NEW OR NOTEWORTHY PLANTS FROM COLOMBIA AND CENTRAL AMERICA—4.

By Henry Pittier.

INTRODUCTION.

The present paper, relating mainly to economically important trees of the families Euphorbiaceae and Sapotaceae, is in continuation of several others which have appeared in the Contributions from the United States National Herbarium [1] and is similar in scope.

MORACEAE.

A NEW SPECIES OF BROSIMUM FROM COSTA RICA.

Brosimum terrabanum Pittier, sp. nov. Figure 76.

A large, lactiferous forest tree. Bark smooth, grayish. Crown elongate.

Leaves rather large, chartaceous, glabrous, petiolate. Petioles rather thick, shallow-canaliculate, 8 to 12 mm. long. Leaf blades elliptic, slightly rounded at the base, long and acutely acuminate, 10 to 18 cm. long, 4 to 7 cm. broad. Costa prominent beneath; primary nerves parallel, forming with the costa a very open angle (about 80°). Margin entire.

Stipules narrowly lanceolate, acute, about 1 cm. long, smooth, caducous.

Receptacles axillary, globose, about 9 mm. in diameter, pedunculate. Peduncles 10 to 14 mm. long, slender, smooth. Bracts of the receptacle surface orbiculate, peltate, pedicellate, hairy-ciliate, not over 0.6 mm. in diameter; pedicels hairy, 0.8 to 1 mm. long. Bractlets at the base of the stamens broad and very short (about 0.7 mm.), hairy and ciliate.

Stamen 1 to 2.5 mm. long; filament sparsely pubescent; anther 1-celled, peltate. Style about 5 mm. long, bifurcate at the middle, dark purple, densely hairy-pubescent.

Fruit not known.

Fig. 76.—Flowers of *Brosimum terrabanum*. *a*, Male flower; *b*, female flower. *a*, Scale 6; *b*, scale 3.

Type in the U. S. National Herbarium, no. 577522, collected in forests of Peñas Blancas del General, Diquís Valley, Costa Rica, at about 600 meters above sea level, February 9, 1898, flowers, by H. Pittier (Inst. Fís. Geogr. Costa Rica, no. 12029).

The type specimen includes a few detached receptacles, gathered on the ground, and two or three branchlets which may have been culled from the base of the trunk. A few notes taken at the same time give some supplemental information. These materials are certainly not a very satisfactory foundation for a new species, but the leaves differ greatly from those of *Brosimum costaricanum* Liebm. in having longer petioles, a large blade, and primary nerves almost perpendicular to the costa, and in being thin and

[1] **12:** 171–181. *pls. 18, 19. figs. 11–19.* January 27, 1909; **13:** 93–132. *pls. 17–20. figs. 2–41.* June 11, 1910; **13:** 431–466. *pls. 78–96. figs. 57–91.* January 5, 1912.

not coriaceous. The receptacles also are larger, with much longer peduncles, and they all seem to be distinctly monoclinous, with well developed and fertile ovaries. On the other hand, they bear a somewhat close resemblance to John Donnell Smith's no. 2603, collected in Guatemala and distributed as *B. alicastrum* Swartz.

EUPHORBIACEAE.

FURTHER NOTES ON SPECIES OF SAPIUM.

Sapium verum Hemsl. in Hook. Icon. Pl. 27: *pl. 2647*. 1900; Engl. Pflanzenreich IV. 147[4]: 211. 1912, char. emend. PLATES 42, 43, 44, B.

A tree 20 to 30 meters high, with ascending, slightly divaricate limbs, and a rounded crown. Floriferous branchlets thick.

Leaves bunched at the ends of the branchlets and rather large; petiole 2.5 to 4 cm. long (1 to 5 cm., Hemsley), thick, hardly sulcate, provided above with two short, rounded glands. Leaf blades oblong or ovate-elliptic, 8 to 16 cm. long (12 to 20 cm., Hemsley), 3 to 5 cm. broad, more or less rounded or cuneate at base, obtuse at tip and provided with a slightly inflexed, cucullate-glandulose acumen; margin glandulose-denticulate; costa impressed above, prominent beneath; primary veins over 20, slender, sinuate, and anastomosed. Stipules suboval, 3 to 4 mm. long and broad, with a broadly scarious, more or less fimbriate margin.

Floral spikes 14 to 15 cm. long, inserted in the axils of the upper leaves. Male flowers short-pedicellate, up to 15 under each bractlet, mixed with small glandulifer-ous scales; glands ovate, about 4 mm. long; bracts broadly triangular and subflabelli-form, about 2.5 mm. long and 5 mm. broad, thick at the base, with a scarious, irregularly sinuate-denticulate margin. Perianth campanulate, attenuate at the base, about 4 mm. long, with rounded-sinuate lobules. Stamens half exserted, the filaments thick, bulging at the middle, the anthers yellow. Female flowers not known.

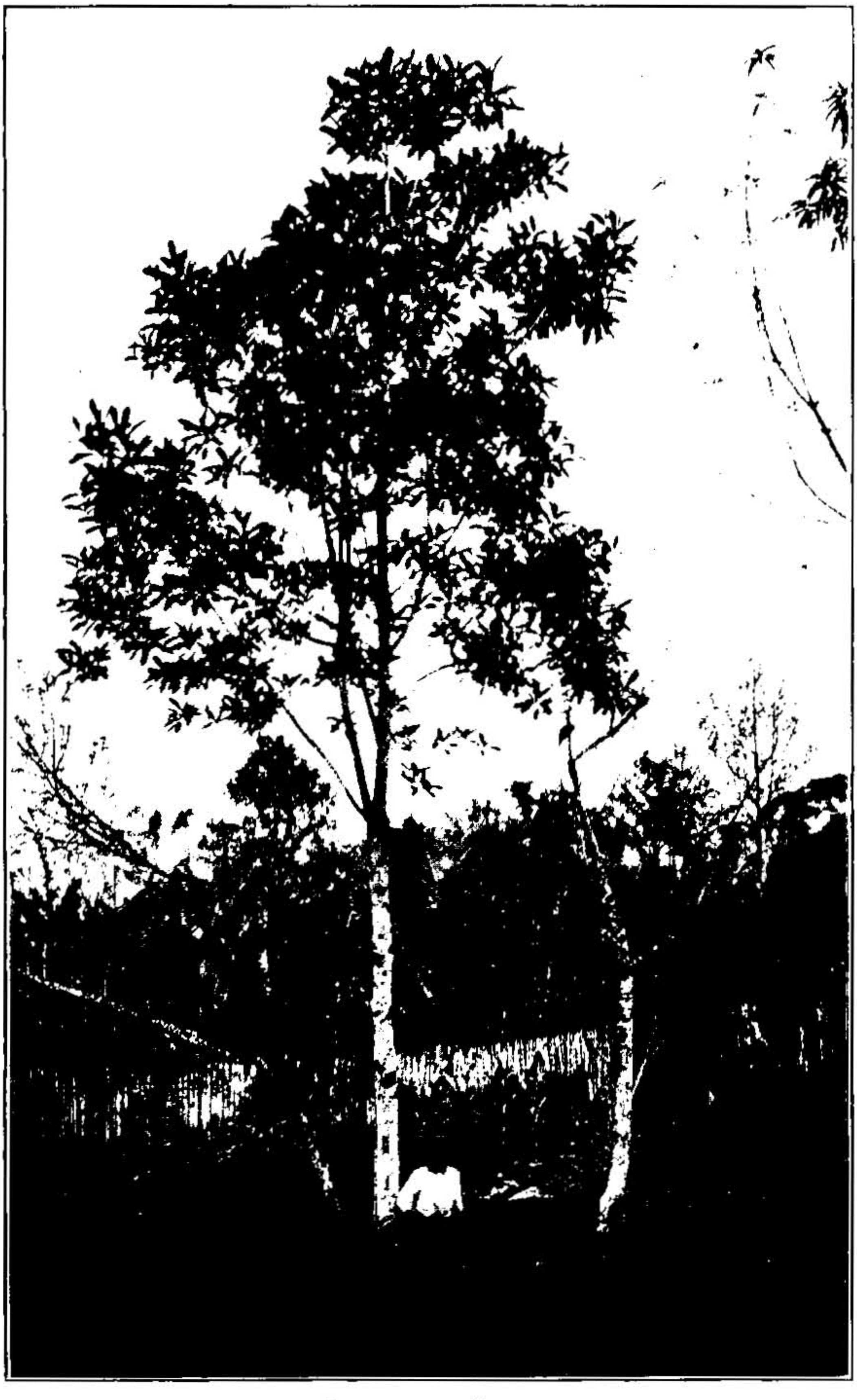
Capsule subglobose, pedicellate, about 12 mm. long and 15 mm. in diameter, 3-celled; pedicels slender, about 4 mm. long, crowned by the persistent stylar column. Seeds lenticular, 7 to 8 mm. long, 5 mm. thick, apiculate, verruculose, sinuate-cristate on the margin; "embryo central; cotyledons orbicular" (Hemsley).

COLOMBIA: Departments of Tolima and Cauca, alt. 2,000 to 2,300 meters, R. B. White in 1890 and again in 1895, no. 9 (Hemsley, loc. cit.); Cuesta de Tocotá, Western Cordillera of Colombia (Cauca), alt. 1,500 meters, *Pittier* 716, male flowers and seeds, December 21, 1905 (U. S. National Herbarium, nos. 530906–7. The foregoing descrip-tion is mainly based on these Tocotá specimens).

In December, 1905, after several unsuccessful attempts to find in the forests and on the farms of the Cauca Valley this important rubber tree, which is one of the prin-cipal sources of the virgin or white rubber of Colombia, the writer was directed to the Cuesta de Tocotá Rubber Plantation, situated in a rather wet district of the seaward slope of the Western Cordillera, on the road leading from Calí to Buenaventura. It was soon found that the plantation really consisted of two fully grown trees, said to be 14 years old, another tree about 4 years old and blooming for the first time, and a few dozen seedlings under 1 year of age. According to the owner, the tree was formerly plentiful in the surrounding woods, but it has been so utterly destroyed by rubber gatherers that not a single sapling could be found.

The larger tree had attained almost portly dimensions, being about 18 meters high and 65 cm. in diameter and branching at about 2.5 meters from the ground. The smaller tree, of which a picture is given here (pl. 43), was 25 cm. in diameter and about 8 meters high. The leaves of the seedlings are twice as large as those of the grown trees and are generally of a deep purple color.

The larger trees bore only young capsules, of which I obtained later some mature specimens, unfortunately all detached from the rachis. On the younger tree there



SAPIUM VERUM HEMSL.

SAPIUM VERUM HEMSL.

were only male flowers. At the time of my visit one of the older trees had just been tapped and had given about 500 grams of an amber yellow, translucent scrap rubber, apparently of excellent quality.

The collected materials were identified later as belonging to *Sapium verum* Hemsl., the small noticed differences in the characters of the leaf being ascribed to their rather immature condition. When, however, our herbarium sheets were submitted to the authorities at the Kew Herbarium, they were very emphatic in their belief that my determination was wrong: "The specimen sent as *Sapium verum* Hemsl. is not that species, and it appears to be distinct from any other in the Kew Herbarium. It has oblong-oblanceolate leaves, acutely cuneate at the base, with sharply serrulate margins, and the upper surface is not papillous, whereas in *S. verum* the leaves are oblong, obtuse at the base, and the margin is very remotely glandular-denticulate, and the upper surface, when seen through a pocket lens, is minutely papillous." The deviation in the shape of the leaf and the details of the margin is, as mentioned above, merely an exponent of the undeveloped condition of the former organ. The papillæ of the upper surface are a general character of the genus, and their absence on a few leaves can not be in any way conclusive. The shape and size of the capsules and seeds, as well as the angle formed by the primary veins and the costa, are far more important and correspond in our specimens with the description given by Mr. Hemsley. In a further communication from the Kew Gardens it is stated that the seeds "are identical with a first sample received in 1901 from Mr. R. Thomson, but smaller than those received from the same source in 1890, and figured by Mr. Hemsley in Ic. Plant., *pl. 2647, fig. 5–8.*" [1] (See also pl. 44, B, herewith.)

Now, I think we have here a fair illustration of the danger of describing a new species on heterogeneous materials. In the plate referred to, figures 2 to 4 represent exactly the seeds which came from the large tree at Tocotá, the smaller tree from which the herbarium specimens were gathered being a seedling obtained from the former. Figures 5 to 8 of the same plate, however, represent seeds of a distinct species. The seeds received in 1890 accompanied the specimens figured by Hemsley and belonged to them. They were sent by a Mr. R. B. White and were understood to have come from the middle belt, at altitudes of from 2,000 to 2,380 meters, of the mountainous departments of Tolima and Cauca in Colombia. The seeds sent by Mr. R. Thomson in 1901 came from La Mesa, in the State of Cundinamerca, near the upper limit of the lower belt (1,000 meters). They are identical with those accompanying specimens received by me from El Chaparral, about 800 meters above sea level, in the State of Tolima, through the kindness of Mr. Andrés Rochá. These two localities, situated on the opposite watersheds of the Magdalena, are not far distant. The identity of the seeds from La Mesa and El Chaparral is confirmed by the fact that Mr. Thomson sent to Dr. E. M. Holmes, the able curator of the Museum of the Pharmaceutical Society of Great Britain, not only a quantity of these, a few of which were presented to the Kew collections, but also leaves of the tree producing them. Mr. Holmes had the kindness to send me an impression of one of the latter and it agrees in its least details with our specimens from El Chaparral.

My attention was first called to the Tolima Sapium by some imperfect and badly prepared herbarium specimens brought from El Chaparral by Mr. C. Wercklé, a botanist residing in San José, Costa Rica. These specimens were sent to Kew with those from Tocotá and were referred to *S. verum* Hemsl., while the latter were pro-

[1] This explanation is in contradiction with those given by Mr. Hemsley in the text accompanying plate 2647. Figures 2 to 4 were drawn from specimens supplied by Mr. White and correspond evidently with his herbarium specimens, while figures 5 to 8 represent seeds sent by Mr. Thomson. The sources, consequently, are not the same, and the localities whence the samples came are far apart geographically and as to climate.

nounced distinct. These Chaparral samples differ, however, from the species described by Mr. Hemsley in several details, which are better seen in the new materials which I succeeded later in obtaining from the same locality.

The materials at hand enable me to show conclusively that the rubber tree of the lower part of Tolima is quite distinct from the *S. verum* growing at high altitudes. Perusing now the literature of the subject, I find that Prof. Henri Jumelle, of the Faculty of Sciences of Marseille, gave in 1903[1] an incomplete description of a *Sapium tolimense* Hort., which corresponds to our specimens as to the leaves, but shows again confusion as to the seeds, attributing to this species the smaller ones of *S. verum*. Nevertheless, Professor Jumelle is categorical in his opinion that *S. tolimense* is distinct from *S. verum:* "Il ne nous est cependant pas possible d'identifier, comme en a tendance Mr. Hemsley, le *Sapium tolimense* avec le *S. verum*." The confusion of the seeds again prevents a clear recognition of the fact that the species grow at different altitudes. It needs to be definitely understood that *S. verum* is an andine species of temperate and even cold climate (upper *tierra templada* and lower *tierra fria*), while *S. tolimense* belongs to the lower belt (upper *tierra caliente*) and to the lower part only of the middle one (lower *tierra templada*).

FIG. 77.—Male flower of *Sapium tolimense*. *a*, Floral bud; *b*, open flower; *c*, stamens. All scale 6.

In conclusion, the following description, drawn from the specimens sent by Mr. A. Rochá, is believed to show clearly that *Sapium tolimense* is not a synonym of *Sapium verum*, but the name of a legitimate and well-characterized species.

EXPLANATION OF PLATES 42, 43.—From photographs taken by Pittier and Doyle at Cuesta de Tocotá, Cauca, Colombia. Pl. 43, natural size.

Sapium tolimense Jumelle, Pl. Caoutch. ed 2. 151. 1903.

PLATE 44 C. FIGURES 77, 78.

Sapium thomsoni Godefr. Leb.; Jumelle, loc. cit.

A tree 20 to 30 meters high. Floriferous branchlets very thick.

Leaves large, thick, glabrous. Petioles thick, 2 to 5 cm. long, broadly canaliculate, the petiolar glands short, rounded, and contiguous to the blade. Leaf blades 15 to 26 cm. long, 6 to 13 cm. broad, ovate, rounded at base, obtusely rounded-acuminate, or rounded, or even emarginate, but never acute at tip; margin more or less distinctly sinuate-toothed;[2] costa broad, prominent beneath; primary veins nearly perpendicular to the costa, prominent on both sides but more so underneath, *strongly reticulate-anastomosed* toward the margin. Stipules elliptic-ovate, up to 7 mm. long and 4 mm. broad, with a scarious, sinuate-denticulate margin.

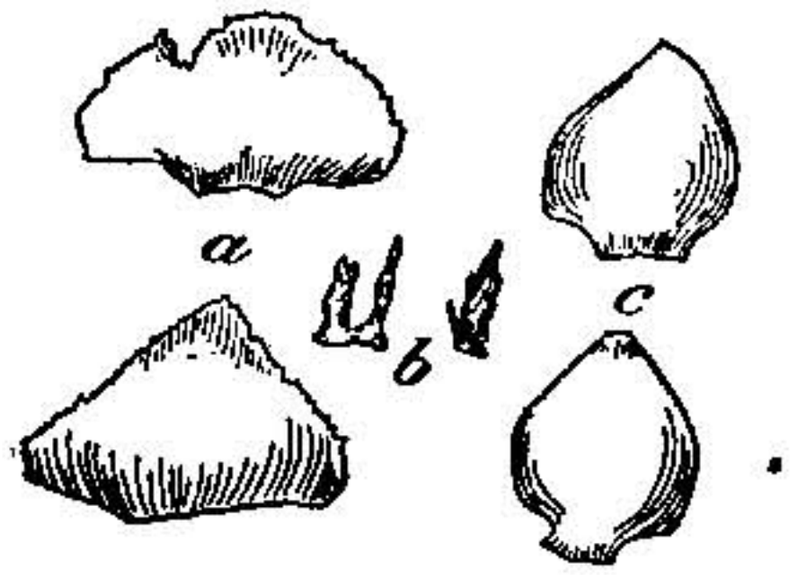
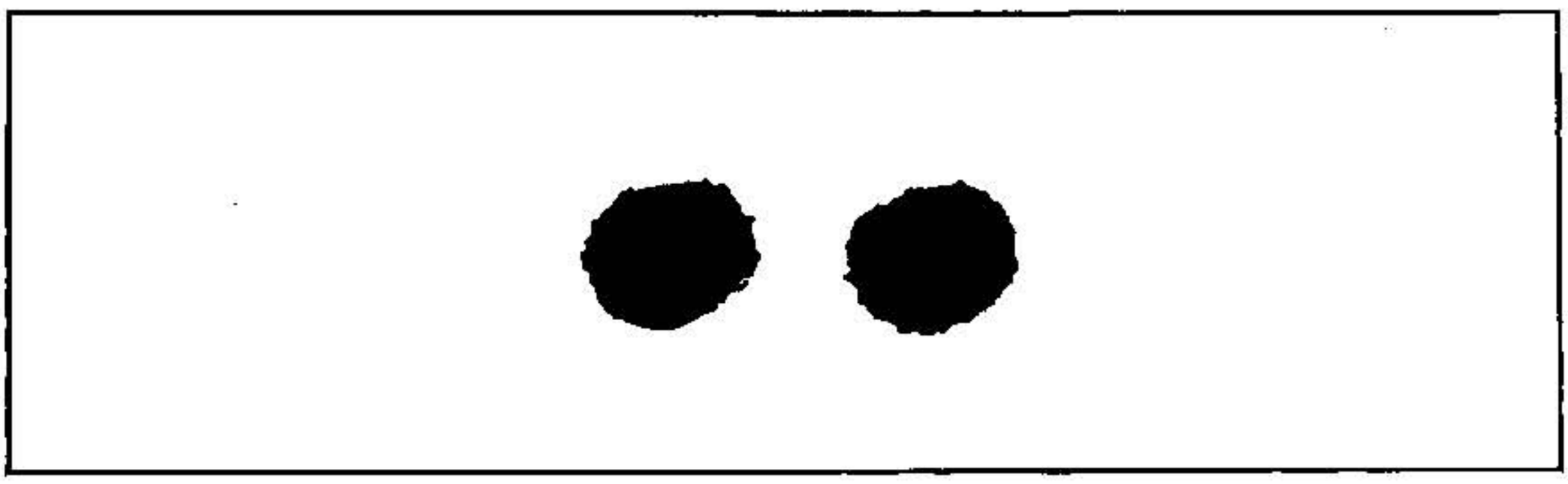


FIG. 78.—Female flower of *Sapium tolimense*. *a*, Bracts; *b*, glandules; *c*, free divisions of perianth. All scale 6.

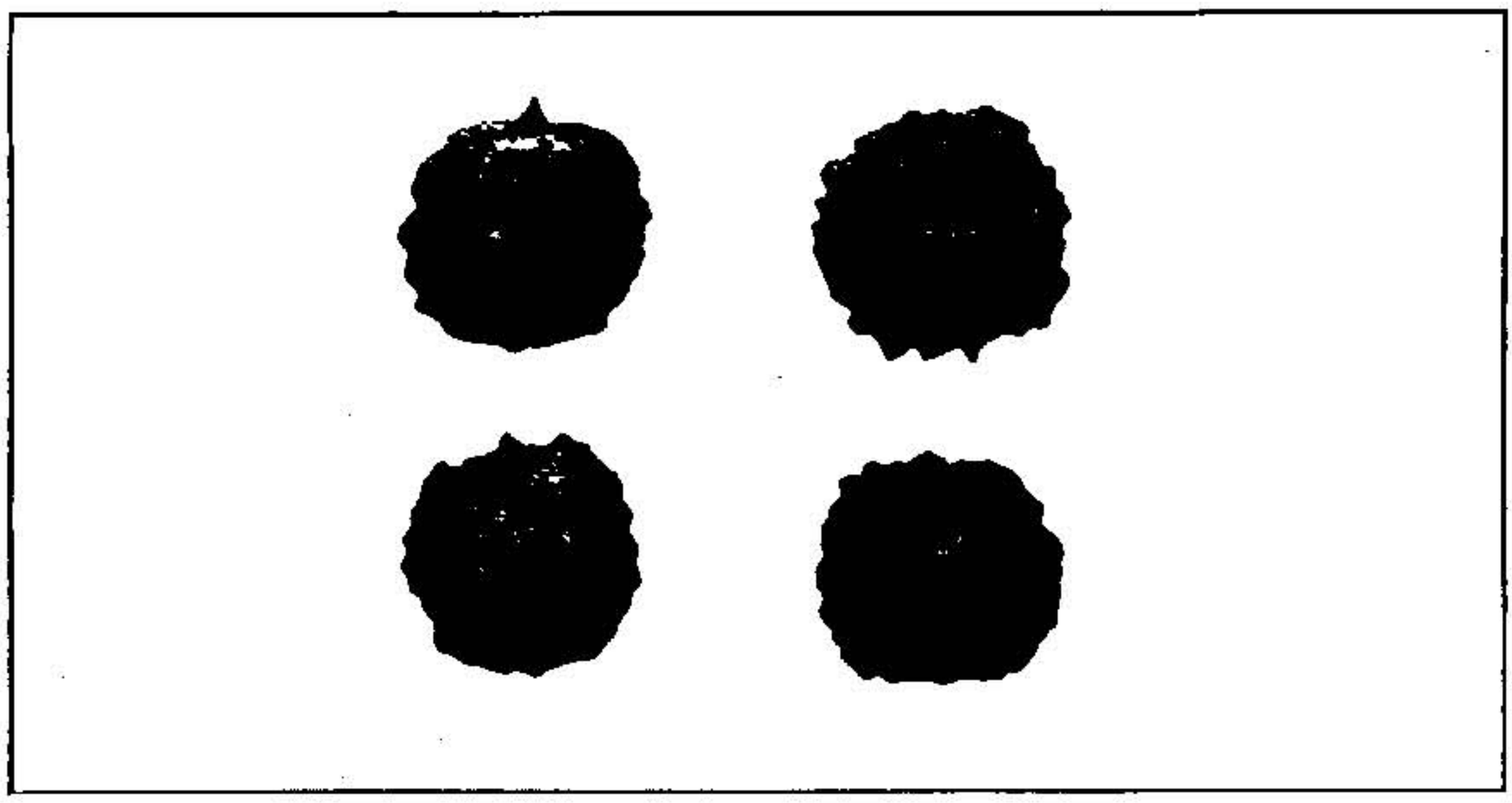
Floral spikes very thick, 20 to 25 cm. long, inserted at the base of the year's new growth. Basal glands small (not over 5 mm. in diameter), orbiculate. Female flowers up to 10, inserted at base of spike; bract 2 mm. long and 4.5 mm. broad, scarious, rounded or broadly triangular, more or less lobulate and denticulate on the margin, accompanied on each side by several clublike, purple glandules about 1

[1] Jumelle, H. Les plantes á Caoutchouc et à Gutta. ed. 2. 151. 1903. The citation in Engler's Pflanzenreich (IV. **147**[4]: 211) refers wrongly to the first (1898) edition of this work, in which the species is not mentioned.

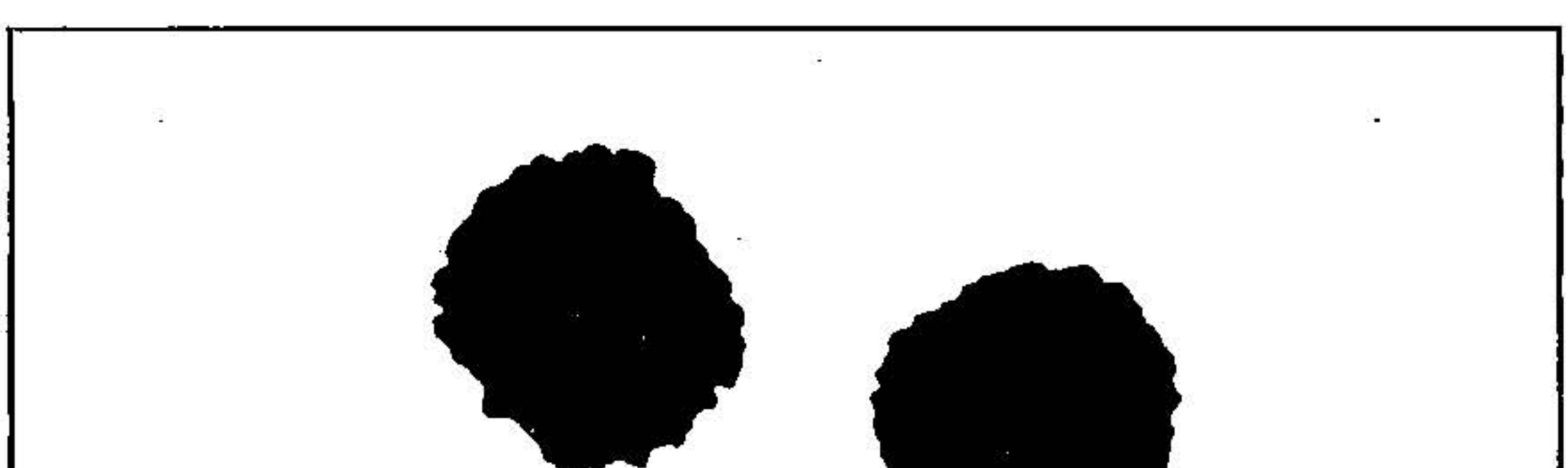
[2] Doctor Jumelle's description applies better to the young leaves of Mr. Wercklé's specimens. It may refer to the leaves of seedlings, communicated by Mr. Godefroy-Lebeuf.



A. SEEDS OF SAPIUM HIPPOMANE MEYER.



B. SEEDS OF SAPIUM VERUM HEMSL.



C. SEEDS OF SAPIUM TOLIMENSE JUMELLE.

SAPIUM HIPPOMANE MEYER.

mm. long; perianth formed of three free divisions, these ovate-acuminate, rounded at tip, narrowed at the base into a short claw, imbricate, 3 mm. long and 2.7 mm. broad; ovary sessile or subsessile, globose, narrowing into a persistent stylar column 3 to 4 mm. long; styles 3, reflexed, early caducous. Male flowers in clusters of 6 to 10, subtended by a short, broad bract and surrounded by a few clavate glandules, the flowers mixed with glandlike bracteoles; perianth yellowish white, campanulate, bilobate, about 3.5 mm. long; stamens 2, exserted.

Capsules sessile or subsessile, large, globose, 18 to 20 mm. in diameter, coriaceous, crowned by the persistent stylar column. Seeds lenticular, more or less orbiculate, about 10 mm. long and wide, obtusely cristate on the edge and rarely apiculate.

COLOMBIA: El Chaparral, State of Tolima, in the Magdalena Basin, alt. about 800 meters, *Andrés Rochá* (U. S. Nat. Herb., nos. 690468–690470); same locality, Wercklé, Inst. Fís. Geogr. Costa Rica, no. 17272 (U. S. Nat. Herb., no. 578904).

FIG. 79.—Tip of leaf of *Sapium hippomane*. *a*, Front view; *b*, lateral view showing auricle. Both scale 3.

Sapium hippomane Meyer, Prim. Fl. Esseq. 275. 1818; Pax in Engl. Pflanzenreich IV. **147**[4]: 231. 1912.

PLATES 44, A, 45. FIGURES 79–81.

Sapium hemsleyanum Huber, Bull. Herb. Boiss. II. **6**:362. 1906.

Sapium obtusilobum Muell. Arg. Linnaea **32:** 116. 1863; Pax, op. cit. 229.

A tree 12 meters high, with a short trunk 32 cm. in diameter at the base, an elongated crown, and horizontal or subascending limbs. Bark smooth, grayish.

Foliage thick, the rather long-petiolate, entirely glabrous leaves covering the whole branchlet. Petioles slender, 1 to 4 cm. long, provided at the upper end with a pair of long (1 to 2.5 mm.), cylindric-conical glands, distant 5 mm. or less from the base of the blade. Leaf blades elliptic, dark green above, paler and finely white-dotted beneath, 5 to 12 cm. long, 2.5 to 5 cm. broad on the floriferous branchlets, 15 to 25 cm. long and 5 to 6 cm. broad on the young, sterile growth; base cuneate or subacute; apex more or less abruptly contracted and ending in an incurved, cucullate-glandulose tip, often with small lateral auricles; main nerve impressed above, prominent and more or less angular beneath; primary veins slender, arcuate, prominent on both faces, about 18 on the leaves of the floriferous branchlets, 28 on those of the younger growth; margin (slightly revolute in dry specimens) remotely denticulate-glandulose (the glandules caducous) and with occasional larger, hydathodal teeth. Stipules scarious, ovate or subacuminate, very small.

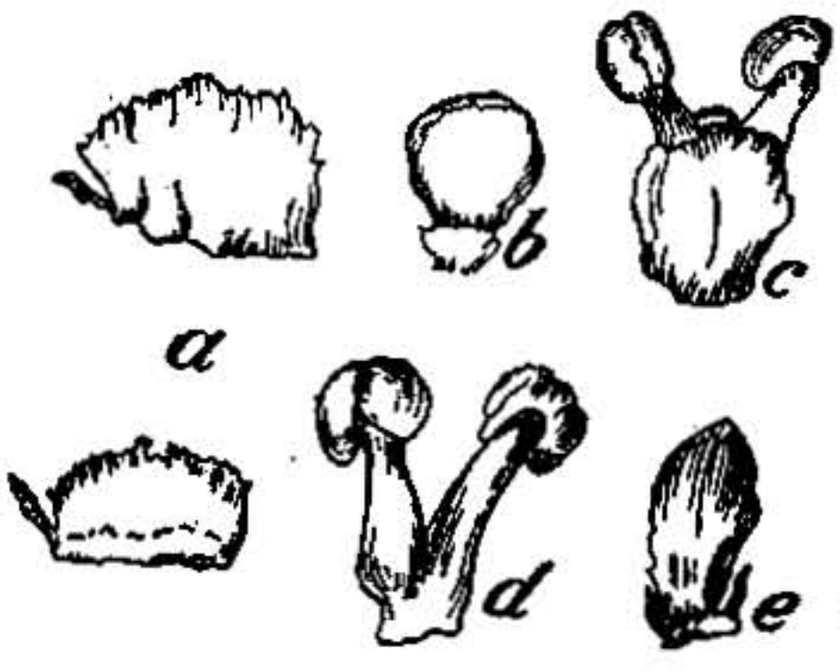


FIG. 80.—Male flower of *Sapium hippomane*. *a*, Bracts with lateral glandule; *b*, floral bud; *c*, mature flower; *d*, stamens; *e*, half of perianth, showing form of lobe and with interfloral glandules at base. All scale 6.

Floral spikes terminal, single or with a basal, axillary branchlet, slender, entirely glabrous, up to 16 cm. long, bearing either male flowers only or both male and female, the female numbering up to 10, inserted at the base of the spikes. Floral glands ovate, larger at the base of the spikes (3 to 3.5 mm. long, 2 mm. broad). Bract short and broad (about 15 mm. long and 2 mm. broad), with the upper margin scarious, rounded, glandulose-pectinate or irregularly denticulate, and bearing on one side only (in male flowers) or on both sides (often in female flowers) a basal, erect, claviform, purple glandule. Male flowers in clusters of 4 to 8, sessile, intermixed with filiform, glandular, persistent appendages; perianth about 1.5 mm. long, purplish, the two lobules entire and more or less rounded; stamens long-exserted (nearly 2.5

mm. long), with yellow filaments and purple anthers. Female flowers provided at the back with two additional bracts, smaller than the outer one, irregularly fringed or denticulate and bearing at the base within several finger-like, dark glandules; perianth 3-lobulate, the lobules more or less ovate-rounded or acuminate, though never acute, at the tip, 1 to 1.5 mm. long, free to the base or almost so; ovary globose, glabrous, 3-locular; styles shortly adnate at the base, up to 5 mm. long, thick, arcuate, green, with a brownish stigmatic surface.

Capsules sessile or very short-pedicellate, coriaceous, 11 mm. long by 13 mm. in diameter, finely rugose and brownish gray outside, 3-celled and each cell monosperm, with both the carpellary divisions and the lines of dehiscence deeply furrowed (the latter yellowish in dry specimens). Seeds medium-sized, with a red pseudoaril, black, lenticular, finely tuberculate, cristate along the margin, distinctly apiculate; length 5.6 mm., breadth 5 mm., thickness 3.6 mm.

JAMAICA: Hope Gardens, a tree derived from a seedling obtained at Medellin, Department of Antioquia, Colombia, and presented by the late Consul Ch. Patin in September, 1899.

I am indebted to Mr. William Harris, superintendent of the Public Gardens of Kingston, for herbarium specimens, materials in alcohol, and interesting notes on this remarkable species. To the Hon. H. H. Cousins, Director of Agriculture of Jamaica, I owe also an acknowledgment for the communication of the original photograph of plate 45.

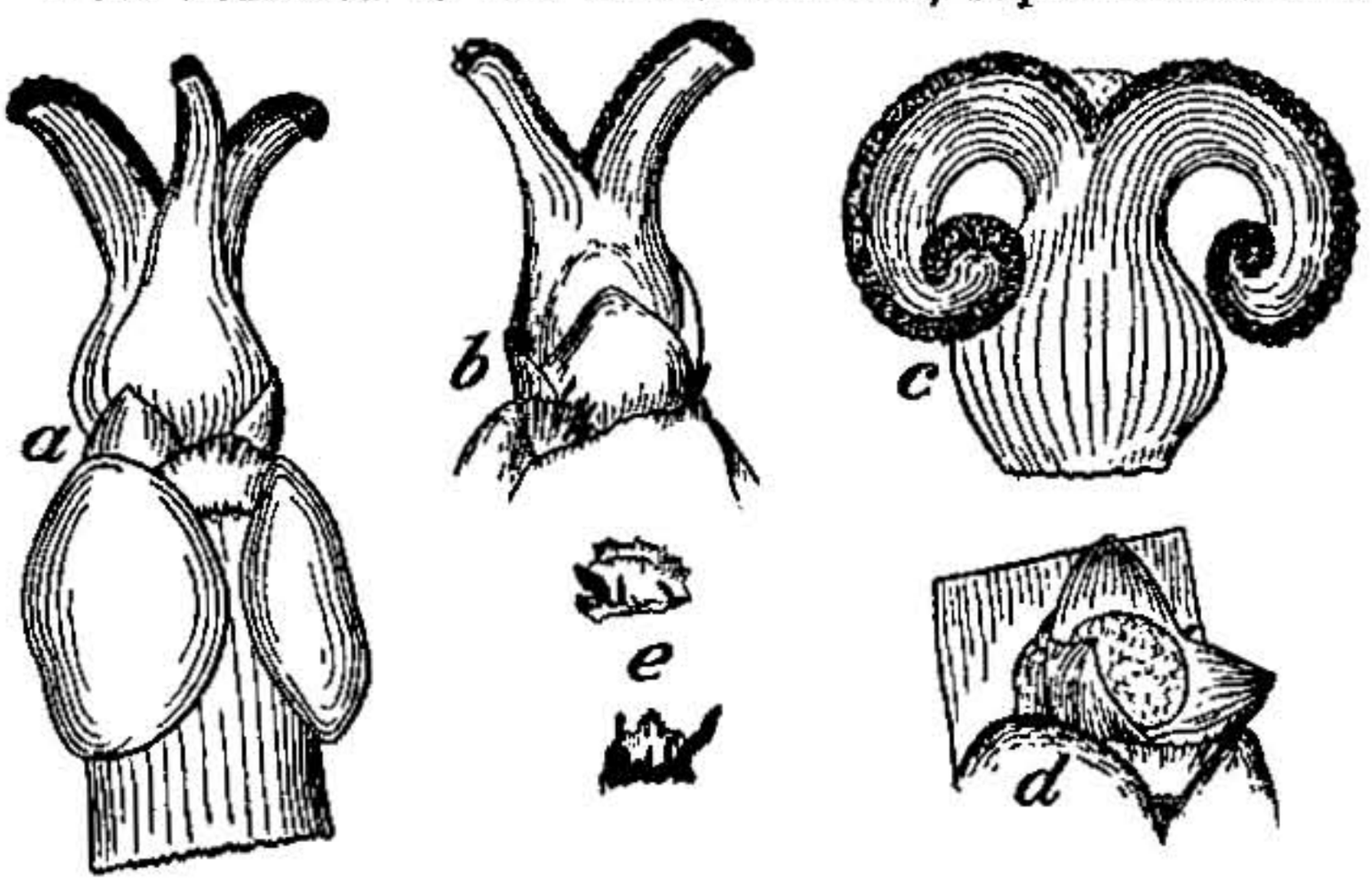


FIG. 81.—Female flower of *Sapium hippomane*. *a*, Young flower, front view, showing glands and bract; *b*, same, back view, showing small bracts and glandules; *c*, mature pistil; *d*, perianth *in situ*; *e*, bractlets and glands on back of flower. All scale 6.

From Mr. Harris's letters I extract the following information:

We have a Sapium here which was presented to us by the late Mr. Chas. Patin in 1899. He called it *S. biglandulosum*. It is evidently not that species, but may be *S. utile* or an allied species. (July 15, 1910.)

The leaves drop off the branches in drying and it is difficult to get nice specimens, but no doubt they will answer your purpose. I may mention that the leaves of the tree were much larger when it was younger, say three or four years ago. (August 11, 1910.)

We sent flowering specimens of this tree to Kew in 1907 and they referred it doubtfully to *S. obtusilobum*. It did not seem to agree with the figure given in Bull. Herb. Boiss. 6, p. 357 (fig. 17), and I named the tree provisionally *S. utile*. This is the first year that the tree has fruited with us and consequently the first time that we could get complete material for identification.

You will notice in the figure of *S. obtusilobum* in Bull. Herb. Boiss. that the petiolar glands are shown to be at the base of the leaf blade, whereas in our tree these glands are 7 or 8 mm. below the base of the leaf blade. The apical gland is an important character. I find that the capsules are not all sessile, but occasionally one is furnished with a short, thick pedicel.

I hope to send you a photograph of our tree in a few days. Our specimen is a round-headed tree 35 feet high, with a trunk girth of 24 inches at 3 feet from the ground. It is furnished with numerous leafy branches, the lower ones drooping and touching the ground. All parts of the tree, but especially the young shoots and leaves, contain an abundance of milky juice. We received the young plant from the late Mons.

Chas. Patin in September, 1899, and it was planted out in its present position in October, 1902; Hope, with its dry, hot climate, is probably not the most favorable situation for this tree.

The late M. Patin was a planter and Belgian consul at Medellin, Colombia, and I believe the species comes from that neighborhood. M. Patin was keenly interested in plants, especially those of an economic nature, and on his rather frequent visits to Europe or the United States he always stopped at Jamaica and came to see us at the Gardens and usually brought something to add to our collections.

He thought very highly of this Sapium as a probable source of rubber and showed me samples of rubber produced by it.

He was very anxious to introduce the species to Jamaica, and I find that he brought four plants in 1899, but two were dead and one was very weak and finally succumbed. (September 22, 1910.)

The examination of the specimens showed that the tree could not be *Sapium utile* Preuss, since it belongs to the subsection Cucullata (Pax & Hoffm.); so, in a letter answering those of August 11 (cited above) and 17, and subsequent to that of September 22 of Mr. Harris, I expressed the opinion that the species might be either "*S. obtusilobum* Muell.-Arg. or *S. hemsleyanum* Huber," coinciding in the first surmise with the tentative identification made at Kew. Further study showed that, while our specimens agreed in almost every detail with the incomplete description of the former by Mueller, they differed in several ways from *S. hemsleyanum* Huber. The petioles, namely, are longer, the petiolar glands more distant from the blade, the marginal teeth rather distant and obsolete, the primary veins less numerous, the floral spikes shorter and more slender, the basal bract of the male flowers cut straight or hardly rounded, with a fimbriate margin, etc.—all these differences found while comparing our Jamaican specimens with nos. 7509 and 7674 of Jenman from British Guiana.

But again *S. hemsleyanum* is now considered by Dr. Pax [1] to be the same as, or, at the utmost, a simple form of, a species of broad scope, *S. hippomane* Meyer, in which our Jamaican specimens can also be included. And as, on the other hand, *S. hippomane* and *S. obtusilobum* do not seem to differ in any essential details, the texture of the leaf being rather the result of certain environmental conditions, I feel justified in considering also the name *S. obtusilobum* Muell.-Arg. as merely another synonym for *S. hippomane* Meyer.

The above description and, unless otherwise indicated, the accompanying drawings have been made from our Jamaican materials.

EXPLANATION OF PLATES 44, 45.—Pl. 44, A, B, C, from photographs taken by C. B. Doyle in Washington. About natural size. Pl. 45, from a photograph furnished by Hon. H. H. Cousins, as mentioned in the text.

ANACARDIACEAE.

A NEW SPECIES OF SPONDIAS FROM COSTA RICA.

Spondias nigrescens Pittier, sp. nov. FIGURE 82.

A forest tree with rounded crown (Tonduz in sched.). Branchlets thick, covered with a purplish brown, smooth bark, showing at the end the prominent scars left by the fallen leaves.

Leaves caducous, 5 to 17-foliate, pubescent. Rachis 15 to 30 cm. long, broadly flattened above, rounded beneath, the petiole 5 to 6 cm. long. Leaflets subopposite, distant about 3 cm. on each side of the rachis; petiolules of the lateral leaflets 7 mm. long, that of the terminal leaflet up to 1 cm. and over; leaflet blades ovate to elliptic-oblong, moderately oblique, rounded or subcuneate at the base, acuminate and acute at the tip, 3.5 to 10 cm. long, 1.5 to 3.5 cm. broad, the smallest ones at the base and the narrowest at the end of the leaf; margin entire; primary veins parallel, arcuate, 10 to 14 on each side of the main rib.

[1] In Engl. Pflanzenreich IV. 147[4]: 232. 1912.

Panicle 20 to 30 cm. long, lax, few branched, the rachis densely pubescent. Flowers white, borne on articulate, hispid-pubescent pedicels 1.5 to 2.5 mm. long, these provided at the base with several diminutive bractlets. Calyx lobes smooth, broadly ovate, more or less acute at the tip, about 1 mm. long and broad. Petals lanceolate-acute, 3.5 mm. long, 1.5 mm. broad near the base, reflexed and strongly revolute on the margin. Stamens seldom over 1.5 mm. long; filaments broader at the base; anthers about 0.5 mm. long. Disk thick, the margin obscurely 10-crenate or sulcate. Ovary subglobose, sparsely hairy, ending always in 4 more or less reflexed, glabrous styles, with a total height of 1.5 to 2.5 mm. Drupe ovoid, hairy-pubescent in its young state; the mature fruit not known.

FIG. 82.—Floral details of *Spondias nigrescens*. *a*, Floral bud; *b*, open flower; *c*, sepal; *d*, petal; *e*, stamens; *f*, gynœcium. All scale 6.

Type in the U. S. National Herbarium, no. 861287, collected in the forests of Nicoya, Costa Rica, May, 1900, by A. Tonduz (Inst. Fís. Geogr. Costa Rica, no. 13925). The specimens bear flowers and young fruits.

Of the genus Spondias three species, or perhaps only two, have been known hitherto in Central America, one or two of them (*S. purpurea*, *S. dulcis*) in a state of semicultivation; the other (*S. lutea*) a large forest tree, which is certainly indigenous, notwithstanding Seemann's assertion of its having been introduced in Panama. The discovery by Mr. Tonduz of a second native species is highly interesting.

SAPOTACEAE.

ZAPOTES AND ZAPOTILLOS.

In a recent paper[1] Mr. O. F. Cook has shown that the binomial *Achras zapota* of the first edition of Linnæus's Species Plantarum is based upon the type of Plumier's Sapota; in other words, on the tree known over most of its area in Central and South America as "níspero," in Mexico and Guatemala, as "chicozapote," or erroneously as "zapote chico," and in the British West Indies as "sapodilla." Mr. Cook agrees in this with the European botanists and any further reference would be uncalled for but for the fact that, owing to a misidentification of Plumier's plate, the name *Sapota zapotilla* Coville was substituted in 1905 and has since been used by the American botanists who have dealt with that well-known fruit tree of the Tropics.

On the other hand, the naming of an allied species, the zapote tree, also important economically, has resulted in an unfortunate imbroglio. Originally placed in the genus Sideroxylum by Jacquin (1760), then in Achras by Linnæus (1762), and used to resuscitate Plumier's genus Sapota in 1768, it was transferred to Lucuma by Gaertner in 1807 and to Vitellaria by Radlkofer in 1882, while Pierre created successively for it the two names Calospermum and Calocarpum in 1890 and 1904,

[1] Nomenclature of the Sapote and Sapodilla, Contr. U. S. Nat. Herb. **16:** 279–282. 1913. Also Journ. Washington Acad. Sci. **3:** 158–160. 1913.

the last being rejected in the paper referred to by Mr. Cook, who proposes Achradelpha as a definite substitute. This would be the eighth change of the generic status of the zapote tree, an extraordinary fate, indeed, with very few parallels in botanical taxonomy.

For brevity's sake the reasons will not be repeated here why the zapote had no standing in any of the first six of the genera just cited. Those who wish for a full explanation of the case are referred to Mr. Cook's very complete presentation of it. This is the place, however, to state my reasons for differing from my colleague as to the necessity of a new generic name.

My contention is that Calocarpum is a perfectly valid name and therefore has to be preserved. It is neither a taxonomic nor even a philologic homonym of Callicarpa. Indeed, the two vocables are so distinct from each other as even to escape in a way the criticism of being synonyms. A taxonomic homonym is a word (the same word with the same spelling, as I understand it) that has been used to name distinct genera. Thus Calospermum, as applied to an alga genus and to the zapote, is both homonymous and homophonous, and had to be rejected in its second application. Donatia Forst., Donatia Bert., and Donatia Loefl. were perfect homonyms, of which only the earliest, first mentioned, could be used. The use of names differing only by their ending in -us, -a, or -um should be absolutely discouraged, as well as that of all those homonymous in the usual sense of the word, that is to say, agreeing in sound and more or less in spelling. But in our case we can reasonably contend that Callicarpa and Calocarpum are quite heteronymous and can not therefore be confused nor identified as one single term. It is true that these two words are very similar, but they differ in formation, spelling, and pronunciation. The principle of exclusion of generic names should never be extended to such cases, and there is apparently no well-grounded reason to drop Calocarpum and to encumber the already too intricate nomenclature of the genus with a new name. The preservation of Pierre's name does not interfere in any way with the American method of types and serves as well as any other to permanently fix the nomenclature of the zapote type.

As to the specific name of the type species, the priority of *Calocarpum sapota* over *C. mammosum* could perhaps be sustained, since Jacquin's name *Sideroxylum sapota* is anterior by two years to Miller's *Sapota mammosa*. But in order to avoid the confusion which may result from the use of a homonymous specific name in two closely related genera, and because *mammosum* or *mammosa* has been used through no less than seven changes of the generic name, I agree with Mr. Cook as to the convenience of retaining it as the specific designation of the zapote.

With reference to the vernacular nomenclature of the same trees, it seems necessary to insist on the fact that the name "chicozapote," sometimes wrongly given as "zapote chico," as applied to the sapodilla, is not intended as a counterpart of "zapote grande," an expression used rarely, if at all, in connection with *Calocarpum mammosum*. "Chicozapote" is simply a modern form of the Nahuatl name "tzicozapotl", or "gum zapote", still used by the native Indians of Mexico. This term, "chicozapote," besides, is known only in the restricted northwest end of the natural range of *Achras zapota* and "níspero" is a name of much more general use, borrowed from the Castilian denomination for *Mespilus germanica*. On the other hand, I do not remember ever having heard the expression "zapote grande" used by the natives of Mexico and Guatemala, "zapote" being the name of the fruit all over the natural territory of the species, while in the countries where it has been introduced it has generally been compared with and named after the mamey or mammee (*Mammea americana*).

The spelling of the native name "zapote," as used by Mr. Cook and authorized by the more recent English dictionaries, is not exempt from criticism. Following the rules of derivation, the *z* initial should be preserved. That "zapote" proceeds from the Nahuatl "tzapotl" is not a mere supposition, but a well-established fact. In passing to the Spanish language, it has dropped the initial "t," in accordance with one of its universally adopted rules. "Zapote" is a Spanish word, figuring in Spanish dictionaries, and as such its original spelling should be respected. "Sapodilla" is an English name derived from "zapotillo." It is unfortunate that the word was originally misspelled, but a mistake once made is no reason for a repetition. As Mr. Cook further observes, "sapodilla" has only a limited use, and that is why I prefer "zapotillo," which is currently applied to several species of the same family.

Achras zapota L. Sp. Pl. 1190. 1753. PLATES 46, 47.

Achras sapota L. Sp. Pl. ed. 2. **1:** 470. 1762.

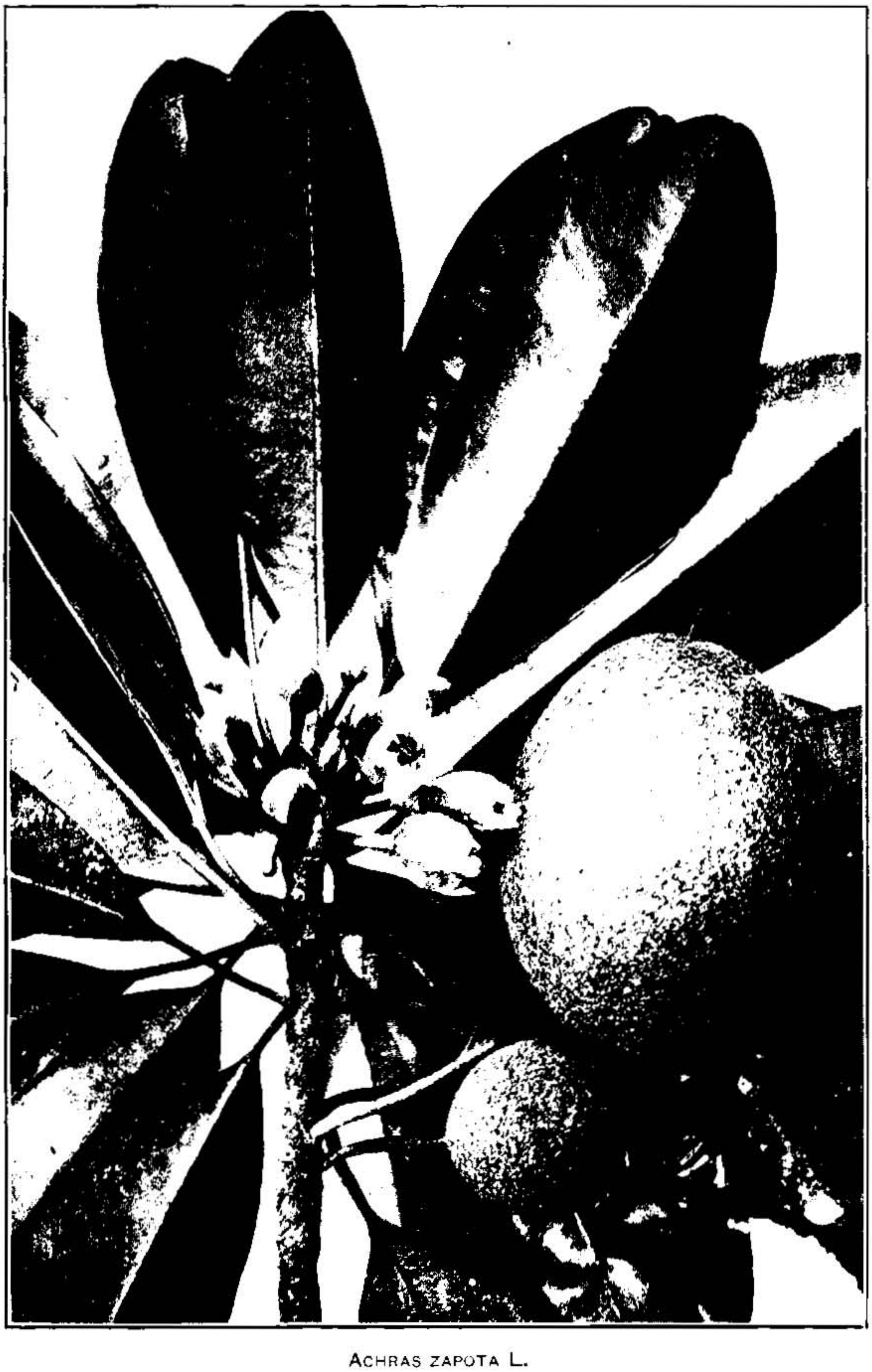
Achras zapota zapotilla Jacq. Stirp. Amer. 57. 1763.

Sapota achras Mill. Gard. Dict. ed. 8. no. 1. 1768.

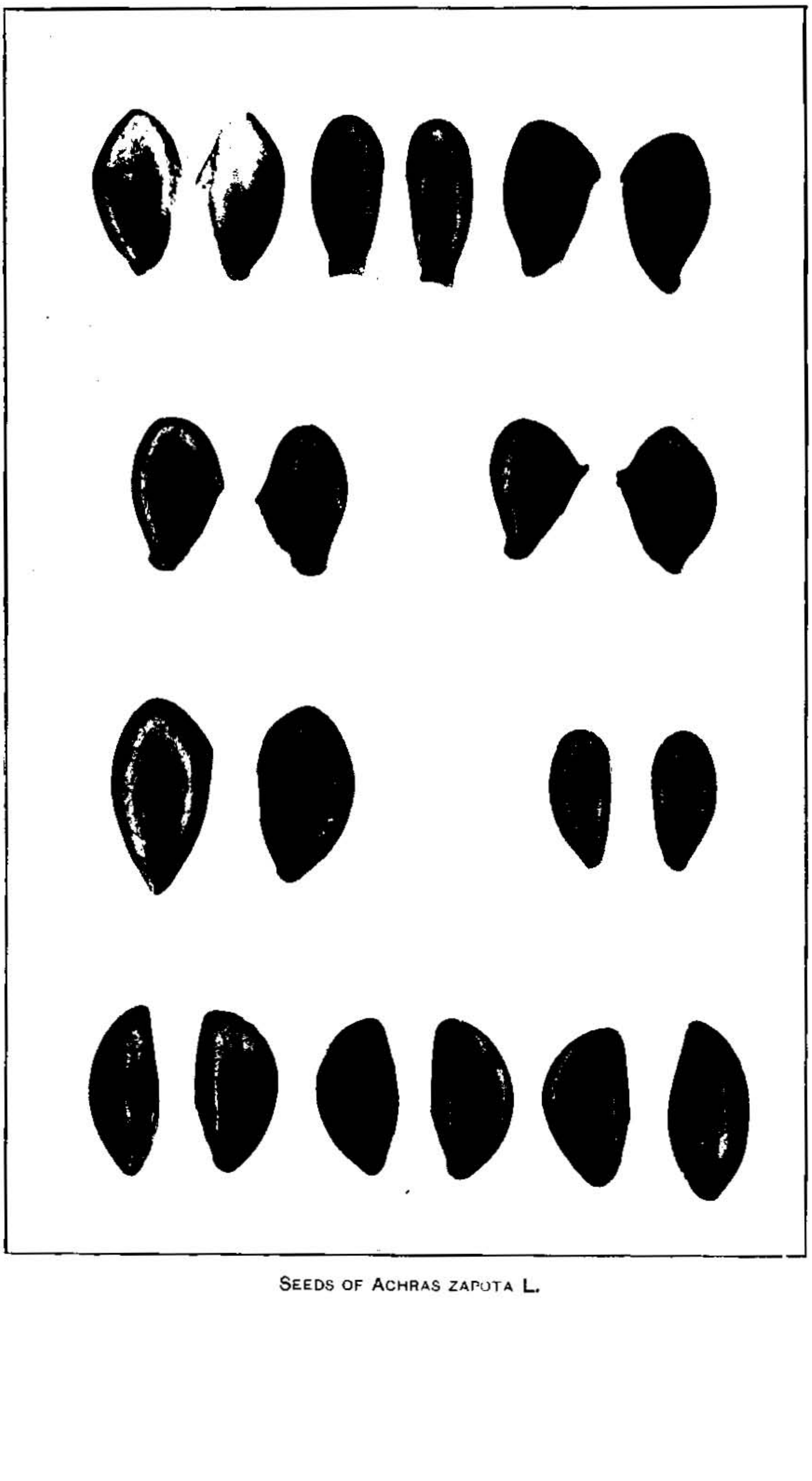
Sapota zapotilla Coville, Contr. U. S. Nat. Herb. **9:** 369. 1905.

A portly tree reaching to 20 meters and over when fully grown. Trunk either short and dividing into several secondary axes or undivided to the top. Main limbs horizontal or drooping. Crown rounded or elongate, richly foliated. Bark brownish, lactescent, more or less furrowed longitudinally. Terminal branchlets rather thick, with a grayish or ferruginous, filmy surface, covered with leaf scars.

Leaves petiolate, coriaceous, clustered at the ends of the branchlets. Petioles 1 to 2.5 cm. long, rather slender, sometimes glabrous, more usually more or less covered with a filmy down. Leaf blades 5 to 14 cm. long, 2.5 to 5 cm. broad, ovate-elliptic to elliptic-lanceolate, rounded-cuneate at the base, more or less obtuse and emarginate at the tip, dark green above and paler beneath, perfectly glabrous at the mature stage but covered beneath when young with a ferruginous film; main rib salient below, the venation parallel and close, scarcely distinct; margin smooth. Stipules none.



ACHRAS ZAPOTA L.



SEEDS OF ACHRAS ZAPOTA L.

Flowers pediceled, single in the axils of the leaves at the ends of the branchlets. Pedicels 1 to 1.5 cm. long, more or less covered with filmy pubescence. Sepals 6, seldom 8, ovate-acuminate, 9 mm. long, 5 mm. broad, densely velvety-hairy except at the base inside, the exterior ones more or less valvate, the interior narrower at the base and apart from each other. Corolla white, glabrous, tubular, urceolate or campanulate, about 10 mm. long and lobulate at the top; lobules about 2.5 mm. deep, ovate, the margin more or less irregularly sinuate and coarsely denticulate at tip. Stamens 6, opposite the lobules of the corolla; filaments short (about 1 mm. long), broad at the base, inflexed and more slender at tip, inserted on the corolla at about 6 mm. from the base; anthers basifix, lanceolate-acuminate, cordate at base, extrorse, with longitudinal dehiscence. Staminodes 6, petaloid, of the same length as the lobules of the corolla and with a more or less sinuate margin. Pistil 10 to 11 mm. long, claviform and stiff; ovary hairy, 10 to 12-celled, each cell 1-ovulate; style smooth, obscurely lobulate and hairy at tip.

Fruit a berry of variable form and size, crowned by the remnants of the persistent stigma and with a thick, verrucose pedicel. Skin thin, brown ferruginous, more or less smooth or scaly. Mesocarp fleshy, succulent, containing usually from 0 to 5 and very seldom 10 to 12 seeds. Seeds brown or black, smooth and shiny, more or less flattened laterally, oblique and obovate, with a narrow cicatricula extending from the lower end to about the middle of the ventral side, where the foramen is usually marked by a more or less pronounced rostrum. Albumen abundant; embryo at the lower part of the seed.

COMMON NAMES: West Indies, sapodilla tree, naseberry tree (English). Danish West Indies, *mispelboom* (Dutch); *Breiapfelbaum* (German). French West Indies, *sapotillier* (French). Porto Rico, Cuba, Venezuela, Colombia, Panama, Costa Rica, Honduras, Nicaragua, Salvador, *níspero* (Spanish). Cuba, *zapote* (Spanish). Mexico, Guatemala, *zapote chico, chico, chicozapote* (Spanish). Ecuador, *níspero quitense* (Spanish). Yucatan, *ya* (Maya). El Salvador, *muyozapot* (Nahuatl). Mexico, *tzicozapotl* (Nahuatl). Costa Rica *korób* (Brunka). Bluefield, Nicaragua, *ibán* (Misquito). Verapaz, Guatemala, *muy* (Kekchí and Pokomchí).

The sapodilla tree is certainly indigenous in Mexico south of the Isthmus of Tehuantepec or of a parallel a little farther north, in Guatemala, and possibly in Salvador and northern Honduras. It is especially abundant in the lowlands of Tabasco and Chiapas and the western part of Yucatan, where lie the principal centers of production of the chicle gum. Farther north, as well as in Nicaragua, Costa Rica, Panama, and the West Indies, it seems to appear only as a cultivated tree. Humboldt, in referring to it, says, "Crescit et colitur prope Cumana, Caracas, etc." [1] It is also reported by Planchon [2] as being abundant in the forests of Venezuela and Jamaica, and from my own recent observations I feel also inclined to believe it a native of the former country, as well as of Colombia.

It was made known from Nicaragua by Oviedo,[3] who called it the best of all fruits and expressly mentions that it was "in the power of the Indians of the Chorotegan stock (esta fructa está en poder de los indios de la lengua de los chorotegas), who are known to have migrated from the North, following the coast of the Pacific Ocean as far as Costa Rica. On the eastern seaboard of this last country, however, it is positively said to have been brought from Jamaica in recent times. There do not seem to be any available data as to its introduction into other countries of Tropical America. In Ecuador it was well known in Velasco's time as a specialty of Quito.[4] We have

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[1] H. B. K. Nov. Gen. & Sp. **3:** 239. 1818.

[2] Planchon, L. Produits des Sapotées 82. 1888.

[3] Oviedo y Valdés, Gonzalo Fernandez de. Historia general y natural de las Indias 308. *pl. 1*. 1851.

[4] Velasco, J. Historia del Reino de Quito 63. *pl. 1*. 1844.

seen, on the other hand, that the tree was frequently described from the West Indies in the course of the eighteenth century. It may have reached Cuba from Yucatan in prehistoric times and spread from there to the other islands.

Although it is seldom met with in Central America and Mexico above 1,000 meters, the upper limit of the *tierra caliente*, the sapodilla tree reaches far up into the temperate belt of Colombia and is even grown around Quito, in Ecuador, at an altitude of about 2,800 meters.

The adult trees seem to vary greatly in size according to locality. Cook and Collins[1] give 7 to 9 feet (2 to 3 meters) for its stature in Porto Rico; Jacquin[2] gives 10 to 15 feet (3 to 5 meters); P. Browne[3] says that it "rises to a considerable height." In Guatemala and Colombia I have often seen specimens 18 meters high and over. As a general rule, it seems that the tree is of a lower stature in the West Indies. The specimens seen by me in Port Limon and on the plains of Santa Clara in Costa Rica were also of less size and more densely foliated than those on the Pacific coast. This can, however, be accounted for by differences of age, climate, and other local conditions.

Pierre[4] has described several varieties which have not been found among the numerous specimens investigated in connection with the preparation of this paper.[5] Frequent and considerable variation was noted in the relative length of the calyx and corolla, or of the latter's lobules and the staminodes, these being in most cases adherent to the lobules and not free above the insertion of the stamens as represented by Engler.[6] With reference to the general form of the flowers an old observation of Loefling was confirmed and thus quoted by Jacquin:[7] "Flores inodori, corolla albida, diu persistentes. Hi ante fecundationem figuram habent ovatam, in ipso autem fecundationis actutoti explicantur magis, ut evadant campanulati; quod, ut ista succedat, antherae inclusae stylusque corolla longior videntur exigere: unde tunc in situ figuraque mutatio partibus accidit insignis. Fecundatione auctem peracta, ovatam denuo assumunt. Extra hunc actum florem descripsisse videtur beatus Loeflingius, cujusmodi ipse illum ego saepissime examinavi: addidi igitur characterem, qualem in ipsamet fecundatione semper se mihi exhibuit."

The seeds also vary widely, not only in number but also in shape, as can be seen from the accompanying plate. As to their number, I found that in the Cauca Valley it is usually not over three and very often less, and it was with no little surprise that I saw later in Velasco a reference to the Ecuador fruit as being also 3-seeded, while my own experience in Central America, as well as that of most authors, indicates a larger number. On the occasion of a recent trip to Venezuela, where the fruit is a

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[1] Contr. U. S. Nat. Herb. **8**: 66. 1903.

[2] Loc. cit.

[3] Civ. Nat. Hist. Jam. 200. 1789.

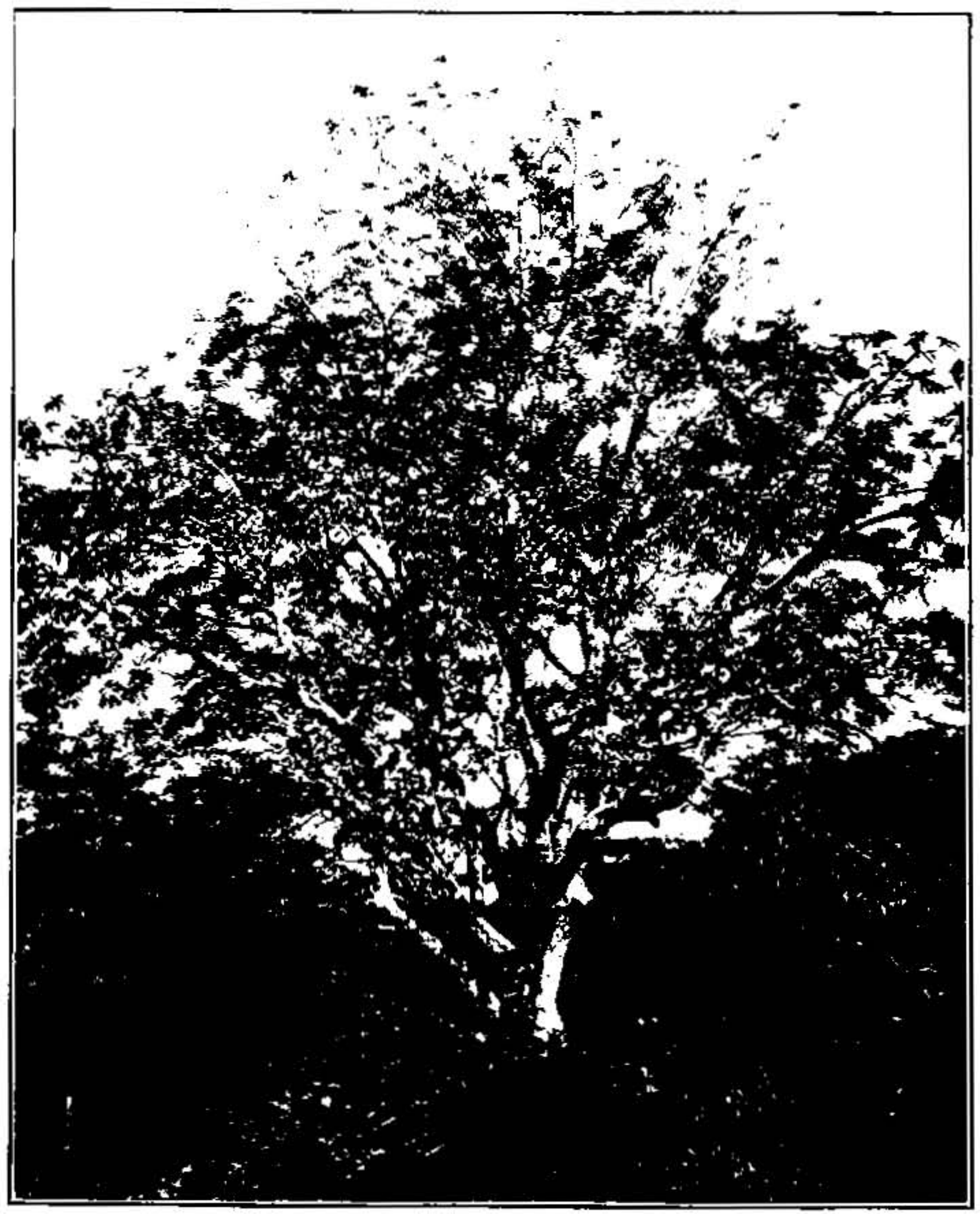
[4] In Urban, Symb. Antill. **5**: 97. 1904.

[5] In the course of my recent investigation of the flora of Panama, I discovered a remarkable variety of this species at Patiño, on the southeastern shore of San Miguel Bay. The tree is rather small, not reaching over 8 meters high; the trunk is straight and the branching divaricate, almost horizontal, with the lower limbs drooping; the crown, the lower part of which is only about 1.5 meters above the ground, is regular and oblong-elongate. The tree was loaded with fruits, *these forming dense clusters at the end of the branchlets*. The peduncles are 1.5 to 2 meters long; the berries themselves not over 4 cm. in diameter and 3.5 cm. long, globose-depressed in shape; the scaly skin is gray, the mesocarp greenish yellow, and the seeds, usually 5 to 7 in number, *always without rostrum*. According to the information obtained at the place, the tree is commonly found in the surrounding woods, and goes under the name of "níspero de monte."

[6] Pflanzenfam. **4**[1]: 197. 1889.

[7] Stirp. Amer. 58. 1763.

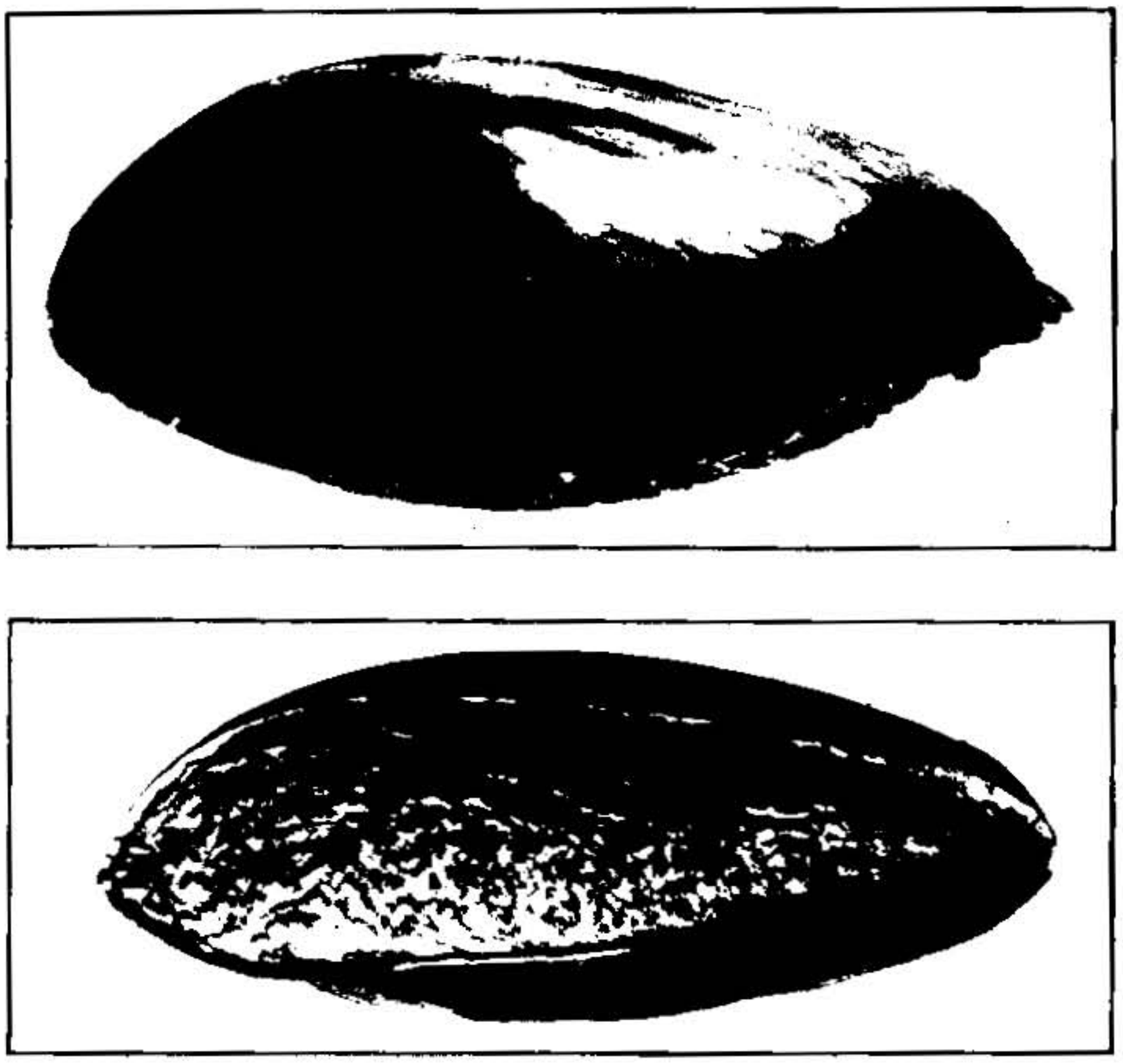
A.



B.

A, B. Calocarpum mammosum (L.) Pierre.

Plate 48.



A. SEEDS OF CALOCARPUM MAMMOSUM (L.) PIERRE.

B. CALOCARPUM MAMMOSUM (L.) PIERRE.

common article of consumption, I investigated a large number of specimens and found the seeds to vary usually in number from 0 to 5.

Mr. G. N. Collins, who has paid special attention to the fruits from the economic standpoint in his travels in Central America and the West Indies, has brought back specimens of three types. An ovate and small type (5 to 6 cm. long, 4 cm. in diameter) seems to be commonest; another, observed in Jamaica, assumes a more spherical shape (diameter about 8 cm.) and is considerably larger; while a third, from Oaxaca (Mexico), has just the shape and dimensions (5 cm. high, 8 cm. in diameter) of an ordinary apple.

The naseberry or sapodilla is regarded by many as one of the best tropical American fruits. The skin is thin, the meat reddish, somewhat milky, melting, and sweet, with a peculiar flavor. If picked at the right time and handled carefully, this fruit will keep from 8 to 12 days, and there is no reason why it could not reach our markets. Moreover, the broad altitudinal range of the tree above mentioned, that is, between 0 and about 2,800 meters, leads to the supposition that there are well-differentiated and hardy mountain varieties that could be made to grow and bear fruit farther north in the United States than Florida and southern California, where the Cuban and Mexican kinds have been tried with encouraging results.

The sapodilla tree has a further importance as being the source of the "chicle" or chewing gum of commerce. That substance is the condensed latex of the tree and is extracted on a large scale in the forests of Tabasco and Chiapas, whence it is shipped, mainly to this country. The sapodilla wood is of fine texture, hard, and reddish, with darker veins, and is of current use in the building of the native carts. The infusion of the bark is sometimes administered as a febrifuge, while the seeds are said to be diuretic and very effective also in the cure of certain diseases of the bladder. According to other information, however, the first is only a poor substitute for quinine, and the use of the seeds can provoke serious accidents.

On account of the sweetness of its fruits, the sapodilla tree attracts many guests of the animal kingdom, such as birds, bats, squirrels, and others. Jacquin gives a lively description of the struggles that go on under its dense cover, the frugivorous hokkoes, wild turkeys, and other fowls being an easy prey to carnivorous enemies, not excepting the native hunter.

EXPLANATION OF PLATES 46, 47.—Pl. 46, from a photograph taken by C. B. Doyle at Cali, Colombia. Pl. 47, from photographs taken by Doyle in Washington. The seeds in the lowest row are from the tree referred to in footnote 5, page 80. Both natural size.

Calocarpum mammosum (L.) Pierre in Urban, Symb. Antill. **5**: 97. 1904.

PLATES 48–51. FIGURES 83, 84.

Achras mammosa L. Sp. Pl. ed. 2. 469. 1762.
Sideroxylum sapota Jacq. Enum. Pl. Carib. 15. 1762.
Lucuma mammosa Gaertn. f. Fruct. & Sem. **3**: 129. *pl. 203*. 1805.
Lucuma bonplandia H. B. K. Nov. Gen. & Sp. **3**: 240. 1818.
Vitellaria mammosa Radlk. Sitzungsb. Math.-Phys. Akad. München **12**: 296, 316, 325. 1882.
Calospermum mammosum Pierre, Notes Bot. Sapot. 11. 1890.
Achradelpha mammosa Cook, Journ. Washington Acad. Sci. **3**: 160. 1913.

A large tree, 10 to 30 meters high, lactiferous, deciduous, with an erect, usually short, trunk, the crown either spreading and rounded-depressed or narrow and elongate. Ramification dichotomous. Bark reddish brown, shaggy. Branchlets thick, densely tomentose at first, then subglabrous.

Leaves caducous, petiolate, clustered at the terminal, newest part of the branchlets. Petioles 2 to 5 cm. long, broad, flattened, and tomentose at the base, more or less rounded, subcanaliculate, and more or less hairy toward the blade. Leaf blade obovate to oblanceolate, long-cuneate at the base, rounded to acute at the tip, 10 to 30 cm. long, 4 to 10 cm. broad, light green above, paler or brownish beneath, quite glabrous or slightly pubescent on the costa and primary veins on both sides; margin entire;

nervation impressed above, prominent beneath; primary veins 14 to 25 on each side of the main nerve.

Flowers pedicellate or subsessile, in numerous glomerules of 2 to 6, inserted in the defoliate axils of the penultimate growth. Pedicels 1 to 3 mm. long, hairy-tomentose. Sepals about 9 (8 to 10), imbricate, increasing gradually in size from the exterior, basal one to the innermost, 2.5 to 6 mm. long, 3.5 to 6.5 mm. broad, but the exterior much broader than long, the interior almost round, all more or less contracted at the base, emarginate or bilobate at the tip, appressed-hairy outside, smooth inside, the larger ones with a smooth, scarious margin. Corolla 9 to 10 mm. long, sallow white, 5-lobate; tube glabrous; lobes more or less imbricate, slightly longer than the tube (about 5.5 mm. long), ovate, rounded and obscurely emarginate or dented at tip, silky-hairy on the back but with a glabrous marginal zone, ciliate. Staminodes 3 to 4 mm. long, rather narrow, short-pubescent. Stamens 5, glabrous, inserted slightly lower than the staminodes; filaments attenuate, 4.5 to 5 mm. long, subulate and incurved at tip; anthers elliptic-ovate, inserted a little below the middle, at first erect and then reversed; connective slightly exceeding the tip of the anther. Pistil clavate, about 9 mm. long; ovary stiff-hairy, the cells normally 5, but more or less obliterated; style conical-elongate, smooth or obscurely 5-sulcate, slightly shorter than the corolla, obtuse at tip.

FIG. 83.—Floral details of *Calocarpum mammosum*. *a*, Outer sepal; *b*, staminode; *c*, stamens; *d*, pistil. All scale 3.

Fruit a large, monospermous, almost sessile berry, varying from globose to almost fusiform, rounded at base, more or less acute at the apex, 8 to 20 cm. long, 6 to 12 cm. in diameter; skin rather thin (1 to 2 mm.), cinnamon brown, rugose-paleate; mesocarp thick, fleshy, reddish or pinkish. Seed large (about 8 cm. long), fusiform-depressed, shiny, of a pale or yellow brown color except the umbilical area, this white, rugose, narrowly elliptic-acuminate in form, extending from one end to the other of the ventral side.

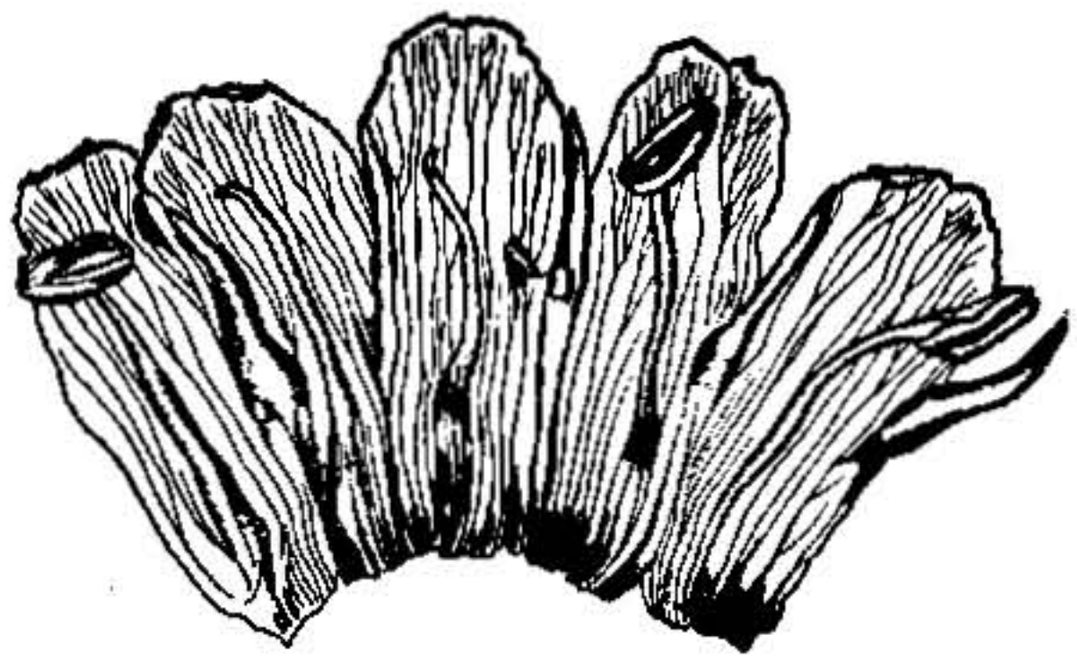


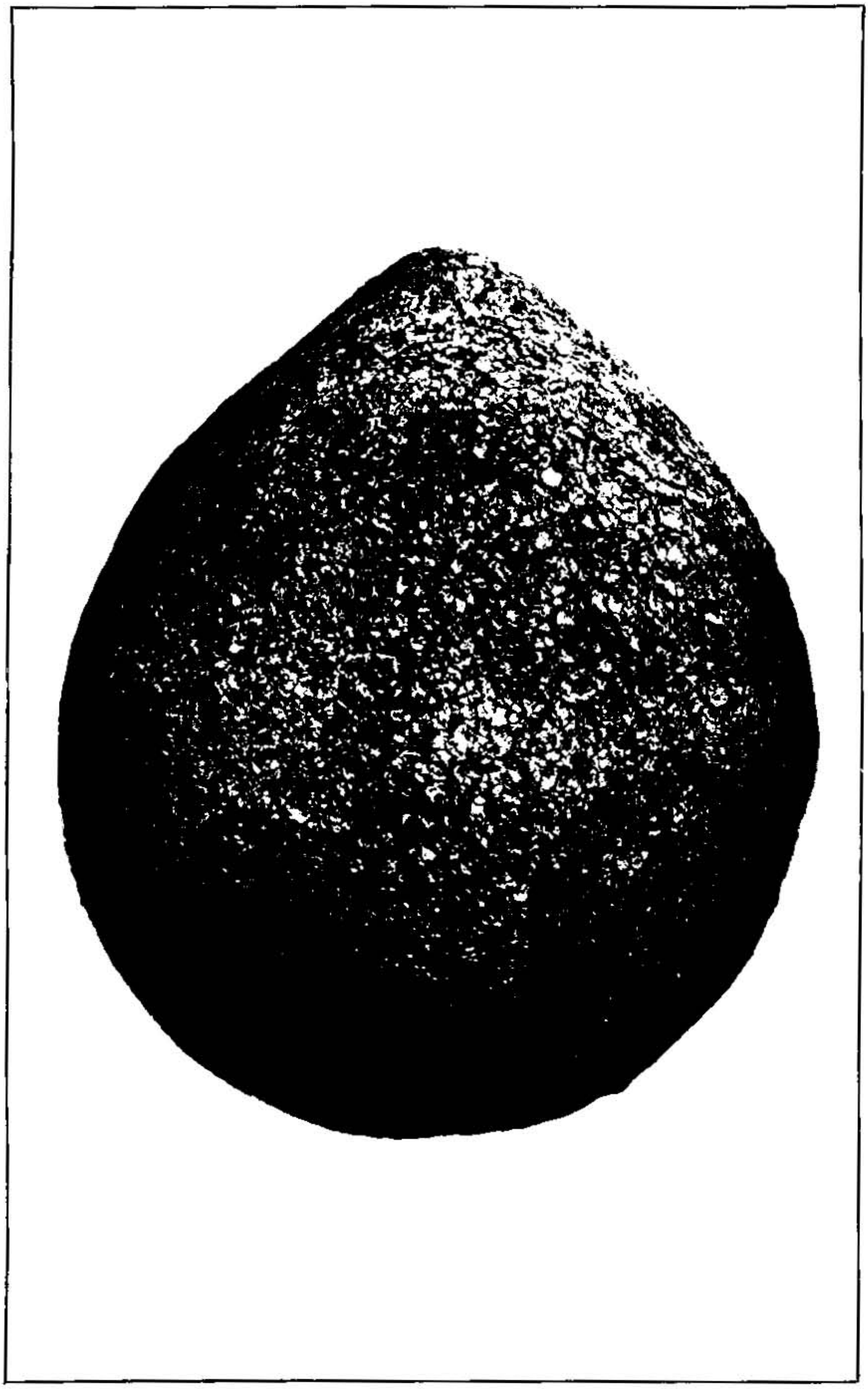
FIG. 84.—Spread corolla of *Calocarpum mammosum* with stamens and staminodes. Scale 3.

COMMON NAMES: West Indies, sapote, mamee-sapote, marmalade fruit (English). Martinique, Guadeloupe, *zapotte, grosse zapotte, zapotte á crême* (French). Cuba, *mamey, mamey zapote* (Spanish). Mexico, Central America, Colombia, Ecuador, *zapote* (Spanish). Mexico, *tzapotl* (Nahuatl); *tsapas sabani* (Zoque). Yucatan, *zapote mamey* (Spanish); *haaz, chacal haaz* (Maya). Venezuela, Colombia, Ecuador, *mamey colorado* (Spanish). Guatemala, *sal-tul* (Kekchí); *tul-ul* (Pokomchí); *chul* (Mame); *chul-ul* (Jacalteca). Costa Rica, *bko* (Cabécara); *kurók* (Bribrí); *kóm-kra* (Brunka); *fiú* (Térraba). Panama, *oa-bo* (Guaymi).

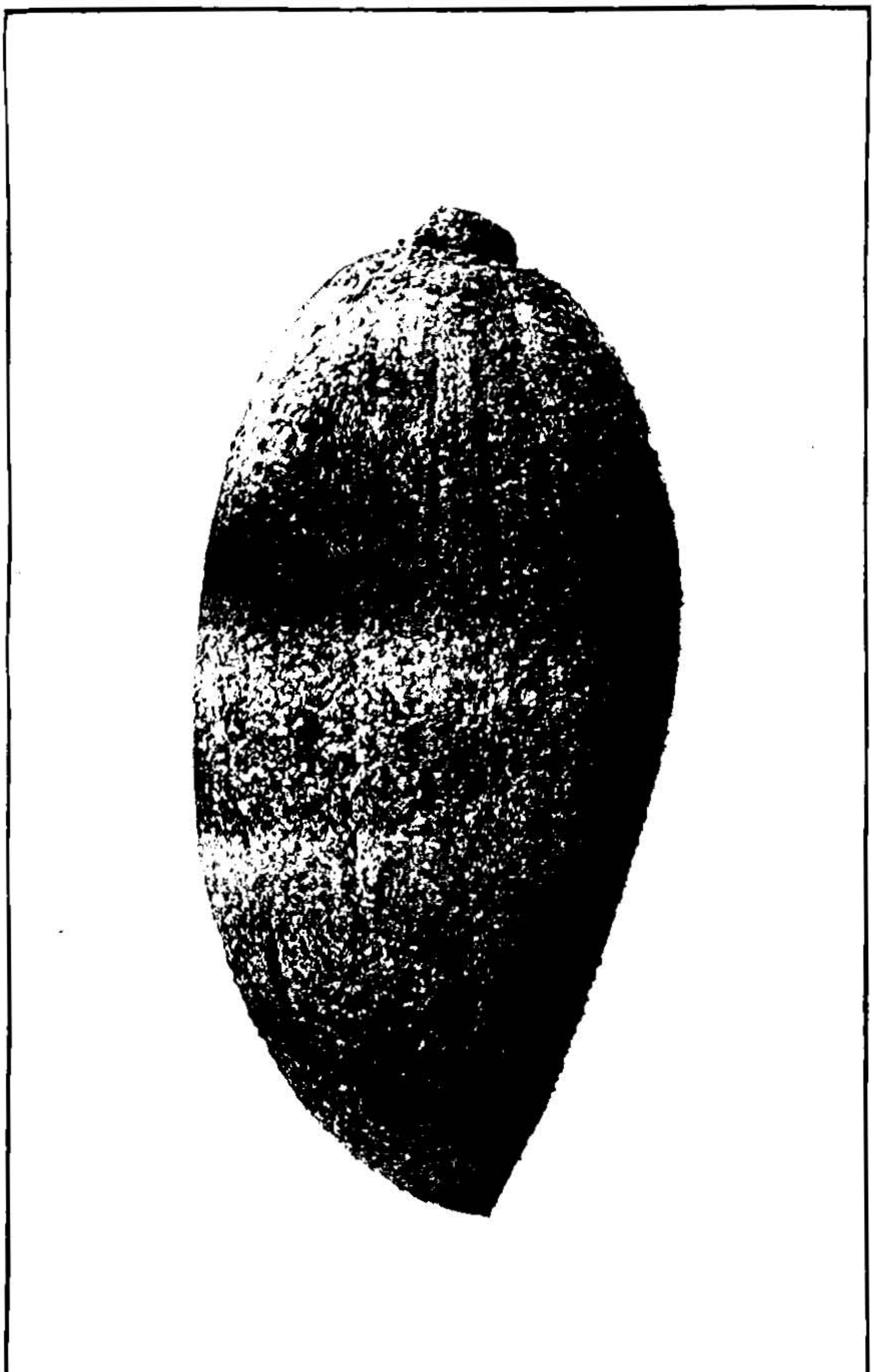
The shape of the leaves and fruits, the degree of pubescence of the former and of the flower, the number of the segments of the calyx, etc., are characters which, though subject to variation, have been taken as ground for creating several varieties. The constancy of these it is difficult to prove on account of the scarcity of adequate specimens in most herbaria.

The specimens which I have investigated do not quite agree with the description of Pierre's genus Calocarpum in Urban.[1] Thus, among 15 flowers from 4 distinct

[1] Symb. Antill. **5**: 97. 1904.



FRUIT OF CALOCARPUM MAMMOSUM (L.) PIERRE.



FRUIT OF CALOCARPUM MAMMOSUM (L.) PIERRE.

localities in Central America and the West Indies, 9 were found to have 9 sepals, while 4 had 10 and 2 only 8. The normal number seems to be 9, though Pierre gives 4 to 7 such divisions. The stamens were found to be generally inserted a little lower than the staminodes, indicating that they belong to the inner whorl of the androecium. The stigma is seldom distinctly or even obscurely radiate, the style ending simply in an obtuse point.

Has *Calocarpum mammosum* ever been found in a truly wild state by botanical collectors? It is one of the principal fruit trees in its area and as such belongs rather to the class of semicultivated plants, like *Bixa orellana*, *Mammea americana*, *Persea gratissima*, *Crescentia cujete*, and others. De la Maza [1] indicates it as cultivated in Cuba, and Cook and Collins [2] say it is rare in Porto Rico. While the product of the cacao tree was highly prized by the Mexicans and constituted the usual beverage among the nobility, Peschel [3] reports that the peoples of Central America, among them principally the Chorotegas, gave the preference to the zapote, which was generally cultivated for a similar use. And again, Juarros [4] informs us that the *sapuyul*, or kernel of the zapote seed, was one of the main exchange products of the people of Suchiltepequez, in Guatemala, at the end of the eighteenth century. According to Mr. G. N. Collins [5] the peeled kernels of the same seeds are still offered for sale in the markets of the Isthmus of Tehuantepec. In Nicaragua, Costa Rica, and Panama the zapote tree is often met with in the forests, in isolated specimens, but almost always in places that are known to have been formerly inhabited by man.

Notwithstanding the lack of evidence as to the existence of *Calocarpum mammosum* in the wild condition, it seems that it must be considered a native of Central America. The showy appearance and cleanliness of the seeds may have helped in some wise in the dissemination of the tree. In Santa Marta (Colombia) I have seen them carried as a curiosity by the Indians of the mountains, who did not seem to know the tree and had no name for it, although they readily assimilated it to their own "manzana" (*Lucuma argoacoensis* Karst.).

The reddish zapote wood is said by Grosourdy [6] to be fine-grained, compact, hard, and apparently suitable for cabinetwork. The supply, however, would always be very limited, as the tree is rather protected by the natives on account of the fruit. Besides, it usually forks very low, so that trunks of any good length are seldom available.

The fruit has a thick, juicy mesocarp, of a reddish or pinkish color, and a little sticky on account of the latex it contains. The flavor is sweetish, with a peculiar squashy strain, quite delectable if we believe some Spanish authors, but not generally to the taste of foreigners. This strain might, however, be removed or improved by

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[1] Gomez de la Maza, Manuel. Nociones de Botánica sistemática. 76. 1893.

[2] Contr. U. S. Nat. Herb. **8**: 178. 1903.

[3] Peschel, Oscar. Geschichte des Zeitalters der Entdeckungen 513. 1858. The Sapota Äpfel here referred to are the fruit of *Achras zapota*.

[4] Juarros, Domingo. Historia de la ciudad de Guatemala, edición del Museo guatemalteco 23. 1857. As the note here referred to is a very interesting addition to the economic history of the zapote tree, it is well to reproduce it in whole:

"*Sapuyul* es la almendra del zapote, fruta como de medio pié de largo: la almendra tiene de dos á tres pulgadas: se halla dentro de una cáscara, como la de la avellana; sobre ella hay una médula de color encarnado, tan hermosa á la vista como deleitosa al gusto, y encima de esta una corteza un poco dura. Los Indios y gente pobre se sirven del sapuyul para hacer chocolate, mezclándolo con cacao: es tanta la abundancia de zapotes en esta provincia, que botan la fruta, por cojer el sapuyul, y éste tiene tal consumo, que solo en la plaza de Quezaltenango se venden de cuatro á cinco mil pesos de dicha almendra al año."

[5] Manuscript notes.

[6] Grosourdy, René de, M. D. El Médico botánico criollo **2**: 398. 1864.

appropriate selection and culture. That same mesocarp can also be turned into an excellent marmalade, or into jelly, and although the fruit does not yet seem to have met with any great favor in our markets, it is not altogether without importance among tropical fruits.

The seed contains a large, oily almond, which has a strong smell and a bitter taste. According to de la Maza [1] it has stupefying properties. Grosourdy calls it a diuretic, and in Costa Rica the oil is used in the treatment of persistent catarrhal complaints, while the whole almond, finely ground, is made into an exquisite confection.[2] Moreover, as seen above, it seems to have been extensively used, and is still used on a small scale, in conjunction with cacao, in the preparation of the current beverage of the natives of Central America. It is called "sapuyul" (Nahuatl *tzap-ullul*, i. e., zapote resin or gum?). According to Mr. G. N. Collins (MS. notes), the Kekchi Indians of Verapaz still use it in the preparation of a drink, in conjunction with cacao and parched corn; it imparts a bitter taste to the beverage. These Indians gather all the seeds they find along the trail; the almonds are first boiled, then roasted and grated. As a historical memorandum, we may also mention that during the first half of the nineteenth century the same seed was still used in Costa Rica in lieu of the present iron to smooth starched white linen.[3]

EXPLANATION OF PLATES 48-51.—All from photographs taken by G. N. Collins in Guatemala, except 49, A; this taken by C. B. Doyle in Washington. Seeds and fruits natural size.

Calocarpum viride Pittier, sp. nov. PLATES 52–54. FIGURES 85, 86.

A tree similar in appearance to *C. mammosum;* branchlets erect, thick, glabrous, or subglabrous and shaggy-verrucose on older growth, densely ferruginous on the newest parts.

Leaves petiolate, densely clustered at the ends of the floriferous branchlets, scattered and irregularly alternate along the sterile shoots. Petioles 2 cm. long, rather thick, broader at the base, subcanaliculate, grayish or ferruginose-tomentose. Leaf blades 10 to 25 cm. long, 5 to 7 cm. broad, usually oblanceolate but sometimes rounded at the tip, long-cuneate or cuneate-rounded at the base, glabrous above, except on the main nerve, here more or less hairy, white and filmy-tomentose beneath; margin entire or obscurely sinuate; nervation impressed above, prominent beneath; primary veins 15 to 21 on each side.

FIG. 85.—Part of corolla of *Calocarpum viride* with stamens and staminodes. Scale 3.

Flowers short-pedicellate, in numerous glomerules of 2 to 5 in the defoliated axils, or single or geminate in the axils of the lower leaves. Pedicels 1 to 3 mm. long, ferruginose-tomentose. Sepals 9 (sometimes 10), imbricate, more or less rounded, subapiculate, 2 to 4 mm. long and broad, the exterior ones smaller, thicker, and densely hairy, the interior ones larger, moderately hairy except on the right margin, covered in the imbrication. Corolla 10 mm. long, pinkish or sallow white, the broad tube pubescent, about 5 mm. long; lobes about 5 mm. long, broadly ovate-rounded, silky on the back and very shortly ciliate on the margin. Staminodes pubescent, 2.5 mm. long, rather broad, contracted or attenuate at the tip. Stamens glabrous; filaments 2.5 mm. long, subulate; anthers ovate, with the connective more prominent than in *C. mammosum*. Pistil clavate, 7 to 9 mm. long; ovary ovoid, covered, together with the base of the style, with stiff brownish hairs; style obscurely 5-sulcate and slightly thickened at the apex, which is often distinctly 5-lobulate.

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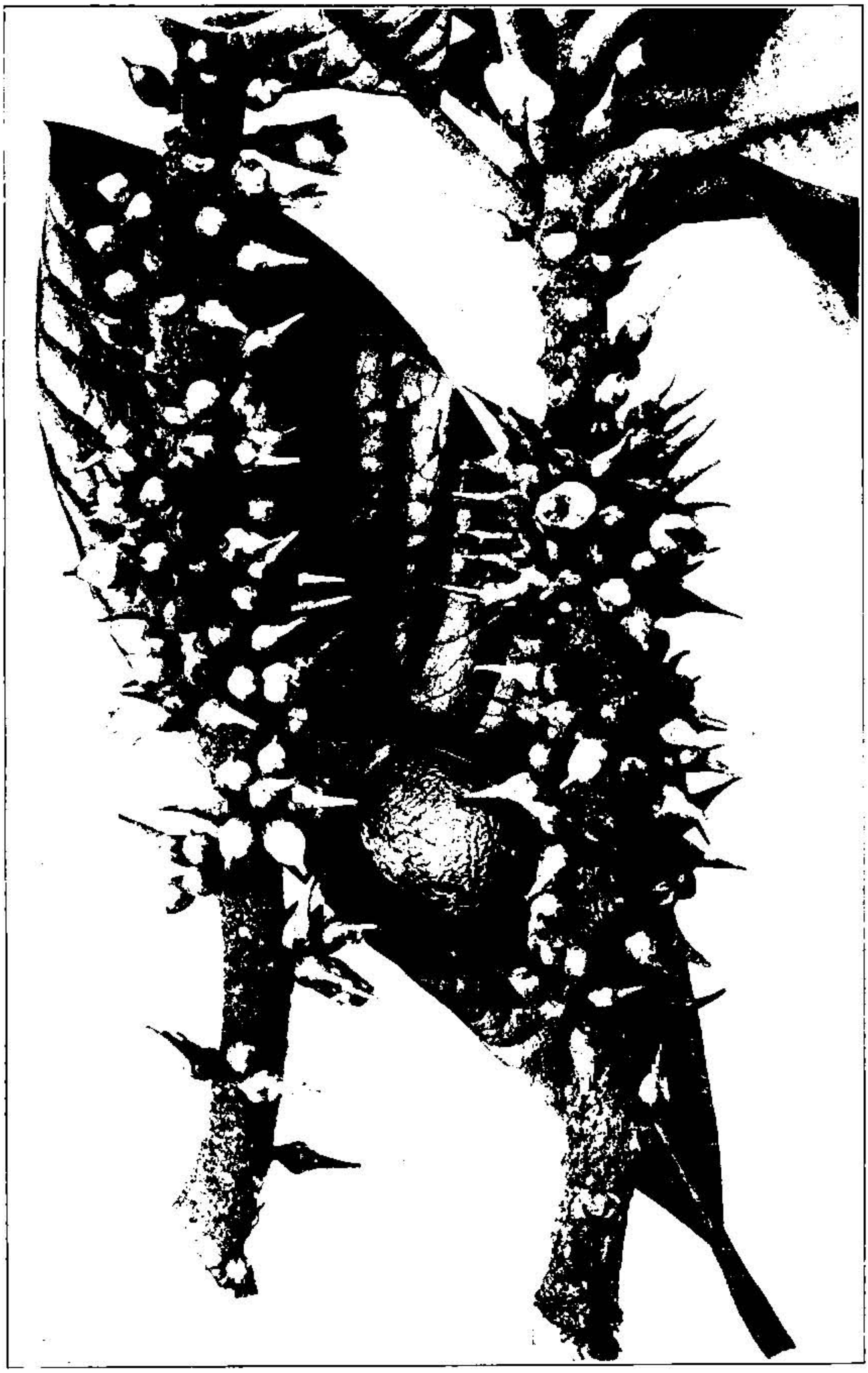
[1] Nociones de Botánica Sistemática 76. 1893.

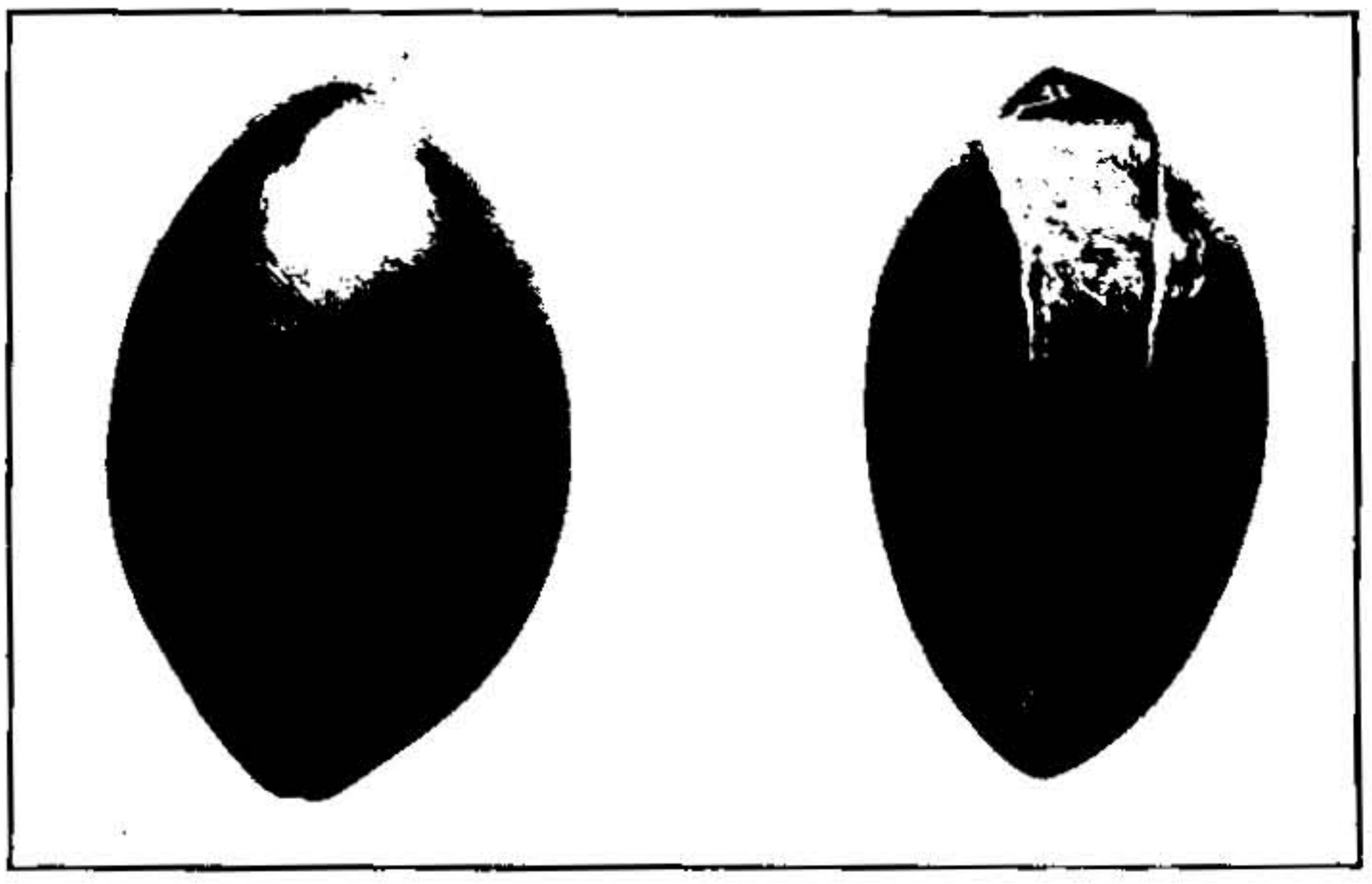
[2] Pittier, H. Plantas usuales de Costa Rica. 141. 1908.

[3] Pittier, loc. cit.

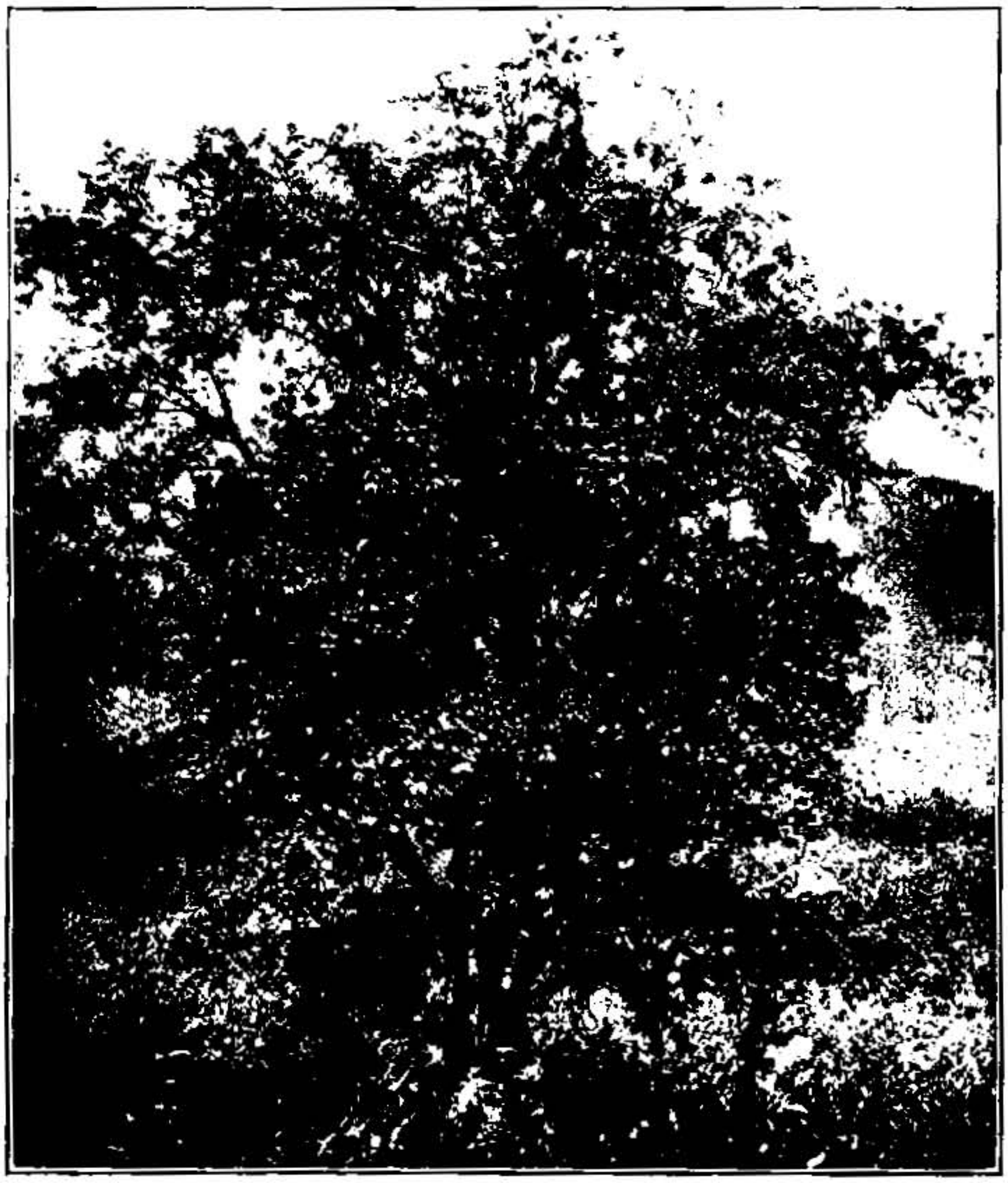


CALOCARPUM VIRIDE PITTIER.

FRUIT AND SEEDS OF CALOCARPUM VIRIDE PITTIER.



A. SEEDS OF CALOCARPUM VIRIDE PITTIER.



B. CALOCARPUM VIRIDE PITTIER.

Fruit varying from subglobose to ovoid, always pointed at the apex, and sometimes also at the base, 9 to 10 cm. long, 6.5 to 8 cm. in diameter, 1 or 2-seeded; skin thin, smooth, olive green, more or less covered with russet dots or lines. Seeds 4.5 to 6 cm. long, 2.3 to 3.7 cm. in diameter, olive-shaped, pointed at both ends, apiculate near the hilum end of the umbilical area, distinctly carinate, light brown and polished; umbilical area obovate-elongate, broader at the hilum, reddish and almost smooth.

Type in the U. S. National Herbarium, no. 860323, collected at Cobán, Alta Verapaz, Guatemala, August 6, 1910, by O. F. Cook (no. 214). Besides the type sheet there is a second sheet in the National Herbarium of the same collection, and another from near the Finca Sepacuité, Alta Verapaz, March 26, 1902, *Cook & Griggs* 183, with a photograph (no. 184).

COMMON NAMES: Guatemala, *ingerto*. Costa Rica, *zapote*. Honduras, *zapotillo calenturiente*.

This species, which curiously enough seems to have hitherto escaped the attention of botanists, is closely related to *Achras mammosa*, differing, nevertheless, by the smaller leaves, downy and white beneath, the smaller and differently shaped sepals, the shorter staminodes and stamens, the latter with broadly ovate anthers, and above all the comparatively small, green, and thin-skinned fruit and the smaller, ovate seed. Morelet[1] calls it *Lucuma salicifolia*, but there can be no possible confusion with that Mexican species of Humboldt and Bonpland.

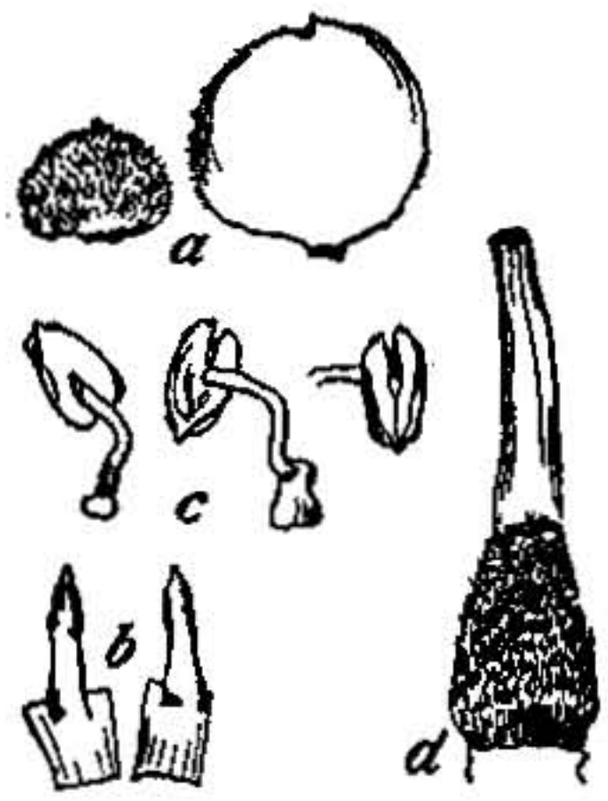


FIG. 86.—Floral details of *Calocarpum viride*. *a*, Sepals, exterior and interior; *b*, staminodes; *c*, stamens; *d*, pistil. All scale 3.

Calocarpum viride is known so far only from Guatemala (where it seems to be rather frequent in Alta Verapaz), from Honduras, and from Costa Rica. It is likely to be found in all the intervening region. The common name "ingerto" suggests some kind of crossing, or the result of budding, but there can be no doubt as to the tree being a good representative of the genus Calocarpum.

The fruit is superior in quality to the common zapote, the flesh not being so fibrous and being free from the squashy flavor that characterizes the latter. It seems to keep pretty well and the skin, although thin, is not easily broken in transportation. The *ingerto* is often seen in the markets of Guatemalan towns and seems to be a favorite with the people; it is rarer in Costa Rica.

EXPLANATION OF PLATES 52–54.—All from photographs taken by G. N. Collins in Guatemala, except 54, A; this from one taken in Washington by C. B. Doyle. All natural size, except 54, B.

Lucuma salicifolia H. B. K. Nov. Gen. & Sp. 3: 241. 1818.

PLATES 55, 56. FIGURE 87.

Richardella salicifolia Pierre, Notes Bot. Sapot. 20. 1890.

Section Rivicoa. A small tree, about 8 meters high and 25 cm. in diameter (R. S. Williams in sched.). Young twigs sparsely pubescent.

Leaves alternate, crowded at the ends of the branchlets, petiolate, entire, perfectly glabrous. Petioles 1 to 1.5 cm. long, broadly canaliculate. Leaf blades 9 to 18 cm. long, 3 to 4 cm. broad, lanceolate, acute at the base, narrowing into an obtuse tip, light green above, paler beneath. Margin slightly revolute. Nervation distinct on both faces, more salient beneath, 14 to 15 primary veins on each side of the costa.

Flowers green (Williams) or white, solitary or geminate in the axils of the leaves. Pedicels 9 to 12 mm. long, pubescent. Sepals 5, 5 to 6 mm. long, free, ovate, coria-

[1] Morelet, P. M. A. Voyage dans l'Amérique centrale, l'Ile de Cuba et le Yucatan 2: 152. 1858–75.

ceous, velvety outside, glabrous inside. Corolla broad, 10 to 11 mm. long, 5 or 6 lobed, pubescent outside, the margins minutely ciliate or denticulate; lobes ovate, equal in length to the tube, rounded at the tip. Staminodes 5, 3.5 to 4 mm. long, papillose, linear, rounded-obtuse at the end, alternating with and one-third shorter than the corolla lobes. Stamens 5, 2 to 3.5 mm. long, glabrous, inserted a little lower than the staminodes; filaments short, attenuate at tip; anthers extrorse, ovate or ovate-elliptic, slightly emarginate at base. Pistil about 10 mm. long; ovary rounded, 6-celled, densely hairy; style smooth; stigma obtuse, hardly distinct from the style.

Fruits fusiform, 1-seeded, 10 to 12 cm. long, 4 to 5 cm. in diameter, rounded at base with the persistent, 5-parted calyx attached, attenuate and rounded-obtuse at the tip (and often with a lateral stigmatic spot). Skin thick, leathery, smooth, yellow; pulp mealy, sweet, edible, the color and consistence of the yolk of a hard-boiled egg. Seed fusiform, 4 to 5 cm. long, 1.5 to 2 cm. in diameter, apiculate at the hilum end, light brown and polished outside the umbilical area, this broad, elliptic-elongate, neither impressed nor salient, whitish and almost smooth.

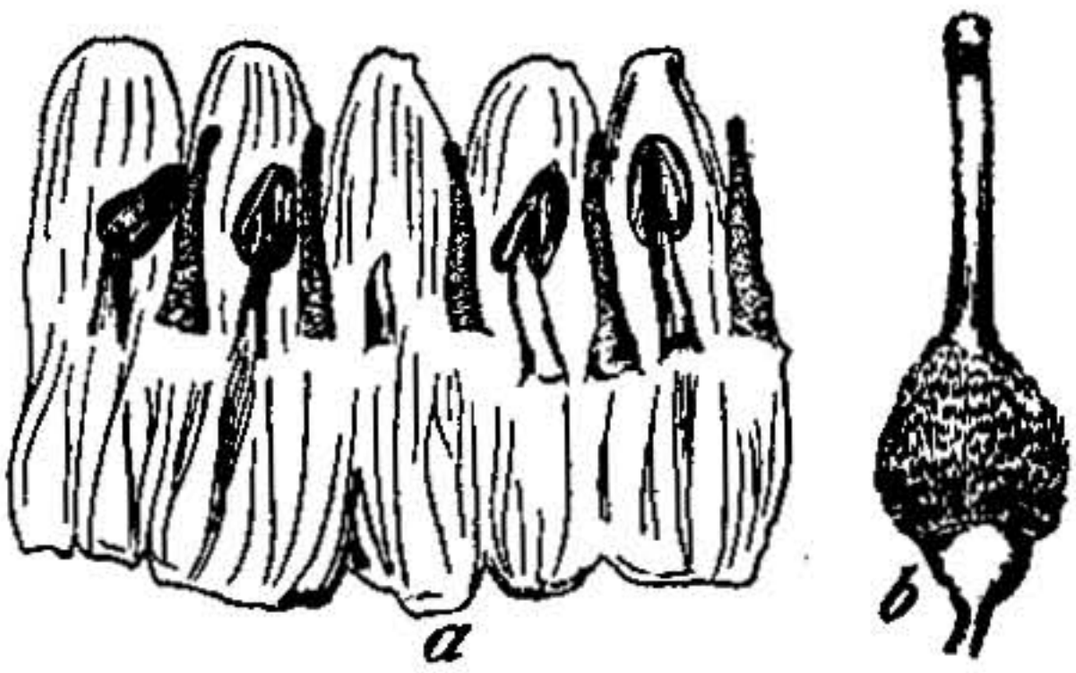


FIG. 87.—Floral details of *Lucuma salicifolia*. *a*, Opened corolla with stamens and staminodes; *b*, pistil. Scale 3.

Description based on the fine Costa Rican specimens sent by Mr. O. Jiménez Luthmer (no. 513).

MEXICO: The species was originally described from this country upon specimens or notes obtained from Cervantes by Bonpland. The fruit and seed are described and figured here probably for the first time. Safford (MSS. notes) reports it from Mexico City, Guanajuato, Oaxaca, Morelos, Guadalajara, and Michoacan. It is doubtful whether *L. palmeri* Fernald, a scrubby form collected in Acapulco, is really distinct.

COSTA RICA: Occasionally cultivated in the valley of San Jose, but never met with in a wild condition.

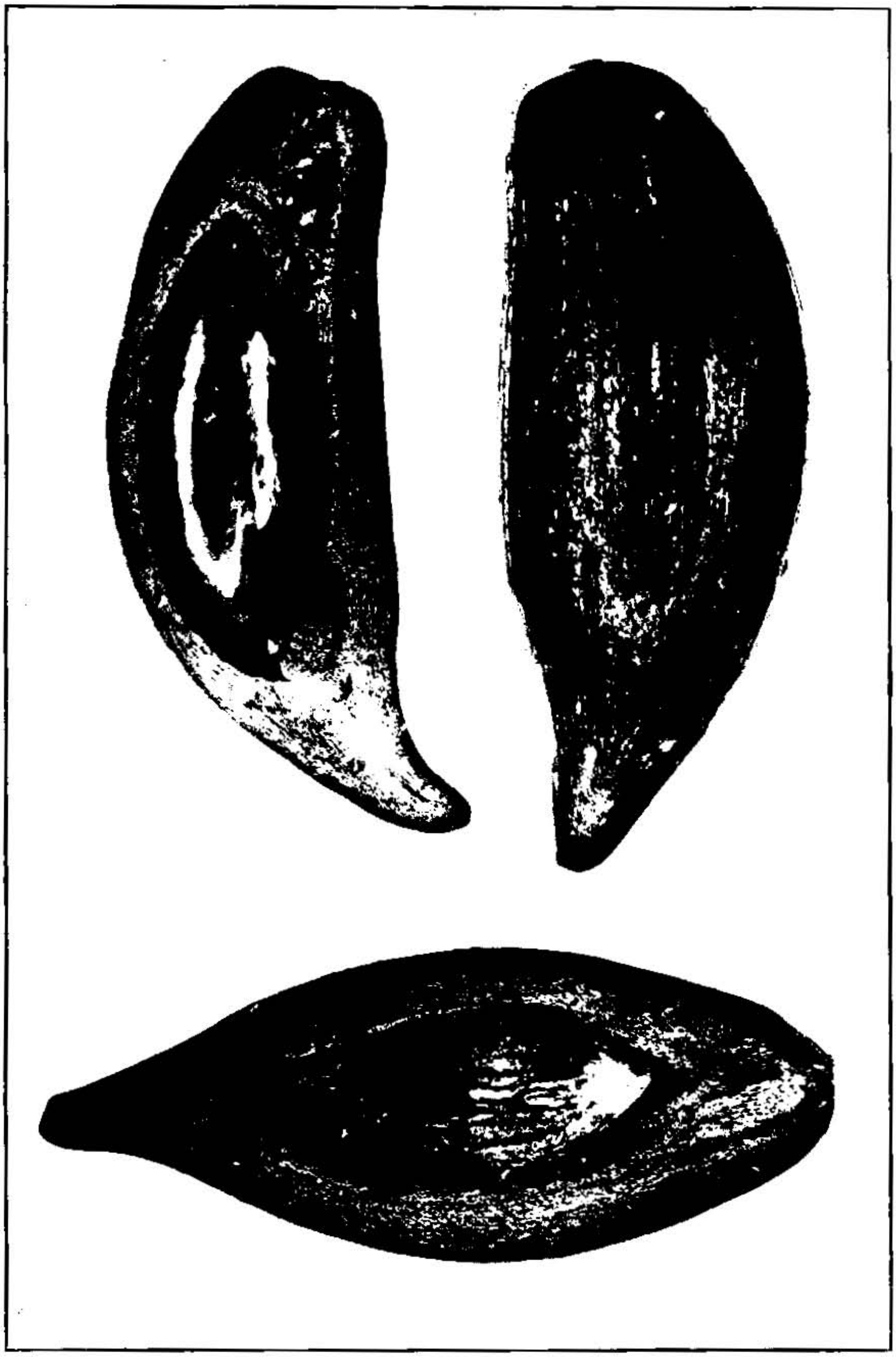
PANAMA: Vicinity of Penonomé, Province of Coclé, in the zone below 300 meters, flowers, between February 23 and March 22, 1908, *R. S. Williams* 56 (U. S. National Herbarium, no. 677891).

There is no indication as to the presence or absence of the species in the northern and middle part of Central America, but it is very likely to be met with in that intervening region.

COMMON NAMES: Mexico—Central Mexico and Guanajuato, *zapote borracho;* Oaxaca and Morelos, *zapote amarillo;* Guadalajara, *mamey de Cartagena;* Michoacan, *huicumo* (Safford). Costa Rica, *zapotillo*, *siguapa*, and *canistel*, the latter probably from "*canisté*," the Maya name for *Lucuma multiflora*.

This species seems to vary as to pubescence, number and disposition of flowers, etc., the only really constant characters being those shown by the fruit and seed. In the absence of these it is likely that several forms of *L. salicifolia* have been described as distinct species.

EXPLANATION OF PLATES 55, 56.—From photographs taken by C. B. Doyle of alcoholic material from Costa Rica.



FRUITS OF LUCUMA SALICIFOLIA H. B. K.

SEEDS OF LUCUMA SALICIFOLIA H. B. K.