willd., Sp. Pl. 3:729. 1801; Mast. in Hook. f. l.c. 368; Cooke, l.c. 137; Brandis, l.c. 91; Talbot, l.c. 149; Bailey, l.c. 2855. Parker, l.c. 45; Cowen, Fl. Tr. & Shr. Ind. 81. 1969. (Fig. 5, A)
Pentapetes acerifolia Linn., Sp. Pl. 698. 1753.

A large tree, up to 10 m high, with smooth, light ash-coloured bark and young parts with ferruginous tomentum. Leaves variable in shape and size, orbicular, oblong, obovate, cordate or somewhat rectangular, often peltate, entire, repand, obscurely to coarsely toothed or irregularly lobed, glabrescent and dark green above, silvery rusty brown below, coriaceous; blade 10-40 X 8-35 cm; petiole 5-15 cm, densely tomentose at the base; stipules pinnatifid, caducous. Flowers axillary, solitary or 2-3, white, fragrant, 10-15 cm across; pedicel c.2 cm long; bracts lacinate. Sepals 5, basally connate, linear-lanceolate or oblong, obtuse, 8-12 X c. 1 cm, densely rusty tomentose outside, leathery, finally reflexed, deciduous. Petals linear-oblong or obovate, somewhat obliquely cuneate, obtuse, 7-12 X 1 cm reflexed, deciduous. Fertile stamens 5-9 cm long; staminodes longer, equalling the petals; column 2-3 cm long; anthers 1-1.5 cm long yellow. Carpels 5; ovary oblong, 5-angled, 5-loculed, densely rusty tomentose. Fruit oblong, 5-valved, 5-10 cm long, rusty brown, glabrescent. Seeds compressed, obliquely oval, with large, membranous, brown wings.

B-6 Peshawar Dist.: Islamia College, Peshawar, *M. A. Kazmi* 64 (KUH); Peshawar, 25.6.1968, *Ramzan* s.n. (PFI-M); Peshawar, 15.6.1969 *Shariq* s.n. (PFII-M); D 7 Lyallpur Dist.: Agri. College, Lyallpur, 28.4.1957, *A.H. Khan* s.n. (PF-B); D-8 Lahore Dist.: Jinnah Garden, Lahore, up to 30 ft. tall, flowers yellowish white, cultivated tree, March 1967 *Saida Qureshi* s.n. (KUH); Jinnah Garden, Lahore, 20.4.1966 *Saida Qureshi*, s.n. (KUH); G 4 Karachi Dist.: Beach Luxury Hotel, Karachi, *M. Qaiser*, 5488 (KUH); Zool. Garden, Karachi, *Sultanul Abedin* 9814 (KUH).

Distribution: Probably a native of the foothills of Himalayas, Assam, Chittagong, Burma and the E. Indies. Cultivated in Pakistan and N. America.

Planted as a garden or roadside tree. The indumentum from the lower surface of leaf is said to be used to stop bleeding from wounds and as tinder. A good tonic is prepared from the flowers which is also a cure for inflammation, ulcers, tumours, blood-troubles and leprosy. The bark and leaves are used in small-pox. The flowers kept among clothes impart a pleasant perfume and keep away insects.

Fl. Per. December- July. *Vern.* "Kanack Champa", "Moo Chkund".

5. HELICTERES

Linn., Sp. Pl. 963. 1753; Gen. Pl. ed. 5.411. 1754; Mast. in Hook. f., Fl. Brit. Ind. 1: 365. 1872; Cooke, Fl. Bomb. Pres. Rep. ed. 1:135. 1958; Talbot, For. Fl. Bomb. Pres. 1:146. 1911; Hutch., Gen. Fl. Pl. 2:516. 1967.

Shrub or small tree with stellate pubescence. Leaves stipulate, the stipules caducous; alternate, simple serrate, 3-7 nerved. Inflorescence axillary, fascicled, few

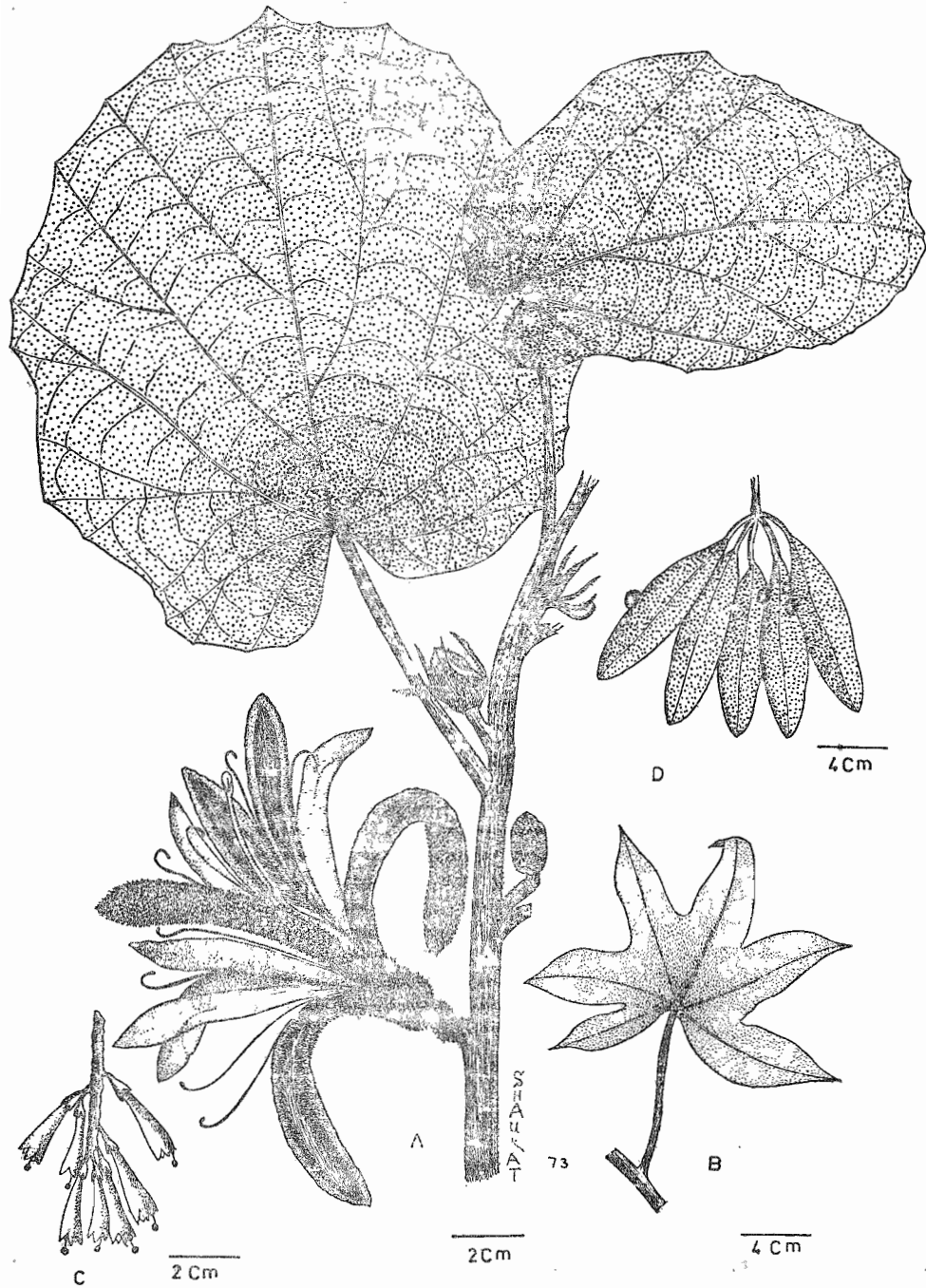


Fig. 5. *Pterospermum acerifolium*, A, Flowering twig. *Fermiana colorata*, B, Leaf; C, Inflorescence, D, Fruit.

flowered cyme or solitary. Flowers pedicellate, bisexual, actinomorphic or zygomorphic. Calyx tubular or bilabiate, 5-lobed, lobes erect or spreading, glandular within at the base. Petals 5, long clawed, claws sometimes auriculate, equal or sometimes bilabiate, twisted. Stamens 6, 8, 10 or numerous, monadelphous, sometimes slightly connate at the base, column adnate to the gynophore, staminodes alternating with the pair of stamens; anther 2-loculed, loculi divergent, often confluent, sessile, extrorse. Carpels 5, syncarpous; ovary supported on the androgynophore, straight or spirally twisted, 5-lobed, 5-loculed, each locule many ovuled; styles 5, free \pm united, slightly thickened and stigmatose above. Fruit a woody capsule, spirally twisted or straight, born on a long androgynophore, separating at maturity into pseudofollicle. Seeds numerous, small, tubercled, with scanty endosperm.

A genus of about 60 species distributed in tropics and warm temperate regions, most common in America. In Pakistan it is represented by 1 species.

Helicteres isora Linn., Sp. Pl. 963. 1753; Dalz. & Gibs., Bomb. Fl. 22. 1861; Roxb., Fl. Ind. ed. Carey 3:143. 1832; Mast. in Hook. f., l.c.; Cooke, l.c. 136; Talbot, l.c.; Ridley, Fl. Mal. Penin. 1:281. 1922; Parker, For. Fl. Punj. ed. 3.44. 1956; (Fig. 2, A-C).

Shrub or a small tree. Leaves irregularly toothed, often 3 angled above, shortly acuminate, oblique at the base, scabrous above, blade 5-10 X 4-8 cm, oblong, obovate or orbicular, cordate or rounded at the base; petiole, tomentose, 3-8 mm; stipule linear, tomentose 3-7 mm long. Inflorescence 2-6 flowered axillary cyme. Flowers with linear, tomentose, 3-5 mm long, bracts; pedicel 3-6 mm, tomentose. Calyx narrow, bilabiate, toothed, teeth triangular, gibbous, compressed, laterally pubescent, 1-2 cm long. Petals 2-3.5 cm long, red, later becoming lead coloured, reflexed, unequal, upper 3 longer and narrower than the lower 2, claws auriculate. Stamens 15, 10 fertile and 5 sterile, 3-4 cm long, exerted, abruptly reflexed; anthers ovate, arranged in a ring round the ovary; staminodes bifid, scale like. Ovary on a 3-4 cm long curved gynophore, tomentose, 5-grooved, ovoid or conical; style as long as ovary, curved, 5-grooved at the base. Fruit cylindrical, long beaked, 4-6 cm long, 4-7 mm in diameter, composed of 5 spirally twisted follicles, densely tomentose. Seeds angular.

B 7 Mardan Dist.: 15 m-N.E. of Mardan just-south of Machai, shrub-5l, *B.L. Burt* 1519 (KUH; PFI-B); **C 7** Rawalpindi Dist.: Saidpur, 2500', *R.R. Stewart* s.n. May 1935 (RAW); Saidpur, *Sarup Singh* s.n. 1.4.1937 (RAW); Chattar, Margala Road, a shrub with twisted pods, *M.A. Siddiqi* 1590 (RAW).

Distribution: India, Pakistan, Ceylon, Australia, Archipelago and Malay Peninsular.

It is a good source of strong fibre obtained from the bark. The fruit is said to be medicinally important in the treatment of gastric and intestinal disorders. *Fl. Per.* July-December. *Vern.* "maror phali".

6. KLEINHOVIA

Linn., Sp. Pl. ed. 2. 1365. 1763; Gen. Pl. ed. 6. 468. 1764; Mast. in Hook. f., Fl. Brit. Ind. 1:364. 1874; Cooke, Fl. Bomb. Pres. Rep. ed. 1:135. 1958; Talbot, For. Fl. Bomb. Pres. & Sind 1:145. 1911; Hutch., Gen. Fl. Pl. 2: 517. 1967.

A tree with rounded, ovate, entire, palminerved and long petioled leaves. Inflorescence a terminal loose drooping panicle. Flowers bisexual, zygomorphic. Sepals 5, free or basally connate, longer than petals. Petals 5, unequal. Stamens 15; monadelphous, column adnate to gynophore, broad and campanulate above, enclosing the ovary, 5-lobed, each with 3 anthers alternating with staminodes; anthers sessile, exserted. Carpels 5, syncarpous; ovary stalked, 5-lobed, 5-loculed, ovules 3-4 in each locule; style slender with 5-lobed stigma. Fruit an inflated membranous, loculicidally 5-valved capsule. Seeds 1-3 in each locule, globose, tubercled, nonendospermic.

A monotypic genus of tropical Asia and East tropical Africa.

Kleinhovia hospita Linn., Sp. Pl. ed. 2:1365. 1763; Dalz. & Gibs., Bomb. Fl. 23. 1861; Hook. f., l.c.; Cooke, l.c.; Talbot, l.c.; Blatter & Millard, Beaut. Tr. Ind. ed. 4.95. 1954. (Fig. 4, F-G).

A medium sized tree. Leaves with ensiform or linear c. 8 mm long stipules, petiole 2-6 cm; blade 5-10 X 4-9 cm, 3-7 nerved, acute or obtuse, glabrous on both sides. Flowers 4-7 mm across; pedicel 2-5 mm; bract 2-4 mm long, lanceolate, pubescent. Sepals 6-8 X c.2 mm, pink, linear-lanceolate, tomentose. Petals 4-6 X 2 mm, upper one saccate ovate-oblong, middle pair concave ovate, clawed, incurved, lower pair flat, obliquely oblong. Stamens 8-10 mm long, exserted. Ovary 1-1.5 mm long, ovoid, tomentose, gynophore 6-8 mm long. Fruit 1-2 cm across, somewhat tapering below, drooping.

G-4 Karachi Dist.: Cultivated tree, up to 5' high, flowers pink, Zool. Garden, Karachi, *Saida Qureshi* s.n. 23.11.1965 (KUH); 10- high, flowers pinkish, Zool. Garden, Karachi, *Saida Qureshi* s.n. 27.11.1965 (KUH); Cultivated, 5 m tall, with inflated membranous fruits, Zool. Garden, Karachi, *Sultanul Abedin* 9801-9803 (KUH).

Distribution: Tropical Asia from the Mascarene Islands to Polynesia and East Tropical Africa. Cultivated in Pakistan and India.

The shoots and young leaves are said to be edible and the extract from leaves is used to cure skin diseases.

7. STERCULIA

Linn., Sp. Pl. 1007. 1753; Gen. Pl. ed. 5.438. 1754; Mast. in Hook. f., Fl. Brit. Ind. 1:354. 1874; Cooke, Fl. Bomb. Prcs. Repr. ed. 1:130. 1958; Talbot, For. Fl. Bomb. Prcs. 1: 135. 1911; Hutch., Gen. Fl. Pl. 2:518. 1967.

Deciduous trees or shrubs. Leaves with fugacious stipules, alternate, simple or digitately compound, entire or lobed. Inflorescence axillary or terminal, panicle or raceme. Flowers pedicellate, unisexual and bisexual on the same plant or only unisexual, terminal mostly pistillate and precocious, usually actinomorphic. Calyx tubular or campanulate, usually 4-5 lobed. Petals absent. Stamens 10-30, united into short or long column. Carpels (3-) 4-5, syncarpous, becoming free in fruit; ovary usually sessile, locules as many as the carpels; each locule 2-many ovuled; style with usually 4-5 lobed or peltate stigma. Fruit woody, radiating and becoming folli-

cular at maturity; each follicle dehiscing along the ventral suture. Seeds 1-many, oblong, brown or velvety black.

About 100 species distributed in tropics and warm temperate regions. Only 2 species are known from cultivation in Pakistan.

- + Leaves digitate. Follicle boat shaped, c. 10 cm long. 1. **S. foetida**
 —Leaves lobed. Follicle not boat shaped, 4-6 cm long. 2. **S. villosa**

1. **Sterculia foetida** Linn., Sp. Pl. 1008, 1753; Roxb., Fl. Ind. ed. Carey 3:154. 1832; Mast. in Hook. f., l.c.; Cooke, l.c.; Talbot, l.c. 136; Cowen, Fl. Tr. & Shr. Ind. ed. 5.10.1969. (Fig. 3, C-D, F).

A large tree with whorls of horizontal branches. Leaves with 15-20 cm long petiole, digitate; leaflets 5-9, 6-15 X 2-5 cm, glabrescent, entire, elliptic lanceolate, acute-acuminate. Panicle 10-20 cm long. Flowers unisexual and bisexual on the same plant, 2-4 cm across, dull red, yellow or purplish with offensive smell; pedicel 1.5-2.5 cm. Sepals 5, fused below, lanceolate, acute, spreading. Staminal column c. 1 cm long, recurved, hairy at the base, with 10-15 anthers grouped into a head. Carpels 5; ovary rounded, 5-lobed, densely villous, on 4-6 mm long gynophore, 5-loculed, each locule 12-20 ovuled. Follicles 5, smooth, boat shaped, shortly beaked, each c. 10 X 7-8 cm, red at maturity. Seeds 10-15 in each follicle, hard, smooth, oblong or ovoid-oblong, black.

Distribution: Native of East Tropical Africa, India, Burma, Ceylon, Moluccas, Malaya, North Australia. Cultivated in Pakistan.

A handsome tree cultivated in the garden and along roadside for shade. The seeds are roasted and eaten like chestnuts, particularly in time of scarcity; raw seeds are not recommended because they may cause nausea and vertigo. Trunk and branches yield gum. Fibre is obtained from bark. The flowers and leaves are said to be medicinally important. (ern. Pinari, pun.
Fl. Per. March-May.

2. **Sterculia villosa** Roxb., Hort. Beng. 50. 1814; Fl. Ind. ed. Carey 3:153. 1832; Mast. in Hook. f., l.c. 355; Cooke, l.c. 132; Talbot, l.c. 138; (Fig. 3 A,B,E)

A medium sized tree. Leaves digitately 5-7 lobed, cordate at base; lobes entire to 3-fid, acuminate-cuspidate, somewhat oblong or obovate; blade 25-40 cm long and broad, glabrescent above, stellately tomentose beneath; petiole as long as blade, with dense tomentum above, ribbed below the top; stipules lanceolate, caducous. Panicle 15-30 cm long, rusty pubescent, pendulous. Flowers unisexual (plant monoecious); males numerous; pedicel 4-8 mm long occasionally articulated in the middle; bracts filiform, caducous. Calyx campanulate, 5-partite, 6-10 mm long, 10-15 mm across, yellow with pinkish throat, nerved; lobes spreading, lanceolate, acute, 4-6 X 2-3 mm. Staminal tube 4-5 mm long, recurved, glabrous; anthers 10, grouped. Ovary globose on 2-3 mm long gynophore, strigose with stellate hairs; style recurved. Fruit of 5, sessile, 4-6 cm long, spreading, coriaceous, rusty pubescent follicles, red when ripe. Seeds many, oblong, smooth, black.

C-7 Rawalpindi Dist.: Panjar, *R.R. Stewart* 28583 (RAW); D 8 Lahore Dist., Lawrence Garden, Lahore, flowers yellow, height up to 40', cultivated tree, *Saida Qureshi* s.n. (KUH).

Distribution: India and Bangladesh. In Pakistan it is occasionally planted in the gardens.

A coarse fibre obtained from the inner bark is used in making ropes, cordage and bags. Trunk yields transparent gum; root is sometimes eaten. *! ern.* Sardol, Udal, Udar. *Fl. Per.* Dec.-March.

8. BRACHYCHITON

Schott & Endl, Melet. 34.1832; Hutch. Gen. Fl. Pl. 2:519. 1967.

Trees with rounded, broad, entire or digitately lobed, leaves. Inflorescence axillary or terminal, solitary, raceme or panicle. Flowers actinomorphic, unisexual or bisexual (plants polygamous). Calyx 5 lobed, lobes commonly spreading. Petals absent. Stamens 10-15. Carpels 5, syncarpous, free at maturity; stigma peltate, radiate or lobed. Fruit stalked, woody, follicular. Seeds numerous, 2-seriate, each with a covering of honeycomb-like cells of the endocarp.

A genus of 11 species, all endemic to Australia. Introduced in Asia and less commonly in Africa or America. In Pakistan it is represented by 2 cultivated species.

1. +Leaves entire to 3-5 lobed, usually longer than broad.
Calyx bell shaped, glabrescent. Stamens glabrous.

1. *B. populneum*

—Leaves palmately 5-7 lobed, broader than long. Calyx tubular campanulate, tomentose without. Stamens hairy.

2. *B. australis*

1. *Brachychiton populneum* (Schott & Endl.) R. Br. in Benn., Pl. Jav. Rar. 234. 1844; Menninger, Fl. Tr. World, 267. 1962. (Fig. 7, A-C).

Poecilodermis populnea Schott & Endl., Melet. 33. 1832; *Sterculia diversifolia* G. Don, Gen. Syst. 1:516. 1831; Parker For. Fl. Punj. ed. 3:44. 1956 non *Brachychiton diversifolium* R. Br.

A glabrous tree, 6-20 m tall. Leaves very variable, entire to 3-5-lobed, ovate, ovate-lanceolate or elliptic, acuminate or cuspidate, glabrous, blade 5-10 X 2-6 cm, petiole 2-6 cm, pulvinate. Inflorescence paniced. Flowers showy; pedicel 2-8 mm, articulated. Calyx bell shaped, 1-2 cm long and broad, usually lobed above the middle, yellowish creamy—greenish red, within reddish, and variegated above, purplish below-staminal column c. 5 mm long, dilated below; anthers grouped. Ovary slightly tomentose. Follicles on 2-3 cm long stalk, elliptic, acute, flattened, 4-6 X 1.5-2.5 cm, glabrous. Seeds rounded, 3-4 mm across, covered with long stiff stellate hairs.

B 6 Peshawar Dist.: Peshawer, Islamia College, *S.M.A. Kazmi* 326 (KUH); University Campus, *S.A. Khan* s.n. (KUH; PFI-B); Bot. Garden, Forest Institute, 5 m tall cult. tree, with fruits, *Sultanul Abedin* 9942 (KUH); C-7 Rawalpindi Dist.: Rawalpindi

1600', cultivated, evergreen small tree, *Mir Alam* 1688 (RAW); cultivated roadside tree, St. Marys School, *Yasin Nasir* s.n. (RAW); **D-7**; Lyallpur Dist.: Lyallpur, Agri. College, April 1957. *A.H. Khan* s.n. (PFI-B).

Distribution: Indigenous to Australia; cultivated in Pakistan.

It is planted along roadside and in gardens for shade and its showy flowers. Shoots are used as fodder in times of drought. *Fl. Per.* March-May.

2. ***Brachychiton australis*** (Schott & Endl.) Teir. in Boll., Ort. Palermo 1:62. 1947 (Fig. 6, C-D, G).

Trichosiphon australe Schott & Endl., Melet. 34. 1832; *Brachychiton platanooides* R. Br. in Benn., Pl. Jav. Rar. 234. 1844; *B. trichosiphon* (Benth.) J.W. Audas, Nat. Tr. Aust. 158. 1947 *Sterculia trichosiphon* Benth. in Benth., Fl. Aust. 1: 229. 1863; Parker, For. Fl. Punj. ed. 3. 44. 1956.

A deciduous tree with a somewhat bottle-shaped trunk. Leaf blade 6-10 X 10-16 cm, glabrous on both surfaces, deeply palmately 5-7 lobed; lobes broadly lanceolate, ovate, rhomboid or somewhat rectangular, acute, acuminate or cuspidate; petiole 4.5-12 cm long. Raceme short. Flowers brownish, pubescent, becoming rusty when dry; pedicel 0.5-1 cm long, articulated. Calyx tubular campanulate, white, 1.5-2 cm long, 1-1.5 cm across, lobed half-way down; lobes lanceolate. Filaments hairy. Ovary tomentose, 2-3 mm long; styles free, cohering above. Follicles shortly stalked, oblong-triangular, 5-7.5 cm long, glabrous.

G-4 Karachi Dist.: Zool. Garden, Karachi, Flowers white with brownish hairs outside, cultivated, 6 m tall tree, *Sultanul Abedin & M. Qaiser* 9811 (KUH).

Distribution: A native of Australia cultivated in Pakistan and elsewhere.

Seeds yield red colour oil possessing high saponific value and is used for making oilcake. *Fl. Per.* February-April.

9. FIRMIANA

Marsigli, Saggi Sci. Accad. Padova 1: t. 1,2.106.1786; Corner, Wayside Tr. Mal. ed. 2.1:610. 1952; Hutch. Gen. Fl. P. 2:519. 1967.

Trees with long petiole, cordate, 3-5 lobed leaves. Inflorescence paniced. Flowers unisexual or bisexual (plants polygamous). Calyx tubular, 5 lobed; lobes sometimes free up to the base. Petals absent. Stamens usually 10 (-30); anthers sessile or on short filaments. Carpels 4-5, apocarpous; ovary 1 loculed, 2, 4 or 6 ovuled; style short. Follicles membranous stalked, opening long before maturity. Seeds few, adhering to the margins, wrinkled when dry.

About 8 species distributed in China, and most of tropical S.E. Asia, Pacific Islands (Fiji), Tropical Africa and Madagascar. Of these 3 are found cultivated in Pakistan.

1. + Sepals free, slightly basally connate, reflexed.

1. ***F. simplex***

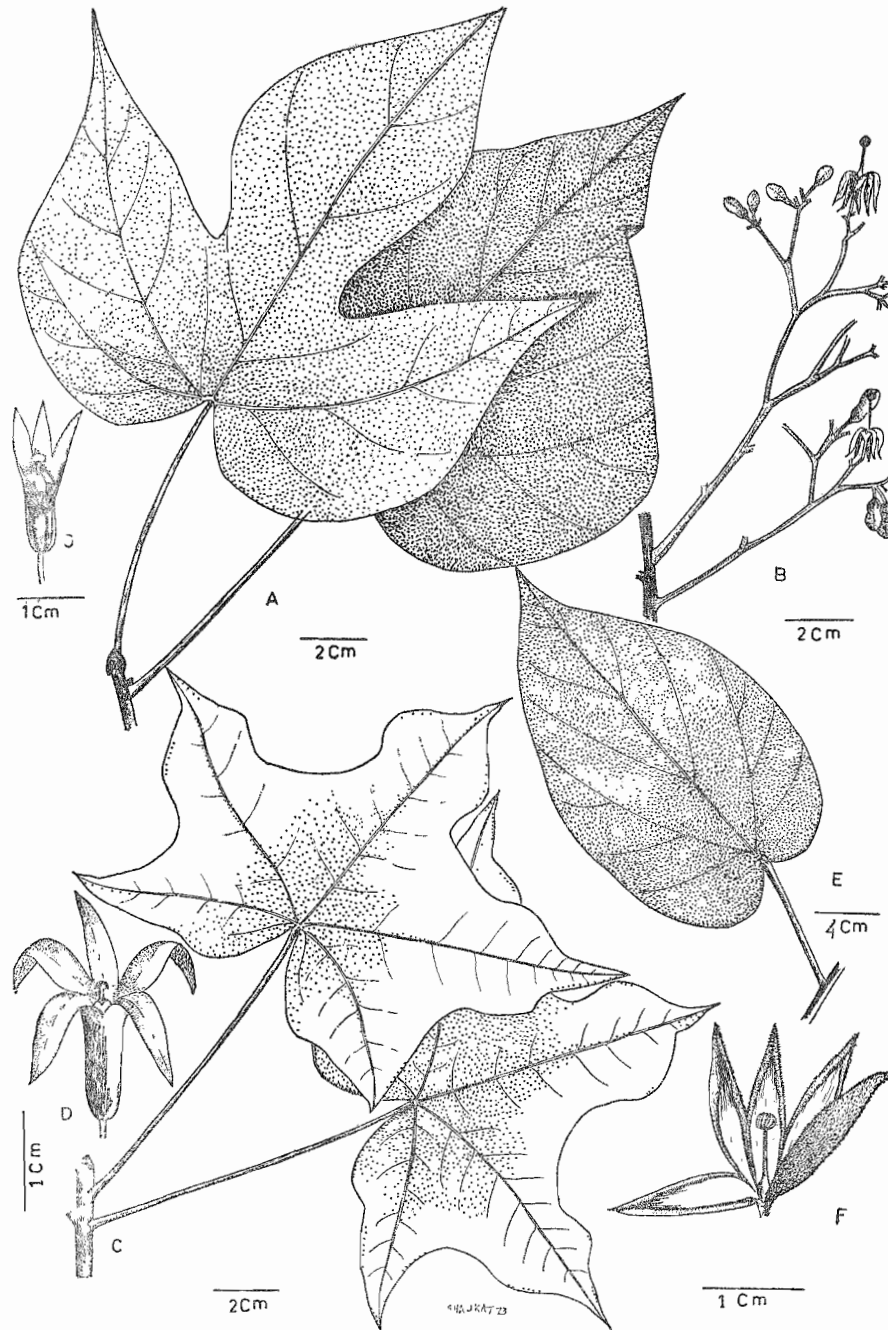


Fig. 6. *Fermiana simplex*, A, Leaves; B, Inflorescence; *Brachychiton australis* C, Leaves; D, Male flower; G, L.S. of bisexual flower. *Pterygota alata*, E, Leaf; F, Male flower.

—Sepals fused into a tube.

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|----|--|----|--------------------|
| 2. | + Calyx c. 5 mm across, coral- red. (seeds 2). | 2. | F. colorata |
| | + Calyx c. 10 mm across, yellowish. (seed 1). | 3. | F. pallens |
1. **Firmiana simplex** (Linn.) W.F. Wight, U.S.D.A. Bur. Pl. Indus. Bull. 142:47. 1909. (Fig. 6 A-B)

Hibiscus simplex Linn., Sp. Pl. ed. 2: 977. 1763; *Sterculia platanifolia* Linn. f., Suppl. 423. 1781; Parker, For. Fl. Punj. ed. 3.43. 1956; *F. platiniifolia* (L.f.) Schott & Endl., Melet. 32. 1832.

A medium sized tree with smooth bark. Leaves with a glabrous, more than 10 cm long petiole; leaf blade 10-25 cm long and broad, cordate orbicular, usually palmately 3-5 lobed; lobes ovate, acuminate; glabrescent above, somewhat velvety below. Panicle large, terminal. Flowers pubescent, pale yellow, appearing after the leaves; pedicel 2-4 mm, articulated. Sepals nearly free to the base, 10-12 X c. 2 mm, linear-oblong, completely reflexed. Staminal column c. 1 cm long with 10, sessile anthers. Follicles 4-5, each c. 10x3 cm elliptic-ovate, veined. Seeds 2 in each follicle, adhering to each margin, glabrous, smooth, pea like, 4-6 mm in diameter.

B-6 Peshawar Dist.: Peshawar, Cant. Garden, S.A. Khan s.n. April, 1973 (KUH; PFI-B), *Sher Ahmad Lodhi* 243 (RAW).

Distribution: Perhaps a native of China and Japan, introduced in Pakistan, America and elsewhere.

It is cultivated in gardens for shade. A brownish black fluid is filled in the unripe fruits which is liberated on bursting of fruits.

Fl. Per. April May.

2. **Firmiana colorata** (Roxb.) R. Br. in Benn., Pl. Jav. Rar. 235. 1844; Blatter & Millard, Beaut. Ind. Tr. ed. 2:79. 1954. (Fig. 5, B-D).

Sterculia colorata Roxb., Pl. Coast. Corom. 1:26. t. 25. 1795; Fl. Ind. ed. Carey 3:146. 1832; Mast. in Hook. f., l.c. 359; Cooke, l.c. 133; Talbot, l.c. 140; Parker, l.c.; *Erythropsis colorata* (Roxb.) Buikill in Straits, Settlements Gard. Bull. 5:231. 1931.

A tree with ash coloured bark. Leaves crowded towards the end of branches; petiole 7-25 cm long; blade, 10-20 X 12-25 cm, cordate, usually palmately 3-5 lobed; stipules lanceolate. Panicle short, terminal. Flowers covered with red or orange red coral-like-stellate pubescence, appearing before the leaves; pedicel 5-7 mm long. Calyx 2-3 cm long, broadly tubular or funnel-shaped; lobes 2-3 mm long, triangular; hairy at the base within. Staminal column red, with 10-30 sessile, yellow anthers. Styles short, recurved. Follicles lanceolate-elliptic oblong, 4-7 cm long, straw-coloured, reticulate. Seeds 2 per follicle, 1 adhering to each margin, yellow, wrinkled or smooth, ovoid, c. 1 cm long.

B-6 Peshawar Dist.: Peshawar, Bot. Garden, Forest Institute, c.4 m tall cultivated tree, *Sultanul Abedin* 9943 (KUH).

Distribution: A native of Ceylon, S.W. India eastward to Burma, cultivated in Pakistan.

An ornamental plant with scarlet or deep orange flowers looking like a mass of coral on the bare branches. Hindus and Ceylonese regard it as a sacred plant. Bark yields fibre of inferior quality and branches with leaves are used as fodder. *Vern.* "Kaushi", *Fl. Per.* March-May.

3. **Firmiana pallens** (Wall. ex King) Stearn in Blatter & Millard, *Beaut. Ind. Tr.* ed. 2:79. 1954 (Fig. 7, D-F)

Sterculia pallens Wall. ex King in *J. As. Soc. Bengal.* 60 (2): 73 in Obs. 1891; Parker, *For. Fl. Punj.* ed. 3:43. 1956; *Erythropsis pallens* (Wall. ex King) Ridley in *Kew Bull.* 1934. 215. 1934.

Tree. Leaves 3-5 lobed, stellately pubescent on both sides, c. 10 X c. 15 cm; petiole 8-9 cm, tomentose. Inflorescence paniced. Flowers appearing before the leaves; pedicel 3-6 mm long, velvety. Calyx 1.5-c.2 X -1 cm, lobed above the middle, pale yellow, densely glandular hairy outside, glabrous, nerved and with a brown coloured 1 mm long membrane adnate to the base within. Stamens 10; column 1-2 cm long, recurved; anthers c. 2 mm long. Follicles 5, free, glabrous, elliptic ovate, 7-9x2.5-3 cm; pedicel 5-10 mm long. Seed 1 in each follicle, 1-1.3 cm X 6-8 mm, oblong.

D 7 Lyallpur Dist.: Agri. College, Lyallpur, April 1957. *A.H. Khan* s.n. (PF₁-B).

Distribution: Indigenous east of the Jumna. Cultivated in Pakistan and elsewhere.

It is planted for shade in gardens.

Fl. Per. May.

10. PTERYGOTA

Schott & Endl., *Melet. Bot.* 32. 1832; Benthall, *Trees Calc.* 50. 1946; Hutch. J., *Gen. Fl. Pl.* 2:520. 1967.

Trees with cordate, usually entire leaves. Flowers axillary, unisexual-bisexual (plants polygamous). Sepals 5, basally connate, fleshy. Petals absent. Stamens in male flowers united into an elongated column with a globose head or a cup on the top, bearing sessile anthers in 5 clusters, each cluster with 5 anthers, shorter than sepals; pistillate flower with 5 bundles of staminodes. Carpels nearly free; ovules many in each locule; stigmas dilated, radiate. Fruit subglobose, woody, long stipitate, opening by one valve. Seeds numerous, with long or broad knife-shaped wing at the apex.

About 20 species chiefly in the tropics of the old world; it is represented by 1 species in Pakistan.

Pterygota alata (Roxb.) R. Br. in *Benn., Pl. Jav. Rar.* 234. 1844; C. McCann, *100 Beaut. Tr. Ind.* ed. 2. 77. 1959. (Fig. 6, E-F)

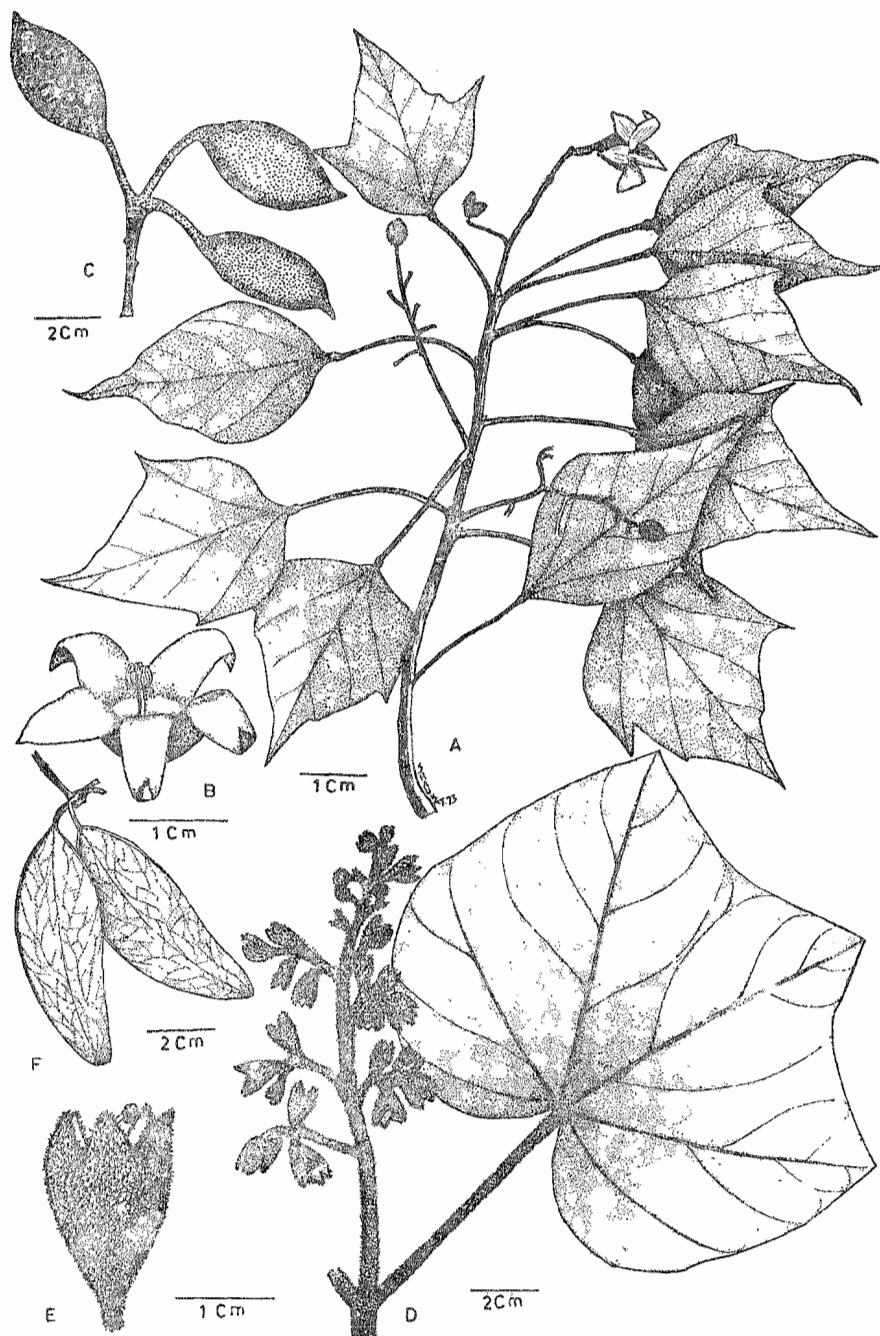


Fig. 7. *Brachychiton populneum*, A, Flowering twig; B, Male flower; C, Fruit. *Firmiana palleas*, D, Flowering twig; E, Male flower; F, Fruit.

Sterculia alata Roxb. Pl. Coast Corom. 3:48. t. 287. 1820; Fl. Ind. ed. Carey 3: 152. 1832; Mast. in Hook. f., l.c. 360; Talbot, l.c.; Parker, l.c.; 43; *Erythropsis roxburghiana* Schott & Endl., Melet. Bot. 33. 1832.

A tall tree. Young parts with ferruginous pubescence. Leaves crowded towards the ends of the branches with 3-10 cm long petiole; leaf-blade 10-25 X 7-15 cm, ovate-cordate, acute or shortly acuminate, entire or undulate glabrous. Inflorescence axillary, few flowered small raceme. Flowers 1-1.5 cm across; pedicel 2-3 mm long. Sepals (4-) 5 (-7), nearly free, 1.2-1.5 cm X 3-4 mm, linear-lanceolate or elliptic, fleshy, somewhat cucullate, densely ferruginous pubescent outside, sparsely pubescent and purple with red streaks (only seen in fresh material) inside. Anthers in male flowers united into 1-2 mm broad head on 4-6 mm long column. In bisexual flowers sessile anthers are arranged in clusters of 4 or 5 in the sinuses formed by the carpels. Carpels 5; ovaries sessile, 2-3 mm long with recurved style, pubescent. Follicles large, woody, 7-12 cm in diameter, obliquely globose. Seeds c. 40, oblong, compressed, in 2 rows, winged.

G-4 Karachi Dist.: Zool. Garden Karachi, 6 m tall cultivated tree, sepals 4-7, fleshy, hooded, rusty outside, brownish red streaked inside, *Sultanul Abedin, M. Qaiser & C. C. Townsend* 9812, 9813 (KUH).

Distribution: Native of S.W. India, Sikkim, Assam, Andamans, Burma and Bangladesh (Chittagong, Sylhet); cultivated in garden in Pakistan.

It is a handsome tree planted for shade in gardens and along roadside. Seeds are said to be edible and in Sylhet these are used as a substitute for opium. *Vern.* "bundha narikella".

Fl. Per. February-March.

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