A New Species of *Mortoniodendron* (Malvaceae sens. lat.) from Chiapas, Mexico

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Abstract: The new species *Mortoniodendron ocotense* is described from northwestern Chiapas, Mexico, where it is a locally abundant tree on karst substrates in seasonal evergreen rain forest. It falls within a group with five previously described species, of which the most closely related is *M. uxpanapense*. A simplified key to the six species is presented.

Resumen: Se describe la especie nueva arbórea de *Mortoniodendron ocotense* del noroeste de Chiapas, México, localmente abundante sobre substratos cársticos en selva mediana perennifolia. Pertenece a un grupo formado por cinco especies anteriormente descritas más la nueva, de las cuáles *M. uxpanapense* parece ser la especie más emparentada. Se presenta una clave para la identificación de las seis especies.

Keywords: Flora of Mexico, Flora of Chiapas, Malvaceae, *Mortoniodendron*, Tiliaceae, Selva del Ocote.

Mortoniodendron Standl. & Steyerm. is a genus containing about 18 species of trees and shrubs and is distributed from southeastern Mexico to Colombia, growing in lowland to mid-montane wet forests (Dorr & Wendt, 2004). From the establishment of the genus in 1938 through 2003, ten species were described, all of them before 1969. Then, in 2004, six new species were described, five from Costa Rica (Rodríguez, 2004) and one from Mexico (Dorr & Wendt, 2004).

The genus *Mortoniodendron* is characterized by: tree or shrub habit; alternate and penninerved entire leaves; scarce to abundant pubescence of simple or stellate trichomes; caducous stipules; a cymose panicle; perfect flowers with all stamens fertile (in five groups opposite the petals) and with valvate sepals and petals; 3–5 locular ovaries with (2)4–many ovules per locule; capsular fruit; and seeds with an orange aril (Steyermark, 1938; Miranda, 1956; Bayer & Kubitzki, 2003; Réndon-Carmona et al., 2006; Rodríguez, 2004; Dorr & Wendt, 2004). The leaves have the secondary veins joined near the margin, translucent points caused by mucilage cells, and anomocytic stomata (Solis-Montero et al., 2013). The pollen grains are small, oblate, and trizonocolporate, with the exine semitectate and reticulate (Rendón-Carmona, 2005). The domatia characteristic of many species (including the new species here described) have been described by Solis-Montero et al. (2009).

Steyermark (1938) included this genus in the Tiliaceae. Later, Bayer and Kubitzki (2003) treated *Mortoniodendron* as *incertae sedis* and placed it between the subfamilies *Tilioideae* and *Brownlowioideae* of the Malvaceae *sens. lat.* More recently, Nyffeler et al. (2005) placed the genus in the *Tilioideae* as a sister group to the *Craigia-Tilia* clade in the Malvaceae *sens. lat.* Recent studies of DNA sequences of several species of *Mortoniodendron* made by Ishiki et al. (unpub.) agree with the conclusion of Nyffeler et al. (2005) and place *Mortoniodendron* with the genera *Craigia* and *Tilia* in a monophyletic group.

Ongoing studies of the vegetation of the Selva El Ocote Biosphere Reserve of northwestern Chiapas have revealed the following new species of *Mortoniodendron*:

Mortoniodendron ocotense Ishiki & T. Wendt, sp. nov. (Figs. 1–3)

TYPE: **MEXICO.** Chiapas: Mpio. Ocozocoautla de Espinosa. Reserva de la Biosfera

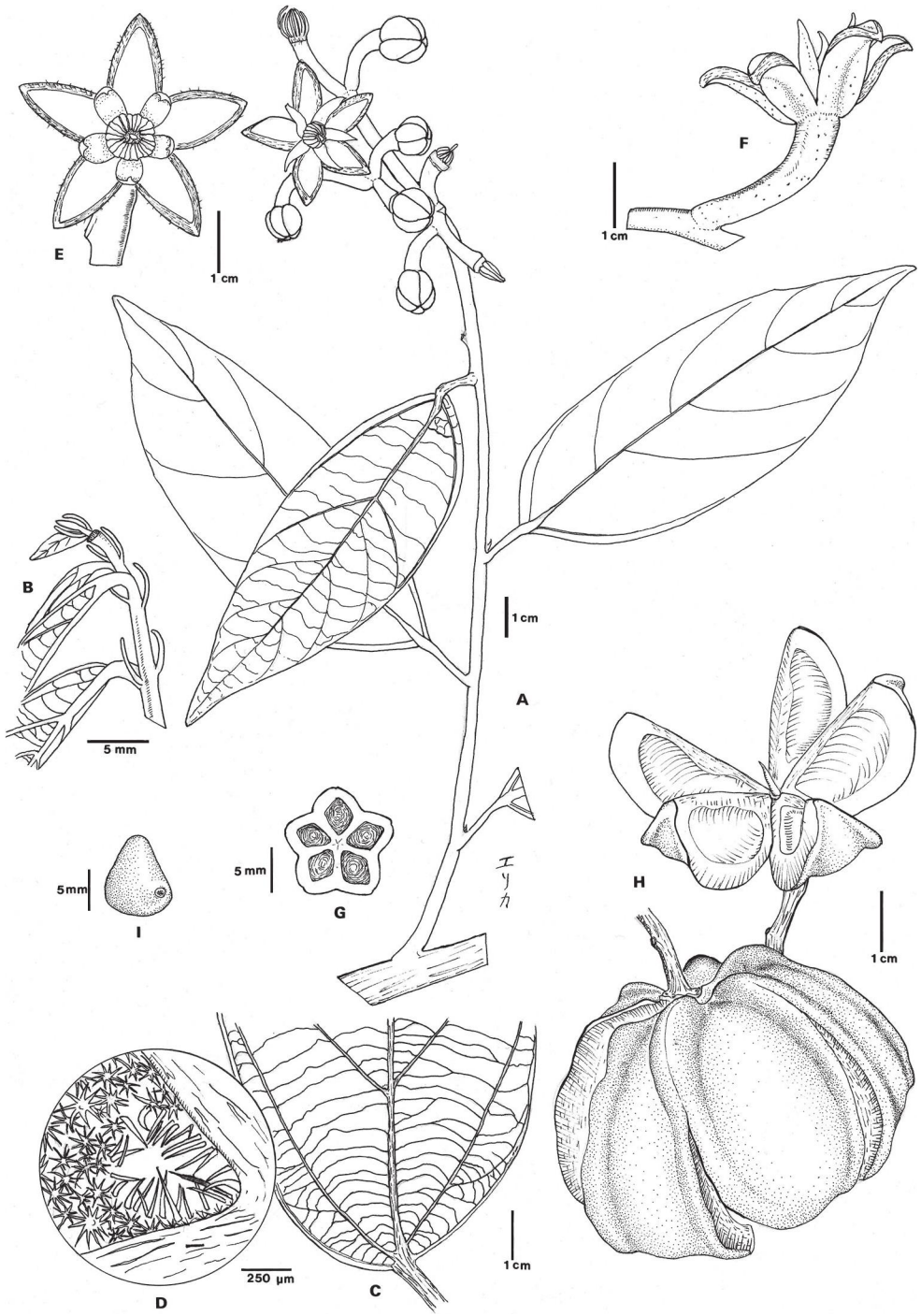

FIG. 1. *Mortoniodendron ocotense.* A. Fertile branchlet. B. Young branchlet with stipules. C. Leaf, adaxial view with venation. D. Domatium surrounded by simple hairs. E. Flower, apical view. F. Flower, lateral view. G. Immature fruit (cross-section). H. Fruit, showing entire capsule and dehiscent carpels. I. Seed, aril removed. A, C, D from *Ishiki & Hernández 2437* (MEXU); B from a photograph by Mario Ishiki; E, F from a photograph by Gerardo Salazar; G from *Hernández 2802* (CH); H from *Ishiki & Hernández 2425* (CH); I from *Ramos-Borrego 198* (CH). (Illustration by Erika Pérez Parra.)

FIG. 2. *Mortoniodendron ocotense*, showing strongly channeled trunk, with leaves (in front of trunk) from sprout; photo by the first author, near Armando Zebadua, Mpio. Ocozocoautla de Espinosa, Chiapas, Mexico.

Selva El Ocote, 1.5 km al S de Emiliano Zapata, 16°56′52″N, 93°30′38″O, 910 m, 26 febrero 1999 (fl), *M. Ishiki y H. Hernández 2437* (HOLOTYPE: MEXU!; ISOTYPES: CAS!, CH!, TEX!, US!).

TREE 8–25 m tall. TRUNK (Fig. 2) 30–60 cm d.b.h., channeled at base; BARK rugose, reddish-brown, asperous, with lenticellar warts in vertical lines; SLASH of bark yellow. BRANCHLETS 2–3 mm thick, completely covered with dense stellate trichomes, these with 8–15 arms and smaller than those of the leaf blades. LEAF BLADES coriaceous, elliptic to slightly oblong, mostly 14–23 cm long by 5.0–10.5 cm wide when mature, 2.2–3.0 times as long as wide, pellucid-punctate due to mucilage cells 49–132 μm in diam., the blade margin entire, the blade apex gradually to abruptly acute, the acumen ca. 0.6–1.0 cm long, the base obtuse to rounded, slightly oblique; VENATION (following terminology of Leaf Architecture Working Group, 1999) weakly actinodromous with a stronger pair of suprabasal to essentially basal lateral veins (these decidedly weaker than midvein) and a much weaker exterior pair of basal veins so close to the inrolled margins as to be sometimes essentially hidden; stronger suprabasal to basal pair weakly agrophic and extending ca. ½ the length of the blade, diverging from midvein at narrower angle than distal secondary veins; non-basal secondary veins 5–7 per side, diverging from midvein at 45°–65°, of moderate thickness, uniformly curved, weakly to (distally) fully brochidodromous; intersecondary veins

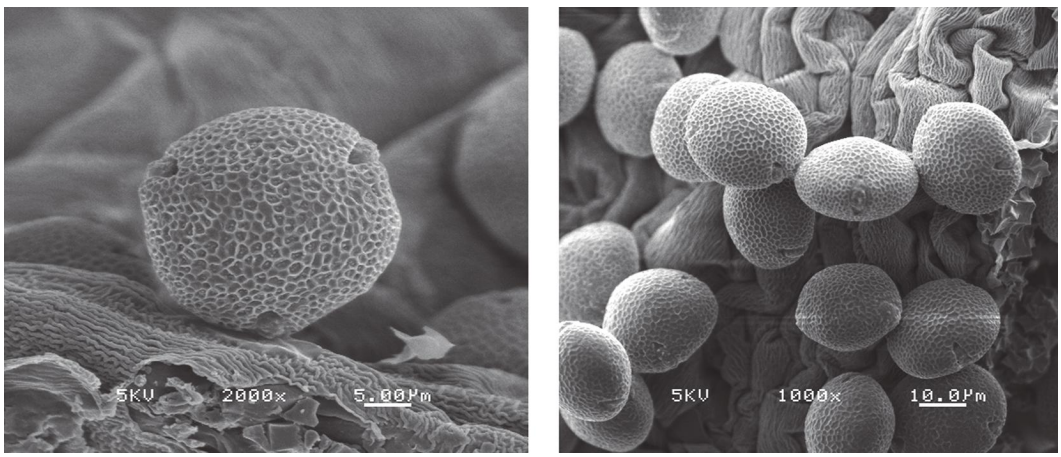

FIG. 3. Pollen of *Mortoniodendron ocotense*, SEM micrographs taken at 2000× and 1000×, scales indicated on images. From *Ishiki & Hernández 2437* (CH).

absent; tertiary veins percurrent, straight, branching 1–2 times, marginal ultimate veins looped; VESTITURE of blade adaxially very sparse with stellate trichomes or nearly glabrous, abaxially with dense persistent vestiture of stellate trichomes with 8–16(18) arms 150–300 μm long, rarely with simple (unbranched) trichomes; DOMATIA 10–13 per leaf, comprising minute glabrous areas surrounded by a ring of prominent simple hairs 1000–1300 μm long in the abaxial primary/secondary vein axils, this ring of hairs surrounded by shorter simple or rarely stellate hairs that grade into the normal abaxial lamina hairs, occasionally in the secondary/tertiary vein axils but then the hairs smaller (450–650 μm long); STOMATA anomocytic or cyclocytic. PETIOLES of mature leaves 15–20 mm long, 1.2–2.0 mm wide, slightly thickened distally, pilose with stellate trichomes. STIPULES linear, green, dark when dry, ca. 3–4 mm long, fugacious, with scattered stellate trichomes. CYMES mostly 5–8-flowered, terminal or axillary, 5.5–10.0 cm long, indumentum like that of the branchlets; PEDUNCLE 4–15 mm long; BRACTS 1.0–1.6 cm long, fugacious, adaxially and abaxially pilose with stellate trichomes with 12 arms; PEDICELS 12–20 mm de long, 2–3 mm thick, distally thickened, pubescent, usually not obviously articulate above base. FLOWERS nutant, 1.2–1.4(1.7) cm long, aromatic; SEPALS 5, spreading, valvate, very thick, white (yellowish when dry), lanceolate with acute apex, 12–18 mm long, 5–7 mm wide, caducous, adaxially with six lines of simple (unbranched) trichomes, abaxially pilose with stellate trichomes like the pedicels; PETALS 5, spreading, thin, white (yellowish-red when dry), 12.5–13.0 mm long, 4 mm wide, lanceolate, with acuminate apex, caducous after anthesis, glabrous on both surfaces; STAMENS ca. 83–85, forming fascicles of 8–16, slightly inflexed, outer stamens much longer than inner, filaments white, 1–3 mm long, anthers basifixed, orange-brown, 0.6–1.1 cm long, bilocular, slightly introrse, dehiscence longitudinal, thecae 0.5–0.8 cm long. POLLEN (Fig. 3) isopolar, oblate, P=16±0.00 μm, E=21.43±0.73 μm, P/E ratio 0.75, 3–colporate, angulaperturate, exine 1.6–2.0 μm thick, semitectate, lumen 1.21±0.47 μm in diameter with 1–10 verrucae. GYNOECIUM 9–11 mm long, pubescent in basal 3/4, ovary 4–5 mm long, ovoid, 5-angled, externally densely stellate-tomentulose, the locules 5, glabrous within, the style 5–6 mm long, stellate-tomentulose in basal 2/5 to 3/5, distally glabrous, the stigma linear. FRUIT a loculicidally dehiscent woody capsule, roughly globose with 4–5 sides, ca. (3.0)5.7–6.6 cm long, ca. (2.8)4.5–6.0 cm thick (before dehiscence), externally very finely and densely stellate-tomentose, greenish brown, the outer walls thick, woody, ca. (5)7 mm thick at mid-fruit; FERTILE LOCULES 4–5, glabrous within, each with 1–3 seeds. SEED red-brown, irregularly pyriform by compression, 11 mm long; TESTA smooth, the hilum conspicuous, 1.5–2.0 mm long; ARIL orange, thin, completely covering seed. (More detailed information on the vestiture and trichome types, on domatia, and on leaf architecture and anatomy of the new species can be found in, respectively, Rendón-Carmona et al. (2005), under the name *M. ocotense*, and in Solis-Montero et al. (2009), and Solis-Montero et al. (2013), under "*M. sp. nov.*" Pollen is described and illustrated in Rendón-Carmona (2005) as *M. ocotense*.)

PHENOLOGY. Collected in flower in January, February and May, and collected with mature fruit in September, October, and January.

DISTRIBUTION AND HABITAT. Known only from the Selva El Ocote Biosphere Reserve and adjacent areas in the northwestern part of the state of Chiapas. Average annual rainfall is ca. 2500 mm. and the average monthly temperature is 22°C (Comisión Nacional de Areas Naturales Protegidas, 2000). Locally abundant at 220–1070 m on limestone karst, typically in steep *Selva Mediana Perennifolia* (Evergreen Seasonal Forest; Breedlove, 1981). Characteristic canopy trees include *Heliocarpus*, *Hampea*, *Bursera simarouba*, *Pithecellobium arboreum*, *Plumeria rubra*, *Quararibea*, *Andira galeotiana*, *Tapirira*, and species of the families

Myrtaceae, Malvaceae (Bombacoideae), Araliaceae, Sapindaceae, and Anacardiaceae.

LOCAL NAME: *jicalpestre*.

ADDITIONAL SPECIMENS: **MEXICO. CHIAPAS. Mpio. Berriozábal**: La Pera, El Pozo a 10 km de la cabecera municipal (tramo de terracería Berriozabal–Joaquin Miguel Gutiérrez), 1070 m, x=465612, Y=1864242 [UTM], 8 Jul 2009 (immature fr), *A. L. Ramos-Borrego 103* (CH!, CHIP); La Cima, El Porvenir 15 km de la cabecera municipal (tramo de terracería Berriozabal–Joaquin Miguel Gutiérrez), x=4639382, Y=1867100 [UTM], 10 Sep 2009 (fr), *A. L. Ramos-Borrego 198* (CH!, CHIP); Ejido El Divisadero, 712 m, 16°54′42.2″ N, 93°22′25.1″ W, 17 Jun 2009 (immature fr), *HGD 2090* (MEXU!, CHIP); **Mpio. Ocozocoautla de Espinosa**: 18–20 km N of Ocozocoautla along road to Mal Paso, 800 m, 20 Oct 1971 (fr), *D. E. Breedlove & R. F. Thorne 21000* (DS!); 26–28 km N of Ocozocoautla along road to Mal Paso, 700 m, 29 Jan 1972 (fl bud), *D. E. Breedlove 23889* (DS!); 32 km N of Ocozocoautla on road to Mal Paso, 800 m, 6 Oct 1974 (fr), *D. E. Breedlove 38202* (DS!); Reserva de la Biosfera Selva El Ocote, 8 km SO del ejido Emiliano Zapata 16°56′20″N, 93°32′07″W, 1120 m, 5 mayo 1999, (fl, immature fr), *H. Hernández 2802* (CH!, TEX!); Reserva de la Biosfera Selva El Ocote, 1 km al NE del Arroyo Caracol, 1080 m, 16°55′57″N, 93°31′02″O, 18 Jan 1999 (fr), *M. Ishiki y H. Hernández 2425* (CH!); Reserva de la Biosfera Selva El Ocote, 5 km de Emiliano Zapata, 1120 m, 16°56′20″N, 93°32′06″O, 14 agosto 1999, (immature fr), *M. Ishiki y H. Hernández 2789* (CH!, TEX!); 3 km antes del poblado Armando Zebadua, 800 m, 16°55′21″ N, 93°28′30″ W, 15 Jul 2004 (immature fr), *M. Martínez-Ico et al. 760* (CH!, TEX!); Cruce Ríos Negro y Venta, 1.5 km SW ribera Río Negro, 220 m, 16°58′ N, 93°46′50″ W, 04 Jun 1992 (immature fr), *S. Ochoa-Gaona y M. Martínez-Icó 3951* (CH!, TEX!).

Solis-Montero et al. (2013), in a study of leaf architecture and anatomy of eleven species of *Mortoniodendron* that included the new species (as "*Mortoniodendron sp. nov.*"), found that *M. ocotense* belongs to group of species distinguishable by several morphological and anatomical character states. This group of species, which also includes *M. palaciosii* Miranda, *M. pentagonum* (Donn. Sm.) Miranda, *M. ruizii* Miranda, and *M. uxpanapense* Dorr & T.Wendt, is distinguished from the rest of the species studied by, among other things: large mucilage cells in the leaves (average diameter 65–99 μm, versus 39–53 for other species), the leaves thus conspicuously glandular-punctate when viewed against light with a lens; strongly percurrent tertiary veins (versus reticulate to weakly percurrent); thick, usually striate cuticle (versus thin, always smooth cuticle); and longer petioles (1.0–2.5 cm versus 0.3–1.0 cm). Unpublished DNA data (Ishiki et al.) support the relationship of these five species and indicate that they form a monophyletic group. A sixth species not included in those studies, *M. apetalum* Al. Rodr., was said to be related to several of these species by the describing author (Rodriguez G., 2004), and examination of material of that species clearly shows him to be correct.

Within this monophyletic group of six species, three species (*Mortoniodendron ocotense*, *M. pentagonum*, *and M. uxpanapense*) have petals, while the other three lack them. Among the petaliferous species, the unpublished DNA data indicate that *M. ocotense* is most closely related to *M. uxpanapense*, which occurs just to the west of the range of the new species, in the Uxpanapa area of southern Veracruz. Although similar in many morphological characters, the new species differs most conspicuously from *M. uxpanapense* by its persistent abaxial leaf vestiture (versus glabrate in *M. uxpanapense*), well developed domatia (versus none or very poorly developed), and usually much larger fruits (57–66 × 45–60 mm, versus 25–30 × 25–35 in *M. uxpanapense*, although occasional fruits in the former are as small as in the latter). Other differences are noted in Solis-Montero et al. (2013). A simplified key to the six species of this group follows:

KEY FOR THE IDENTIFICATION OF *MORTONIODENDRON OCOTENSE* AND RELATED SPECIES:

1. Lamina glabrescent to glabrous; petals present or absent; domatia present or absent.
   2. Petals absent; domatia present.
      3. Sepals 5, fruits generally 5-valved . . . . . *M. apetalum*
      3. Sepals 4, fruits generally 4-valved.
         4. Lamina membranaceous or subcoriaceous, less than 12 cm long; endocarp with trichomes . . . . *M. palaciosii*
         4. Lamina coriaceous or subcoriaceous, more than 12 cm long; endocarp without trichomes . . . . *M. ruizii*

2. Petals present; domatia absent or extremely weakly developed.
   5. Mature fruit to 30 mm long; twigs and petioles covered with dense persistent vestiture of minute flat stellate hairs . . . . . *M. uxpanapense*
   5. Mature fruit 55–90 mm long; twigs and petioles at first with scattered stellate hairs but soon glabrate . . . . . *M. pentagonum*
1. Lamina densely and persistently covered by trichomes on the abaxial surface; petals present; domatia present . . . . . *M. ocotense*

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