



Coccoloba floresii (Polygonaceae), a new species from Chiapas (Mexico)

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Abstract

Coccoloba floresii is here described as a new species from Mexico. Morphological characters of the leaf, inflorescence, and fruit show discontinuities among populations of *C. floresii* and its relatives, *C. barbadensis* and *C. cozumelensis*. In addition, *C. floresii* is exclusive of the tropical dry forests of Central Depression and Plateau of Chiapas (Mexico) at high elevations.

Key words: *Coccoloba barbadensis*, *C. cozumelensis*, Central Depression, Chiapas Plateau, Mexico, taxonomy

Resumen

Se describe *Coccoloba floresii* como nueva especie para México. Al comparar los caracteres morfológicos de la hoja, inflorescencia y frutos de *C. floresii* se encontraron discontinuidades con aquellos de *C. barbadensis* y *C. cozumelensis*. Además, *C. floresii* es exclusiva de los bosques tropicales secos de las provincias fisiográficas Depresión Central y Meseta Central de Chiapas (México) a elevadas altitudes.

Palabras clave: *C. barbadensis*, *C. cozumelensis*, Depresión Central, Meseta de Chiapas, México, taxonomía

Introduction

Coccoloba P.Browne (1756: 209) is the most species-rich genus of the subfamily Eriogonoideae Arn. (Polygonaceae Juss.) (Burke & Sanchez 2011), including about 150 species mainly distributed in the Caribbean The Amazon basin (Howard 1961, Brandbyge 1993). Current taxonomic knowledge of this genus is mainly based on the treatment of Bentham and Hooker (1888: 102) who recognized *Campderia* Bentham [1844, t. 52: 159, *nom. illeg.*, art. 53.1 of ICN (McNeill *et al.* 2012)] as a different genus, while Lindau (1891) treated *Campderia* at section rank of *Coccoloba*. Recent phylogenetic studies clarified the position of *Neomillspaughia emarginata* (H.Gross 1913: 218) S.F.Blake (1921: 85) that is sister to *Coccoloba* (Burke *et al.* 2010, Burke & Sanchez 2011), while none of the previous infrageneric classifications was supported by these studies.

Concerning Mexico and Central America, important works for *Coccoloba* were made by Standley and Steyemark (1946) and Howard (1959, 1992). This latter author recognized 35 species (32 in 1959, plus 3 additional new taxa in 1992) for the Central American flora, 18 of which occur in Mexico. Since then, few taxonomic studies have been done in Mexico, and only the taxonomic work by Ortiz-Díaz (1994) has contributed to a better understanding of this diverse and complicated genus in The Yucatan Peninsula.

From the morphological point of view, *Coccoloba* can be identified by its simple and alternate leaves, well defined ochreae, its achenes surrounded by an accrescent hypanthium and perianth lobes. It is well known, as Howard (1961) pointed out, the number of reliable characteristics useful for identification and classification of the species of this genus are few. The flowers and their parts show little variation. The most taxonomically useful characters to differentiate species are the shape of leaf blades, inflorescences and fruits. This last structure shows different shapes, sizes, and degrees of fusion, so that it is critical-to be observed when it is mature.

As part of the treatment of *Coccoloba* for the Flora Mesoamericana project, we here present a contribute concerning three related species, *C. barbadensis* Jacquin (1760: 36), *C. cozumelensis* Hemsley (1887:108), and *C. floresii* Ortiz-Díaz & Arnelas, *sp. nov.* this latter from Central Depression, and Chiapas Plateau. Considering that Chiapas is a state with a high rate of endemism (Matuda 1950 a, b, Miranda 1952, Breedlove 1973, 1981, 1986, Long & Heath 1991), we carried out a comparative morphological study of the unplaced populations, in order to evaluate taxonomic status of them. As a result, we concluded that these populations should be recognized as a new species.

Material and Methods

The present study was based in a morphological and biometrical analyses carried out on material collected by one of the authors (J.J. Ortiz-Díaz), and on material preserved in different herbaria (BM, CAS, CHIP, F, MEXU, MO, UADY). All the studied material were compared and measured using a digital caliper Absolute Digimatic Mitutoyo.

Taxonomic Treatment

Coccoloba floresii Ortiz-Díaz & Arnelas, *sp. nov.* (Fig. 1)

Type:—MEXICO. **Chiapas:** Municipio Tuxtla Gutiérrez, Parque Nacional Cañón del Sumidero, Mirador La Coyota, 17 km N to Tuxtla Gutiérrez, laderas rocosas de selva baja con *Calophyllum*, *Zanthoxylum*, *Bursera*, *Quercus*, *Ficus* y *Erythrina*, alt. 1320 m, 16° 49' 06.86" LN 93° 04' 08.60" LO, 23 October 2013, J. J. Ortiz, J. Tun, G. Palma, J. J. Ancona y F. Hernández 2941 (holotype UADY, isotypes CHIP, CICY, MEXU, MO, XAL).

Diagnosis:—Similar to *Coccoloba barbadensis* Jacq., differing in lanceolate and acuminate apex leaf blades, longer and glabrous petiole, spicate inflorescence, longer ocreole and shorter fruiting pedicels.

Description:—Trees 6–15 m tall. Branches internodes solid, glabrous, striated, sparsely glandular–punctate, lenticelate, yellowish. Ochrea 4–11 mm long, glabrous, membranous, sparsely glandular–punctate, cylindrical, apex coronate by a reddish nerve, brown or brownish when dry, usually the portion above the nerve of golden colour. Leaves simple, alternate, petiole (5–)11–15(–23) × 1.3–2(–3) mm, glabrous, inserted at base or up to 2 mm above base of the ochrea, striated, sparsely glandular–punctate near the base, brown. Leaf blade (7–)10–15 × 36(–9.5) cm, lanceolate to oblong-lanceolate, subcoriaceous, margins revolute, acuminate at the apex, subcordate to rounded at the base, glabrous above and beneath, hirtellous on the axils of the midvein, and primary veins; venation reticulate with 9–12 primary veins, midvein prominent beneath, brown when dry. Inflorescence terminal, solitary, spicate 10–17(–30) cm long; rachis striate, puberulent, 1–2 mm width; ochreolae (0.7–)1–1.5 mm long, membranous, pubescent with unicellular hairs, yellowish; bracteolae 1–1.5 mm long, lanceolate, pubescent. Flowers 1–2.2 mm long, solitary or fascicled, sessile or short pedicelled, pedicel when present 0.3–0.7 mm long in fruit, hypanthium 0.8–1 mm long, imbricate aestivation in bud, green to whitish, fleshy; 5 perianth lobes, 1–1.2 mm long, glandular-punctate. Stamens 8–9, (1.8–)2–2.5 mm long, connate at base, filaments 0.5–2 mm long, subulate; anthers 0.3–0.5 mm long, dorsifixed, yellowish. Ovary 1 mm long, style 3; stigma 3, linear. Fruit achene, trigonous, globose, 6–7(–8) × 4–6 mm, enclosed among the accrescent and fully fused hypanthium and brown, fleshy perianth lobes, these crowned at the apex, crown 0.8–1.1 mm long. Seed with ruminant endosperm.

Eponymy:—The name of the species honors the Mexican botanist José Salvador Flores Guido.

Distribution and ecology:—*Coccoloba floresii* is a tree growing in cliff faces or disturbed slopes on limestone or sandstone, near streams in tropical dry forests at an elevation of 850–2070 m. (Fig. 2). It is only known from the physiographic regions Central Depression, and Chiapas Plateau (Müllerried 1957).

Conservation status:—According to the distributional map (Fig. 2), *C. floresii* mostly occur in the North and Central areas, particularly in the National Park “Cañón del Sumidero” (IUCN & UNEP, category II, WDPA 2014), where one of the authors collected the holotype (Fig. 3), and in the Biosphere Reserve “Selva del Ocote” (IUCN & UNEP, category VI, WDPA 2014). Southwestern populations are rare, and are not included in any protected areas. The available data to assign an IUCN category (2012), is related with B1 criteria. The area of occupancy of the new species is less than 2,000 km², suggesting the inclusion of it in “vulnerable” IUCN criteria. However, considering the number

of available herbarium material studied, we assumed the presence of more than 10 populations over the distribution range of the new species (Fig. 2). Therefore, we considered that *C. floresii* is in a “least concern” category. However, more field studies are needed to look for new populations, and to evaluate the possibility of the existence of fragmented populations, especially in southwestern area (because of the stochastic events like fire or human activity). Certainly, field studies will allow us to assess the correct IUCN category (IUCN 2010).

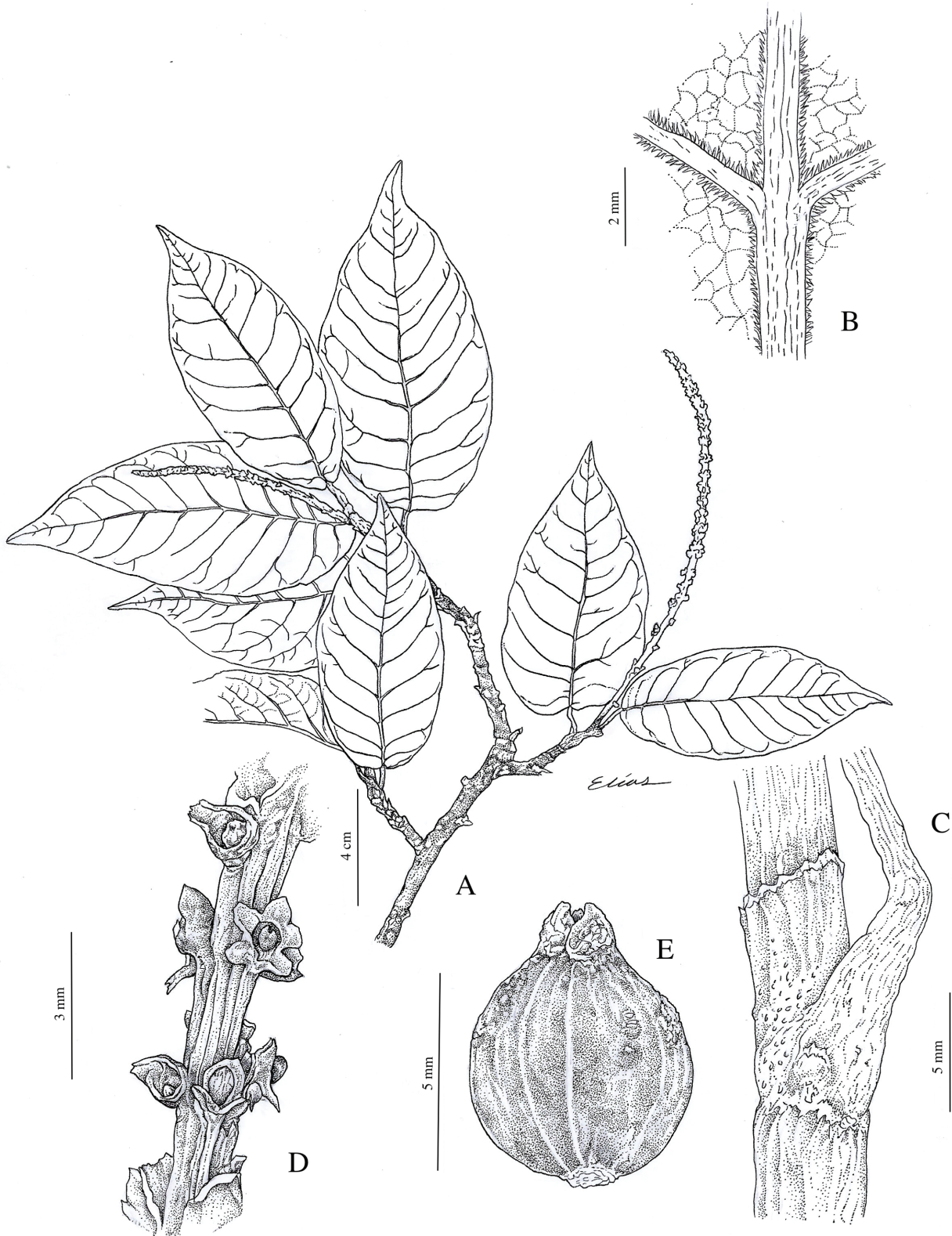


FIGURE 1. *Coccoloba floresii*. Drawing based on the holotype. **A)** Branch and inflorescence axis. **B)** Detail of indumentum on midvein, and primary veins. **C)** Ochrea and petiole. **D)** Portion of the inflorescence, bracteoles, and ochreolae. **E)** Fruit.

Observations:—On the basis of the morphological characters, and patterns of geographic distribution, *C. floresii* appears to be more related to *C. barbadensis* rather than *C. cozumelensis* (Table 1). Since the high morphological variability, many taxa have been described in the past for the widespread *C. barbadensis*, and Howard (1959, 1992) placed them in synonymy. Also misidentifications has been common. Breedlove (1986) in his Flora of Chiapas, cited quite a few collections of *Coccoloba barbadensis*, *C. diversifolia*, and *C. hondurensis*. The following collections formerly included in those species are now as a part of the additional specimens examined of *C. floresii*: *C. barbadensis* (Breedlove 13978, 27160, 27508, 49070; Shilom 2742), *C. diversifolia* (Breedlove 25664, 29701, 44365, 45974, 51909, 51953), and *C. hondurensis* (Breedlove 30260, 30033). *C. floresii* differs from *C. barbadensis* in the shape of the leaf blades (lanceolate and acuminate in the new species vs. obovate to oblong-elliptic with an obtuse apex or short acuminate in *C. barbadensis*), the petiole (longer in the new species), the indumentum (*C. floresii* is glabrous, while *C. barbadensis* shows an indumentum scarcely to densely hirtellous with ferruginous trichomes), the inflorescence (spicate in *C. floresii*, racemose in *C. barbadensis*), the ochreole (longer in the new species), and the fruiting pedicels (shorter in *C. floresii*). On the other hand, *C. floresii* also differ from *C. cozumelensis* by the petiole indumentum, being glabrescent in the new species, and puberulent to scarcely hirtellous in *C. cozumelensis*; the leaf blades are markedly longer in the first. Fruit characters are definitive to regard *C. floresii* as different from *C. cozumelensis*, because the first have an achene enclosed among the accrescent and fully fused hypanthium and fleshy perianth lobes, crowned at the apex. All fruiting specimens of *C. cozumelensis* examined so far have an achene enclosed among the hypanthium, and partially fused perianth lobes, free in the upper half.

TABLE 1. Morphological comparison among *Coccoloba floresii*, *C. cozumelensis*, and *C. barbadensis*.

| | <i>C. floresii</i> | <i>C. cozumelensis</i> | <i>C. barbadensis</i> |
|-------------------------------------|---|--|---|
| Petiole length (mm) | (5–)11–15(–23) | 5–8(–14) | (4–)7–12(–20) |
| Indumentum of the petiole | glabrous | puberulent to densely hirtellous, trichomes ferruginous | sparsely to densely hirtellous, trichomes ferruginous |
| Leaf blades shape; apex; and base | lanceolate to oblong-lanceolate; acuminate; rounded to subcordate | narrowly ovate, ovate-lanceolate; acuminate; rounded to subcordate | oblong-ovate to obovate; obtuse to shortly acuminate; rounded to cordate |
| Leaf blades length x width (cm) | (7–)10–15(–17.6) x 3–6(–9.5) | (3–)4–9(–11.5) x 2–5(–6.3) | (4.5–)5.8–12.5(–14.2) x 3.5–8 |
| Primary Nerves (pairs) | 9–12 | 7–8 | 7–10 |
| Inflorescence (type) | spicate | spicate | racemose |
| Ochreolae length (mm) | (0.7–)1–1.5 | 0.5–1 | (0.3–)0.5–1 |
| Fruiting pedicels (mm) | 0.3–0.6(–0.7) | 0.3–0.5 | 1–1.5 |
| Fruit shape; length x diameter (mm) | globose; 6–7(–8) × 4–6 | subglobose; 5–7 × 3–5 | globose; 6–10 × 4–5 |
| Hypanthium | achene enclosed among the accrescent and fully fused hypanthium and perianth lobes, crowned at the apex | achene enclosed among the hypanthium, and partially fused perianth lobes, free in the upper half | achene enclosed among the accrescent and fully fused hypanthium and perianth lobes, crowned at the apex |

The three species also differ in their distribution areas (Fig. 2). *C. barbadensis* occurs in Belize, Guatemala, Honduras, Mexico, and El Salvador. It is frequent in Yucatan Peninsula (Mexico), appearing as a typical member from lowland savannahs, as well as in semi-deciduous low forest or secondary vegetation, usually on black clay soils along water streams, at an elevation that ranges from 20 to 600 m, being rare at higher altitudes. *C. cozumelensis* is distributed in a restricted area of Yucatan Peninsula, which includes Mexico (Yucatan, Campeche y Quintana Roo), Belize and Guatemala (Petén). *C. cozumelensis* grows in tropical dry forests in rendzina soils, at an elevation that ranges from sea level to 400 m, while *C. floresii* is located exclusively in tropical deciduous forest of the Central Depression, and Chiapas Plateau provinces at higher altitudes that ranges from 850 to 2070 m with a characteristic habitat of cliff faces or disturbed slopes on limestone or sandstone near streams.

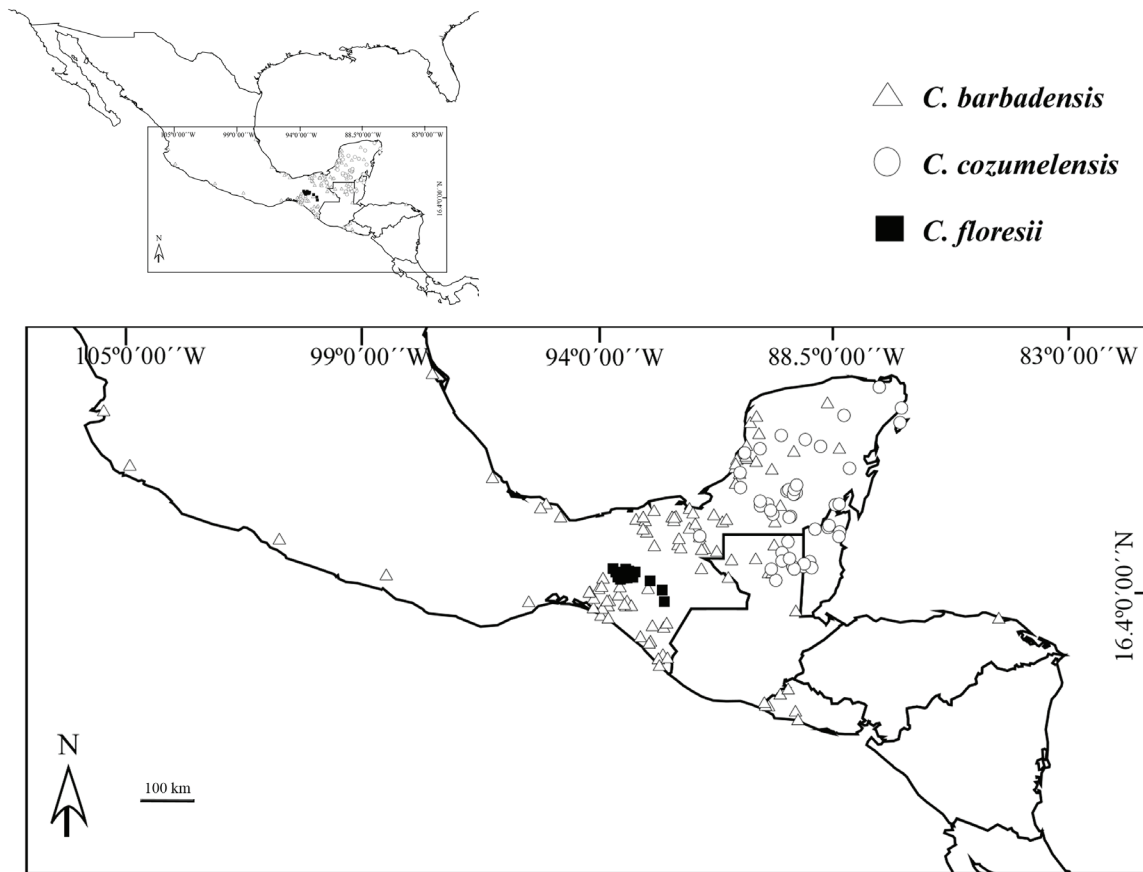


FIGURE 2. Distribution map of *Coccoloba barbadensis* (triangle), *C. cozumelensis* (circle), and *C. floresii* (black square).

Diagnostic key to *Coccoloba barbadensis*, *C. cozumelensis* and *C. floresii* from Mexico:—A key to distinguish the Mexican species of *Coccoloba* follows:

1. Leaf blades oblong-obovate to obovate, with obtuse or shortly acuminate apex; indumentum of the petiole sparsely to densely hirtellous with ferrugineous trichomes, (4–)7–12(–20) mm length; inflorescence racemose; fruiting pedicels 1–1.5 mm *C. barbadensis*
- Leaf blades lanceolate to oblong-lanceolate, or narrowly ovate to ovate-lanceolate, with acuminate apex; indumentum of the petiole glabrous or puberulent to densely hirtellous with ferrugineous trichomes, 5–15(–23) mm length; inflorescence spicate; fruiting pedicels 0.3–0.6(–0.7) mm.....2
2. Leaf blades lanceolate to oblong-lanceolate, (7.0–)10.0–15.0(–17.6) × 3.0–6.0(–9.5) cm, with 9–12 pairs of primary nerves; indumentum of the petiole glabrous, (5–)11–15(–23) mm length; ochreolae length (0.7–)1.0–1.5 mm; achene enclosed among the accrescent and fully fused hypanthium and perianth lobes crowned at the apex *C. floresii*
- Leaf blades narrowly ovate to ovate-lanceolate, (3.0–)4.0–9.0(–11.5) × 2.0–5.0(–6.3) cm, with 7–8 pairs of primary nerves; petiole indumentum puberulent to densely hirtellous with ferrugineous trichomes, 5–8(–14) mm length; ochreolae length 0.5–1.0 mm; achene enclosed among the hypanthium and partially fused perianth lobes free in the upper half..... *C. cozumelensis*

Additional specimens examined (paratypes):—MEXICO. Chiapas. Municipio Amatenango del Valle: 12 km al S de Amatenango del Valle, sobre el camino a Villa Las Rosas, 4 September 1984, *Cabrera & de Cabrera* 7535 (BM, MEXU). Municipio Berriozabal: near Berriozabal, 2 January 1981, *Breedlove* 49070 (CAS, MEXU, MO); Berriozabal a Las Vistas, 17 July 1949, *Miranda* 5389 (MEXU); camino a La Pera, 19 May 2010, *Sánchez* 506 (CHIP). Municipio Chiapa de Corzo: El Chorreadero, 5.6 miles Southeast of Chiapa de Corzo along Mexican Highway 190, 12 August 1967, *Shilom Ton* 2742 (CAS). Municipio Chicoasén: Chicoasén, 7 September 1974, *Breedlove* 37230 (CAS, MEXU, MO). Municipio Ocozocoautla de Espinosa: 8 km southwest to international airport (Tuxtla) 21 Jul 1994, *Chamé et al. III* (CAS); along road to Malpaso, 5 km North of Ocozocoautla de Espinosa, 28 October 1965, *Breedlove* 13978 (CAS); along road to Malpaso, 25 June 1972, *Breedlove* 25664 (CAS); 3 km North of Ocozocoautla along

road to Mal Paso, 19 September 1972, *Breedlove 29701* (CAS, MEXU, MO); idem, 15 December 1972, *Breedlove 30260* (CAS, MEXU, MO); 18–20 km North of Ocozocoautla along road to Mal Paso, 8 December 1972, *Breedlove 30033* (CAS, MEXU, MO); 7 km North of Ocozocoautla, 8 October 1980, *Breedlove & Strother 45974* (CAS); 1 km NW Ocozocoautla-México airport, 19 September 1988, *Reyes & Urquijo 990* (MEXU, MO); Selva del Ocote 32 km northwest of Ocozocoautla, 27 August 1972, *Breedlove 27508* (CAS, MO); Rancho km. 5, road to Malpaso, 8 January 1987, *Palacios 191* (CAS, MEXU); Llano San Juan, Cerrro Meyapac, 20 August 2008, *Ruiz 148* (CHIP); Llano de San Juan above Ocozocoautla NE of the next Tuxtla Gutierrez Airport, 3 November 1979, *Breedlove 44365* (CAS, MEXU, MO). Municipio San Cristobal de las Casas: Santa Cruz en San Felipe, 15 November 1986, *Mendez & Martínez 9815* (CAS, MEXU). Municipio San Fernando: 2 km NE of ejido La Pimienta, brecha del ejido La Pimienta a la cañada El Mojón del Diablo, 5 October 2009, *López 968* (CAS, MEXU); Ribera San José, a 17.3 km de Col. Gabriel Esquinca, 22 May 2009, *Martínez 2645* (CAS). Municipio Socoltenango: near Socoltenango, 3 August 1981, *Breedlove 51909* (CAS, MEXU). Municipio Tenejapa: Jeshab, 15 August 1983, *Méndez 6489* (MO). Municipio Tuxtla Gutiérrez: 16 miles West on Pan American highway, Barranca South of highway, drops sharply, 8 May 1949, *Carlson 2071* (F); Mirador La Coyota, 17 km N to Tuxtla Gutiérrez, Cañón del Sumidero, 3 July 1990, *Reyes et al., 1736* (BM, MEXU); El Sumidero, 22 km North of Tuxtla Gutiérrez, 19 August 1972, *Breedlove 27160* (CAS, MO); 21 km N to Tuxtla Gutiérrez, Tepehuaje, 20 November 1989, *Soto et al., 13247* (BM, MEXU); El Zapotal, SE of Tuxtla Gutierrez, 15-Jun 1986, *Palacios 108* (CAS, CHIP, MEXU); idem, 03 July 1991, *Palacios 1912* (CAS, CHIP). Municipio Venustiano Carranza: outskirts of Venustiano Carranza, 23 March 1973, *Breedlove 34348* (CHIP). Municipio Usumacinta: between Soyalo and La Bomba on road to Chicoasen, 10 km west northwest of Soyalo, 7 August 1981, *Breedlove 51953* (CAS, MEXU, MO).

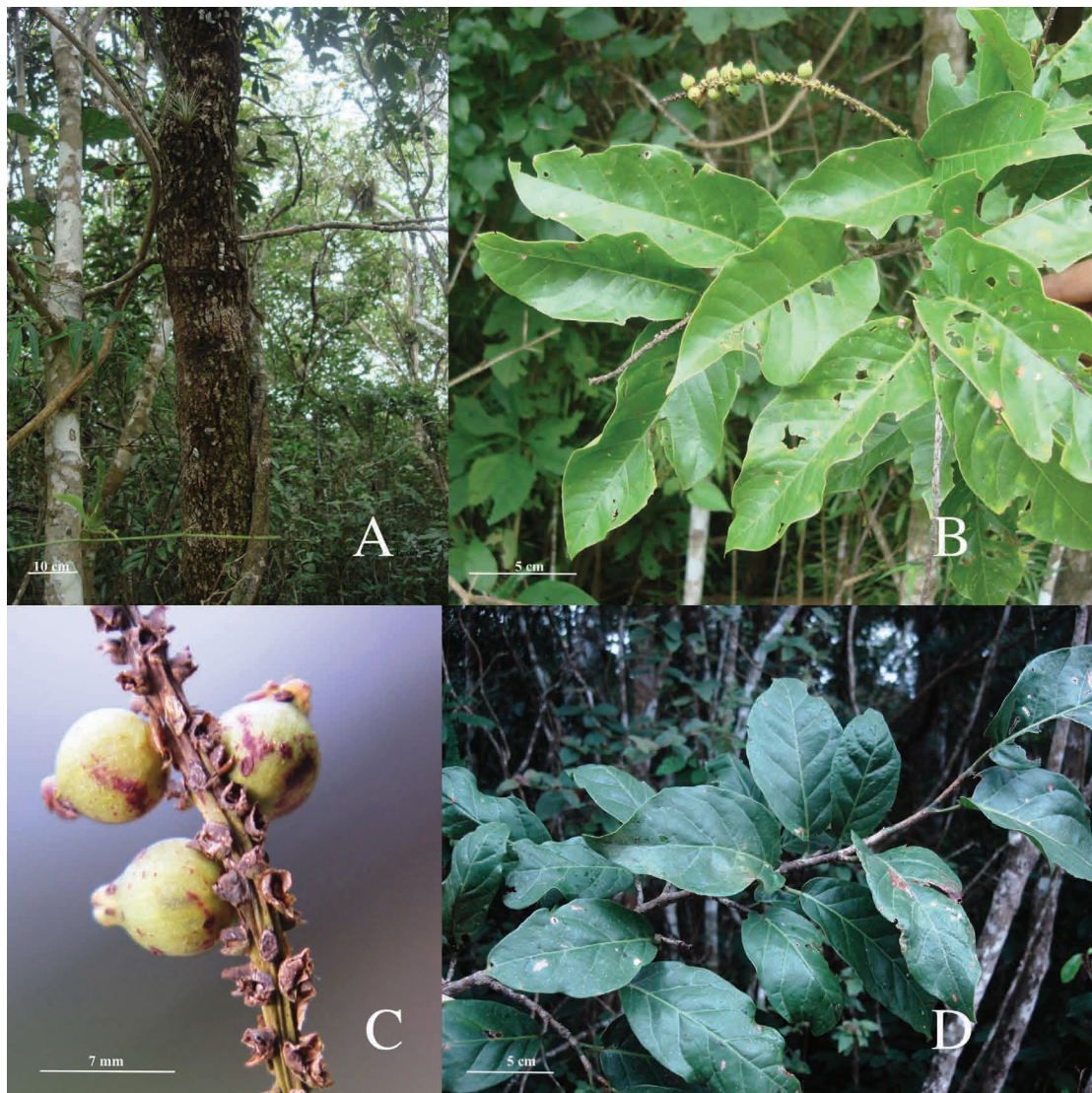


FIGURE 3. *Cocoloba floresii* in the locus classicus. **A)** Stem and bark. **B)** Branch, inflorescence, leaves and fruits. **C)** Inflorescence and fruit. **D)** Branch, leaves and ochrea.

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