Croton pascualii (Euphorbiaceae s.s.), a New Arborescent *Croton* with an Accrescent Calyx from the Pacific Slope of Oaxaca, Mexico

Emily J. Lott[1] and Martha Martínez-Gordillo[2]

[1]Plant Resources Center, The University of Texas at Austin, Main Bldg. Rm. 127, 110 Inner Campus Dr. Stop F0404, Austin, TX 78712-1711
emilyjlott@gmail.com

[2]Herbario de la Facultad de Ciencias, Universidad Autónoma de México, A.P. 70-399, Delegación Coyoacán, 04510 México, Distrito Federal, México
mjmg_unam@yahoo.com

Abstract: A new arborescent species of *Croton* with accrescent pistillate calyx, **Croton pascualii,** is described and illustrated from the Pacific Slope of Oaxaca, Mexico. It has certain characteristics in common with *Croton oerstedianus*, a species included in the section *Corylocroton*. The proposed new species is characterized by its unisexual cymules, large and broadly ovate imbricate sepals of the pistillate flowers, and capsules ca 12 mm long. The foliage and resin of the new species have a pleasant, persistent aromatic fragrance suggestive of *Quararibea* or of celery (*Apium graveolens*). *Croton pascualii* is thus far known only from the Tropical Moist Semi-Evergreen Forest (selva mediana subperennifolia) of the Pacific Slope of Oaxaca, and has been collected in flower from June to September.

Resumen: Se describe **Croton pascualii** como una especie nueva de la selva mediana subperennifolia de la vertiente del Pacífico de Oaxaca, México. La especie nueva tiene ciertas características en común con *Croton oerstedianus*, de la sección *Corylocroton*. Sin embargo, la nueva especie se distingue, de otras descritas para México y Centroamérica, por las siguientes caracteres: los sépalos de las flores pistiladas grandes, ovados, imbricados y acrescentes. El follaje y la resina de la nueva especie tienen un aroma agradable parecido al de *Quararibea* (Malvaceae) o a apio (*Apium graveolens*). *Croton pascualii* hasta la fecha se conoce solamente de la vertiente del Pacífico del estado de Oaxaca, donde se ha colectado con flor de junio a septiembre.

Keywords: *Croton*, Euphorbiaceae s.s., flora of Mexico, flora of Oaxaca, Pacific Slope.

The genus *Croton* L. is one of the most diverse genera of Euphorbiaceae sensu stricto (APG II, 2003), with ca 1223 species (Berry et al., 2005). Recent studies in the family (Wurdack et al., 2005) have shown that *Croton*, *Brasiliocroton*, *Acidocroton*, *Astraea*, *Sagotia* and *Sandwithia* make up the tribe Crotoneae, a sister tribe of Jatrophae. In Mexico, it was estimated in 2002 that the genus is represented by 124–126 species, of which approximately 60% are endemics (Martínez-Gordillo et al., 2002; Steinmann, 2002). Since that time, several more Mexican species have been described (e.g., *C. astrostellatus* V.W. Steinm., *C. balsensis* V.W. Steinm. & M. Martínez-G., *C. gomezii* G. L. Webster, *C. guerreroanus* M. Martínez-G. & Cruz Durán, *C. mayanus* B.L. León & Vester, *C. websteri* M. Martínez-G. & Jiménez Ram.), and other newly-discovered species as yet await description.

Extensive and sustained collecting efforts carried out in the Mexican state of Oaxaca since 1981 by the Sociedad para el Estudio de los Recursos Bióticos de Oaxaca, A. C. (SERBO) have resulted in the discovery of a number of botanical novelties, most notably from the Pacific Slope, among them the species described below.

Croton pascualii E.J. Lott & M. Martínez-G., sp. nov. (Fig. 1).

TYPE: **MEXICO. Oaxaca**: Dto. Pochutla. Mpio. San Miguel del Puerto. Cima de Cerro Campana. Selva Mediana Subperennifolia sobre cerro. 15°59′19.9″N, 96°6′33.9″W, 1215 m, 31 May 2011, *A. Sánchez Martínez*

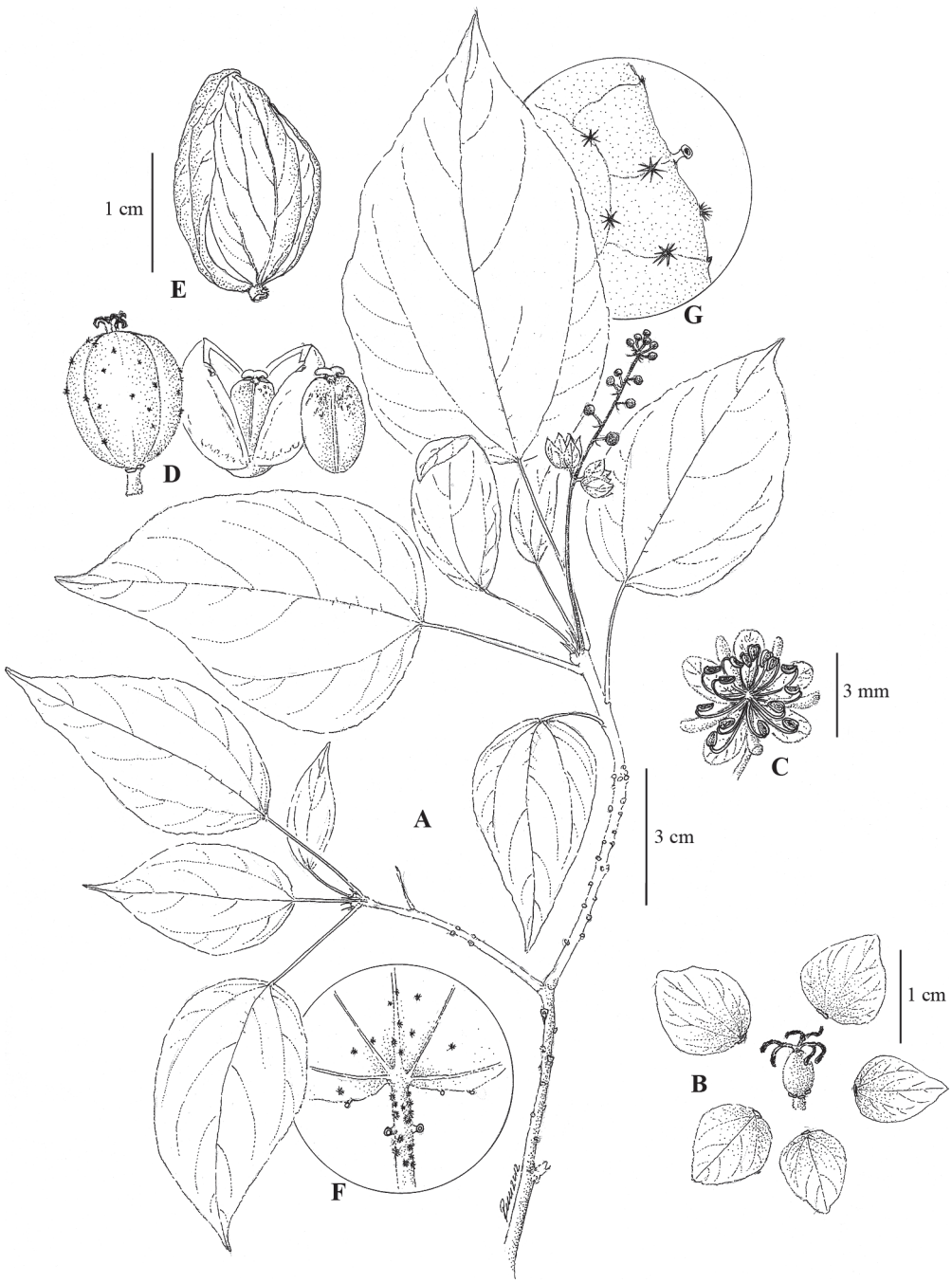

FIG. 1. *Croton pascualii*. A. branch with flowers. B. pistillate flower, dissected. C. staminate flower. D. fruit, one cell of capsule dehisced, and seed E. fruit enclosed by sepals. F. detail of leaf base with paired glands on petiole. G. detail of adaxial leaf margin. (D-E from *Nava & Elorsa 230* (MEXU); E from *Lott, Sánchez M. & Pascual C. 5898* (MEXU, SERO, TEX); others from the holotype. Drawn by R. Cruz Durán.

3116. (HOLOTYPE: MEXU!; ISOTYPES: SERO!, TEX!)

Croton oerstedianus Müll. Arg. affinis sed trichomatibus multiradiatis, inflorescentiis cymulis unisexualibus, sepalis floris feminei late ovatis imbricatis, 1.3–2 cm longis, capsulis ca. 12 mm longis, pubescentibus trichomatibus multiradiatis.

MONOECIOUS SHRUB OR SMALL TREE 2–6 m high with pubescence of small, mostly multiradiate trichomes; bark cream-brown-colored, more or less smooth, with small red stripes in the cut, and copious aromatic colorless to red transparent resin; stems densely and finely stellate-pubescent. LEAVES membranaceous, ovate to ovate-lanceolate, at anthesis (Fig. 1) ca. 8–10 cm long, 4–6 cm broad, at maturity mostly 12–18 cm long, 6–10 cm broad, apex acuminate (acumen 0.7–2 (–3) cm long), margin denticulate, or repand with small yellowish, shortly stipitate glands, base obtuse or rounded to truncate or subcordate; palmately (3-) 5- to 7-nerved, veins yellowish, raised above and below; adaxial surface sparsely stellate with very small multiradiate trichomes and scattered, somewhat larger adpressed trichomes and numerous imbedded epidermal glands, glabrescent with age; abaxial surface paler, sparsely and minutely stellate, especially on the veins; petioles sparsely stellate, 2.5–12 cm long, acropetiolar glands (1) 2 or 3 near (below) the apex of the petiole, or sometimes wanting, 0.4 mm wide, cupular, short-stalked or nearly sessile, yellowish; stipules linear, ca. 5 mm long, pubescent, caducous. INFLORESCENCES terminal on main and lateral axes, 6–20 cm long, rachis 1–2 mm thick, minutely stellate-pubescent, bisexual, cymules unisexual, the pistillate flowers in the proximal part and the staminate flowers distal; bracts caducous. STAMINATE FLOWERS one per bract, crowded in bud but spaced up to about 1 cm apart at anthesis; bracts linear, ca 1 mm long, with a tuft of stellate hairs at the apex; pedicel slender, ca 1–2.5 mm long; flowers ca 1.5–2 mm tall at anthesis excluding the exserted stamens; sepals 5, oblong, imbricate; petals 5, more or less equal in length, villous adaxially, densely stellate abaxially, lanceolate, ciliate and pubescent at the apex, with glandular punctations; receptacle more or less densely pubescent, with long, erect straight hairs; stamens in two whorls, 14–16, filaments basally villous; anthers with glandular connective, promptly caducous. PISTILLATE FLOWERS 1–10, one per bract, bracts lance-ovate, 2–3 mm long, short-pedicellate, the pedicel in fruit ca 3 mm long, stout, densely stellate-pubescent; sepals 5, unequal, palmatinerved, ovate to broadly ovate, imbricate, the outermost (abaxial) one slightly longer, 1–2 cm long, to 1 cm wide in flower, apex obtuse, foliaceous with prominent midveins, pubescent on both faces, the trichomes minute and concentrated along the midvein and principal nerves, abaxially (outside) minutely stellate pubescent as in rest of plant, adaxially (inside) also, pilose at base of sepals with larger, fewer-rayed trichomes than in other parts, strongly accrescent, completely but loosely enclosing the young fruit, turning pale brown [''*color coyuche*''] at maturity; petals absent (or else present as minute red linear traces); ovary densely stellate-pubescent, the trichomes yellowish, porrect; ovary ca 1.5–3 mm tall and 2 mm wide, triquetrous, styles bifid to within ca 1–2 mm of the base, style branches drying blackish, ca 3–4 mm long, sparsely stellate-pubescent up to the point of branching. CAPSULE (known only from two collections) ca 1.2 cm tall and 1 cm wide, minutely stellate puberulent at maturity; columella slender, slightly shorter than the valve of the capsule, fragile; seeds golden-brown, shiny, somewhat evenly mottled, ca 8 mm long and 4 mm wide; caruncle ca 2 mm broad, lunate. (Fig. 1).

ADDITIONAL SPECIMENS EXAMINED: **MEXICO. Oaxaca**. **Dto. Pochutla:** Mpio. San Miguel del Puerto, Cerro La Campana, SMSP, con café. [Arbol de 4 m, flor color coyuche], 15°59′17″N, 96°6′33″W, 1231 m, 23 Aug 2003, *J. Pascual C. 819* (MEXU, SERO, TEX); [a few pistillate fls]; same locality, 15°59′17″N, 96°6′33.1″W, 1226 m, 15 Jun 2006, *J. Pascual C. 2070* (SERO, FCME);

same locality, 15°59′17.2″N, 96°6′32.9″W, 1180 m, 21 Aug 2001, *A. Saynes 2471* (SERO, FCME); same locality, en suelos negros derivados de roca caliza, terreno accidentado y rocoso; 15°59′ 20.7″ N, 96°06′ 41.2″W, ca 1120 m, *E. J. Lott, A. Sánchez Martínez & J. Pascual C. 5898*, 29 Aug 2009 (SERO, TEX and to be distributed). Same Dto. & Mpio.: Por el camino que va a ''Oreja de Leon'' en el Arroyo Arena, Selva Mediana Subperennifolia con café; 15° 58′ 45.9″N, 96° 6′8.9″W, ca 753 m, *A. Nava Zafra 230*, 27 Nov 2003 (MEXU, SERO, TEX) [mature fruits].

DISTRIBUTION AND HABITAT: The new species occurs in Tropical Moist Semi-Evergreen Forest (Selva Mediana Subperennifolia) from ca 750 to 1230 m. Some associated species are: *Ficus* sp., *Pseudobombax ellipticum*, *Alstonia longifolia*, *Sapium* sp., and *Leucaena leucocephala*. *Croton pascualii* is known only from the vicinity of the type locality in Oaxaca at present. Van Ee et al. (2011) state that nearly all species of *Croton* subg. *Quadrilobi*, to which the new species belongs, are ''rare and restricted'' and the new species may well be a local endemic.

FLOWERING AND FRUITING: Flowering from June to September; fruiting in November.

COMMON NAME: Croto [*J. Pascual C. 2070*]

ETYMOLOGY: The species epithet honors José Pascual Cortés, ''Don Chepe,'' (born 1956), caretaker, guide and discriminating collector of plants of the coffee-growing zone where this species is native. Pascual described the color of the mature pistillate calyx of the proposed new species as the color of ''coyuche,'' or native cotton.

RELATIONSHIPS: Concepts of sections and subsections within the large genus *Croton* (ca. 1200–1300 species, fide Berry et al., 2005, and Van Ee et al., 2011) have until recently been very fluid (Webster, 1993). Intensive investigations with molecular data are underway (e.g., Cordeiro et al., 2008; Berry et al., 2002; Van Ee et al., 2011) which are helping greatly to elucidate relationships and to update classification of *Croton*. With the broadening of the sectional description in Van Ee et al. (2011) to include imbricate pistillate sepals, *C. pascualii* would fit neatly into the section *Corylocroton*, and appears to be most closely related to *C. oerstedianus* (known from southern Mexico (Campeche, Chiapas) to Honduras and Nicaragua in Central America). The new species is distinguished from the latter by its multiradiate trichomes (vs. stellate-lepidote), inflorescences with unisexual cymules (vs. bisexual), broadly ovate pistillate sepals (vs. lanceolate) ca 13–20 mm long (vs. 2–3 mm), capsule 12 mm long (vs. 5–8 mm long), with pubescence of multiradiate trichomes (vs. lepidote).

The new species is distinguished from all other Mexican and Central American Crotons in the combination of these characters: arborescent stature, nearly sessile paired acropetiolar glands, large, broadly ovate imbricate and accrescent pistillate calyx, and striking, persistent and pleasant aroma, which has been compared to that of some species of *Quararibea* Aubl. (Malvaceae), commonly known as ''flor de cacao'' or ''flor de rosita,'' a popular flavoring for Mexican chocolate drinks (Schultes, 1957), or of celery (*Apium graveolens* L.), in addition to differences in shape and pubescence of the fruit as described above.

ASSESSMENT OF THREATS: The proposed new species occurs along rough limestone ridges at the top of Cerro Campana above the zone where coffee is cultivated, and also along the nearby steep drainages of Arroyo Arena, at the foot of Cerro Campana. Although as yet known from few collections, it is not deemed to be in immediate danger of threat or extinction.

ACKNOWLEDGEMENTS

We are very grateful to Plant Resources Center and Texas Natural Science Center, University of Texas at Austin, for generously granting use of their facilities; to the curators of FCME, MEXU, and TEX; to SERBO A.C., and especially to M. en C. Silvia H. Salas Morales and her family, for their unfailing hospitality and support during lengthy stays of the senior author at SERO; to Timothy Gregory for his generous support of SERBO; to Geoff Levin and an anonymous reviewer

for their constructive comments which helped to improve the manuscript; to Bob Harms, Thomas Atkinson and Tom Wendt for technical and other assistance; to Ramiro Cruz Durán (FCME) for the illustration.

Literature Cited

APG II (Angiosperm Phylogeny Group). 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. Bot. J. Linn. Soc. 141: 399–436.

Berry, P. E., et al. 2002**.** *Croton* Research Network. http://www.botany.wisc.edu/croton. Accessed 16 Nov 2010.

———, A. L. Hipp, K. J. Wurdack, B. Van Ee, and R. Riina. 2005. Molecular phylogenetics of the giant genus *Croton* and tribe Crotoneae (Euphorbiaceae sensu stricto) using ITS and trnL-trnF DNA sequence data. Amer. J. Bot. 92: 1520–1534.

Cordeiro, I., P. E. Berry, M. B. R. Caruzo, and B. W. Van Ee. 2008. *Croton laceratoglandulosus* (Euphorbiaceae s.s.), a new glandular-stipitate species from Brazil and Bolivia, and its systematic position based on molecular analysis. Bot. J. Linn. Soc. 158(3): 493–498.

Martínez-Gordillo, M., J. Jiménez, R. Cruz, E. Juárez, R. García, A. Cervantes, and R. Mejía. 2002. Los géneros de la familia Euphorbiaceae en México. Anales Inst. Biol. Univ. Nac. Autón. Méx. Bot. 73(2): 155–281.

Schultes, R. E. 1957. The genus *Quararibea* in Mexico and the use of its flowers as a spice for chocolate. Bot. Mus. Leaflets 17: 247–264.

Steinmann, V. W. 2002. Diversidad y endemismo de la familia Euphorbiaceae en México. Acta Bot. Mex. 61: 61–93.

Van Ee, B. W., R. Riina, and P. E. Berry. 2011. A revised infrageneric classification and molecular phylogeny of New World *Croton* (Euphorbiaceae). Taxon 60: 791–823.

Webster, G. L. 1993. A provisional synopsis of the genus *Croton* (Euphorbiaceae). Taxon 42: 793–823.

Wurdack, K. J., P. Hoffmann, and M. W. Chase. 2005. Molecular phylogenetic analysis of uniovulate Euphorbiaceae (Euphorbiaceae *sensu stricto*) using plastid rbcL and trnL-F DNA sequences. Amer. J. Bot. 92: 1397–1420.