

STERCULIA XOLOCOTZII (STERCULIACEAE), A NEW SPECIES OF RAIN FOREST CANOPY TREE FROM THE ISTHMUS OF TEHUANTEPEC, MEXICO

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Abstract: The new species *Sterculia xolocotzii* represents the second native New World *Sterculia* species with palmately compound leaves to be described, the first being *S. mexicana* R. Br. *Sterculia xolocotzii* is known only from Mexico, where it has been collected in lowland rain forests of the Uxpanapa-Chimalapa region of Veracruz and Oaxaca and once in the Los Tuxtlas area of Veracruz. It can be distinguished from *S. mexicana*, with which it often grows, by habit, phenology, and numerous morphological characters. The morphology and ecology of *S. xolocotzii* are detailed, and the distribution and typification of *S. mexicana* are also discussed.

Resumen: La especie nueva *Sterculia xolocotzii* representa la segunda especie de *Sterculia* con hojas palmeado-compuestas que se describe para el Nuevo Mundo, siendo la otra *S. mexicana* R. Br. *Sterculia xolocotzii* se conoce solamente de México, donde ha sido colectada de las selvas de la región de Uxpanapa-Chimalapa en Veracruz y Oaxaca, además una vez de Los Tuxtlas, Veracruz. Se distingue de *S. mexicana*, con la cual frecuentemente se encuentra en forma simpátrica, por su hábito, su fenología, y diversos caracteres morfológicos. Se incluyen detalles sobre la morfología y ecología de *S. xolocotzii*, además se discuten la distribución y la tipificación de *S. mexicana*.

Keywords: *Sterculia*, Sterculiaceae, Uxpanapa, Chimalapa, Los Tuxtlas, Flora of Mexico

The pantropical genus *Sterculia* (Sterculiaceae), which includes about 43 species of trees in the Neotropics and a much larger number in the Old World (Taylor, 1989), has traditionally been treated as consisting of two species in Mexico: *S. apetala* (Jacq.) G. Karst., a widespread Neotropical species with simple, lobed leaves, and *S. mexicana* R. Br., the only previously described native Neotropical species with palmately compound leaves. (The Old World species *S. foetida* L., also with palmately compound leaves, is widely cultivated the Neotropics.) *Sterculia mexicana* has been treated *sensu lato* as ranging from Mexico through Costa Rica (see Taylor, 1989). Field work by the first author in the Uxpanapa-Chimalapa region of the Isthmus of Tehuantepec in

Veracruz and Oaxaca, Mexico, has revealed that two quite distinct compound-leaved *Sterculia* species occur in this area. One of these represents typical *S. mexicana*, while the other is herein described as new. The second author has written a monographic dissertation on the Neotropical species of *Sterculia* (Taylor, 1989) and has concluded that the *S. mexicana* complex consists of five distinct species, of which three occur in Mexico. One of these is the species described below; the three other new species will be published by the second author in a separate article.

Sterculia xolocotzii T. Wendt & E. Taylor,
sp. nov. (Figs. 1–4).

TYPE: MEXICO: VERACRUZ: Mpio. Minatitlán: 13.7 km al E de La Laguna sobre terracería a Uxpanapa, luego 3.8 km al N sobre camino nuevo (no completo) a Belisario Domínguez; afloramientos cársticos, selva perturbada, rodeada por acahual; 17°18'30"N, 94°23'W, 130 m, 7 Apr 1981 (fl, fr), T. Wendt, A. Villalobos, & I. Navarrete 3149 (holotype: MEXU!; isotypes: CHAPA!, ENCB!, F!, GH!, TEX!).

A *Sterculia mexicana* R. Brown habitu (> 15 m), foliis deciduis, foliolis ellipticis vel anguste ellipticis infra indumento sparse hirsuto (super nervis densis) praeditis, trichomatibus sessilibus stellatis, radiis sex ad octo rectis erectis, foliolis juvenibus hirsutis trichomatibus stellatis non glanduliferis, inflorescentiis paniculatis redactis dense hirsutis sine gemmis apicalibus persistentibus, basibus alabastrorum acutatis, ore calycis tubi non dense barbato, ovulis sex ad octo, et fructibus velutinis pilis aureospadiceis ex parte > 0.5 mm differt.

TREES to 40 m, diam. above buttresses to 90 cm., with large well-developed buttresses, developmental architecture conforming to Rauh's model (cf. Hallé et al., 1978). BARK creamy to gray-brown or coppery, with longitudinal lines of prominent lenticellar warts that with time become vertical furrows; slash ca. 10–14 mm thick in medium-sized trees, fibrous, pinkish, oxidizing slowly or rapidly to orange- or red-brown, the innermost layer yellowish; sapwood cream, fibrous. TWIGS 3–7 mm diam. at apex (non-flushing), prominently ridged, with dispersed stipulaceous bract scars, black-brown to gray, eventually glabrescent, with sticky transparent exudate when cut, when flushing gold to golden-red or brown velutinous; lenticels uncommon, scattered, same color as twig; terminal bud ovoid, 12–20 X 7–8 mm (resting). STIPULACEOUS BRACTS ("bud scales" of stipular origin; see discussion in Taylor, 1989) deciduous, triangular to ovate, slightly carinate, 13–27 X 7–10 mm, golden brown velutinous (more densely so abaxially), apex (sub)acuminate. LEAVES palmately compound, borne in a diffuse spiral; petiole 5–21 cm long [leaf dimen-

sions refer to mature leaves of fertile branchlets], slender, dark red to brown (dry), tomentose, lenticels obscured by indumentum, basal pulvinus weakly developed, apical pulvinus strongly developed, both same color as petiole, tomentose; leaflets 6–8(–9), petiolules 2–10 mm long; blades elliptic to narrowly elliptic, sometimes slightly obovate, outer ones 6.5–16 X 2.4–6.7 cm with length/width ratio 2.2–2.9, central ones 10–24 X 4–8.5 cm with l/w ratio 2.5–2.9, all coriaceous, olive-green (dry) on both sides, glabrous adaxially except subpersistently hirsute on parts of major venation, sparsely but evenly hirsute on blade (trichomes arising from finest venation) and densely hirsute on larger veins abaxially with reddish-golden sessile mostly 6–8-rayed stellate trichomes with straight erect rays to 0.5 mm long (somewhat appressed on midvein), blade base obscurely decurrent on petiolule, apex acute to acuminate, margin entire, undulate, venation eucamptodromous or distally brochidodromous, midvein raised on both sides, secondaries ca. 13–21 per side on outer leaflets, ca. 18–26 on central ones, arising at mostly 60–85°, often with scattered intersecondaries, raised on both sides, finer venation reticulate, finely raised at least below; expanding leaves densely canescent throughout. INFLORESCENCES reduced panicles of perfect and staminate flowers, maturing ca. synchronously, borne loosely erect at end of previous flush on flushing main shoots, from axils of fallen or soon-deciduous leaves, 3–10 per shoot, 11–25.5 cm long, all parts hirsute to canescent with many hairs > 0.5 mm long; secondary axes to 6 cm long, with 3–12 flowers; tertiary axes to 3 mm long; apical buds not persistent, bracts and bracteoles deciduous; flower buds obovate, distinctly gradually narrowed to a narrowly rounded base; pedicels 5–12 mm long, articulate near middle. CALYX pale creamy-yellow, tube velutinous externally with stellate hairs, interior never ribbed, red when fresh, with golden glands scattered

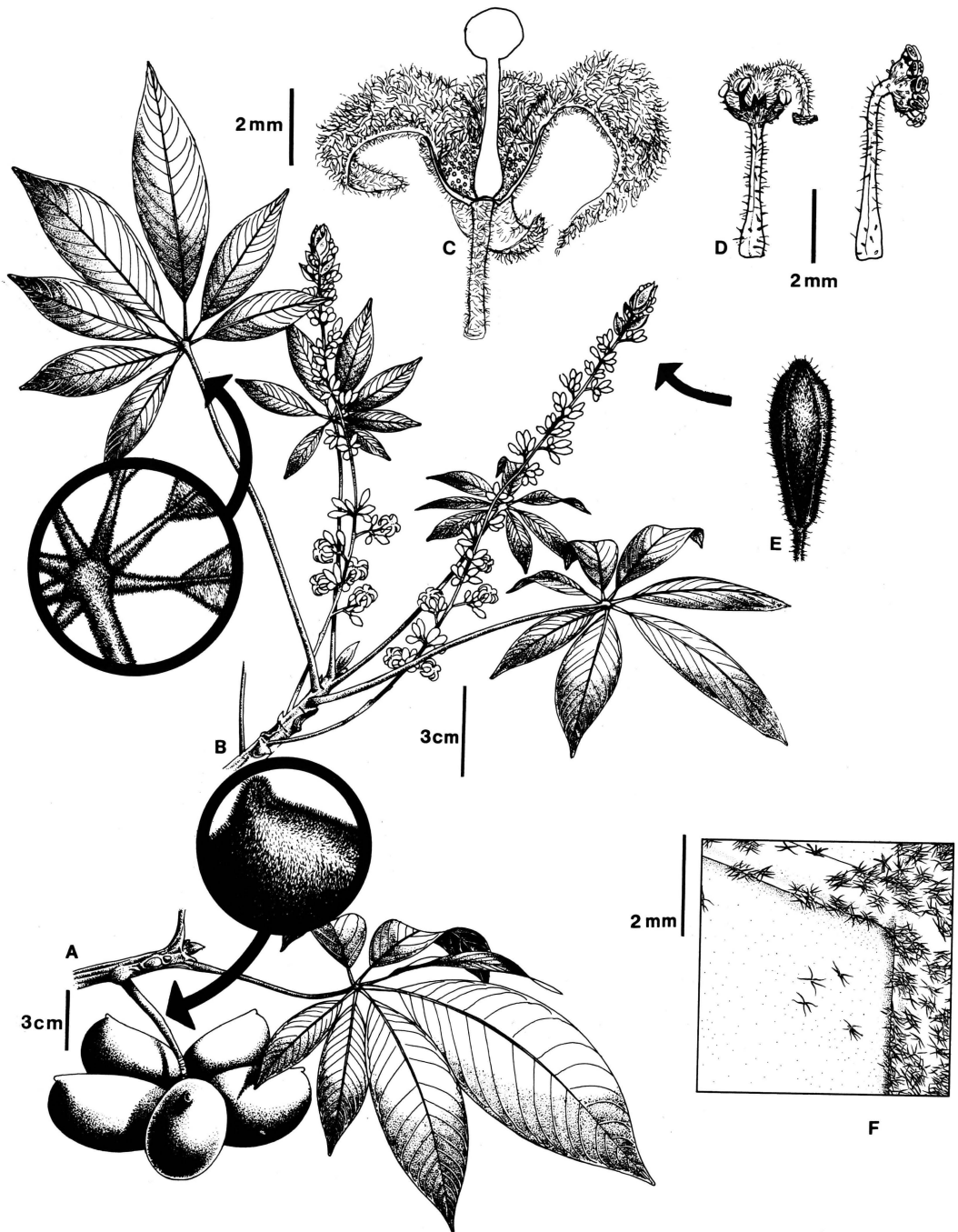


FIG. 1. *Sterculia xolocotzii*. A. Twig with fruit and mature leaf. B. Twig with young (flushing) leaves and inflorescences. C. Pedicel and calyx (central blank area corresponds to structures in D). D. Androgynophores and reproductive organs of perfect (left) and staminate flowers. E. Flower bud. F. Indumentum of abaxial surface of mature leaf. (A, F: *Wendt et al.* 4241; B-E: *Wendt* 3819). A, B, E drawn by Eduardo Merino; C, D, F by E. Taylor.

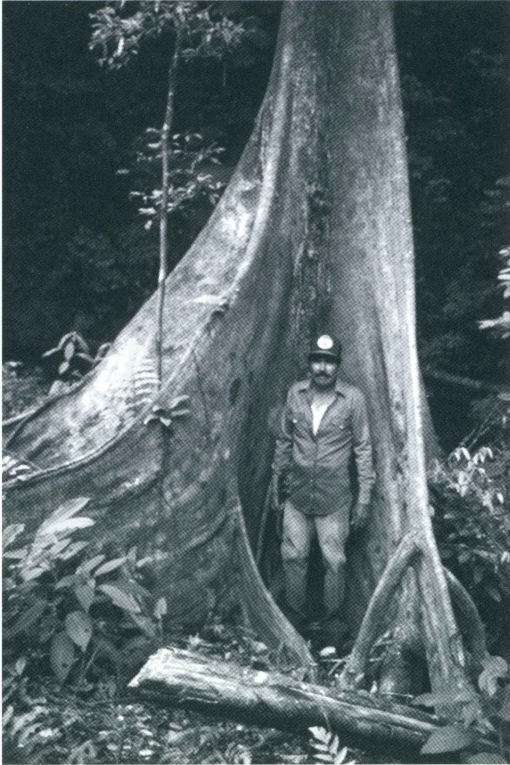


FIG. 2. *Sterculia xolocotzii*. Buttresses and lower trunk, with Agustín Montero. (Wendt et al. 4241).

throughout and with obscure golden papillae, distally densely beset with sessile 4–8-rayed stellate hairs with interlocking rays to 0.6 mm long, lobes curled or reflexed, linear, lacking appendages, tomentose like throat, with narrowly acute apex; staminate flowers with calyx tube 2–2.5 mm long, throat 2–2.5 mm wide, lobes 6.5–8 X 1.7–2.1 mm; perfect flowers with calyx tube 1.5–2.5 mm long, throat 2–2.5 mm wide, lobes 5–7.5 X 1.7–3 mm. ANDROGYNOPHORE symmetrically or asymmetrically expanded at base, filiform above, with short glands at base and apex and simple hairs at mid-axis, bright reddish-pink, in staminate flowers 5–5.5 mm long and curled or reflexed at tip, in perfect flowers 3–4 mm long, erect with the expanded apex covering the carpel bases. ANDROECIUM in staminate flowers ca. 2 mm in diam.

with 14–15 stamens, filaments very short or to ca. 0.7 mm long, glandular, thecae ca. 0.4–0.5 mm long, in perfect flowers with 6–13 stamens, thecae mostly 0.2–0.4 mm long. GYNOECIUM 1.3–1.5 X 1.7–2.2 mm, tomentose, style to 2.5 mm long, strongly recurved, stigma peltate, very obscurely 5-lobed, red, ovules (4–)6–8 per carpel. FOLLICLES slightly compressed laterally, 5–8 X 2–3.8 X 3.3–5.5 cm, golden-brown velutinous with erect hairs with many > 0.5 mm long, drying strongly finely ridged, beak ca. 5 mm long; wall to 6 mm thick, interior smooth, chartaceous, red, glabrous except for abundant pungent bristles ca. 1.5 mm long along suture, these easily deciduous. Seeds 4–8 per follicle, 1.6–1.9 X 0.8–0.9 cm.

ADDITIONAL SPECIMENS EXAMINED: MEXICO: Oaxaca: Mpio. Matías Romero, Colonia Cuauhtémoc, camino La Esmeralda - Río Escondido, 6 km. después de la desviación, 15 Nov 1985 (immature fr), Hernández P. & Sanchez M. 77 (CHAPA); Mpio. Matías Romero, 8.3 km al S de Esmeralda sobre camino al Río Verde, luego 0.3 km al E sobre camino al Río Escondido, 17°06'N, 94°47'W, 140 m, 2 Apr 1982 (fl), Wendt 3819 (CAS, CHAPA, ENCB, GH, TEX); Mpio. Matías Romero, Colonia Cuauhtémoc, Arroyo Azul (Agua Azul), ca. 5.5 km en línea recta al NNE del Aserradero Río Escondido, 17°07'N, 94°42'W, 120 m, 10 Apr 1986 (fl, fr), Wendt et al. 5260 (CHAPA, TEX); Mpio. Sta. María Chimalapa, Arroyo Chocolín, población de Nicolás Bravo, cerca del rancho de Agustín Montero, ca. 3–4 km al S de la población de Río Alegre (Veracruz), 17°10'30"N, 94°42'W, 150 m, 21 Oct 1983 (immature fr), Wendt et al. 4241 (CHAPA, ENCB, GH, TEX). Veracruz: Mpio. Jesús Carranza, Lomas al S del Poblado Dos (ca. 3 km al S del entronque de la terracería La Laguna-Sarabia con el camino que va al N al Pob. 2), 17°12'N, 94°39'W, 150 m, 8 Jul 1988 (immature fr), Wendt et al. 6065 (CHAPA); Mpio. San Andrés Tuxtla, Estación de Biología Tropical "Los Tuxtlas", U.N.A.M., 18°35'N, 95°05'W, 31 May 1978 (fl), Chavez L. & Torquebiau 613 (MEXU).

Sterculia xolocotzii is a rain forest canopy tree species known from the Uxpanapa-Chimalapa region along the Veracruz-Oaxaca border in the central Isthmus of Tehuantepec and from a single collection at the Los Tuxtles Tropical Biolo-



FIG. 3. *Sterculia xolocotzii*. Early stage of flowering, mature leaves of previous leaf flush still present. (Wendt et al. 5260).



FIG. 4. *Sterculia xolocotzii*. Full flowering and early leaf flush, inflorescences arising from axils of fallen leaves of previous flush. Figs. 3 and 4 are from the same tree at the same time. (Wendt et al. 5260).

gy Station, Veracruz, in the extreme northwest portion of the Isthmus. The Uxpanapa region may be loosely characterized as having two floristically different extant major lowland rain forest types: "karst forest," an edaphically drier, partly deciduous rain forest on eroded limestone substrates in the northern part of the region, and "hill forest" in the strongly hilly southern part (extending southward into the Chimalapa area) with very deep soils derived partly from sedimentary substrates but mostly from the granites and associated igneous rocks of the Sierra de Tres Picos to the south (see Wendt, 1997, for overview of the area). Between these two major forest types is a flat alluvial east-west strip several kilometers wide and over 100 kilometers long from which the original forest has been completely removed, the original nature of

that forest being somewhat unclear. In the Uxpanapa area, *S. xolocotzii* generally grows in canyons and along streams and lower slopes of the northern fringe of the hill forest area at 120–150 m elevation, associated with such canopy tree species as *Terminalia amazonia* (J. F. Gmel.) Exell, *Dialium guianense* (Aubl.) Sandwith, *Calophyllum brasiliense* Cambess., *Symphonia globulifera* L.f., *Ficus lapathifolia* (Liebm.) Miq., and *Dussia mexicana* (Standl.) Harms. It does not appear to extend southward into the "heart" of the hill forest, not having been found, for instance, in two 4–5-hectare tree study plots in that area (Vera-Caletti, 1988; Wendt, unpub.). However, *S. xolocotzii* has also been collected along the southern fringe of the karst forests bordering the central, deforested strip. This new species thus may

have been a component of the now-extirpated forests of the flat alluvial plain.

Within the context of the genus *Sterculia*, *S. xolocotzii* is considered deciduous in that all the leaves of one flush typically fall at roughly the same time before the next flush. Nevertheless, the tree does not remain leafless for an extended period, and at times a fair number of mature leaves remain on the tree as a new flush begins. Flowering, leaf flush, and the fall of mature leaves of the previous flush are all closely associated annual events that occur in the dry season, usually in early April (Figs. 3, 4). Perfect flowers are produced first in each inflorescence, followed by staminate ones. Since flowering is highly synchronous on a fertile shoot, at any one time a given group of inflorescences will usually be producing mostly one kind of flower. Very small fruits have been collected in July, full-sized but not dehiscent ones in October and November, and mature fruits in April with the flowers; fruits thus take a year or nearly so to mature.

The epithet honors Efraím Hernández Xolocotzi (1913–1991), outstanding student of Mexican botany and teacher of

Mexican botanists, whose numerous contributions ranged from taxonomy through vegetation classification to ethnobotany and indigenous agricultural systems and well beyond. He is much missed as a scientist and even more so as a teacher, mentor, inspiration, and source of pungent and colorful commentary on the human condition. His encouragement and advice were instrumental in the initiation of floristic and ecological studies in the Uxpanapa-Chimalapa area by the first author.

In the Uxpanapa region *Sterculia xolocotzii* is known as “apompo” or “apompillo” (for the similarity of the palmately compound leaves to those of the true “apompo,” *Pachira aquatica* Aubl.); it is also occasionally called “pepetaca” (a name used elsewhere in Mexico for *S. apetala*). The wood is pale yellow flecked with tan, medium textured, straight grained, and of high luster, and has been used in making veneer, as well as for more general uses, in the Uxpanapa region.

Sterculia xolocotzii differs from *S. mexicana sensu stricto* in numerous characters, of which the salient ones are included in the following key:

Large trees to 40 m tall, usually not reproductive when less than 15 m; leaflets when young densely canescent with stellate hairs, when mature abaxially sparsely hirsute on blade and densely so on veins; inflorescences appearing with the new leaves in a single annual flush, mature leaves generally absent or few at flowering; inflorescences hirsute to canescent with many hairs > 0.5 mm long; flower buds obovoid, distinctly tapered to a narrowly rounded base; throat and lobes of calyx tomentose adaxially throughout; fruit golden-brown to dull reddish, with dense tomentum including many hairs > 0.5 mm long. ***S. xolocotzii***

Small to medium-sized trees rarely exceeding 18 m tall, often reproductive at ca. 5 m; leaflets sparsely minutely glandular-puberulent when young but otherwise glabrous from the first; leaves produced more or less continuously, mature leaves always present at flowering; inflorescence closely granular tomentulose or puberulent with hairs < 0.1 mm long; flower buds ovoid or quadroid, the base truncate and nearly or quite as broad as the rest of the bud; throat of calyx and extreme bases of lobes densely barbate, lobes otherwise finely granular-puberulent; fruit bright red, with very fine tomentum of hairs 0.1–0.15 mm long. ***S. mexicana***

Both species occur in the Uxpanapa-Chimalapa rain forests, at times sympatrically. In this area, *Sterculia xolocotzii* is a canopy tree restricted to the habitat mentioned above at 120–150 m elevation, while *S. mexicana* is a common lower to mid-sto-

ry treelet or tree that occurs throughout the hill forests up to at least 750 m elevation and also in karst forest. Unlike *S. xolocotzii*, *S. mexicana* is evergreen and may flower in either the dry or the rainy season. Geographically, *S. mexicana* extends east-

ward into southern Tabasco and northern Chiapas, conforming generally to a "crescent area" distribution as defined by Wendt (1989).

In describing *Sterculia mexicana*, Robert Brown (1844) mentions two sheets of Linden's type collection, and thus lectotypification is necessary. Synonymy and lectotypification of *S. mexicana* are as follows:

Sterculia mexicana R. Br., *Pterocymbium* 227. [Jun] 1844; R. Br. in Bennett, *Pl. Jav. Rar.* 227. [Nov] 1844. Type: Teapa, fl. en Avril [1840], Chiapas [Tabasco], Mexique, *Linden s.n.*, lectotype (here designated): P!; isolectotype: G!. The P specimen is designated as lectotype because it is the more complete of the two, having several inflorescences and a nearly intact leaf. Brown (1844) cited the type locality as "Mexico ad Chiapas", and Linden's labels state that the collection was made in Chiapas. However, this seems to be a simple error in labeling, since Teapa, the type locality, is and long has been in the state (and before that, the province) of Tabasco (Secretaría de Gobernación, 1987), and Linden labeled at least some Teapa collections as being from Tabasco (E. Robbrecht, pers. com.) The collection month but not year is given on the labels ("1840" on the G isolectotype indicates the year of accession by the Delessert herbarium, not the year of collection, according to F. Jacquemoud [pers. com.]); however, 1840 is the only year in which Linden was in southeastern Mexico in April (Lasègue, 1845; Linden & Planchon, 1867.)

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