



Flora of Panama. Part VI. Family 117. Sterculiaceae

Andre Robyns; Jose Cautrecasas

Annals of the Missouri Botanical Garden, Vol. 51, No. 1/4 (Feb. - Nov., 1964), 69-107.

Stable URL:

<http://links.jstor.org/sici?sici=0026-6493%28196402%2F11%2951%3A1%2F4%3C69%3AFOPPVF%3E2.0.CO%3B2-W>

Annals of the Missouri Botanical Garden is currently published by Missouri Botanical Garden Press.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/mobot.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact support@jstor.org.

FLORA OF PANAMA¹

Part VI

FAMILY 117. STERCULIACEAE²

By ANDRÉ ROBYNS³

Theobroma By JOSÉ CUATRECASAS

Herbs, shrubs or trees, sometimes lianas, mucilaginous, generally with stellate hairs, sometimes with simple hairs or lepidote, infrequently aculeate. *Leaves* alternate, rarely subopposite, simple and entire to lobate or digitately compound, generally stipulate, the stipules usually deciduous. *Inflorescences* axillary or sometimes terminal, cymose, paniculate, umbelliform, racemose or often more complex, or flowers solitary, sometimes cauliflorous. *Flowers* generally bracteolate, the bracteoles forming sometimes a calycle, rather small, hermaphrodite or unisexual, actinomorphic or rarely zygomorphic; calyx valvate, gamo- or polysepalous, the sepals (2-3-)4-5(-6-8), sometimes petaloid, generally persistent or even accrescent; petals usually 5, rarely absent, contorted or valvate, usually free, sometimes adnate to the base of the staminal tube, often unguiculate at the base and appendaged at the apex, sometimes marcescent; stamens inserted on the receptacle or on a gonophore, 5 to numerous, usually more or less long-monadelphous, often with staminodes alternating with the stamens or with fascicles of stamens; anthers usually 2-thecate, rarely 3-thecate, the thecae generally parallel, the dehiscence longitudinal or occasionally apically porose; pollen generally 3-colporate, sometimes colpate, porate or oligoforate, the sexine usually reticulate, sometimes spinulose; gynoecium with 2-5(-15-30) syncarpous or coherent or even sometimes apocarpous carpels, or reduced to a single carpel; ovary superior, sessile on the receptacle or on the gonophore, or sometimes slightly stipitate, 1- to 5(-15-30)-celled, with 2-many ovules in each cell and generally with axile placentation; ovules anatropous; styles as many as carpels, distinct or variously connate; stigma entire or divided. *Fruit* capsular or baccate and loculicidally dehiscent or not, or separating into follicles, cocci or samaroid indehiscent mericarps; seeds 1-many, sometimes alate or arillate; albumen abundant or scanty; embryo straight or curved; cotyledons flat or folded, foliaceous.

About 65 genera, chiefly distributed in the tropics of both hemispheres; eight genera are represented in Panama, while three other genera occur in Central

1. The Flora of Panama by Robert E. Woodson, Jr. and Robert W. Schery and Collaborators should be cited as: Ann. Missouri Bot. Gard., with volume number, pagination and date of the Annals.

2. Assisted by National Science Foundation Grants No. G-7144 (Principal Investigator, R. E. Woodson, Jr.) & GB-170 (Principal Investigator, H. C. Cutler).

3. I wish to express my sincere thanks and appreciation to the directors and curators of the following herbaria for the loan of material and facilities for study: Arnold Arboretum, Chicago Natural History Museum, Gray Herbarium, New York Botanical Garden and United States National Herbarium.

Published November 30, 1964.

America. Two of the most important tropical crops are supplied by *Theobroma Cacao* L. (cacao, chocolate) native to tropical America but now grown extensively in all the tropics and by different species of the genus *Cola* Schott & Endl. (Cola Nut Trees) native to tropical Africa.

- a. Petals none; gonophore well developed1. STERCULIA
- aa. Petals 5.
 - b. Staminodes none; gonophore wanting.
 - c. Ovary 1-celled; capsules 2-valved2. WALTHERIA
 - cc. Ovary 5-celled; capsules separating into 5 cocci, each coccus opening along the inner angle or splitting completely into 2 valves3. MELOCHIA
 - bb. Staminodes 5.
 - d. Gonophore well developed; fruit spirally twisted4. HELICTERES
 - dd. Gonophore wanting.
 - e. Fruit smooth, rugose or 5- to 10-costate.
 - f. Leaves simple5. THEOBROMA
 - ff. Leaves compound-digitate6. HERRANIA
 - ee. Fruit spinose or muriccate.
 - g. Aculeate scandent shrubs or lianas; capsules densely spinose, separating into 5 cocci, each coccus dehiscent along the ventral suture and along the dorsal upper half.7. BYTTNERIA
 - gg. Small to tall trees without aculei; capsules tuberculate, indehiscent (the tubercles separating irregularly at maturity to a greater or less degree)8. GUAZUMA

1. STERCULIA L.

STERCULIA L., Sp. Pl. 1007. 1753, Gen. Pl. ed. 5, 438. 1754.

- Cavalam* Adans., Fam. Pl. **2**: 357. 1763.
Culhamia Forsk., Fl. Aegypt.-Arab. 96. 1775.
Ivira Aubl., Hist. Pl. Gu. Fr. 694. 1775.
Theodoria Neck., Elem. Bot. **2**: 286. 1790.
Triphaca Loureiro, Fl. Cochinch. 577. 1790.
Southwellia Salisb., Paradisus Londinensis t.69. 1807.
Mateatia Vell., Fl. Flum. 382. 1825, Fl. Flum. Ic. **9**: t.95. 1835.
Chichaea Presl, Rel. Haenk. **2**: 140. 1835.
Balanghas Rafin., Sylva Tellur. 72. 1838.
Kavalama Rafin., loc. cit. 72. 1838.
Karaka Rafin., loc. cit. 72. 1838.
Braxipis Rafin., loc. cit. 72. 1838.
Clompanus Rafin., loc. cit. 73. 1838.
Opsopea Rafin., loc. cit. 73. 1838.
Icosinia Rafin., loc. cit. 75. 1838.
Triplobus Rafin., loc. cit. 110. 1838.
Carpophyllum Miq., Fl. Ind. Bat. Suppl. 401. 1861.

Trees or infrequently shrubs, deciduous. *Leaves* alternate, simple and entire to lobate or digitately compound, petiolate, stipulate, the stipules fugacious. *Inflorescences* axillary or terminal, paniculate or sometimes racemose. *Flowers* hermaphrodite or unisexual, monoecious or dioecious, actinomorphic or somewhat zygomorphic through the bending of the gonophore, pedicellate, bracteolate, the bracts fugacious; calyx more or less deeply (3-)4- or 5(-6)-lobate, the lobes sometimes appendiculate inside; petals none; gonophore well developed; stamens 10-20, only vestigial in the pistillate flowers, the anthers crowded at the apex of

a short staminal tube, shortly stipitate, 2-thecate, the thecae parallel, extrorse, longitudinally dehiscent; ovary sessile, consisting of (3-)4-5 coherent locules, rudimentary in the staminate flowers, each locule 2- to many-ovulate; styles coherent; stigma (3-)4- or 5-lobulate or peltate. *Carpels* separating at maturity and becoming follicular, ligneous or coriaceous, dehiscent along the ventral suture, 1- to many-seeded; seeds albuminous, the radicle removed from the hilum; cotyledons thin, plane or undulate.

A pantropical genus of about 200 species of which only two occur in Panama.

- a. Leaves deeply 3- to 5-palmatilobate; calyx 1.5-2 cm. long, the lobes triangular, not appendiculate inside; gonophore not enlarged at the base, 10-12 mm. long in the staminate flowers and 6-8 mm. long in the hermaphrodite ones; anthers 15 1. *S. APETALA*
- aa. Leaves entire or with slightly undulate margins; calyx 0.9-1.2 cm. long, the lobes linear-lanceolate, the inner surface appendiculate from the base to the middle of the lobes; gonophore much-enlarged at the base, 5.5-6 mm. long in the staminate flowers and ca. 5 mm. long in the hermaphrodite ones; anthers 10 2. *S. COSTARICANA*

1. *STERCULIA APETALA* (Jacq.) Karst., Fl. Colomb. **2**: 35, pl. 118. 1869; Standley, Contr. U. S. Nat. Herb. **27**: pl. 49, 50. 1928.—Fig. 1 (A-E).

Helicteres apetalata Jacq., Select. Stirp. Am. Hist. 238, pl. 181. 1763.

Sterculia carthagenensis Cav., Mon. Cl. Diss. Dec. **6**: 353. 1788.

Tree up to 30-40 m. high, the trunk straight, thick and often with prominently developed buttresses, the crown broad and dense. *Leaves* simple, large, the petiole 8-24 cm. long, stellate-villous, the blade deeply 3- to 5-palmatilobate, the broad lobes rounded to subacute, deeply cordate at the base, up to 22 cm. long and 40 cm. wide, membranous, the upper surface glabrous except near the base of the 5 main nerves, the lower surface stellate-arachnoid when young, promptly glabrescent, the nerves slightly prominent beneath. *Inflorescences* axillary or subterminal, paniculate, the axes densely stellate-villous-arachnoid. *Flowers* hermaphrodite or staminate, the pedicel 1-2 cm. long; calyx campanulate, 5-lobate, 1.5-2 cm. long and 1.5-2.5 cm. wide, often somewhat larger in the hermaphrodite flowers than in the staminate ones, the lobes triangular, acute and ca. 0.7-1.2 cm. long, reddish-brown, densely puberulous and with tufted hairs outside, greenish-yellow, striped-red or maroon and glabrous inside; gonophore of the staminate flowers slender, arcuate, inflexed, ca. 1-1.2 cm. long, scatteringly papillate, sometimes loosely stellate-puberulous toward the base, the staminal tube pendulous, somewhat thicker than the gonophore, ca. 1 mm. long and densely covered with short simple hairs, the anthers 15, ca. 0.75 mm. long, the rudimentary ovary ca. 0.75 mm. broad and glabrous; gonophore of the hermaphrodite flowers like in the staminate ones but only 6-8 mm. long, the staminal tube very short, the anthers 15, around the base of the ovary and ca. 0.75 mm. long, the ovary subglobose, 5-sulcate, ca. 0.4 mm. in diam., stellate-tomentellous, 5-locular, the styles reflexed, ca. 4 mm. long and stellate-tomentellous, the stigma obscurely 5-lobulate. *Follicles* obovoid, ca. 6 cm. long and 4 cm. thick, tomentellous outside, the inner surface covered with a dense layer of erect, stiff, yellowish and ca. 2 mm. long prickly hairs, 2- to 4-seeded;

seeds oblong-ellipsoid, ca. 2 cm. long and 1.1-1.3 cm. in diam., the testa brown or black, covered with stiff, little adhesive, prickly hairs.

From southern Mexico through Central America to Panama, West Indies and northern South America; along rivers, in moist or dry thickets or forests.

The common Indian name of *S. apetala* is *panamá* and the name of the country proceeds probably from this tree which is abundant in the region. The seeds, known as *castañas*, are oily and edible boiled or roasted; the tree is often planted for shade and the wood is sometimes used for construction purposes.

CANAL ZONE: Barro Colorado Island, *Aviles 101, Wetmore & Abbe 114, Wilson 97, Woodworth & Vestal 651*; Gamboa Road and Madden Dam Road near Naval Station, *Harvey 5034*; near Summit Gardens, *Harvey 5252*; Victoria Fill, near Miraflores Locks, *Allen 1720*; vicinity of Miraflores Lake, *P. White 281*; Balboa, *Standley 27160, 30856*. CHIRIQUÍ: Progreso, *Cooper & Slater 301*; vicinity of San Félix, alt. 100 m., *Allen 3656*. PANAMA: roadside near Panama Viejo, 5-10 m., *Dodge 17520*; near Panama City, *Mell s.n.*; vicinity of Bella Vista, *Piper 5327*. SAN BLAS: Peimé, *Cooper 652*. PROVINCE UNKNOWN: *Hayes 719, Sargent 15*.

2. *STERCULIA COSTARICANA* Pittier, Contr. U. S. Nat. Herb. **13**: 449, fig. 77-78. 1911.
—Fig. 1 (F-H).

Sterculia Recordiana Standley, Trop. Woods **44**: 25. 1935.

Tree 5-25 m. high, the trunk up to 90 cm. in diam., the young branches tomentellous and sparsely pilose, the pubescence of stellate hairs. *Leaves* crowded toward the end of the branchlets, simple, the petiole rounded, 2.5-7 cm. long, tomentellous and sparsely pilose, the blade ovate-oblong to elliptic-oblong, obtuse, truncate or slightly cordate at the base, abruptly acuminate-apiculate at the apex, 9.5-22.5 cm. long and 5.5-12.5 cm. wide, subcoriaceous, the margins entire to somewhat undulate, the upper surface glabrous or nearly so and with impressed venation, the lower surface sparsely pubescent and with prominent venation, 5-nerved at the base. *Inflorescences* axillary, paniculate, the axes villous. *Flowers* hermaphrodite (or pistillate only?) or staminate, the pedicel 4-10 mm. long; calyx deeply (4-)5-lobate, 9-12 mm. long, the lobes linear-lanceolate, acute, 6.5-10 mm. long and 2-3 mm. wide, the outer surface puberulous-villous, the inner surface provided from the base to the middle of the lobes with a tiny appendage, the appendage villous especially near the base and cucullate at the apex, puberulous-villous above the appendage; gonophore of the staminate flowers filiform, arcuate, inflexed, glabrous except the much-thickened papillate base, 5.5-6 mm. long, the staminal tube pendulous, urceolate, very short, glabrous, the anthers 10, ca. 0.5 mm. long, the rudimentar ovary rather obsolete; gonophore of the hermaphrodite flowers (according to Pittier, Contr. U. S. Nat. Herb. **13**: 450, fig. 78. 1911) suberect, glabrous except the much-thickened papillate base and ca. 5 mm. long, the staminal tube cupuliform, ca. 0.8 mm. long and 2 mm. wide, glabrous, the anthers 10, the ovary depressed-globose, 5-sulcate, tomentellous, 5-locular, the styles reflexed, ca. 1.8 mm. long and tomentellous, the stigma indistinctly 5-lobulate. *Follicles* subglobose, obliquely apiculate, ca. 7(10-15) cm. in diam., shortly to-

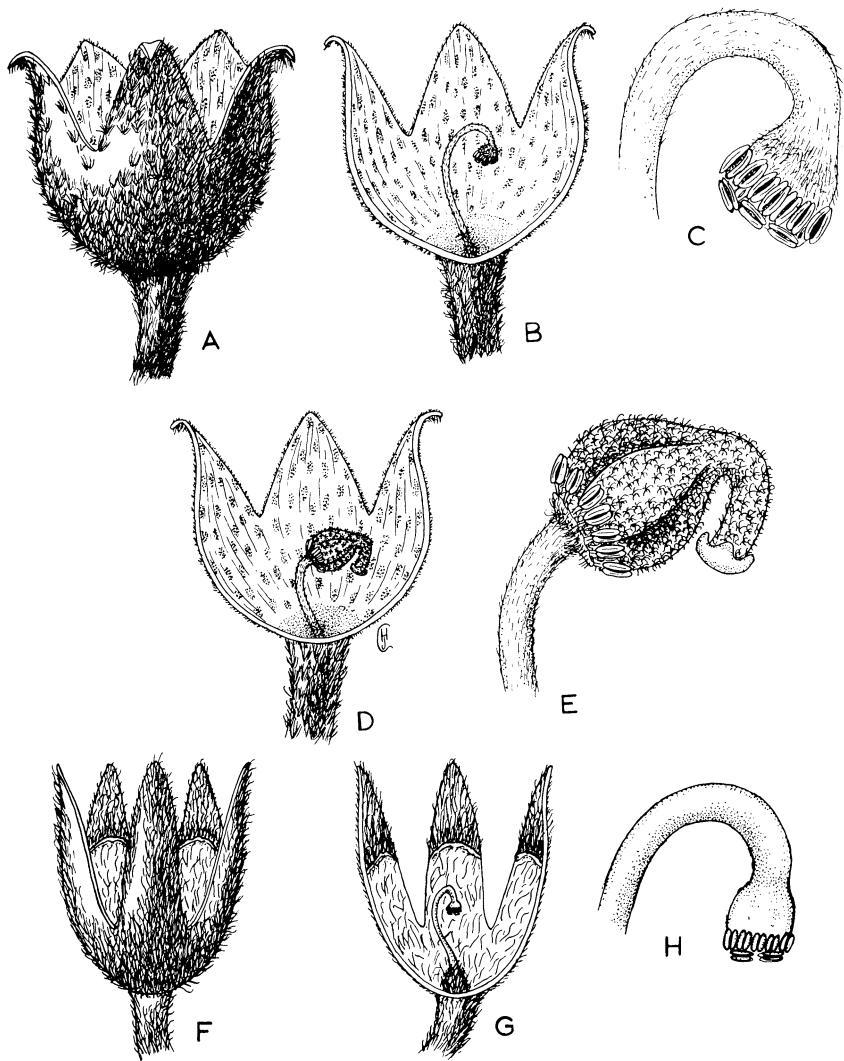


Figure 1. *STERCULIA APETALA* (Jacq.) Karst.: A, staminate flower ($\times 1\frac{1}{2}$); B, id., longitudinal section ($\times 1\frac{1}{2}$); C, id., upper part of gonophore and androecium ($\times 1\frac{1}{2}$); D, hermaphrodite flower, longitudinal section ($\times 1\frac{1}{2}$); E, id., upper part of gonophore, androecium and gynoecium ($\times 5$). *STERCULIA COSTARICANA* Pittier: F, staminate flower ($\times 2\frac{1}{2}$); G, id., longitudinal section ($\times 2\frac{1}{2}$); H, id., upper part of gonophore and androecium ($\times 10$).

mentellous; seeds ellipsoid-oblong, ca. 1.6 cm. long and 0.7 cm. thick, the testa covered with fine sharp hairs ca. 1.5-2 mm. long.

Costa Rica and Panama.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 104*; Cricamola Valley, Holstien pasture, *Cooper 536*.

2. WALTHERIA L.

WALTHERIA L., Sp. Pl. 673. 1753, Gen. Pl. ed. 5, 304. 1754.

Lophantus J. R. & G. Foster, Char. Gen. Pl. 27, t.14. 1775.
Asrophus Spreng., Neue Entdeck. 3: 64. 1822.

Herbs or shrubs, the pubescence chiefly of stellate hairs. *Leaves* alternate, simple, petiolate, stipulate, the stipules deciduous, the blade crenate to serrate, 3- to 5-nerved at the base. *Inflorescences* axillary or terminal, of globose, sessile or pedunculate clusters, sometimes of scorpioid spikes or branched cymes. *Flowers* hermaphrodite, actinomorphic, sessile or subsessile, bracteolate; calyx gamosepalous, 5-lobate, 10-nerved, persistent; petals, 5, adnate to the base of the staminal tube, contorted, marcescent; stamens 5, more or less long-connate at the base into a staminal tube, the anthers 2-thecate, the thecae parallel, extrorse, more or less medifixus, longitudinally dehiscent; staminodes none; ovary sessile, 1-celled, 2-ovulate, the ovules ascending; style somewhat excentric, often geniculate near the middle; stigma clavate or plumose-papillate. *Capsules* 2-valved, 1(-2)-seeded, the seeds small, albuminous; embryo straight; cotyledons flat.

A pantropical genus of about 45 species, especially well represented in tropical America; only one species, *W. indica* L., is pantropical; two species are known from Panama.

- a. Leaves soft-velvety-lanate-arachnoid on both sides, the nervation not reticulate; calyx ca. 4-4.5 mm. long, the lobes triangular-subulate; petals yellow or orange; staminal tube ca. 2 mm. long, the anthers subsessile1. *W. INDICA*
- aa. Leaves tomentellous when young to scabrous-puberulous later above, densely tomentellous beneath, the nervation reticulate; calyx ca. 5-6.5 mm. long, the lobes ovate-triangular and acuminate; petals white; staminal tube ca. 3-5 mm. long2. *W. GLOMERATA*

1. WALTHERIA INDICA L., Sp. Pl. 673. 1753.—Fig. 2 (E).

Waltheria americana L., Sp. Pl. 673. 1753; Johnston, *Sargentia* 8: 203. 1949.

Waltheria angustifolia L., Syst. Nat. ed.10, 1140. 1759.

Waltheria arborescens Cav., Mon. Cl. Diss. Dec. 6: 316. 1788.

Waltheria elliptica Cav., loc. cit. 316, t.171,2. 1788.

Waltheria microphylla Cav., loc. cit. 317, t.170,2. 1788.

Waltheria ovata Cav., loc. cit. 317, t.171,1. 1788.

Waltheria corchorifolia Pers., Syn. Pl. 2: 216. 1807.

Waltheria laevis Schrank, Pl. Rar. Hort. Acad. Monac. t.55. 1819.

Waltheria erioclada DC., Prodr. 1: 493. 1827.

Waltheria guineensis Schumacher, Kongl. Danske Vidensk. Selskabs Naturv. Math. Afhandl. 4: 69. 1829.

Waltheria africana Schumacher, loc. cit. 70. 1829.

Waltheria americana var. *elliptica* (Cav.) K. Schum. in Mart., Fl. Bras. 12(3): 65. 1886.

Waltheria americana var. *densiflora* K. Schum. in Engl., Monogr. Afr. Pflanzenf. und -gatt. **5**: 46. 1900.

Waltheria americana var. *indica* (L.) K. Schum. in Engl., loc. cit. 47. 1900.

Waltheria americana var. *subspicata* K. Schum. in Engl., loc. cit. 47. 1900.

Waltheria Wildii Suesseng., Proc. Trans. Rhod. Sci. Ass. **43**: 107. 1951.

Herb or small shrub 0.60-2 m. high, the young stems grayish and soft-velvety-lanate-arachnoid. *Leaves* with a pedicel 0.5-3.3 cm. long, lanate-arachnoid to sericeous, the stipules subfiliform, the blade narrowly ovate to ovate, rounded or truncate or somewhat subcordate at the base, obtuse or subacute at the apex, 3.5-12 cm. long and 1.5-7 cm. wide, chartaceous, the margins serrate-crenate, grayish and soft-velvety-lanate-arachnoid on both sides, the indumentum slightly denser on the lower surface, the nervation not reticulate, impressed above and prominent below. *Inflorescences* axillary or terminal, of tight-globose, subsessile to long-pedunculate glomerules, the peduncles lanate-arachnoid to sericeous. *Flowers* sessile, the bracts linear-lanceolate, about as long as the flowers, sericeous; calyx tubular-campanulate, somewhat 5-angled, ca. 4-4.5 mm. long, divided about $\frac{1}{2}$ way into 5 triangular-subulate lobes ca. 2-2.5 mm. long, long-sericeous outside, glabrous inside except the sericeous lobes; petals obovate-oblong, unguiculate, 4-4.5 mm. long and 1-1.5 mm. wide, yellow or orange, glabrous outside, scatteringly arachnoid near the base just above the claw inside; staminal tube ca. 2 mm. long, glabrous; anthers subsessile, ca. 0.8 mm. long; ovary oblong-ellipsoid, ca. 1.5 mm. long and 0.75 mm. wide, sericeous on the upper half; style geniculate in the middle, ca. 1.5 mm. long, loosely arachnoid; stigma plumose-papillate. *Capsule* included in the calyx and surrounded by the marcescent corolla, obovoid, ca. 2.5-3 mm. long and 1.5-2 mm. wide, sericeous above, 1-seeded; seed obovoid, ca. 1.8-2.1 mm. long and 1-1.3 mm. wide, the testa smooth.

A polymorphous, pantropical weed, extending to some subtropical regions, common especially in second-growth vegetation, along roads, in dry thickets and open forests.

CANAL ZONE: Corozal to Pedro Miguel, *Cowell* 408; Ancon Hill, *Bro. Heriberto* 299, *Killip* 12057, *Piper* 5536. COCLÉ: Aguadulce, *Pittier* 4831; vicinity of Natá, alt. 50 m., *Allen* 844; Penonomé, *Ebinger* 1035, *R. S. Williams* 155; between Las Margaritas and El Valle, *Woodson*, *Allen & Seibert* 1264; hills south of El Valle de Antón, alt. 600-800 m., *Allen* 2856; vicinity of Santa Clara Beach, *Woodson*, *Allen & Seibert* 1702; Santa Clara, *Ebinger* 1132. HERRERA: vicinity of Chitré, alt. ca. 20 m., *Allen* 1105. PANAMA: sabanas north of Panama City, *Bro. Paul* 564; vicinity of Bella Vista, *Piper* 5341; vicinity of Juan Franco Race Track, near Panama, *Standley* 27708; Riomar, Playa near the Río Mar, *Ebinger* 500; Taboga Island, *Allen* 1292, *Bro. Celestine* 48, *Macbride* 2813; San José Island, *Erlanson* 40, 477, *Harlow* 83, *Johnston* 88. VERAGUAS: Isla de Coiba (Colonia Penal), *Dwyer* 1547. PROVINCE UNKNOWN: *Seemann* 95.

2. *WALTHERIA GLOMERATA* Presl, Rel. Haenk. **2**: 152. 1835.—Fig. 2(A-D).

Waltheria brevipes Turcz., Bull. Soc. Imp. Nat. Moscou **31**(1): 213. 1858.

Waltheria rhombifolia J. D. Sm., Bot. Mag. **23**: 3. 1897.

Shrub 1.5-2 m. high, the young branches tomentellous to puberulous. *Leaves* shortly petiolate, the petiole 0.5-1 cm. long, puberulous to tomentellous, the stipules narrowly triangular-acuminate and ca. 0.8-0.9 cm. long; blade oblong-elliptic or

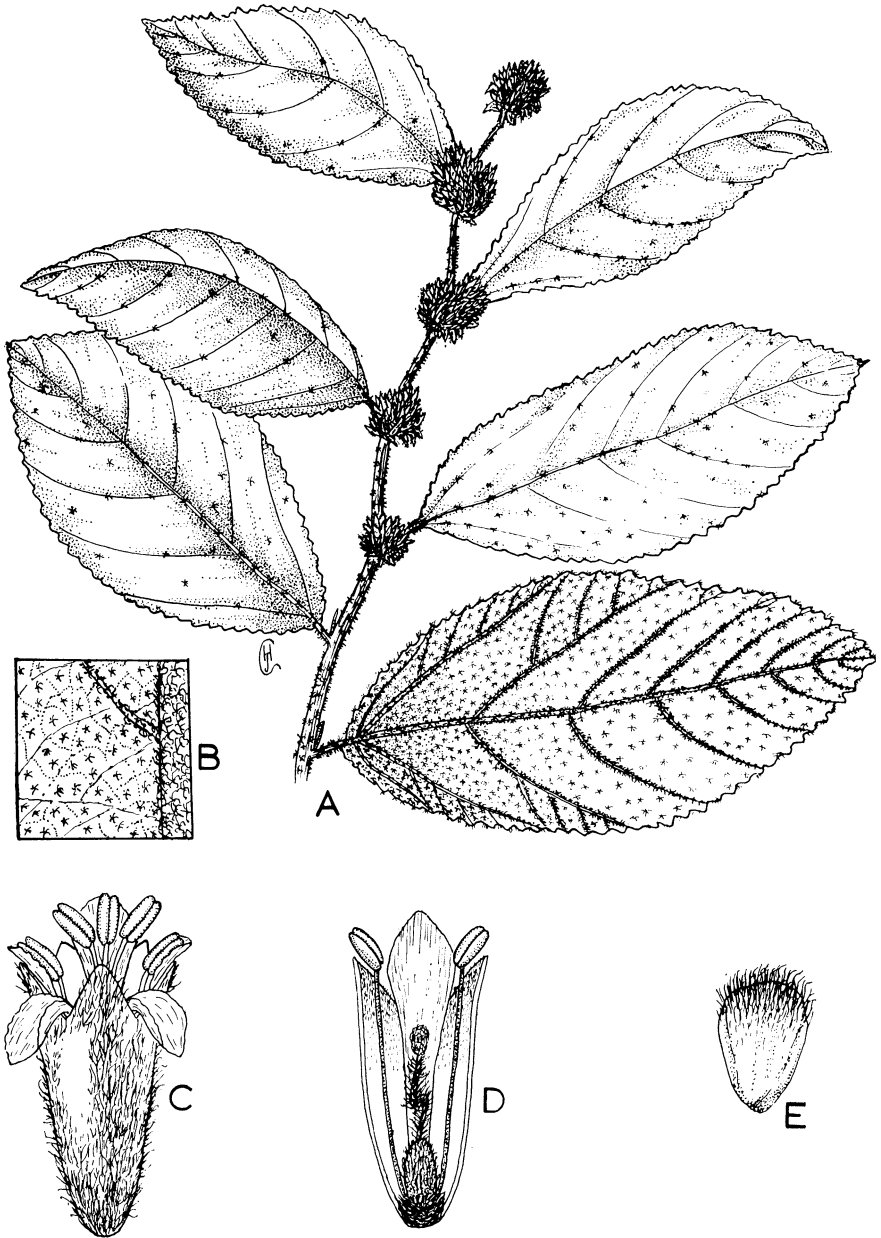


Figure 2. *WALTHERIA CLOMERATA* Presl: A, flowering branch ($\times \frac{2}{3}$); B, detail of indumentum on the lower leaf-surface; C, flower ($\times 6\frac{2}{3}$); D, id., longitudinal section ($\times 6\frac{2}{3}$). *WALTHERIA INDICA* L.: E, capsule ($\times 6\frac{2}{3}$).

elliptic or even slightly obovate, obtuse or truncate to subcordate at the base, acute at the apex, 6-13 cm. long and 2-8 cm. wide, chartaceous, discolor, the margins irregularly serrate, tomentellous when young to scabrous-puberulous later above, whitish-tomentellous beneath, the nervation reticulate, impressed above and prominent beneath. *Inflorescences* axillary, of densely globose, usually shortly pedunculate, solitary or fasciculate glomerules. *Flowers* sessile, subtended by several bracts, these distinct or 2- to 3-connate, linear to linear-obovate, acute at the apex, equalling more or less the calyx, tomentellous and with 2 tiers of hairs outside, a lower tier with appressed hairs and an upper one with long sericeous hairs, tomentellous-sericeous inside; calyx obovate-tubular, 5-angled and carinate, ca. 5-6.5 mm. long and ca. 2.5 mm. wide, the lobes ovate-triangular, acuminate and ca. 1.5-2.5 mm. long, tomentellous and with 2 tiers of hairs outside, a lower tier with short appressed hairs and an upper one with long sericeous hairs, shortly puberulous to tomentellous on the upper half inside; petals narrowly obovate-spatulate, unguiculate, rounded at the apex, ca. 5-7 mm. long and 1-2 mm. wide, white, glabrous; staminal tube very short, ca. 1-1.2 mm. long, glabrous, the filaments 3-5 mm. long; anthers ca. 1 mm. long; ovary narrowly obovoid, ca. 1 mm. long and 0.5 mm. broad, sericeous; style geniculate near the middle, ca. 2-2.5 mm. long, hirsute; stigma ca. 0.8-1 mm. long, densely plumose-papillate. *Capsule* unknown.

Mexico, Costa Rica and Panama, on hills, up to 800 m.

CANAL ZONE: around Las Cruces, alt. 20-100 m., *Pittier* 2618; Summit, *Standley* 26955; Cerro Gordo, near Culebra, *Standley* 25958; Ancon Hill, *Bro. Celestine* 67, *R. S. Williams* 44; Ancon Hill near Quarantine Station, *Pittier* s.n.; Balboa Heights, *J. M. & M. T. Greenman* 5060; hills east of Curundu, *Harvey* 5207. COCLÉ: Aguadulce, near sea level, *Pittier* 4980; hills south of El Valle de Antón, *Allen* 2527, 2819. HERRERA: vicinity of Ocú, 100 m., *Allen* 4057. PANAMA: road to San Carlos, *Harvey* 5150; hills above Campana, alt. 600-800 m., *Allen* 1303; hills between Capira and Potrero, 80-130 m. *Dodge & Hunter* 8644; vicinity of Panama, *Macbride* 2619; sabanas northeast of Panama City, *Bro. Paul* 200; vicinity of Bella Vista, *Piper* 5385; Punta Paitilla, *Bro. Heriberto* 216, *Piper* 5402; near Punta Paitilla, *Standley* 26302; near Matias Hernández, *Standley* 28864; between Matias Hernández and Juan Díaz, *Standley* 31979; Juan Díaz, *Standley* 30636; Río Tocumen, *Standley* 29464; near Pacora River, *Miller* 1783; along road between Panama and Chepo, *Dodge Hunter, Steyermark & Allen* 16651. VERAGUAS: hills west of Soná, alt. ca. 500 m., *Allen* 1051. PROVINCE UNKNOWN: *Haenkel* s.n., *Hays* 14, 153.

3. MELOCHIA L.

MELOCHIA L., Sp. Pl. 774. 1753, Gen. Pl. ed. 5, 304, 1754.

Visenia Houtt., Nat. Hist. **2**(8): 308. 1778.
Altheria Du Petit-Thouars, Gen. Nov. Madag. 19. 1806 (1808?).
Riedlea Ventenat, Mém. Math. Phys. Inst. Nat. Fr. **1**: 2. 1807.
Mougeotia H. B. K., Nov. Gen. Sp. Pl. **5**: 326. 1823.
Aleurodendron Reinwardt, Syll. Pl. Nov. (Ratisb.) **2**: 12. 1828.
Polychlaena G. Don, Gen. Syst. Gard. Bot. **1**: 488. 1831.
Physoodium Presl, Rel. Haenk. **2**: 150. 1835.
Lochemia Arnott, Ann. Sci. Nat., Bot., ser.2, **11**: 172, 1839.
Anamorpha Karst. & Triana, Linnaea **23**: 443. 1856.
Physocodon Turcz., Bull. Soc. Imp. Nat. Moscou **31**(1): 212. 1858.

Herbs, undershrubs or shrubs, infrequently small trees, the pubescence of simple or stellate hairs, sometimes of gland-tipped hairs. *Leaves* alternate, simple, petiolate, stipulate, the stipules deciduous, the blade crenate or serrate, usually 5-nerved at the base. *Inflorescences* axillary or terminal, rarely oppositifolious, paniculiform or of cymose clusters, the clusters sessile or pedunculate, forming sometimes interrupted or continuous, leafy spikes. *Flowers* hermaphrodite, actinomorphic, often heterostyled, sessile or pedicellate, generally bracteolate, the bracts persistent; calyx gamosepalous, 5(6)-lobate or -lobulate, persistent or sometimes accrescent; petals 5, unguiculate at the base, more or less long-adnate to the base of the staminal tube, contorted, marcescent; stamens 5, more or less long-monadelphous, the anthers 2-thecate, the thecae parallel, extrorse, more or less medifixus, longitudinally dehiscent; staminodes none or infrequently obsolete; ovary sessile or sometimes shortly stipitate, 5-celled, the cells oppositipetalous, 2-ovulate; styles 5, free or connate at the base, the stigmas minutely tuberculate or plumose-papillate. *Capsules* sessile or shortly stipitate, globose and 5-lobate or pyramidal and sometimes 5-winged, 5-celled, each cell 1-seeded, rarely 2-seeded, the dehiscence either loculicidal or septicial, the capsule separating into 5 cocci, each coccus opening by the inner angle or splitting completely into 2 valves; seeds small, ascending, 3-angular, dorsally convex, rarely winged, albuminous; embryo straight; cotyledons flat.

A pantropical genus of about 65 species, especially well represented in tropical America; five species, of which one is introduced (*M. corchorifolia*), are reported at the present time from Panama.

- a. Cocci opening along the inner angle.
 - b. Inflorescences of solitary or mostly fascicled, shortly pedunculate, umbelliform cymes; flowers shortly pedicellate, the pedicel 2.2-3 mm. long; calyx much-acrescent; petals white; ovary very shortly stipitate1. *M. LUPULINA*
 - bb. Inflorescences of dense, sessile or subsessile, more or less globose clusters; flowers sessile or subsessile; calyx persistent; petals pink; ovary sessile2. *M. NODIFLORA*
- aa. Cocci splitting completely into 2 valves.
 - c. Inflorescences of axillary or terminal, sessile or shortly pedunculate cymes; flowers 2.5-5.5 mm. long; staminal tube glabrous; leaves long-petiolate, sparsely pubescent.
 - d. Inflorescences and flowers sessile or subsessile; calyx outside and capsules hispidulous and with simple or stellate hairs; ovary sericeous; styles free.
 - e. Young stems hispidulous all round; flowers 2.5-3.4 mm. long; calyx ca. 1.5-2 mm. long; capsule ca. 1.8-2.5 mm. long and 2.5-3 mm. in diam.; seed ca. 1.4-1.8 mm. long3. *M. MELISSIFOLIA*
 - ee. Young stems puberulous and with a row of hairs decurrent from the stipule-bases; flowers 4.5-5.5 mm. long; calyx ca. 3 mm. long; capsule ca. 3.5-4 mm. long and 4-5 mm. in diam.; seed 3-3.4 mm. long4. *M. CORCHORIFOLIA*
 - dd. Inflorescences shortly pedunculate; flowers shortly pedicellate, the pedicel 1.5-4 mm. long; calyx outside and capsules hispidulous and chiefly with gland-tipped hairs; ovary nearly glabrous; styles connate at the base5. *M. MANDUCATA*
 - cc. Inflorescences of axillary and terminal, dense, sessile or subsessile clusters forming interrupted or continuous, leafy spikes; flowers 7-8.5 mm. long; staminal tube generally sparsely hirtellous; leaves shortly petiolate, densely pubescent6. *M. VILLOSA*

1. *MELOCHIA LUPULINA* Sw., Nov. Gen. Sp. Pl. Prodr. 97. 1788; Standley, Contr. Arnold Arb. **5**: 104. 1933.

Mougeotia inflata H. B. K., Nov. Gen. Sp. Pl. **5**: 330, *t.484*. 1823.

Riedlea inflata (H. B. K.) DC., Prodr. **1**: 491. 1824.

Visenia inflata (H. B. K.) Spreng. in L., Syst. Veg. ed. 16, **3**: 30. 1826.

Visenia lupulina (Sw.) Spreng. in L., loc. cit. 31. 1826.

Melochia inflata (H. B. K.) Benth., Bot. Voy. Sulph. 71. 1844.

Riedlea lupulina (Sw.) Beurling, Kongl. Sv. Vet.-akad. Handl. 1854: 115. 1854 (?).

Anamorpha waltherioides Karst. & Triana, Linnaea **28**: 443. 1856.

Herb, undershrub or shrub, erect or sometimes procumbent, 0.60-2 m. high, the young stems and branches villous, the hairs simple or stellate. *Leaves* rather long-petiolate, the petiole slender, slightly canaliculate above, up to 5 cm. long, more or less densely villous, the stipules filiform, up to 4 mm. long; blade ovate, cordate at the base, acuminate at the apex, up to 10 cm. long and 7 cm. wide, chartaceous, the margins serrate-crenate, loosely to densely softly velutinous, the indumentum always denser on the lower surface, usually 5(-7)-nerved at the base, the nervation slightly prominent beneath. *Inflorescences* axillary, of solitary or mostly fascicled, umbelliform cymes, the cymes shortly pedunculate, the peduncles densely stellate-puberulous. *Flowers* 4-4.7 mm. long, heterostyled, shortly pedicellate, the pedicel 2.2-3 mm. long and densely stellate-puberulous, the bracts linear-subulate, 1.5-2.5 mm. long, stellate-puberulous and ciliolate; calyx globose-campanulate, ca. 4-4.5 mm. long and 4 mm. wide, the lobes triangular, acute or acuminate, ca. 1.8-3 mm. long and 1.5-2 mm. wide at the base, stellate-puberulous outside, glabrous inside, much-acrescent; petals obovate, shortly unguiculate and slightly adnate to the base of the staminal tube, rounded at the apex, ca. 4-4.7 mm. long and 1.7-2 mm. wide, white; long-styled flowers with a staminal tube ca. 2-2.5 mm. long and glabrous, the anthers sessile or nearly so and ca. 0.8-1 mm. long, the ovary shortly stipitate, ellipsoid to oblong, ca. 1-1.5 mm. long and 0.8-0.9 mm. in diam., shortly and densely sericeous, the styles free, ca. 2.5-2.8 mm. long, stellate-hirtellous near the base, the stigmas papillate; short-styled flowers with a staminal tube ca. 1.6-1.7 mm. long and glabrous, the filaments ca. 2-2.2 mm. long, the anthers ca. 0.8-0.9 mm. long, the ovary very shortly stipitate, ellipsoid, ca. 1-1.2 mm. long and 0.7-0.8 mm. in diam., shortly and densely sericeous, the styles free, ca. 1.7-1.9 mm. long, the stigmas papillate. *Capsule* surrounded by the accrescent calyx, depressed-globose, ca. 2.2-2.3 mm. long and 2.7-3 mm. in diam., shortly stellate-puberulous, each coccus ca. 1.3 mm. thick, opening along the inner angle; seed ca. 1.4-1.7 mm. long and 1.1 mm. thick.

A common, often weedy species dispersed throughout the American tropics and growing in moist thickets, on brushy slopes and in weedy fields.

BOCAS DEL TORO: Almirante, *Skutch 1*; region of Almirante, Farm Six, *Cooper 190*; vicinity of Monkey Hill, *Cowell 39*; Changuinola Valley, along railroad, *Dunlap 334*; vicinity of Chiriquí Lagoon, Water Valley, *von Wedel 1671, 1848*; locality unknown, *Carleton 183*. CANAL ZONE: Mindi, *Cowell 184*; Gatun, *Bro. Heriberto 22*; hills west of the Canal, near Gatun, *Standley 27273*; forest along telephone trail between the Río Indio Hydrographic Station and the Natural Bridge of Río Puente, Casa Larga trail, *Dodge &*

Allen 17484; Barro Colorado Island, *Shattuck* 656, *Wetmore & Abbe* 33, 86, *Wilson* 19, *Woodworth & Vestal* 629; Frijoles, *Standley* 27640; Darien Station, *Standley* 31524; Gamboa, *Standley* 28329, 28501; Obispo, *Standley* 31772; Empire to Mandinga, *Piper* 5460; Las Cascadas Plantation, near Summit, *Standley* 25817, 29630; Summit, *Standley* 26932; Summit, exp. gardens, *Woodworth & Vestal* A50A; vicinity of Summit, *Standley* 30059; Río Grande, near Culebra, 50-100 m., *Pittier* 2109; Paraiso Sta., *Hayes* 30; Pedro Miguel, *Piper* 5498. COCLÉ: vicinity of El Valle, 800-1,000 m., *Allen* 80. COLÓN: Juan Mina Plantation, Río Chagres, 25 m., *Allen* 4118. DARIEN: Marraganti and vicinity, *R. S. Williams* 1002; along Sambú River, *Pittier* 5537; vicinity of Pinogana, *Allen* 4280. PANAMA: hills between Capira and Potrero, 80-130 m., *Dodge & Hunter* 8636, 8637; Agricultural Experiment Station at Matias Hernández, *Pittier* 6900; vicinity of Matias Hernández, *Standley* 32063; Río Tapia, *Standley* 28053. PROVINCE UNKNOWN: *Hayes* 786, *Sinclair* s.n.

2. *MELOCHIA NODIFLORA* Sw., Nov. Gen. Sp. Pl. Prodr. 97. 1788.

Mougeotia nodiflora (Sw.) H. B. K., Nov. Gen. Sp. Pl. 5: 330. 1823.

Riedlea nodiflora (Sw.) DC., Prodr. 1: 491. 1824.

Visenia nodiflora (Sw.) Spreng. in L., Syst. Veg. ed. 16, 3: 30. 1826.

Shrub, sometimes herb or undershrub, 1-3.5 m. high, the young stems and branches slightly pilose, the hairs chiefly stellate. *Leaves* short- to long-petiolate, the petiole slender, 0.5-3 cm. long, more or less densely stellate-hispidulous, the stipules linear-lanceolate, 4-5 mm. long; blade ovate, rounded or slightly subcordate at the base, acuminate at the apex, up to 12 cm. long and 6.5 cm. wide, membranous, the margins serrate, more or less densely appressed-pilose, the indumentum denser on the lower surface, becoming glabrescent, the nervation slightly prominent beneath. *Inflorescences* axillary, of dense, sessile or subsessile, more or less globose clusters. *Flowers* 4.5-5.3 mm. long, sessile or subsessile, the bracts distinct or 2- to 3-connate, linear to linear-subulate, stellate-puberulous and ciliolate; calyx campanulate, ca. 3.5-4 mm. long and 3 mm. wide, the lobes triangular, somewhat caudate-acuminate, ca. 2.2-3 mm. long and 1-1.5 mm. wide at the base, stellate-puberulous and appressed-pilose outside, glabrous inside, persistent; petals oblong-obovate, shortly unguiculate and more or less long-adnate to the base of the staminal tube, rounded at the apex, ca. 4.5-5.3 mm. long and 1.7-1.9 mm. wide, pink; staminal tube ca. 2.5 mm. long, glabrous, the anthers subsessile and ca. 0.8 mm. long; ovary sessile, oblong to oblong-ellipsoid, ca. 1-1.4 mm. long and 0.7-1.2 mm. in diam., sericeous and with simple hairs, the styles free and ca. 1.6-1.7 mm. long, the stigmas minutely papillate. *Capsule* surrounded by the persistent calyx, subglobose, ca. 3.5 mm. long and 3.8-4 mm. in diam., shortly stellate-puberulous and pilose, each coccus ca. 1.7 mm. thick, opening along the inner angle; seed ca. 2-2.2 mm. long and 1.2-1.3 mm. thick.

From southern Mexico to Panama, West Indies and western South America from Colombia to Peru; chiefly in open, wet habitats and moist thickets.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley* 29649; vicinity of Miraflores Lake, *P. White* 260; along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29149; in Government forest along Las Cruces Trail, 75 m., *Hunter & Allen* 733, 748; Balboa, *Standley* 25545, 27126, 29260, 32112. PANAMA: vicinity of San Carlos, alt. 0-10 m., *Allen* 1140; Panama City, *Macbride* 2618; Bella Vista, *Standley* 25301; between Las Sabanas and Matias Hernández, *Standley* 31847; Agricultural Experiment Station at Matias Hernández, *Pittier* 6905; near Matias Hernández, *Standley* 28870; between Matias Hernández and Juan Díaz, *Standley* 32092; near Chepo, 30 m., *Hunter & Allen* 61; Pearl Islands, *Johansen* 116. PROVINCE UNKNOWN: *Cowell* 286, *Hayes* 154, 786A.

3. *MELOCHIA MELISSIFOLIA* Benth., Hook. Jour. Bot. **4**: 129. 1842; Johnston, *Sargentia* **8**: 203. 1949.—Fig. 3.

Melochia bracteosa F. Hoffmann, Beitr. Kenntn. Fl. Centr.-Ost-Afr. 13. 1889.

Melochia crinata R. Br. ex Hiern, Cat. Afr. Pl. Welw. **1**: 90. 1896.

Melochia Welwitschii Hiern, loc. cit. 91. 1896.

Melochia melissifolia var. *microphylla* K. Schum. in Engl., Monogr. Afr. Pflanzenfam. und -gatt. **5**: 43. 1900.

Melochia melissifolia var. *brachyphylla* K. Schum. in Engl., loc. cit. 43. 1900.

Melochia melissifolia var. *bracteosa* (F. Hoffmann) K. Schum. in Engl., loc. cit. 43. 1900.

Melochia melissifolia var. *Welwitschii* (Hiern) K. Schum. in Engl., loc. cit. 43. 1900.

Melochia melissifolia var. *mollis* K. Schum. in Engl., loc. cit. 43. 1900.

Melochia mollis (K. Schum.) Hutch. & Dalz., Fl. W. Trop. Afr. **1**: 250. 1928.

Herb, sometimes undershrub, 0.30-1 m. high, the young stems hispidulous, the hairs chiefly stellate. *Leaves* rather small, long-petiolate, the petiole slender, 0.7-3 cm. long, hispidulous, the stipules linear, acute, 4-7 mm. long, long-ciliate; blade lanceolate or ovate to broadly ovate, rounded or truncate or subcordate at the base, subacute to acute at the apex, up to 4.5 cm. long and 2.5 cm. wide, membranous, the margins serrate-crenate, sparsely appressed-hispidulous and with chiefly simple hairs, the nervation slightly prominent beneath. *Inflorescences* axillary, of subsessile glomerules. *Flowers* 2.5-3.4 mm. long, subsessile or sessile, the bracts linear-subulate, ca. 3.5-5 mm. long, hispidulous and long-ciliate; calyx campanulate, ca. 1.5-2 mm. long and 2 mm. broad, the lobes from a large base acuminate, ca. 0.5-0.8 mm. long and 1 mm. wide at the base, sparsely appressed-hispidulous and with simple hairs outside, glabrous inside, persistent; petals obovate or oblong-obovate, shortly unguiculate and slightly adnate to the base of the staminal tube, rounded at the apex, ca. 2.5-3.4 mm. long and 0.8-1.8 mm. wide, pink; staminal tube ca. 1-1.2 mm. long, glabrous, the filaments ca. 0.5 mm. long, the anthers ca. 0.5 mm. long; ovary sessile, subglobose, ca. 0.8 mm. long and 0.6-0.7 mm. in diam., sericeous, the styles free and ca. 1-1.4 mm. long, the stigmas very minutely tuberculate. *Capsule* surrounded by the persistent calyx, subglobose to depressed-globose, ca. 1.8-2.5 mm. long and 1.8-3 mm. in diam., hispidulous, each coccus ca. 1.5 mm. thick, splitting completely into 2 valves; seed ca. 1.4-1.8 mm. long and 0.8-1.3 mm. thick, the testa dorsally rugulose.

A polymorphic, weedy species distributed in tropical America and in tropical Africa; in tropical America it ranges from Costa Rica to northern South America and usually grows in wet habitats.

CANAL ZONE: hills west of the Canal, near Gatun, *Standley* 27271; Gamboa, *Standley* 28364; Summit, *Standley* 26925; Las Cascadas Plantation, near Summit, *Standley* 29629; vicinity of Summit, *Standley* 30131; Cerro Gordo near Culebra, *Standley* 26028; Corozal, *Standley* 27351; Balboa, *Standley* 25520. COCLÉ: Aguadulce, *Pittier* 4833. COLÓN: between France Field, Canal Zone and Catival, *Standley* 30384. PANAMA: along the Corozal road, near Panama, *Standley* 26863; Paitilla, *Bro. Heriberto* 235; Nuevo San Francisco, *Standley* 30756; vicinity of Juan Franco Race Track, near Panama, *Standley* 27756; north of Panama City, *Bro. Paul* 586; near Matias Hernández, *Standley* 28992; Río Tocumen, *Standley* 29435; near the big swamp east of the Río Tocumen, *Standley* 26496; Laguna de Portala, near Chepo, 50 m., *Pittier* 4619; San José Island, *Johnston* 898.

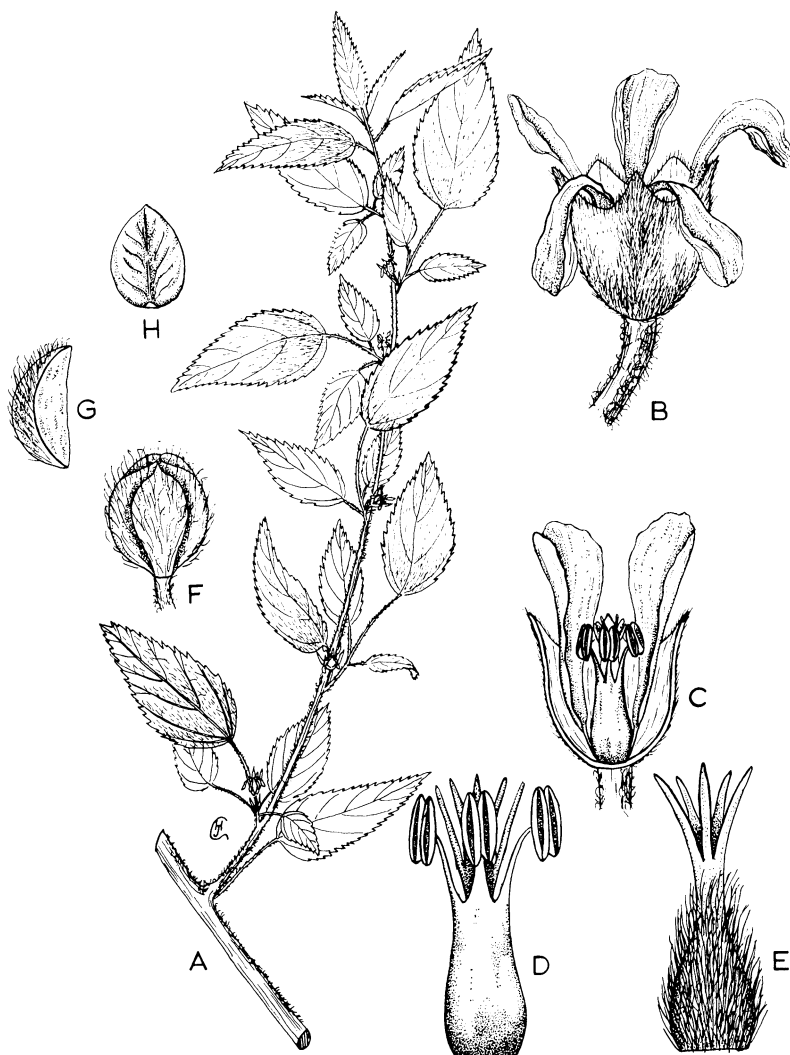


Figure 3. *MELOCHIA MELISSIFOLIA* Benth.: A, flowering branch ($\times \frac{1}{2}$); B, flower ($\times 10$); C, id., longitudinal section ($\times 10$); D, androecium ($\times 20$); E, gynoecium ($\times 20$); F, capsule ($\times 7\frac{1}{2}$); G, coccus ($\times 7\frac{1}{2}$); H, seed ($\times 10$).

4. *MELOCHIA CORCHORIFOLIA* L., Sp. Pl. 675. 1753; Johnston, *Sargentia* **8**: 203. 1949.

Melochia supina L., Sp. Pl. 675. 1753.

Melochia truncata Willd. in L., Sp. Pl. ed.4[i.e. 5], **3**: 601. 1880.

Riedlea corchorifolia (L.) DC., Prodr. **1**: 491. 1824.

Riedlea supina (L.) DC., loc. cit. 491. 1824.

Riedlea truncata (Willd.) DC., loc. cit. 491. 1824.

Visenia corchorifolia (L.) Spreng. in L., Syst. Veg. ed.16, **3**: 30. 1826.

Visenia supina (L.) Spreng. in L., loc. cit. 31. 1826.

Herb or undershrub, 0.30-2 m. high, the young stems stellate-puberulous and with a row of stellate hairs decurrent from the stipule-bases. *Leaves* long-petiolate, the petiole slender, up to 2.8 cm. long, stellate-puberulous, the stipules linear-filiform, 4-6 mm. long and ciliate; blade ovate to broadly ovate, rounded or truncate or subcordate at the base, subacute to acute at the apex, up to 4.5 cm. long and 3.5 cm. wide, membranous, the margins serrate, sparsely appressed-hispidulous especially along the nerves and with chiefly simple hairs, the indumentum somewhat denser on the lower surface than on the upper one, the nervation slightly prominent beneath. *Inflorescences* terminal or axillary, of dense, sessile, clustered cymes. *Flowers* ca. 4.5-5.5 mm. long, sessile, subtended by 4 bracts, the bracts linear-filiform, 4-5.5 mm. long, hispidulous and ciliate; calyx broadly campanulate, ca. 3 mm. long and wide, the lobes usually 5, sometimes 6, from a broad base abruptly short-acuminate, ca. 0.5 mm. long and 1.2 mm. wide at the base, appressed-hispidulous outside, glabrous inside, persistent; petals obovate, shortly unguiculate and slightly adnate to the base of the staminal tube, rounded at the apex, ca. 4.5-5.5 mm. long and 1.7-2.5 mm. wide, pale pink; staminal tube ca. 1.5 mm. long, glabrous, the filaments ca. 1 mm. long, the anthers ca. 0.8-1 mm. long; ovary subglobose, ca. 1 mm. in diam., densely sericeous, the styles free and ca. 1.5-2 mm. long, the stigmas minutely tuberculate. *Capsule* surrounded by the persistent calyx, more or less globose, ca. 3.5-4 mm. long and 4-5 mm. in diam., hispidulous and with mostly simple hairs, each coccus ca. 2.5 mm. thick, splitting completely into 2 valves; seed ca. 3-3.4 mm. long and 1.5-2.3 mm. thick, the testa minutely rugulose.

An Old World species introduced in America, where it is well established in southeastern United States; in Panama it is only reported from San José Island, where it was first collected in 1945 by Erlanson.

PANAMA: San José Island, at Goat Farm, near Río Mato Puerco, *Erlanson 189, Johnston 1243*.

5. *MELOCHIA MANDUCATA* Wright & Sauvalle in Sauvalle, Fl. Cubana 14. 1873.

Herb or undershrub, 0.30-1 m. high, the young stems usually with a row of short stellate hairs decurrent from the stipule-bases, sometimes also with few gland-tipped hairs. *Leaves* long-petiolate, the petiole slender, canaliculate and stellate-puberulous above, rounded and nearly glabrous beneath, 0.7-3 cm. long, the stipules linear-lanceolate, ca. 4-5 mm. long and ciliolate; blade ovate to broadly ovate, rounded at the base, acute at the apex, up to 5.5 cm. long and 3.5 cm. wide, membranous, the margins irregularly serrate or doubly serrate, sparsely

and shortly appressed-pilose especially along the nerves, the nervation very slightly prominent beneath. *Inflorescences* axillary or terminal, of solitary or mostly fasciculate, more or less clustered cymes, the cymes shortly pedunculate, the peduncles generally glabrous. *Flowers* ca. 2.7 mm. long, shortly pedicellate, the pedicel 1.5-4 mm. long, generally glabrous, the bracts 3, linear-lanceolate, ca. 3 mm. long, ciliolate; calyx broadly campanulate, ca. 2 mm. long and 1.8-2 mm. wide, the lobes abruptly and shortly acuminate, ca. 0.5 mm. long and 1 mm. wide at the base, sparsely hispidulous and chiefly with gland-tipped hairs outside, glabrous inside, persistent; petals oblong-obovate, shortly unguiculate and slightly adnate to the base of the staminal tube, rounded at the apex, ca. 2.7 mm. long and 1 mm. wide, pink; staminal tube ca. 1.5 mm. long, glabrous, the anthers shortly stipitate, ca. 0.5 mm. long; ovary sessile, ellipsoid, ca. 0.7 mm. long and 0.5 mm. in diam., nearly glabrous, the styles connate at the base, ca. 1-1.1 mm. long, the stigmas obscurely tuberculate. *Capsule* surrounded by the persistent calyx, depressed-globose, ca. 3-3.5 mm. long and 4.5 mm. in diam., hispidulous and chiefly with gland-tipped hairs, each coccus ca. 2 mm. thick, splitting completely into 2 valves; seed ca. 2.2-2.5 mm. long and 1.2 mm. thick.

Cuba, Panama and probably Colombia; from Panama I have seen only one collection; in swampy ground.

PANAMA: near the big swamp east of the Río Tocumen, *Standley* 26655.

The description of the above species agrees pretty well with the description of the Mexican species: *M. glandulifera* Standley (*Contr. U. S. Nat. Herb.* **23**: 803. 1923), but comparison with the type-specimen is necessary before this species can be reduced to synonymy.

6. *MELOCHIA VILLOSA* (Mill.) Fawc. & Rendl., *Fl. Jamaica* **5**: 165. 1926.

Sida villosa Mill., *Gard. Dict.* ed.8. 1768.

Melochia hirsuta Cav., *Mon. Cl. Diss.* Dec. **6**: 323, *t.175(1)*. 1788.

Riedlea serrata Ventenat, *Choix de Plantes* *t.37*. 1808.

Mougeotia hirsuta (Cav.) H. B. K., *Nov. Gen. Sp. Pl.* **5**: 331. 1823.

Riedlea hirsuta (Cav.) DC., *Prodr.* **1**: 492. 1824.

Visenia serrata (Ventenat) Spreng. in L., *Syst. Veg.* ed.16, **3**: 30. 1826.

Visenia hirsuta (Cav.) Spreng. in L., *loc. cit.* 30. 1826.

Melochia clinopodium St.-Hil. & Naud., *Ann. Sci. Nat., Bot., ser.2*, **18**: 36. 1842.

Melochia serrata (Ventenat) St.-Hil. & Naud., *loc. cit.* 36. 1842.

Melochia vestita Benth., *Hook. Jour. Bot.* **4**: 130. 1842.

Riedlea heterotricha Turcz., *Bull. Soc. Imp. Nat. Moscou* **31**(1): 211. 1858.

Herb or undershrub, erect or sometimes decumbent, 0.30-1 m. high, the young stems more or less densely stellate-puberulous and long-pilose-arachnoid, sometimes with gland-tipped hairs near the apex. *Leaves* shortly petiolate, the petiole canaliculate above, 0.5-1(-2) cm. long, more or less densely sericeous, the stipules linear-lanceolate, 5-6 mm. long, long-ciliate; blade oblong-ovate to ovate, rounded to mostly cordate at the base, acute at the apex, up to 5.5 cm. long and 3 cm. wide, chartaceous, the margins doubly serrate, more or less densely and softly stellate-puberulous and long-sericeous, the indumentum always denser on the lower sur-

face, the nervation somewhat impressed above and prominent beneath. *Inflorescences* terminal or/and axillary, of dense, sessile or subsessile clusters forming interrupted or continuous, leafy spikes. *Flowers* 7-8.5 mm. long, heterostyled, sessile, subtended by 3-4 bracts, the bracts linear-filiform, ca. 6-8 mm. long, sericeous and long-ciliate, the hairs mostly simple, sometimes gland-tipped; calyx campanulate to broadly campanulate, ca. 4.5-5 mm. long and 4.5 mm. wide, the lobes from a broad base abruptly acuminate, ca. 1-2 mm. long and 1.7-2 mm. wide at the base, sericeous and mostly with simple hairs or stellate-puberulous and sericeous and often with gland-tipped hairs outside, glabrous inside, persistent; petals obovate, long-unguiculate and rather long-adnate to the base of the staminal tube for ca. 2-3 mm., rounded at the apex, ca. 7-8.5 mm. long and 2.2-3 mm. wide, pink to pinkish-purple; long-styled flowers with a staminal tube ca. 3.5-4.5 mm. long, generally sparsely hirtellous, the anthers sessile and ca. 1.5 mm. long, the ovary sessile, oblong-ellipsoid, ca. 1.5 mm. long and 0.75-0.9 mm. in diam., densely sericeous, the styles shortly connate at the base, ca. 5.5-6.5 mm. long, the stigmas plumose-papillate; short-styled flowers with a staminal tube ca. 2.6-2.7 mm. long, generally sparsely hirtellous, the filaments ca. 2.5-3 mm. long, the anthers ca. 1.5 mm. long, the ovary sessile, oblong, ca. 1.5 mm. long and 0.6-0.7 mm. in diam., densely sericeous, the styles shortly connate at the base, ca. 3-3.5 mm. long, the stigmas obscurely tuberculate. *Capsule* surrounded by the persistent calyx, depressed-globose, ca. 2.5 mm. long and 3 mm. in diam., stellate-puberulous and sericeous especially on the upper part, each coccus ca. 1.5-1.8 mm. thick, splitting completely into 2 valves; seed ca. 1.8-2 mm. long and 1.3 mm. thick, the testa minutely tuberculate.

Throughout tropical America and introduced in Africa (Madagascar); usually in moist thickets or wet savannas.

CANAL ZONE: Chiva-Chiva trail, Red Tank to Pueblo Nuevo, *Piper* 5757; along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29087. CHIRIQUÍ: Boquete, *Ebinger* 745; rocky plains about 5 miles south of Boquete, 3,000 ft., *Allen* 4692; vicinity of Boquete, *Stern*, *Chambers*, *Dwyer*, *Ebinger* 1175; Sabana de la Tortuga, between El Boquete and Caldera, 300-700 m., *Pittier* 3304; San Carlos, *Roy* 4. COCLÉ: Aguadulce, near sea level, *Pittier* 4858; between Porto Posada & Penonomé, *R. S. Williams* 164; El Valle de Antón, 500-700 m., *Seibert* 475; Llano Bonito, north of Las Margaritas, 400-500 m., *Seibert* 543. PANAMA: near Arraijan, ca. 15 m., *Woodson*, *Allen*, *Seibert* 1388; Nuevo San Francisco, *Standley* 30748; La Sabana de Panama, *Bro. Gervais* 159; Sabanas Road, *Killip* 3122; Sabanas, *Bro. Paul* 74, *Standley* 25845, 25934; Agricultural Experiment Station at Matias Hernández, *Pittier* 6797, 6875; near Matias Hernández, *Standley* 28897; between Matias Hernández and Juan Díaz, *Standley* 31980; Río Tapía, *Standley* 28300; near Tapía River, Juan Díaz region, *Maxon & Harvey* 6632; Tocumen, *Dwyer* 4069; near the big swamp east of the Río Tocumen, *Standley* 26506; vicinity of Pacora, alt. ca. 35 m., *Allen* 1002; along road between Panama and Chepo, *Dodge*, *Hunter*, *Steyermark & Allen* 16660; Sabana de Juan Corso, near Chepo, alt. 60-80 m., *Pittier* 4510.

In *R. S. Williams* 1152 (Coclé, Penonomé and vicinity), the indumentum differs from that of the above species. All the plant, vegetative and floral parts, is covered with a heterotrichous pubescence of stellate and gland-tipped hairs. Since most of the other floral characters agree with those of *M. villosa* and because the indumentum is a very variable character in the *Malvales*, I consider this collection, at the present time, as only an ecological variation.

4. HELICTERES L.

HELICTERES L., Sp. Pl. 963. 1753, Gen. Pl. ed. 5, 411. 1754

- Isora* Adans., Fam. Pl. **2**: 382. 1763.
Alicteres Neck., Elem. Bot. **2**: 304. 1790.
Methorium Schott & Endl., Melet. Bot. 29. 1832.
Orthothecium Schott & Endl., loc. cit. 31. 1832.
Anisora Rafin., Sylva Tellur. 74. 1838.
Nisoralis Rafin., loc. cit. 74. 1838.
Camaion Rafin., loc. cit. 75. 1838.
Ozoxeta Rafin., loc. cit. 75. 1838.
Oudermansia Miq. in Junghuhn, Plant. Junghuhnianae 295. 1854.

Undershrubs, shrubs or small trees, the pubescence of stellate hairs. *Leaves* alternate, simple, petiolate, stipulate, the stipules caducous, the blade serrate, 3- to 7-nerved at the base. *Inflorescences* axillary or oppositifolious, fasciculate or flowers solitary. *Flowers* hermaphrodite, actinomorphic or zygomorphic, pedicellate, bracteolate; calyx gamosepalous, tubiform, either erect, regular and (4-)5-lobate, or horizontal, bilabiate and (2-4-)5-divided, the inner base glandular, deciduous; petals 5, contorted, long-unguiculate, the claws often appendiculate above the base, equal or not; gonophore well developed, longer than the calyx; stamens 6, 8, 10 or numerous, the filaments by pairs, the anthers 2-thecate, the thecae divergent or sometimes confluent, extrorse, longitudinally dehiscent; staminodes alternating with the pairs of stamens; ovary sessile, straight or spirally twisted, 5-celled, the cells many-ovulate; styles 5, free or coherent, filiform; stigmas acute or slightly capitate. *Fruit* borne on the accrescent gonophore, capsular, ligneous, straight or spirally twisted, the carpels separating at maturity by the rupture of the walls in the vicinity of the placenta (follicles); seeds numerous, small and angular; albumen scant; embryo straight; cotyledons foliaceous, folded.

A genus of about 40 species, native to the tropics of both hemispheres, exclusive Africa, but most abundant in America; only two species are at the present time reported from Panama.

- a. Flowers erect, actinomorphic; calyx ca. 1.8-2.2 cm. long; gonophore ca. 2.7-3.5 cm. long, sparsely puberulous, the hairs simple and glandular; fruit 2.2-3 cm. long, glabrous at maturity1. *H. GUAZUMAEOFOLIA*
 aa. Flowers horizontal, zygomorphic; calyx ca. 3 cm. long; gonophore ca. 8 cm. long, whitish-pubescent-arachnoid, the hairs stellate; fruit 4-5.5 cm. long, tomentose to puberulous2. *H. BARUENSIS*

1. *HELICTERES GUAZUMAEOFOLIA* H. B. K., Nov. Gen. Sp. Pl. **5**: 304. 1823.—Fig. 4.

- Helicteres mexicana* H. B. K., loc. cit. 305. 1823.
Helicteres carpinifolia Presl, Rel. Haenk. **2**: 138. 1835.
Helicteres Gardneriana St.-Hil. & Naud., Ann. Sci., Nat., Bot., ser. 2, **18**: 212. 1842.
Helicteres guazumaefolia var. *parvifolia* K. Schum. in Mart., Fl. Bras. **12**(3): 18, t. 4. 1886.
Helicteres retinophylla R. E. Fries, Kungl. Sv. Vet.-akad. Handl. ser. 4, **42**(12): 23. 1908.
Helicteres guazumaefolia var. *Gardneriana* (St.-Hil. & Naud.) R. E. Fries, loc. cit. 25. 1908.

Shrub or small tree 1-4 m. high, the young branches arachnoid. *Leaves* shortly petiolate, the petiole 3-13 mm. long, arachnoid, the stipules subulate, ca. 6-8 mm. long, the blade ovate to elliptic, sometimes somewhat obovate, rounded to



Figure 4. *HELICTERES GUAZUMAEFOLIA* H. B. K.: A, flowering branch ($\times \frac{1}{2}$); B, flower ($\times 1$); C, id., longitudinal section, androecium and gynoecium removed ($\times 1\frac{1}{2}$); D¹, petal from inside ($\times 1\frac{1}{2}$); D², id., lateral view ($\times 1\frac{1}{2}$); E, androecium and gynoecium ($\times 3\frac{1}{2}$); F, 2 staminodes and gynoecium ($\times 3\frac{1}{2}$); G, fruit ($\times 1$).

more or less cordate at the base, more or less long-acuminate at the apex, 2-11 cm. long and 1-7 cm. wide, chartaceous, the margins serrate to doubly serrate, somewhat rugose and sparsely puberulous above, densely puberulous to tomentellous beneath, 3- to 7-nerved at the base, the nerves prominent beneath. *Inflorescences* axillary or oppositifolious, biflorous, the peduncle 0.5-1 cm. long and arachnoid. *Flowers* scarlet, erect, actinomorphic, the pedicel 2.5-3 mm. long, minutely arachnoid, the bracts lanceolate to oblong-lanceolate, slightly inaequilateral, acute to acuminate, 7-13 mm. long and 1.5-3.5 mm. wide, the margins entire to subentire and ciliate, puberulous on both sides; calyx ca. 18-22 mm. long and 5 mm. wide, the lobes 5, rarely 4, triangular, acuminate, unequal and ca. 4-5 mm. long, membranous, shortly villous outside, villous near the top inside; petals spatulate, the claw provided above the base with 2 winged and fimbriate appendages, the apex asymmetric and rounded, unequal, ca. 21-24 mm. long and 3-7 mm. wide, glabrous; gonophore ca. 27-35 mm. long and 1 mm. wide, sparsely puberulous, the hairs simple and glandular; stamens 10, the filaments in 5 groups of 2, each pair very slightly connate at the base, ca. 2.5-4 mm. long, the anthers 1.8-2.5 mm. long; staminodes 5, ca. 2.5-3.5 mm. long and 0.5 mm. wide; ovary somewhat spirally twisted, ca. 1.5 mm. long and 1 mm. broad, villous; styles free, coalescent near the apex, ca. 6 mm. long, villous on the lower half, the stigmas acute. *Fruit* spirally twisted, 2.2-3 cm. long and 0.8-1.1 cm. broad, glabrescent at maturity, the accrescent gonophore 3-3.5 cm. long; seeds ovoid, 2-2.5 mm. long and 1.5-1.7 mm. broad, the testa slightly muricate.

From southern Mexico through Central America to Panama, West Indies and northern South America; dry or moist thickets, grassy or brushy slopes, clearings, often in second-growth vegetation.

CANAL ZONE: Gatun, *Hayes* 142; near Gatun, *Standley* 27330; along an old trail above the Reservoir, 1 to 3 miles from Gorgona, alt. 40-150 m., *Maxon* 4750; along trail between Gamboa and Cruces, alt. 50-80 m., *Pittier* 3777; Gamboa, *Bro. Heriberto* 87; Las Cruces trail, *Harvey* 5038; Obispo, *Standley* 31761; Empire to Mandinga, *Piper* 5488; vicinity of Summit, *Standley* 30105; Cerro Gordo, near Culebra, *Standley* 25965; Río Grande, near Culebra, alt. 50-100 m., *Pittier* 2137; Paraiso Station, *Hayes* 28; Chivi-Chivi trail, 2 miles above Red Tank, *Maxon & Harvey* 6576, 6602; between Miraflores and Corozal, alt. 20-30 m., *Pittier* 2501; Chiva-Chiva trail, Red Tank to Pueblo Nuevo, *Piper* 5762; Cocoli lighthouse, *P. White* 93; vicinity of Río Cocoli, Road K-9, *Stern, Chambers, Dwyer, Ebinger* 17; between Corozal and Ancon, alt. 10-30 m., *Pittier* 6728; road to Corozal, Ancon, *Bro. Celestine* 33; Ancon Hill, *Standley* 25192, *R. S. Williams* 34, *Woodson, Allen & Seibert* 1323; western slope of Ancon Hill, vicinity of Balboa, 20-75 m., *Seibert* 402; about 2 miles west of Balboa, *Correll* 12271; along drowned Río Azote Caballo, 66-70 m. *Dodge, Steyermark & Allen* 16837; locality unknown, *L. H. & E. Z. Bailey* 556. COCLÉ: above Penonomé, *R. S. Williams* 279, 535; vicinity of El Valle, 800-1,000 m., *Allen* 97. COLÓN: vicinity of Gatuncillo, *Piper* 5630. PANAMA: Cerro Campana, *Ebinger* 369; Capiro, *Bro. Paul* 130; near Arraijan, ca. 15 m., *Woodson, Allen & Seibert* 1356; around Alhajuela, Chagres Valley, 30-100 m., *Pittier* 3476; Bella Vista, *Maxon & Valentine* 6938, *Standley* 25379; Camino de Las Sabanas, *Bro. Heriberto* 180; along Río Juan Díaz above Juan Díaz, about 30 m., *Allen* 933; between Matias Hernández and Juan Díaz, *Standley* 32015; near Tapía River, Juan Díaz region, *Maxon* 6647; Río Tapía, *Standley* 28063; near the big swamp east of Río Tocumen, *Standley* 26707; near Pacora River, *Miller* 7180, 7181; along road between Panama and Chepo, *Dodge, Hunter, Steyermark & Allen* 16703; roadside near Chepo, *Dodge* 10724; Laguna de Portala, alt. 50 m., *Pittier* 4589, Río Tatare, *Woodson & Schery*

997; Taboga Island, *Standley 28031*; Pedro Gonzalez Island, 0-20 m., *Allen 2595*; Pearl Islands, *Johansen 121*. VERAGUAS: trail between Cañazas and the foot of the Cordillera Central, headwaters of Río Cañazas, 300-600 m., *Allen 186*. PROVINCE UNKNOWN: *Hayes 346, 768*.

2. *HELICTERES BARUENSIS* Jacq., Enum. Syst. Pl. 30. 1760.

Shrub or slender tree 2-4 m. high, the young branches ferruginous-tomentose. *Leaves* shortly petiolate, the petiole thick, up to 1.5 cm. long, ferruginous-tomentose, the stipules subulate and 1-1.2 cm. long, the blade ovate, cordate at the base, acuminate at the apex, 6-14 cm. long and 5-9 cm. wide, chartaceous, the margins irregularly serrate or doubly serrate, shortly tomentellous above, tomentose-arachnoid beneath, 5- to 7-nerved at the base, the nerves impressed above and prominent beneath. *Inflorescences* axillary or oppositifolious, 3- to 5-flowered, the peduncle thick, ca. 1 cm. long, ferruginous-tomentellous. *Flowers* horizontal, zygomorphous, the pedicel ca. 5 mm. long, ferruginous-tomentellous, the bracts subulate, ca. 7-8 mm. long, ferruginous-tomentellous; calyx bilabiate, ca. 3 cm. long and 1 cm. wide, the lobes triangular, acuminate, unequal and ca. 1 cm. long, ferruginous-tomentellous outside, tomentose-arachnoid near the top inside; petals linear, long-unguiculate, the claw provided above the base with small appendages, rounded at the apex, ca. 4 cm. long, reddish; gonophore curved, ca. 8 cm. long, whitish-pubescent-arachnoid; stamens 10, the filaments ca. 3-4 mm. long, the anthers ca. 4 mm. long; staminodes 5, ca. 3 mm. long; ovary spirally twisted, ca. 3 mm. long and 1.5-2 mm. broad, whitish-villous, the styles coherent. *Fruit* cylindrical, spirally twisted, 4-5.5 cm. long and 1 cm. broad, the follicles dorsally canaliculate, tomentose to puberulous, the accrescent gonophore up to 10-12 cm. long; seeds flattened, ca. 2 mm. in diam.

Tropical Central America, Trinidad and northern South America; only one specimen, in fruit, is reported from Panama.

COCLÉ: Penonomé and vicinity, *R. S. Williams 450*.

5. *THEOBROMA* L.

By JOSÉ CUATRECASAS

THEOBROMA L., Sp. Pl. 782. 1753; Cuatrecasas, Contr. U. S. Nat. Herb. **35**: 449. 1964.

Cacao Mill., Gard. Dict. Abridg. ed. 4. 1754.

Tribroma Cook, Jour. Wash. Acad. Sci. **5**: 288. 1915.

Trees with primary branching 3- or 5-verticillate; further branching alternate; apical growth of the stem limited to the production of a whorl (jorquette) of 3-5 spreading, verticillate branches; continuing growth of the stem sympodial, by adventitious, subterminal shoots (below jorquette) (called chupons) or by pseudo-apical shoots (above jorquette) from buds axillary to the terminal verticillate branches. *Leaves* simple, long-petiolate and varied in phyllotaxy on the primary stem, short-petiolate and distichous on the lateral branches, penninerved or sub-palmatinerved, persistent, coriaceous or subcoriaceous; pluricellular trichomes

usually as stellate hairs, rarely simple, sometimes glandular hairs. *Inflorescences* dichasial or monochasial, axillary or on reduced, tuberculiform branchlets on trunk and larger branches; pedicels articulate to bracteate peduncles. *Flowers* hermaphrodite; sepals 5, almost free and spreading or more or less united; petals 5, contorted, each one strangulated in 2 halves; lower part, corresponding to the claw, rigid and strongly veined with the shape of a hood; upper part a flat lamina, articulated to the inflexed apex of the claw; androecium in 2 whorls, united at base; outer whorl with 5 sterile, petaloid or linear staminodes opposite to the sepals; inner whorl with 5 fertile stamens opposite to the petals, the filaments short, shortly 2- to 3-branched, each branch with one anther; anthers hidden inside the petal-hoods, bithecate, the thecae unilocular and longitudinally dehiscent; pollen grains 3-colporate, peritreme, suboblate; gynoecium 5-carpellar, the ovary ovoid, pentagonal, 5-celled with axile placentation; ovules many, in two rows, anatropous with two integuments and dorsal raphe; styles 5, free or more or less united, filiform; stigmas apical, short, acute. *Fruit* large, subbaccate or subdrupaceous, indehiscent, the pericarp fleshy or hard and partly woody or coriaceous, the vascular axis thin and vanishing; seeds usually in 5 rows, each seed surrounded by a thick, fibrose, pulpy tissue filling the cavity at maturity, ovoid, ellipsoid or amygdaloid, the epispERM double, thick, subcoriaceous, the other layer with a trichomatic and gelatinous epiderm developing into a thick, pulpy envelope; embryo straight; cotyledons thick, strongly plicate-corrugate; endosperm reduced to a filmy membrane covering the cotyledons; germination epigeous or hypogeous.

A neotropical genus of 22 species of small or medium-sized trees, many of them endemics, usually growing in the tropical rain forests.

Theobroma is important as a source of cacao beans which are produced mainly by one species, widely cultivated, *T. Cacao*.

In Panama five species are known to be found at present.

- a. Leaves glabrous or puberulous beneath; jorquette 5-branched; petal-laminae stipitate, yellowish; staminodes narrowly subulate, red or purplish; stamens 2-antheriferous; fruit globose to fusiform and acute, more or less pentagonal or decagonal, glabrous, with carnose, relatively thick pericarp; flowers on trunk and on branches; growth below jorquette3. *T. CACAO*
- aa. Leaves densely stellate-tomentose beneath; jorquette 3-branched.
 - b. Leaves apparently glabrous and shining beneath, the indumentum, homotrichous, extremely minute and appressed in the areolae; inflorescences on trunk; petal-laminae sessile, crimson; staminodes lanceolate or subulate, purplish-red; stamens 2-antheriferous; fruit ellipsoid-oblong, more or less obtusely pentagonal, 15-20 x 6-7.5 cm., coriaceous; growth below jorquette2. *T. BERNOULLII*
 - bb. Leaves clearly tomentose beneath; inflorescences on branches.
 - c. Leaves elliptic-ovate or oblong-ovate, the lower surface silvery-greenish or cinereous, covered with a dense layer of uniform, stellate hairs; petal-laminae subsessile, red, brownish-red or purplish; staminodes linear-oblong, obtuse or subacute, brownish-red; stamens 2-antheriferous; fruit ellipsoid, 15-20 x 9-12 cm., with a thick-woody, strongly costate-reticulate and lacunose pericarp; growth below jorquette.3. *T. BICOLOR*

- cc. Leaves obovate-oblong, elliptic-oblong or oblanceolate, heterotrichous beneath with dense, minute, whitish, stellate hairs and large, ochraceous or ferruginous, stellate hairs on the nerves; petal-laminae stipitate; staminodes oblong-obovate; stamens 3-antheriferous; pericarp coriaceous; growth above jorquette.
- d. Petal-laminae and staminodes yellow; fruit oblong-ellipsoid or ovoid-ellipsoid, umbilicate and 5-costate at base, slightly attenuate at apex, 10-18 x 6-9 cm., tuberculate-rugose; leaves cinereous beneath, the nerves with large, ochraceous, stellate hairs, these with long, spreading rays4. *T. ANGUSTIFOLIUM*
- dd. Petal-laminae and staminodes brownish-red; fruit ellipsoid, rounded at both ends, about 7 x 4 cm., smooth; leaves cinereous beneath, the nerves with thick, ferruginous, stellate hairs, these with short rays5. *T. HYLAEUM*

1. *THEOBROMA BICOLOR* Humb. & Bonpl., Pl. Aequin. **1**: 104, pl. 30. 1806; Cuatrecasas, Contr. U. S. Nat. Herb. **35**: 458, figs. 2, 5, 9, 12, 18, 35, map 3. 1964.

Theobroma ovatifolia Moç. & Sesse ex DC., Prodr. **1**: 485. 1824; Icon. Fl. Mex. ex DC. pl. 113.

Cacao bicolor (Humb. & Bonpl.) Poir. in Lam., Encycl. Méth. Bot. Suppl. **2**: 7. 1811.

Tribroma bicolor (Humb. & Bonpl.) Cook, Jour. Wash. Acad. Sci. **5**: 288. 1915.

Tree usually 3-8 m. tall, up to 25-30 m. in high forest, with rather narrow crown; growth below jorquette; trunk erect with light bark and white wood; primary branches ternate, dichotomous, spreading, horizontal or pendulous, subterete, densely and appressed-cinereous-tomentose with minute, stellate hairs; older branches glabrate, smooth, gray; stipules oblong-lanceolate, minutely appressed-tomentose, more or less persistent. *Leaves* with a petiole rather thick, subterete, 12-25 mm. long, minutely appressed-tomentose; blade oblong-ovate or elliptic-ovate, cordate or emarginate, asymmetrical at base, attenuate, abruptly acuminate at apex, entire or rarely sinuate at the upper margin, 12-34 cm. long and 6-18 cm. broad, the acumen triangular and 6-12 mm. long, firmly chartaceous, subpalmatinerved; upper surface green, glabrous or with scattered hairs, the main nerves noticeable, the lesser slightly conspicuous; lower surface silvery-greenish or cinereous, covered with a dense layer of intricate, stellate hairs, 5- to 7-nerved at base, the thicker costa and 2 or 3 main nerves on each side strongly prominent; leaves on primary stem and chupons larger, symmetrical, deeply cordate, 30-50 cm. long and 21-36 cm. broad, with a petiole 10-38 cm. long. *Inflorescences* axillary or extra-axillary on leafy, juvenile branchlets, usually 3-6 cm. broad, with short axis and divaricate, dichasial and cincinnate branching, densely ochraceous- or cinereous-tomentose; pedicels 3-6 mm. long; bracteoles 1.5-2.5 mm. long, densely and minutely tomentose; buds oblong-ovate, subacute, minutely cinereous- or ochraceous-tomentose. *Flowers* with spreading, lanceolate or ovate-lanceolate sepals, these shortly connate at base, acute at apex, 5-6 mm. long and 2-2.5 mm. broad, subappressed-stellate-tomentose and reddish outside, 3-nerved and sparsely pilose inside; petal-hoods oblong-obovate, rounded-cucullate with incurved apex, 2-2.5 mm. long and 1-1.2 mm. broad, submembranaceous, whitish-rosy or reddish with a darker midrib, hirtellous-pubescent with a depressed, tomentellous midrib outside, glabrous with a thick, trifurcate midrib inside; petal-laminae ovate, abruptly contracted at base in a short nail, rounded at apex, 1-1.2 mm. long and 0.8 mm. broad, carnos, red,

brownish-red or purplish, hirtellous-pubescent; staminodes linear-oblong, slightly narrowed at base, obtuse or subacute at apex, 3.5-4.5 mm. long and 0.6-0.8 mm. wide, carnose, brownish-red, covered with minute, thickish, patulous hairs; filaments about 1-1.5 mm. long, glabrous, 2-antheriferous; ovary velutinous-tomentose; styles united, rigid, whitish. *Fruit* subglobose-ellipsoid or oblong-ellipsoid, 15-20 (10-25) cm. long and 9-12(-15) cm. broad, green, when ripe yellow or brownish; pericarp hard, woody, 7-15 mm. thick, densely stellate-pilose, strongly 10-costate, the deep furrows reticulate, deeply lacunose; pulp fibrose, yellowish, sweet, scented; seeds complanate, ovoid-amygdaliform, 16-30 mm. long, 14-23 mm. wide and 8-13 mm. thick; embryo white; germination epigeous.

Theobroma bicolor probably originated in Central America. It is found in cultivation, in limited extension, throughout tropical America. It is a very distinctive species, easy to recognize by its small, lax, horizontal crown, by its large, papery, cinereous, pendulous leaves and by the thick, woody, carved shell of its ellipsoid fruits. These remain green until ripening, when they change the color into yellow or brownish, falling from the tree.

The common name in Panama is *pataste*; in Darien, the Choko Indians call it *cu-lu-hu*, according to *Allen 4539*.

The seeds are locally used like those of cacao, giving a chocolate of inferior quality. Although the pulp does not have a very attractive flavor, it is sucked by the natives and used in the preparation of refreshments.

BOCAS DEL TORO: Laguna de Chiriquí and its neighborhood, Pope's Island, *Hart 158* (US). CANAL ZONE: Caño Quebrado, *Pittier 6883* (GH, NY, US). DARIEN: headwaters of Río Chica, 500-750 ft., cultivated by Choko Indians, *Allen 4539* (G, MO, NY).

2. *THEOBROMA BERNOULLII* Pittier, *Repert. Sp. Nov.* **13**: 319. 1914; Cuatrecasas, *Contr. U. S. Nat. Herb.* **35**: 489, *figs. 15-17, 19, map 4*. 1964.

Tree 15-20 m. high; growth below jorquette; primary branches ternate, dichotomous, the terminal leafy, terete, dark brown, subappressed-tomentulose, when older puberulous or glabrate; stipules linear-oblong, acute, pubescent. *Leaves* with a petiole thick, terete, 5-10 mm. long, densely and minutely tomentulose; blade elliptic-oblong, obtusely cuneate-attenuate and asymmetrical at base, narrowed toward the apex, ending in a long, linear acumen, entire or very slightly sinuate, 13-28 cm. long and 5-8 cm. broad, the acumen 1-3 cm. long, thin-coriaceous, trip-linerved; upper surface green and glabrous, the main nerves filiform and prominent, the others reticulate and slightly prominulous; lower surface pale-greenish-ochraceous or ashy, apparently glabrous but the tawny, shining veins with very sparsely minute, stellate hairs and the areolae covered with a very appressed, white tomentum of smaller, microscopic, entangled, stellate hairs, the midrib and 6-7 secondary nerves on each side very prominent. *Inflorescences* on the main trunk usually many-flowered, borne on short, tuberculate, woody branches; panicles corymbiform, 4-10 cm. long, the axes cymose-bifurcate in the upper third or rarely from the base, the branchlets rigid, erect at acute angle; peduncles capillary, 3-

bracteolate at apex; bracteoles narrowly linear, 1-2 mm. long, very soon deciduous; pedicels thicker than the peduncles, minutely stellate-tomentellous like the branchlets; buds ovoid, densely tomentose. *Flowers* with lanceolate-oblong sepals, these shortly united at base, rather acute at apex, 8-10 mm. long and 3 mm. wide, moderately thick, reddish and with sparse, slender, flexuous, sericeous hairs inside, ferruginous and stellate-tomentose outside, with thick, glandular hairs at the insertion at base; petal-hoods oblong-obovate, rounded-cucullate at apex, 4-5 mm. long and about 2 mm. wide, 0.6 mm. wide at base, red, hirtellous-pubescent outside, prominently 3-nerved inside; petal-laminae sessile, round or elliptic, shortly unguiculate-articulate, minutely crenulate, 2.5-4 mm. long and 3-4 mm. broad, moderately thick, crimson, rugulose, glabrous; staminodes sublanceolate-linear-subulate, 6-10 mm. long, thick, purplish-red, covered with minute, spreading, acute, conical hairs; filaments about 2.5 mm. long, glabrous, 2-antheriferous; ovary tomentose; styles adherent into a column but separable. *Fruit* ellipsoid-oblong, more or less obtusely 5-angulate, umbilicate at base, abruptly narrowed and subacute or subobtuse at apex, 15-20 (12-25) cm. long and 6-7.5 (5.2-8) cm. broad, the pericarp thick, dull brown, velvety-tomentose, coriaceous at maturity, shrinking in drying; pulp white, flavored, acidulous; seeds compressed-ovoid, 16-22 x 9-14 x 9-11 mm., the testa reddish, papery; germination epigeous, the cotyledons white.

T. Bernoullii, broadly considered, includes three heteromorphic elements, two from the Atlantic coast of Panama and the subsp. *capilliferum* (Cuatr.) Cuatr. from the Pacific coast of Colombia. For further discussion, see my Revision of the genus *Theobroma*, Contr. U. S. Nat. Herb. **35**: 491. 1964.

2a. *THEOBROMA BERNOULLII* subsp. *BERNOULLII*; Cuatrecasas, loc. cit. 492. 1964.

Peduncles 2-5 mm. long; pedicels 5-8 mm. long; petal-hoods 4-5 x 2-2.5 mm.; petal-laminae suborbicular, 3 x 3-4 mm. long; staminodes lanceolate, 5.5-6 mm. long, 1.5-2 mm. broad at base, slightly pilose; fruit unknown.

COLÓN: Fato, Loma de la Gloria (Nombre de Dios), selvas, 10-104 m. alt., *Pittier 4105* (US, holotype; BM, BR, C, F, GH, K).

2b. *THEOBROMA BERNOULLII* subsp. *ASCLEPIADIFLORUM* (Schery) Cuatrecasas, loc. cit. 493. 1964.

Theobroma asclepiadiflorum Schery, Ann. Missouri Bot. Gard. **29**: 360. 1942.

Peduncles 6-12 mm. long; pedicels 10-12 mm. long; petal-hoods 5 x 3 mm.; petal-laminae elliptic, 4 x 3 mm.; staminodes subulate, 9-10 mm. long and 1.5 mm. broad, densely pilose; fruit ellipsoid-oblong, slightly pentagonal, not attenuate above the base, attenuate at apex, 17 x 7 cm., with a filiform, impressed furrow on each obtuse, inconspicuous ridge.

BOCAS DEL TORO: Water Valley, *Allan Lucas 1* (F, TURRI), *von Wedel 681* (MO, US), 1535 (MO).

3. *THEOBROMA CACAO* L., Sp. Pl. 782. 1753; Cuatrecasas, Contr. U. S. Nat. Herb. **35**: 495, figs. 1-6, 20-26, pl. 6, map 6. 1964.

Theobroma pentagonum Bernoullii Uebers. Art. *Theobroma* 6-7, pl. 2. 1869.

Theobroma leiocarpum Bernoulli, loc. cit. 6, pl. 2. 1869.

Theobroma sphaerocarpum Chev., Végét. Util. Afr. Trop. Fr. **4**: 12. 1908.

THEOBROMA CACAO subsp. *CACAO*; Cuatrecasas, loc. cit. 513. 1964.

THEOBROMA CACAO subsp. *SPHAEROCARPUM* (Chev.) Cuatrecasas, loc. cit. 515. 1964.

Tree usually 4-8 m. high, rarely taller and up to 20 m.; growth below jorquette; primary branching quinate; young branchlets terete, grayish-green or brownish, densely or sparsely pubescent with slender, patulous, acute, simple or furcate hairs, later glabrate, rugulose and sparsely lenticellate; stipules subulate, deciduous. *Leaves* alternate, distichous, the petioles thickened-pulvinate at both ends, 1.5-2 (1-3) cm. long, on orthotropous stems 3-10 cm. long, pubescent or tomentose with slender, spreading, acute, simple hairs; blade subobovate-oblong or elliptic-oblong, slightly asymmetrical, rounded or obtuse at base, attenuate and acuminate at apex, entire or slightly and irregularly sinuate, 15-50 cm. long and 4-15 cm. broad, coriaceous or chartaceous, the acumen acute or subacute and 1-2.5 mm. long; upper surface green, glabrous except for the pubescent or puberulous, prominent costa, the secondary nerves filiform; lower surface lighter green, glabrous or with very sparse, minute, simple, furcate or stellate hairs, rarely puberulous, the costa prominent, the 9-12 secondary nerves on each side prominent, subpatulous. *Inflorescences* on the trunk and on the branches, usually borne on small tubercles, the cymose peduncles 1-3 mm. long, stellate-pubescent, hirtellous and with scattered, glandular hairs; bracts and bracteoles ovate or ovate-oblong, acute or subacute, pubescent, deciduous; pedicels capillary, rigid, 5-15 mm. long, pale green, whitish or reddish, hirtellous with patulous, stellate or furcate hairs and glandular, capitate hairs; buds ovoid or oblong-ovoid, acute, white, whitish-green, lilac or reddish, subglabrous or sparsely puberulous. *Flowers* with lanceolate or oblong-lanceolate sepals, these shortly united at base, acute at apex, 5-8 mm. long and 1.5-2 mm. wide, thick-membranaceous, white, greenish-white, pale violaceous or reddish, slightly 3-nerved, glabrous or with stellate and glandular hairs outside, glabrous or with rare, glandular hairs inside; petals thick-membranaceous; petal-hoods obovate, rounded at apex, 3-4 mm. long and 5-2 mm. wide, white, 3-nerved; petal-laminae stipitate, the stipe linear and 2-4 mm. long, obovate or rombic-obovate, the apex attenuate, acuminate or subtruncate and shortly mucronate, rarely blunt, the margin entire or sinuate, 1.5-2.5 mm. long and 1.5-2 mm. wide, pale yellowish; staminodes narrowly subulate, very acute, 4-6 mm. long, the middle vein thick, angular, red or purplish, minutely papillose-pilose, the thin margin whitish, ciliate with slender, flexuose, simple hairs; filaments 1.5-2 mm. long, glabrous, 2-antheriferous; ovary glabrous or usually glandular, the glands numerous, stipitate, white or reddish, pluricellular; styles adherent, glabrous. *Fruit* variable in shape, from globose to fusiform and acute, with a very smooth to a strongly ridged and rugose or verrucose surface; pericarp consistently fleshy, 5-15 mm. thick, usually made of 2 more or less conspicuously different, carnosose layers (epicarp and endocarp) separated by a thin, ligneous membrane (mesocarp), the latter sometimes reduced to isolated

bundles of fibers or lacking, the endocarp also sometimes lacking; pulp white and sweet; seeds 20-40, ovoid, ellipsoid, amygdaloid, more or less complanate or almost round in cross-section, variable in size, 20-40 mm. long and 12-20 mm. broad, the testa subcoriaceous, brown; cotyledons white, purplish, violet or intermediate in color.

A polymorphic species, especially with regard to the color, size and shape of the parts of the flower and the fruits. Several species and varieties have been described based on these variations, the most significant are those related to the shape of the fruit and to the color of the cotyledons. Two main underspecific groups may be considered: in one group the fruits are more or less angulate, verrucose, gradually elongate and narrowed to the acute apex, and the cotyledons are white; in the other group the fruits are obtuse and smooth with shallow furrows, and the cotyledons are purplish. The first group comprises the commercially known *criollo* cacaos, which produce the best quality of cacao beans. Probably this type of cacao, since ancient times widely spread in Central America, represents the form of the original species described by Linnaeus. To the second group, of South American origin, belong the commercially known *forastero* cacaos, which can be classified under the subsp. *sphaerocarpum*. Cultivars of both groups of cacao may be found in Panama as well as in many other tropical countries.

T. Cacao originated in Central and South American rain forests, but is now cultivated throughout the humid tropics of the world. Being the source of the cacao beans, it is one of the most important tropical crops of the world.

In Panama, *T. Cacao* is cultivated in more or less extension in the lowlands of all parts of the country. It may also be found spontaneous or wild in the rain forests, but the lack of good collections prevent me from identifying the varieties and from speculations on the role played by the Isthmus of Panama in the origin and evolution of cacao. The common Panamanian name is *cacao*. For further information concerning infraspecific taxa, typification, etc., see my Revision of the genus *Theobroma*, Contr. U. S. Nat. Herb. **35**: 495-517. 1964.

No citations of specimens are given because the existing collections are lacking fruits and flowers and do not have much significance.

4. *THEOBROMA ANGUSTIFOLIUM* Moç & Sesse ex DC., Prodr. **1**: 484. 1824; Icon. Fl. Mex. ex DC., *pl. 112*; Cuatrecasas, Contr. U. S. Nat. Herb. **35**: 526, *figs. 6, 25, 29-31, 37, map 8*. 1964.

Tree 8-26 m. high; trunk up to 30 cm. in diam., with smooth bark and whitish wood; growth above jorquette; primary branches ternate; lower branches horizontal, the higher ascending; branchlets green-ochraceous, tomentose with very minute, fine, translucent-white and other mediocre, fulvous or ochraceous, thicker, stellate hairs, when older grayish, more or less glabrate and rugulose; stipules lanceolate-subulate, stellate-tomentose, deciduous. *Leaves* distichous, the petioles moderately thick, 6-10 mm. long, tomentose; blade subobovate-oblong, elliptic-oblong or oblanceolate, slightly narrowed to the obtuse and slightly asymmetrical base, atten-

uate and acuminate at apex, entire or at the upper part slightly sinuate-dentate, 9-25 cm. long and 3-9 cm. broad, chartaceous, rather flexible, the acumen 1-2 cm. long; upper surface smooth, glabrous or with few hairs scattered on the depressed, filiform costa, the other nerves less conspicuous; lower surface greenish or cinereous, appressed-tomentose with minute, white, stellate hairs, the main nerves with larger, ochraceous, stellate hairs, these with long, spreading rays, the costa very prominent, the 6-8 secondary nerves on each side prominent, ascending. *Inflorescences* axillary or extra-axillary, usually abundant on the branchlets, the cymes reduced to few 1- to 3-flowered branchlets; peduncles 0.4-1 mm. long, 3-bracteolate; bracteoles, linear, very minute, deciduous; pedicels 5-10 mm. long, densely ochraceous or ferruginous, ebracteate; buds globose, densely ochraceous-tomentose. *Flowers* with a calyx 8-9 mm. long, reflexed at anthesis, the sepals ovate, rather obtuse, 4-5 mm. wide, united to 3-4 mm. into a cupular base, in the upper part united by pairs forming 3 unequal lobes, tomentose and greenish-ochraceous or ferruginous outside, scarcely puberulous and with minute, oblong, glandular hairs at the base inside; petal-hoods broadly obovate, rounded-cucullate at apex, about 5 mm. long and 4 mm. broad, yellowish, 7-nerved and with very sparse, thin hairs outside; petal-laminae stipitate, the stipe linear and about 4-5 mm. long, subobovate-spatulate, attenuate toward the base, emarginate at apex with 2 ovate or rounded lobes, about 5.5 mm. long and 3 mm. broad, thick-membranous, yellow, glabrous; staminodes laminar, oblong-obovate, rounded or subspatulate at apex, 8-11 mm. long and 4.2-5 mm. broad, 1.2 mm. broad at base, thick-membranous, sulphur yellow, glabrous, with marked venation; filaments 2 mm. long, glabrous, 3-antheriferous; ovary densely stellate-tomentose; styles united into a rigid, erect column ending in 5 slender branches. *Fruit* unequally oblong-ellipsoid or ovoid-ellipsoid, more or less pentagonal, umbilicate and 5-costate at base, slightly attenuate at apex, 10-18 cm. long and 6-9 cm. broad, brown-tomentose, very irregularly tuberculate-rugose, the epicarp ligneous and about 1.5 mm. thick; pulp thick, juicy, aromatic, edible; seeds compressed-oblong-ovoid, 26-32 x 16-19 x 14-16 mm.; germination hypogeous, the cotyledons white.

T. angustifolium is native to tropical Central America, where it is often planted in lowland areas. In Chiriquí, it is called *cacao cimarrón*. Its seeds are occasionally used as cacao, although it is considered as of inferior quality. The herbarium specimens from Panama are sterile.

CHIRIQUÍ: Progreso, *Cooper & Slater 242* (F, GH, NY, US, Y); Comarca del Barú, Puerto Armuelles, United Fruit Co. farms between Canasco and Cocos, *Stern & Chambers 140* (MO, US, Y).

5. *THEOBROMA HYLAEUM* Cuatrecasas, *Contr. U. S. Nat. Herb.* **35**: 570, *figs.* 25, 39, *map 11*. 1964.

Tree about 10 m. high; growth above jorquette; primary branches ternate; leafy branches brownish, the hornotinous ferruginous-tomentose becoming glabrate; stipules linear-subulate. *Leaves* with a petiole 6-10 mm. long, ferruginous-tomentose; blade elliptic-oblong or obovate-oblong, attenuate near the obtuse or subob-

tuse, symmetrical base, shortly narrowed or almost rounded and abruptly acuminate at apex, entire or upwards sinuate, 12-20 cm. long and 4-9 cm. broad, coriaceous, moderately rigid, the acumen 6-15 mm. long; upper surface brownish-green, glabrous, the main nerves thinly impressed, the others almost inconspicuous; lower surface ochraceous-cinereous, tomentose with dense, intricate, minute, whitish, stellate hairs and thicker, ferruginous, stellate hairs especially on the nerves, the costa very prominent, the 7-8 secondary nerves on each side prominent, ascending. *Inflorescences* axillary, very small, reduced to 1-3 flowers, the axes and branchlets very short; peduncles slender, up to 12 mm. long, ferruginous-tomentose, 3-bracteolate at apex; bracteoles narrowly linear, subacute, 3-6 mm. long and 1-2 mm. broad, tomentose; pedicels 5-6 mm. long, tomentose. *Flowers* with ovate-oblong sepals, these united about 2 mm. from the base, acute and spreading or reflexed at apex, 8-9 mm. long and 4-5 mm. broad, thick, ochraceous-tomentose outside, orange and glabrous except for the minutely tomentose margin and for a ring of glandulous hairs at base inside; petal-hoods obovate, rounded-cucullate at apex, 3 mm. long and 2 mm. broad, orange, 7-nerved, glabrous and rugose outside, minutely hispidulous inside; petal-laminae stipitate, the stipe 2.5 mm. long and sparsely puberulous, rhomboid-obovate, 4-5 mm. long and 4 mm. broad, thick, brownish-red, sparsely covered with minute hairs, the margin with larger, flexuose hairs; staminodes petaloid, oblong-obovate, rounded and retuse at apex, 5-5.5 mm. long and 2.2 mm. broad, rather thick, brownish-red, minutely pilose; filaments 1 mm. long, 3-antheriferous; ovary densely tomentose; styles coherent, 1 mm. long, glabrous. *Fruit* ellipsoid, rounded at both ends, about 7 x 4 cm., smooth, greenish-brown, densely appressed-tomentose, the epicarp woody-coriaceous, about 1 mm. thick when dry.

T. hylaeum is closely related to *T. subincanum* Mart., the widespread Amazonian and Orinocian species; it differs, however, in the tomentose ovary and by the smaller, shorter fruit and by the lesser venation and the more compact hairs of the leaves.

T. hylaeum is known from Chocó region of northern Antioquia in Colombia. This region is covered with rain forests extending northwards along the Atlantic coast to Panama. The only Panamanian specimen seen by me is sterile, but I have little doubt about this identification.

COLÓN: along Río Fató, in forests or thickets, 0-100 m. alt., Pittier 4194 (US).

6. HERRANIA Goudot

HERRANIA Goudot, Ann. Sci. Nat., Bot., ser. 3, 2: 230. 1844.

Shrubs or small trees, the pubescence of stellate hairs. *Leaves* alternate, compound-digitate, petiolate, stipulate, the stipules caducous or sometimes persistent, the leaflets inarticulate, entire or not, penninerved. *Inflorescences* cauliflorous, fasciculate. *Flowers* hermaphrodite, actinomorphic, pedicellate, bracteolate; calyx patelliform or cymbiform, divided more or less deeply into 3, rarely 4 lobes at anthesis; petals 5 (sometimes 4?), valvate, cucullate, the apex involute and

provided with an extraordinarily elongate liguliform appendage; stamens usually 15, the staminal tube short, divided into 5 alternipetalous, petaloid staminodes and 5 oppositipetalous groups of generally 3 short filaments; anthers 2-thecate, the thecae divergent, extrorse, longitudinally dehiscent; ovary sessile, globose to ovoid, 5-celled, the cells many-ovulate, the ovules biseriate; style filiform; stigma obscurely 5-fid. *Fruit* baccate, coriaceous to ligneous, longitudinally 10-costate, indehiscent, pulpy inside; seeds obtusely angulate, the albumen scanty; embryo erect; cotyledons thick, corrugate.

A neotropical, chiefly South American genus of about 20 species; only one species occurs in Panama and in Central America.

1. *HERRANIA PURPUREA* (Pittier) R. E. Schultes, *Caldasia* **2**: 33. 1944.—Fig. 5.

Theobroma purpureum Pittier, *Repert. Sp. Nov.* **13**: 319. 1914; Standley, *Contr. U. S. Nat. Herb.* **27**: pl. 51. 1928

Shrub or small tree, up to 10 m. high, the bark grayish and glabrous; young branches ferruginous-tomentellous. *Leaves* 5-foliolate, the petiole strong, terete, striate, somewhat swollen at the base, 18-42 cm. long, tomentellous to densely puberulous, the stipules linear, acute, up to 5 cm. long and 0.3 cm. wide, puberulous and caducous; leaflets subsessile, obovate to obovate-oblong, cuneate at the base, obtusely long-acuminate and mucronulate at the apex, 12-42 cm. long and 3-13 cm. wide, thin-chartaceous, the margin entire to obscurely sinuate, glabrous above except along the nerves, sparsely puberulous beneath, the nerves prominent on both sides but especially beneath. *Inflorescences* cauliflorous on the lower part of the trunk, 5- to 8-flowered. *Flowers* shortly pedicellate, the pedicel terete, articulate, ca. 4 mm. long, ferruginous-tomentose, the bracts small, naviculiform, ferruginous-tomentose outside and glabrous inside; calyx patelliform, deeply divided into 3, rarely 4 lobes, the lobes unequal, broadly ovate, rather obtuse at the apex, densely ferruginous-puberulous to tomentose outside, sparsely villous inside; petals 5, obovate, up to 8 mm. long (without appendage) and 4-5 mm. wide, fleshy, purplish, loosely papillate, the pendulous appendage ca. 15 mm. long and 2 mm. wide; stamens 15, the staminal tube ca. 2.5-3 mm. long, the filaments in 5 groups of 3, in each group 1 free and 2 connate filaments ca. 2 mm. long; anthers ca. 1 mm. long; staminodes obovate, rounded to acute at the apex, 9-11 mm. long and 8 mm. wide, papillate on both sides; ovary ovoid, slightly 10-sulcate, 2-2.5 mm. long and 2 mm. broad, villous; style short, ca. 1.5 mm. long, glabrous; stigma villous. *Fruit* ellipsoid, oblong-ellipsoid or slightly oblong-obovoid, somewhat apiculate at the apex, 6-10 cm. long and 2.5-4 cm. broad, yellow, very sparsely hispid to glabrescent and with stinging hairs outside; seeds obtusely rhomboid, ca. 1-1.3 cm. long, 0.7-1 cm. wide and 0.5-0.6 cm. long.

Costa Rica and Panama, usually in wet forests; called *cacao cimarrón* and *chocolatillo* in Panama.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 12a, Dunlap 448*; Farm 6a, between Changuinola and Sixaola Rivers, *Rowlee & Stork 1029*; Chiriquí Lagoon, *Hart 96, von Wedel 1112*; Water Valley, *von Wedel 976, 1781*. CANAL ZONE: near Fort Randolph, *Standley 28647*; Cristobal, *Cook & Martin 4*; Monte Lirio, *Hayes 398*; along the Río Indio

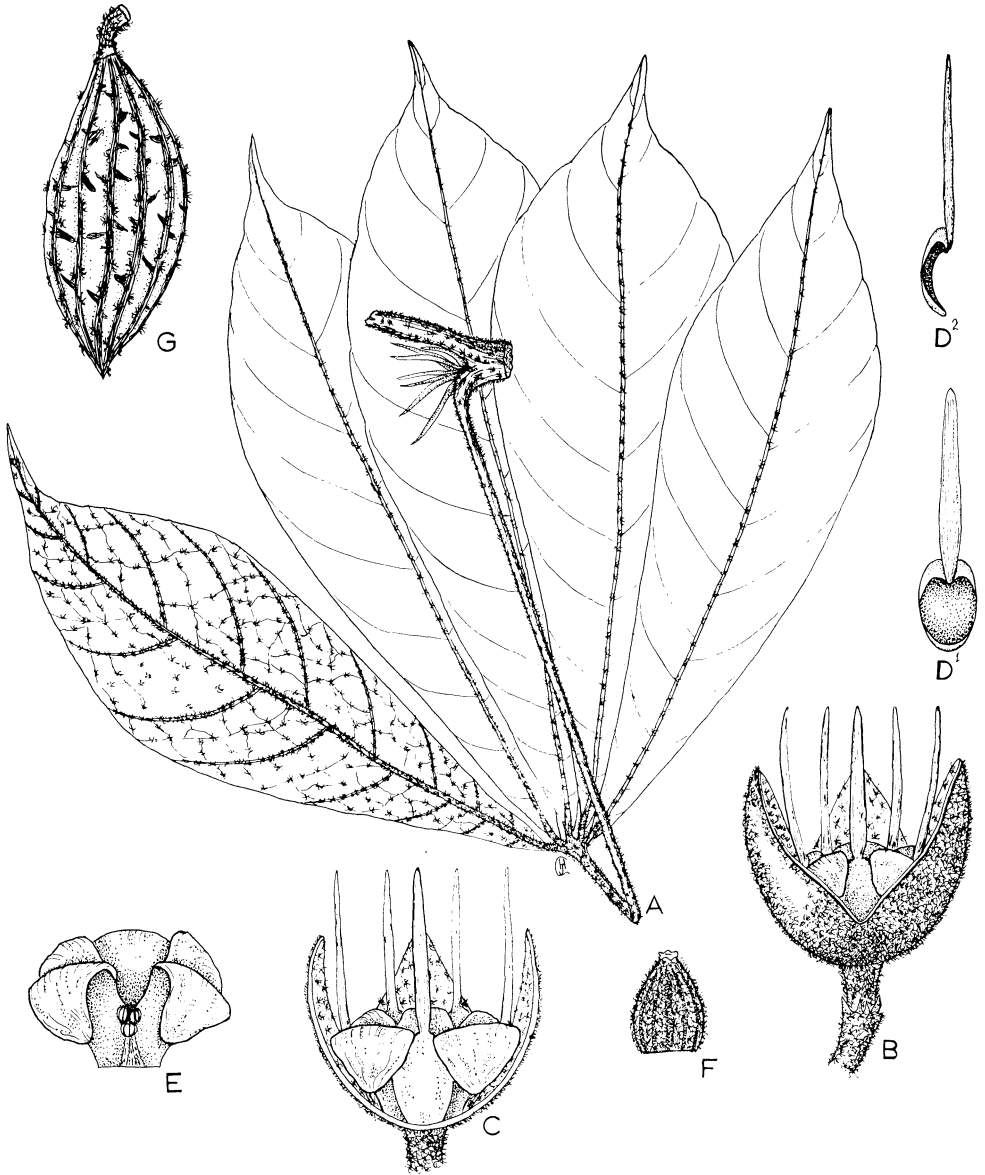


Figure 5. *HERRANIA PURPUREA* (Pittier) R. E. Schultes: A, leaf ($\times \frac{1}{4}$); B, flower ($\times \frac{1}{2}$); C, id., one half of calyx removed ($\times \frac{1}{2}$); D¹, petal from inside ($\times \frac{1}{2}$); D², id., lateral view ($\times \frac{1}{2}$); E, androecium ($\times \frac{1}{2}$); F, ovary ($\times 5$); G, fruit ($\times \frac{1}{2}$).

de Gatun, near sea level, *Maxon* 4835; Barro Colorado Island, *Bangham* 549, *Kenoyer* 443, *Maxon*, *Harvey & Valentine* 6804, *Shattuck* 198, *Standley* 31319, 40911, *Wetmore & Abbe* 73; hills north of Frijoles, *Standley* 27434; near Madden Dam, near sea level, *Alston* 8861; Gamboa, *Standley* 28416; Obispo, *Standley* 31722; Valley of Masambi, on the road to Las Cascadas Plantation, alt. 20-100 m., *Pittier* 2675; around El Paraiso, alt. 30-100 m., *Pittier* 2574 (type). CHIRIQUÍ: Progreso, *Cooper & Slater* 283. DARIEN: Marraganti and vicinity, *R. S. Williams* 662; trail between Pinogana and Yavisa, alt. ca. 15 m., *Allen* 282; vicinity of Yaviza, along Río Chucunaque, in woods by Interamerican Hwy., between Pinogana and Yaviza, 1 km. from Tuirá, *Stern*, *Chambers*, *Dwyer*, *Ebinger* 137; vicinity of Caná, 900 m., *Goldman* 1974. PROVINCE UNKNOWN: *Hayes* 399.

7. BYTTNERIA Loeffl.

BYTTNERIA Loeffl., *Iter Hisp.* 313. 1758.

Pentaceros G. F. W. Meyer, *Primit. Fl. Essequiboensis* 136. 1818.

Undershrubs or shrubs, erect or scandent, sometimes lianas, the stems often aculeate, glabrous or with simple or stellate hairs. *Leaves* alternate, simple, petio- late, stipulate, the stipules caducous, the blade entire or not. *Inflorescences* axillary, usually umbelliform, sometimes of sessile or pedunculate, axillary or subterminal cymes. *Flowers* small, hermaphrodite, actinomorphic, pedicellate, bracteolate; calyx deeply 5-lobate, deciduous; petals 5, valvate, the limb concave, unguiculate, lobulate or not at the apex, the apex inflexed and adnate to the androecium, pro- longed dorsally into an elongate, simple or 3-fid appendage; stamens 5, the staminal tube short, the sessile or short-stipitate anthers oppositipetalous, the 5 staminodes alternipetalous; anthers 2- or 3-thecate, the thecae parallel, extrorse, longitudinally dehiscent; ovary sessile, 5-celled, each cell 2-ovulate; style simple, short; stigma 5-fid or entire. *Capsule* globose, spinose, the carpels separating at maturity into 5 cocci, each coccus dehiscent along the ventral suture and along the dorsal upper half, 1-seeded; seeds ascending, exalbuminous; embryo straight; cotyledons large, foliaceous, spirally convolute around the radicle.

A pantropical genus of about 90 species, especially well represented in tropical America (about 50 species) and in Madagascar (27 native species).

1. BYTTNERIA ACULEATA Jacq., *Select. Stirp. Am. Hist.* 76. 1763.—Fig. 6.

Chaetaea aculeata Jacq., *Enum. Syst. Pl.* 17. 1760, nom.nud.

Byttneria carthagenensis Jacq., *Select. Stirp. Am. Hist. Pict.* 40. 1780.

Byttneria lateralis Presl, *Rel. Haenk.* 2: 144. 1835.

Byttneria guatemalensis Loes., *Verh. Bot. Ver. Prov. Brandenb.* 55: 171. 1913.

Scandent shrub, sometimes liana, the hairs simple, the stems and branches more or less angular, hollow, pilose along one vertical row and aculeate, the prickles sharp and recurved. *Leaves* with a petiole 0.5-4.5 cm. long, pilose on the adaxial side, sparsely and shortly aculeate on the abaxial side, the blade very variable, rounded-ovate to narrowly lanceolate, obtuse to cordate at the base, acute to long-acuminate at the apex, 4-18 cm. long and 1.2-13 cm. wide, thin and membranous, the margins entire or remotely serrate, sparsely pilose to glabrous on the upper surface, pilose especially near the base and with the midrib sparsely and shortly aculeate on the lower surface. *Inflorescences* axillary, umbelliform,

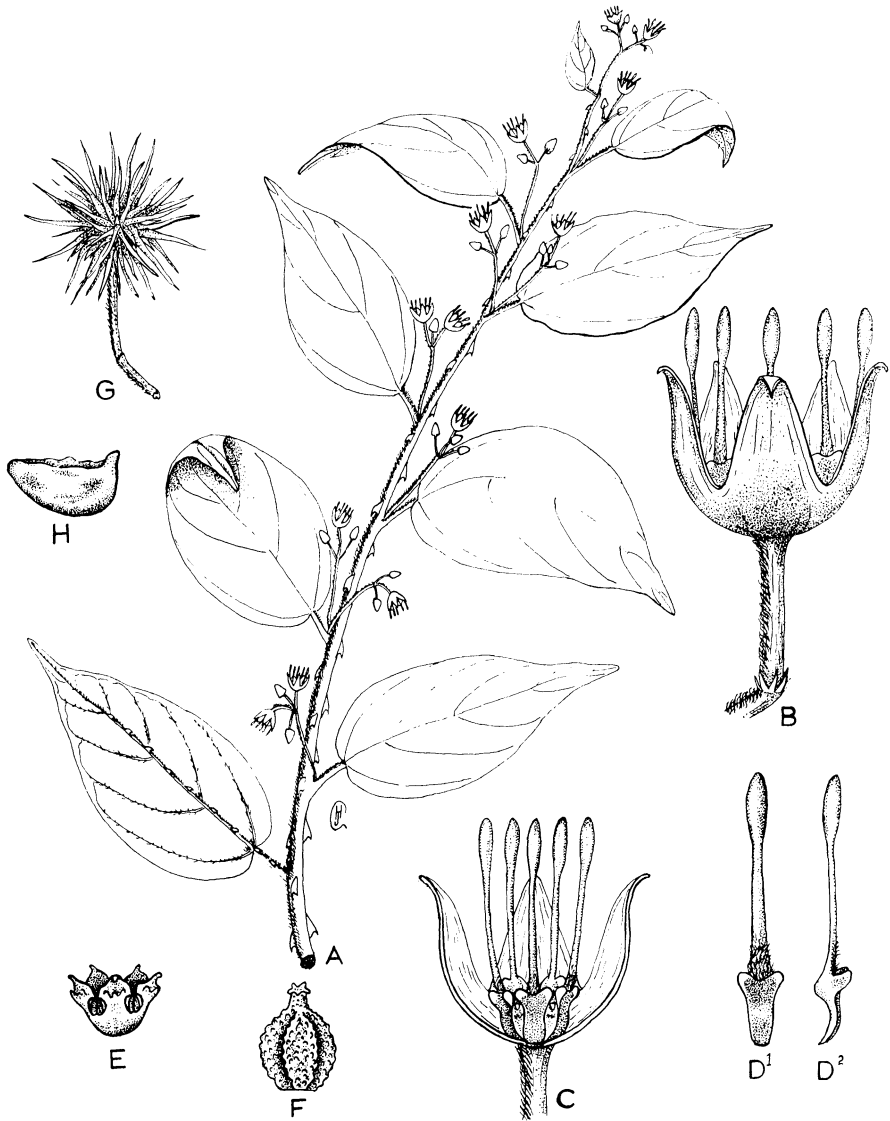


Figure 6. *BYTTNERIA ACULEATA* Jacq.: A, flowering branch ($\times \frac{1}{2}$); B, flower ($\times 5$); C, id., one half of calyx removed ($\times 5$); D¹, petal from inside ($\times 6$); D², id., lateral view ($\times 6$); E, androecium ($\times 10$); F, gynoecium ($\times 20$); G, capsule ($\times 1$); H, seed ($\times 5$).

few-flowered, pedunculate, the peduncles pilose, the hairs generally uncinatate. *Flowers* with a pedicel 2-4 mm. long, pilose, the bracts very small, triangular; calyx ca. 4.5 mm. long, the lobes elliptic, acute, ca. 3.5 mm. long and 2-2.5 mm. wide, membranous, glabrous; petals ca. 5.5-6 mm. long, the limb ca. 1.5 mm. long and 1 mm. wide, bilobate at the apex, the appendage clavate and ca. 4-4.5 mm. long, the upper part of the limb and the lower part of the appendage sparsely ciliolate; anthers very shortly stipitate, ca. 0.25 mm. long, 2-thecate; staminodes 3-lobulate, the central lobe caudate and ca. 0.25 mm. long, the 2 lateral ones rounded and very small; ovary more or less globose, 5-lobulate, ca. 0.5 mm. in diam., muricate; style ca. 0.25 mm. long; stigma obscurely 5-subdenticulate. *Capsule* ca. 2.5 cm. in diam., the body more or less globose, 5-lobed, ca. 0.5 cm. long and 0.7 cm. in diam., densely spinose, the spines of various length, up to 1.2 cm. long; seeds ca. 3 mm. long and 1.5 mm. wide.

A variable species of tropical Central America and northern South America; usually in wet habitats, often in second growth. Colloquial names reported in Panama are *espino hueco*, *zarza*, *rabo de iguana* and *rangay*.

BOCAS DEL TORO: region of Almirante, Research Grounds, *Cooper* 94; Changuinola Valley, *Dunlap* 280, 376 vicinity of Chiriquí Lagoon, *von Wedel* 1066, 1127, 1240, 1241, 1276. CANAL ZONE: along road to Battery VII, area west of Limon Bay, Gatun Locks and Gatun Lake, *Johnston* 1776; hills west of the Canal, near Gatun, *Standley* 27269; shore of Gatun Lake, east of laboratory, *Wetmore & Abbe* 8a; Barro Colorado Island, *Shattuck* 374, 734, *Standley* 31466, *Wetmore & Abbe* 8, *Wilson* 36; between Gorgona and Mamei, alt. 10-30 m., *Pittier* 2697; Las Cascadas Plantation, near Summit, *Standley* 25720, 29598; around Culebra, alt. 50-100 m., *Pittier* 2214; Paraiso Station, *Hayes* 22; Pedro Miguel, *Piper* 5509; vicinity of Miraflores Lake, *P. White* 275; along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29181; Las Cruces Trail, *Harvey* 5042; Camino de Corozal, *Bro. Heriberto* 254; Corozal, roadside, *Killip* 3147; Balboa, *Standley* 25612; between Madden Dam and Saddle II near Alahuella, 90-100 m., *Dodge, Steyermark & Allen* 16509; near Fort Kobbe, *Allen* 2014; Colón to Empire, *Crawford* 508. COCLÉ: Penonomé and vicinity, *R. S. Williams* 369. DARIEN: Marraganti and vicinity, *R. S. Williams* 657; vicinity of Yape, ca. 30 m., *Allen* 851; Chepigana, Tucuti, 50 ft., *M. E. & R. A. Terry* 1390. PANAMA: along the Corozal Road, near Panama, *Standley* 26769; Laguna de Portala, near Chepo, alt. 50 m., *Pittier* 4591; Taboga Island, *Standley* 27096, 27849; Taboguilla Island, *Miller* 1995. PROVINCE UNKNOWN: *Hayes* 332.

8. GUAZUMA Adans.

GUAZUMA Adans., *Fam. Pl.* **2**: 382. 1763.

Bubroma Schreb. in L., *Gen. Pl.* ed. 8, 513. 1791.

Diuroglossum Turcz., *Bull. Soc. Imp. Nat. Moscou* **25**(2): 157. 1852.

Shrubs or trees, deciduous, the hairs chiefly stellate. *Leaves* alternate, simple, petiolate, stipulate, the stipules deciduous, the blade often somewhat asymmetrical, dentate to serrate, 3- to 7-nerved at the base. *Inflorescences* axillary, cymose, pedunculate. *Flowers* hermaphrodite, pedicellate, bracteolate; calyx divided into 2 to 5 lobes at the anthesis, the lobes reflexed and pubescent outside, deciduous; petals 5, valvate, cucullate, unguiculate, the apex involute and provided with a long, deeply bifid, liguliform appendage; stamens 15, the staminal tube divided into 5 alternipetalous, triangular staminodes and 5 oppositipetalous groups of 3

filaments, the filaments short, geniculate at the apex, 1 free and 2 connate; anthers 2-thecate, the thecae divergent, extrorse, longitudinally dehiscent; ovary sessile or stipitate, ellipsoid to globose, with 5 minute geniculate lobes at the apex, 5-celled, the cells many-ovulate, the ovules biseriate; style filiform; stigma 1- to 5-parted, the lobes usually connivent. *Capsules* ligneous, muricate or bearing filiform appendages, indehiscent or imperfectly 5-valvate; seeds small, albuminous; embryo erect; cotyledons foliaceous, folded.

A neotropical genus of three species of which only one occurs in Panama.

1. *GUAZUMA ULMIFOLIA* Lam., *Encycl. Méth. Bot.* **3**: 52. 1789; Standley, *Contr. U. S. Nat. Herb.* **27**: pl. 52. 1928; Johnston, *Sargentia* **8**: 202. 1949.—Fig. 7.

Theobroma Guazuma L., *Sp. Pl.* 782. 1753.

Guazuma polybotra Cav., *l.c. Descr. Pl.* **3**: 51, t.299. 1796.

Bubroma Guazuma (L.) Willd. in L., *Sp. Pl. ed. 4*[i.e. 5], **3**: 1423. 1802.

Bubroma polybotryum (Cav.) Willd., *Enum. Pl. Hort. Berol.* 806. 1809.

Bubroma Invira Willd., *loc. cit.* 806. 1809.

Guazuma tomentosa H. B. K., *Nov. Gen. Sp. Pl.* **5**: 320. 1823.

Bubroma tomentosum (H. B. K.) Spreng. in L., *Syst. Veg. ed. 16*, **3**: 332. 1826.

Bubroma grandiflora Willd. ex Spreng. in L., *Syst. Veg. ed. 16*, **3**: 332. 1826.

Guazuma Bubroma Tussac, *Fl. Antilles* **4**: 69. 1827.

Guazuma tomentosa var. *monpoxensis* G. Don, *Gen. Syst. Gard. Bot.* **1**: 523. 1831.

Guazuma tomentosa var. *cumanensis* G. Don, *loc. cit.* 523. 1831.

Guazuma Blumei G. Don, *loc. cit.* 523. 1831.

Guazuma grandiflora (Willd. ex Spreng.) G. Don, *loc. cit.* 523. 1831.

Guazuma Invira (Willd.) G. Don, *loc. cit.* 523. 1831.

Guazuma utilis Poepp. & Endl., *Nov. Gen. Sp. Pl.* **3**: 72, t.283. 1844.

Guazuma parvifolia A. Rich., *Bot., Pl. Vasc. in Ramon de la Sagra, Hist. Phys. Pol. Nat. Cuba* 190. 1845.

Diuroglossum rufescens Turcz., *Bull. Soc. Imp. Nat. Moscou* **25**(2): 156. 1852.

Guazuma ulmifolia var. *glabra* K. Schum. in Mart., *Fl. Bras.* **12**(3): 81. 1886.

Guazuma ulmifolia var. *tomentella* K. Schum. in Mart., *loc. cit.* 81. 1886.

Guazuma ulmifolia var. *tomentosa* (H. B. K.) K. Schum. in Mart., *loc. cit.* 81. 1886.

Guazuma ulmifolia var. *velutina* K. Schum. in Mart., *loc. cit.* 81. 1886.

Theobroma tomentosa (H. B. K.) Gomez de la Meza, *Anal. Soc. Esp. Hist. Nat.* **19**: 217. 1890.

Guazuma Guazuma (L.) Cockerell, *Bull. Torrey Bot. Club* **19**: 95. 1892.

Guazuma Guazuma var. *ulmifolia* (Lam.) O. Ktze, *Rev. Gen. Pl.* **3**(3): 24. 1898.

Guazuma coriacea Rusby, *Bull. N. Y. Bot. Gard.* **4**: 332. 1907.

Tree 2-25 m. in height, the trunk 5-60 cm. in diam., the young branches tomentellous to puberulous. *Leaves* with a terete petiole 0.5-2 cm. long, tomentellous to puberulous, the stipules small and triangular, the blade ovate, ovate-oblong, oblong or seldom narrowly oblong, slightly to very much inaequilateral, rounded to cordate at the base, long-acuminate at the apex, ca. 6-16 cm. long and 2-6 cm. wide, membranous to chartaceous, sometimes subcoriaceous, the margins irregularly dentate to serrate, the upper surface shortly puberulous, seldom glabrous, generally scabridulous and sometimes somewhat lustrous, the lower surface puberulous to tomentellous, the pubescence either of only appressed hairs or of appressed and spreading hairs, 3- to 7-nerved at the base, the nervation reticulate and prominent beneath. *Inflorescences* thyriform, the ultimate axes scorpioid, the axes and bracts densely puberulous to tomentellous. *Flowers* with a pedicel ca. 3-6 mm. long;

calyx ca. 3 mm. in diam., divided irregularly into 3 lobes ca. 3 mm. long, densely puberulous to tomentellous outside and glabrous or nearly so inside; petals obovate, slightly bifid at the apex, ca. 4 mm. long (without appendage) and 2 mm. wide, the claw ca. 0.5-1 mm. long, the appendage ca. 5 mm. long and bifid for ca. 3 mm., yellowish, puberulous outside, glabrous inside; staminal tube 1.2-1.5 mm. long, glabrous outside, loosely puberulous and with simple hairs on the upper part inside, the filaments ca. 0.8-1 mm. long, the staminodes ca. 0.8-1 mm. long and loosely puberulous; anthers very small, reddish; ovary ovoid to globose, ca. 0.8-1 mm. long and 0.8 mm. broad, shortly puberulous especially on the upper half; style and stigma ca. 1-1.5 mm. long. *Capsule* oblong, oblong-ellipsoid to globose, rounded on both ends, 1.5-4 cm. long and 1.2-2.5 cm. broad, black at maturity, tuberculate, the tubercles short, stout and more or less pyramidal, puberulous when young, indehiscent (the tubercles separating irregularly at maturity to a greater or less degree), somewhat pulpy inside; seeds numerous, obovoid, ca. 2.5-3.5 mm. long and 1.8-2 mm. wide, the testa maculate.

A polymorphous species widely distributed throughout the American tropics; frequent in pastures and second-growth forest, usually on dry soil, sometimes on swampy soil, chiefly near sea level.

In his recent revision of the genus, G. F. Freytag (*Ceiba* 1: 193-225, *pl. 1-4*, *figs.* 1951) considers that *G. ulmifolia* is composed of two separate species: *G. ulmifolia* and *G. tomentosa* H. B. K., the differential characters being the dehiscence or indehiscence of the capsules, the form of the base of the petals, and the form and pubescence of the leaves. Study of abundant material from Panama and Central America, however, does not permit me to agree with Freytag. I consider the variations of the petals and leaves as extreme variations within a single species, all intermediate stages being present, and I believe that the capsule is always indehiscent or sometimes very incompletely loculicidally dehiscent.

The mucilaginous sap of the *guacimo* is used sometimes to clarify sirup in the manufacture of sugar and the bark contains a tough fiber employed for cordage; the capsule contains a small quantity of sweet edible pulp.

BOCA DEL TORO: region of Almirante, *Cooper* 354, *Cooper & Slater* 20; Changuinola Valley, *Dunlap* 145a; vicinity of Chiriquí Lagoon, *Cocoa Cay*, *von Wedel* 2875; vicinity of Chiriquí Lagoon, *Johns Creek*, *von Wedel* 2764; vicinity of Chiriquí Lagoon, *von Wedel* 1183, 1269A, 1324. CANAL ZONE: Isthmus of Panama, *Hayes* 171; area west of Limon Bay, Gatun Locks and Gatun Lake, road to Battery VII, *Johnston* 1659; near Frijoles, Río Agua Salud, *Piper* 5870; Barro Colorado Island, *Aviles* 23; second road past Summit, *Harvey* 5181; around El Paraiso, alt. 30-100 m., *Pittier* 2579; Chivi-Chivi Trail, 2 miles above Red Tank, *Maxon & Harvey* 6572; vicinity of Miraflores Lake, *G. White* 183; vicinity of Miraflores Lake, *Cocoli Island*, *P. White* 305; near *Cocoli lighthouse*, *P. White* 92; Corrosion Laboratory, vicinity of Miraflores Locks, *Stern*, *Chambers*, *Dwyer*, *Ebinger* 79; along the old Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29012; Ancon Hill, 600 ft. ele., *R. S. Williams* 2; Sabana of Panama, *Pittier* 2547; region of Balboa, *Johansen* 5; Madden Dam area near road, Transisthmian Highway, *Stern*, *Chambers*, *Dwyer*, *Ebinger* 43; *Kobbe*, *Harvey* 5010; locality unknown, *Christopherson* 176. CHIRIQUÍ: Progreso, *Cooper & Slater* 315; vicinity of David, 30-80 m., *Pittier* 3368. COCLÉ: Penonomé, *R. S. Williams* 347. COLÓN: vicinity of Gatuncillo, *Piper* 5634. DARIEN: Marraganti, *R. S. Williams* 636; near El Real, on edge of creek, *Stern*, *Chambers*, *Dwyer*, *Ebinger* 457; vicinity of Pinogana, ca. 20 m.,

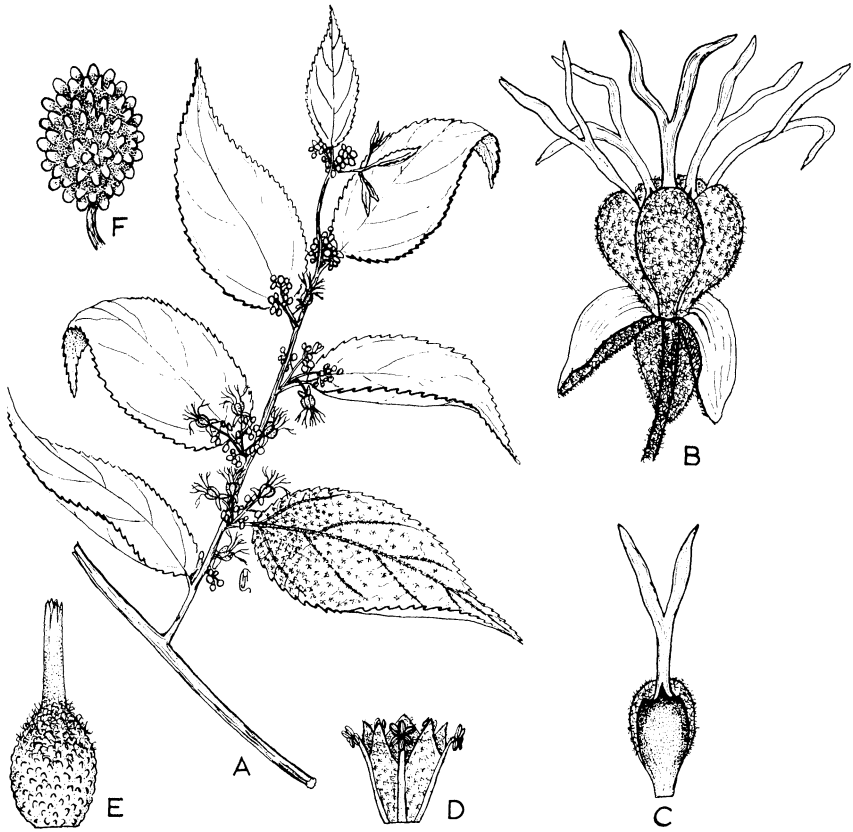


Figure 7. *GUAZUMA ULMIFOLIA* Lam.: A, flowering branch ($\times \frac{1}{2}$); B, flower ($\times 4$); C, petal from inside ($\times 4$); D, androecium ($\times 5$); E, gynoecium ($\times 15$); F, capsule ($\times 1$).

Allen 928, 4279. *HERRERA*: vicinity of Ocu, 100 m., *Allen* 4058. *PANAMA*: drowned forest near Vigia and San Juan on Río Pequení, 66 m., *Dodge*, *Steyermark & Allen* 16560, 16569; along the Corozal Road, near Panama, *Standley* 26878; Bella Vista, *Standley* 25322; along sea beach from Panama Vieja to Bella Vista, *Allen* 828; vicinity of Bella Vista, *Piper* 5328; Punta Paitilla, *Piper* 5400; between Sabanas and Río Yguana, *Macbride* 2668; Sabanas, *Bro. Paul* 12; near Tapía River, Juan Díaz region, *Maxon & Harvey* 6615, 6619; Taboga Island, *Hayes* 612, *Miller* 1959, *Pittier* 3524, *Standley* 27084, 27977, *Woodson*, *Allen & Seibert* 1535; San José Island, *Erlanson* 76, 277, *Johnston* 353. *PROVINCE UNKNOWN*: *Anderson s. n.*, *Hayes* 732, 796, *Moore* 33, *Seemann* 94.

INDEX OF LATIN NAMES

Numbers in **boldface** type refer to descriptions; *italic* refers to the listing of a name as a synonym; ordinary type indicates names incidentally mentioned.

- Aleurodendron, 77
 Alicteres, 86
 Altheria, 77
 Anamorpha, 77
 walthertoides, 79
 Anisora, 86
 Astrophus, 74
 Balanghas, 70
 Braxipis, 70
 Bubroma, 102
 grandiflorum, 103
 Guazuma, 103
 Invira, 103
 polybotryum, 103
 tomentosum, 103
 Byttneria, **100**
 aculeata, **100**
 carthagenensis, 100
 guatemalensis, 100
 lateralis, 100
 Cacao, 89
 bicolor, 91
 Camaion, 86
 Carpophyllum, 70
 Cavalam, 70
 Chaetaea aculeata, 100
 Chichaea, 70
 Clompanus, 70
 Cola, 70
 Culhamia, 70
 Diuroglossum, 102
 rufescens, 103
 Guazuma, **102**
 Blumei, 103
 Bubroma, 103
 coriacea, 103
 grandiflora, 103
 Guazuma, 103
 —var. ulmifolia, 103
 Invira, 103
 parvifolia, 103
 polybotra, 103
 tomentosa, 103, 104
 —var. cumanensis, 103
 —var. monpoxensis, 103
 ulmifolia, **103**, 104
 —var. glabra, 103
 —var. tomentella, 103
 —var. tomentosa, 103
 —var. velutina, 103
 utilis, 103
 Helicteres, **86**
 apetala, 71
 baruensis, **89**
 carpinifolia, 86
 Gardneriana, 86
 guazumaefolia, **86**
 —var. Gardneriana, 86
 —var. parvifolia, 86
 mexicana, 86
 retinophylla, 86
 Herrania, **97**
 purpurea, **98**
 Icosinia, 70
 Isora, 86
 Ivira, 70
 Karaka, 70
 Kavalama, 70
 Lochemia, 77
 Lophantus, 74
 Malvales, 85
 Mateatia, 70
 Melochia, **77**
 bracteosa, 81
 clinopodium, 84
 corchorifolia, 78, **83**
 crinata, 81
 glandulifera, 84
 hirsuta, 84
 inflata, 79
 lupulina, **79**
 manducata, **83**
 melissifolia, **81**
 —var. brachyphylla, 81
 —var. bracteosa, 81
 —var. microphylla, 81
 —var. mollis, 81
 —var. Welwitschii, 81
 mollis, 81
 nodiflora, **80**
 serrata, 84
 supina, 83
 truncata, 83
 vestita, 84
 villosa, **84**, 85
 Welwitschii, 81
 Methorium, 86
 Mougeotia, 77
 hirsuta, 84
 inflata, 79
 nodiflora, 80
 Nisoralis, 86
 Opsopea, 70
 Orthothecium, 86
 Oudermansia, 86
 Ozoxeta, 86
 Pentaceros, 100
 Pysocodon, 77
 Physodium, 77
 Polychlaena, 77
 Riedlea, 77
 corchorifolia, 83

- heterotricha*, 84
hirsuta, 84
inflata, 79
lupulina, 79
nodiflora, 80
serrata, 84
supina, 83
truncata, 83
Sida villosa, 84
Southwellia, 70
Sterculia, **70**
 apetala, **71**, 72
 carthagenensis, 71
 costaricana, **72**
 Recordiana, 72
Theobroma, **89**, 90, 93, 95
 angustifolium, **95**, 96
 asclepiadiflorum, 93
 Bernoullii, **92**, 93
 —subsp. *asclepiadiflorum*, **93**,
 —subsp. *Bernoullii*, **93**,
 —subsp. *capilliferum*, 93
 bicolor, **91**, 92
 Cacao, 70, 90, **94**, 95
 —subsp. *Cacao*, **94**
 —subsp. *sphaerocarpum*, **94**, 95
Guazuma, 103
 hylaeum, **96**, 97
 leiocarpum, 94
 ovatifolia, 91
 pentagonum, 94
 purpureum, 98
 sphaerocarpum, 94
 subincanum, 97
 tomentosa, 103

Theodoria, 70
Tribroma, 89
 bicolor, 91
Triphaca, 70
Triplobus, 70
Visenia, 77
 corchorifolia, 83
 hirsuta, 84
 inflata, 79
 lupulina, 79
 nodiflora, 80
 serrata, 84
 supina, 83
Waltheria, **74**
 africana, 74
 americana, 74
 —var. *densiflora*, 75
 —var. *elliptica*, 74
 —var. *indica*, 75
 —var. *subspicata*, 75
 angustifolia, 74
 arborescens, 74
 brevipes, 75
 corchorifolia, 74
 elliptica, 74
 eriolada, 74
 glomerata, **75**
 guineensis, 74
 indica, **74**
 laevis, 74
 microphylla, 74
 ovata, 74
 rhombifolia, 75
 Wildii, 75