

NEW RECORDS OF *CORCHORUS* (TILIACEAE) FOR MEXICO

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ABSTRACT

Two species of *Corchorus* (Tiliaceae) are reported for Mexico: *Corchorus olitorius* L. of Asian origin and *C. trilocularis* L., native of the tropics of Africa and Asia. The first species was introduced into Brazil and the Antilles toward the end of the 19th century and is now recorded for Mexico from the state of Sinaloa. The second species is known from Veracruz and Chiapas, Mexico, and as well as Panama and Ecuador. The exchange and trade of seeds from other continents could be an important way for their introduction and that might explain the presence of these two species in Mexico. At present six species of *Corchorus* are known to occur in Mexico. A dichotomous key for the identification of the Mexican species of the genus is provided, as well as descriptions of the two species, a map of geographic distributions for these species in America, and their vernacular names.

KEY WORDS: *Corchorus olitorius*, *C. trilocularis*, alloctonous species, Tiliaceae, Mexico.

RESUMEN

Se dan a conocer dos nuevos registros de especies alóctonas del género *Corchorus* (Tiliaceae): *Corchorus olitorius* L. de origen asiático y *C. trilocularis* L., nativa de los trópicos de África y Asia. La primera especie fue introducido a Brasil y a las Antillas desde finales del siglo 19, en nuestro país se reporta por primera vez del estado de Sinaloa; la segunda especie se registra de Veracruz y Chiapas, México, además de Ecuador y Panamá, se desconoce la fecha exacta de su arribo al continente americano. Se propone que el intercambio y comercio de semillas provenientes de otros continentes, puede ser una vía importante para su introducción, lo que podría explicar su presencia en México. En la actualidad son seis las especies reconocidas de este género para México. Se proporciona una clave dicotómica para separar de el género *Corchorus* de México, así como la descripción de las dos especies, un mapa de distribución geográfica para estas especies en América y sus nombres comunes.

PALABRAS CLAVE: *Corchorus olitorius*, *C. trilocularis*, especies alóctonas, Tiliaceae, México.

INTRODUCTION

The genus *Corchorus* (Tiliaceae) was originally described by Linnaeus in 1753, who included four species in the genus: *Corchorus capsularis* L., *C. hirsutus* L., *C. olitorius* L., and *C. siliquosus* L. At the present time the genus is considered pantropical with approximately 40 species, with about 10 species in the New World (Howard 1989). *Corchorus olitorius* and *C. capsularis*, of Asian-African

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origin, have been cultivated since the XIX century in some tropical regions of America for their well known jute fiber.

In Mexico, Standley (1923) registers the presence of three species: *Corchorus hirtus* L., *C. orinocensis* Kunth, and *C. siliquosus* L.; later Standley and Steyermark (1949) recognize *Corchorus aestuans* L. for Mexico and South America; Fryxell (2001) recognize: *C. aestuans*, *C. siliquosus* and *C. hirtus* for the Flora Novo-Galiciana. In the present work *C. olitorius* and *C. trilocularis* L. are added to the previous list, resulting in six species presently reported for Mexico.

The genus *Corchorus* is characterized as follows: annual or perennial herbs, subshrubs, or shrubs, with simple, stellate, or stellate-dendritic hairs or glabrous; leaves alternate, simple, with stipules, persistent or deciduous; blades dentate, serrate or crenate, occasionally with two teeth prolonged into long setae at base; inflorescences lateral or leaf-opposed, bracteate, shortly pedunculate, 1-to several-flowered umbellate or racemose cymes; flowers hermaphroditic; calyx valvate, sepals 4–5, generally free, often apiculate or caudate at apex; petals 4–5, yellow, free, usually shortly unguiculate, with an inconspicuous glandular patch at the base of each petal; androgynophore usually present; stamens 4 to many, free, filaments free or connate; anthers with two theca, introrse, dorsifixed; ovary 2-to10-locular, ovules 2 to many per locule, placentation axile, parietal, or pendulous; style terete, papillate; capsules cylindrical to subglobose, muricate, glabrous, glabrescent, or pubescent, 2- to 10-valved, valves sometimes with transverse septae adaxially; seeds many and small.

METHODS

Specimens of *Corchorus* were studied in the herbaria CHAPA, ENCB, MEXU, UAS, and XAL. Specialized works on the genus were reviewed, with the morphological characteristics of stem, leaves and fruits being compared with the respective descriptions in the works of Martinez (1981), Edmons (1990), and Halford (1995). For the particular case of *C. trilocularis*, the pubescence of the fruit was observed in the compound microscope. The specimens were also compared with the phototypes of the herbarium S-LINN, deposited in the ENCB herbarium. Synonymies and vernacular names were taken from literature sources.

RESULTS

Two species of *Corchorus* are added to the family Tiliaceae in Mexico, *C. olitorius* and *C. trilocularis*. The first one is native of the region of India and Malaysia and is widely cultivated for its fiber, well known as jute. *Corchorus trilocularis* is native to the region of Africa and Asia and is less important from a economic point of view, not being a commercial crop. A dichotomous key for the identification of all Mexican species of *Corchorus* is included below, followed by morphological descriptions, uses, and specimens examined for each of the two newly reported species, as well as a distribution map (Fig. 1).

KEY TO THE SPECIES OF *CORCHORUS* IN MÉXICO

1. Subligneous more than 1 m tall; ovary with 5–6 celled; capsules with 5–6 _____ ***Corchorus olitorius***
1. Herbs smaller than 1 m tall; ovary with 2–4 celled; capsules with 2–4 valves.
 2. Capsules 2 valved; ovary 2 celled.
 3. Shrubs; branchlets subglabrous; leaves glabrous below; ovary puberulent; capsules aplanate with the apex obtuse and with 1–4 minute apical beaks _____ ***Corchorus siliquosus***
 3. Herbs; branchlets densely tomentose and hirsute; leaves hirsute or pilose below; ovary densely sericeous; capsules teretes without apical beaks.
 4. Capsules hirsute with trichomes conspicuous ca. 1.5 mm long, lightly curved; stipules and leaves hirsute; calyx hirsute; stamen 40; ovary hispid _____ ***Corchorus hirtus***
 4. Capsules glabrous or with trichomes inconspicuous ca. 1 mm de largo, right; stipules and leaves essentially glabrous; calyx glabrous; stamens 20–30; ovary appressed pubescent _____ ***Corchorus orinocensis***
 2. Capsules 3–4 valved; ovary 3–4 celled.
 5. Leaves mostly ovate, slightly cordate, base rounded and sometimes with a pair of teeth prolonged; stamens 9–14, capsule oblongoid with 6–8 winged and 3 or 4 apical bifid beak divergent and recurved _____ ***Corchorus aestuans***
 5. Leaves narrowly ovate or linear, base obtuse or broadly cuneate never with a pair of teeth prolonged, stamens 20–30, capsule torulose without winged and only one apex straight _____ ***Corchorus trilocularis***

Corchorus olitorius L. Sp. Pl. 529. 1753. (Figs 1, 2). TYPE: cultivated specimen *Herb. Clifford* 209, *Corchorus* no. 1, (LECTOTYPE: BM). Lectotype designated by Wild, Fl. Zambes. 2:84. 1963.

Corchorus quinquelocularis Moench, Méth. 248. 1794.

Corchorus decemangularis Roxb., Hort. Beng. 42. 1814.

Corchorus lanceolatus G. Don, Gen. Syst. 1:543. 1831.

Corchorus longicarpus G. Don, Gen. Syst. 1:543. 1831.

Corchorus cartharticus Blanco, Fl. Filip. Ed. 1:442. 1837.

Corchorus malchairi De Wild., Etudes Fl. Bangala & Ubangi 345. 1911.

Corchorus olitorius var. *australiensis* Domin, Biblio. Bot. 89:380. 1927

Vernacular names in other countries, taken from the literature.—bunani waweza, eteke nyamusiri, niimbawa-lusali, otigu-kal, pombo mgunda (Africa); yute (Argentina); gramigrain (Bahamas); yute, gringuele (Cuba); bogi, koshta, jute, chehuncho, changhas, rajaana, tossa jutee (India); feuilles lalo, lalo, petit lalo, ti-la-lo (Dominican Republic-Haiti).

Subligneous herb to (1–)2–4 m tall; branchlets glabrous, somewhat angular or sulcate when young, stipules 5–16 mm long, glabrous; leaves with petioles terete, thin, (1–)3–4(–60) mm long, glabrous except for simple hairs on a margin; stipules linear, (7–)10(–12) mm long, pilose or glabrous; blades narrowly ovate to ovate, ovate-lanceolate, (1.5–)10(–12) cm long and (1–)2–5 cm wide, upper and lower surfaces usually glabrous, veins sometimes pilose, base rounded and with two basal setaceous teeth to 10(–15) mm long, margin serrate to crenate-serrate, apex acute to acuminate; inflorescences leaf-opposed, solitary

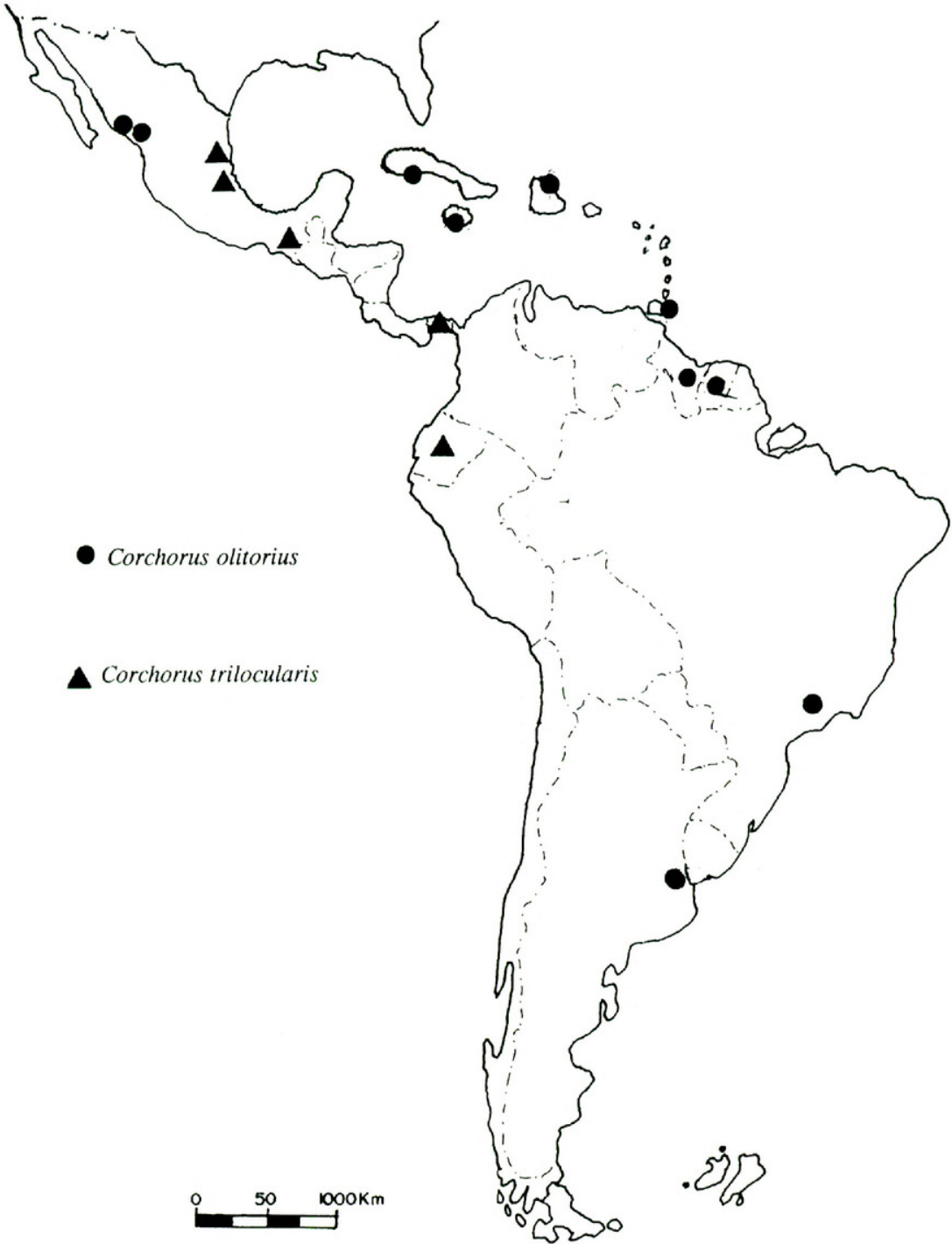


FIG. 1. Geographical distribution in America of *Corchorus olitorius* and *C. trilocularis*

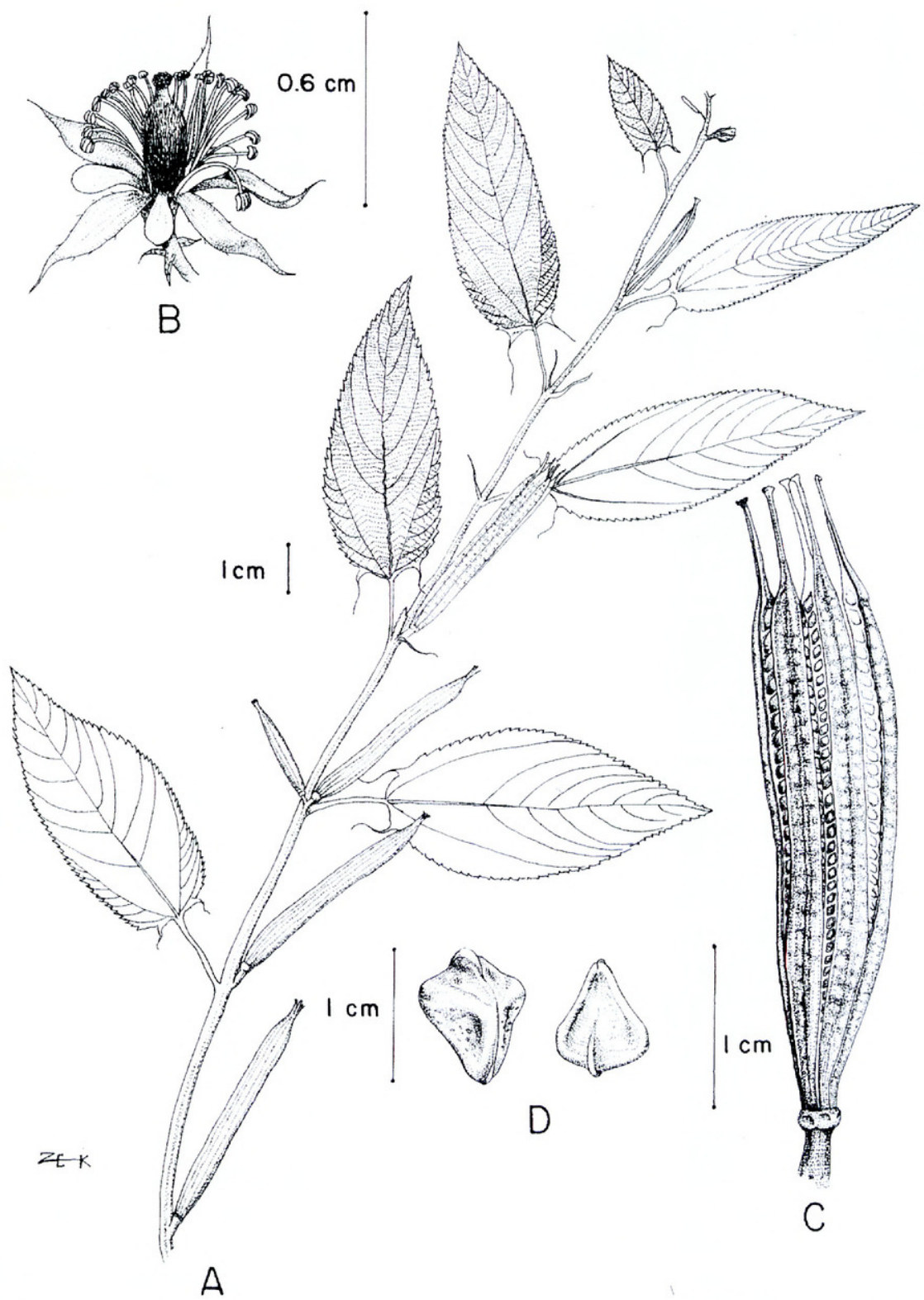


FIG. 2. *Corchorus olitorius* L. **A.** Branch with leaves, buds and fruits; **B.** Immature flower, seen laterally; **C.** Lateral view of the fruit; **D.** Seeds (based on D. Bates, O. Blanchard and P. Fryxell 1543).

at the nodes, geminate or ternate, pedicels very short, 1–2 mm long, glabrous, bracts (1–)3–5 mm long, pilose or glabrous; sepals valvate, 7 mm long, linear-lanceolate, concave and glabrous; petals obovate, imbricate, yellow, same length as sepals, 1 mm long and 2–3 mm wide, glabrous but minutely ciliate on margin; androgynophore 2–5 mm long; annulus 5-lobed; stamens 30–50, borne inside of annulus; filaments filiform, 3–4 mm long; anthers dorsifixed, oblong; ovary cylindrical, 5–6 celled, 10-sulcate, minutely setose and glandular, with 36–42 axial ovules per cell; style stout, glabrous, 1–2 mm long, stigma lobed, fimbriate; capsule cylindrical, (3–)4–6(–8) cm long and (3–)4–5(–6) mm wide, appressed to stem, sometimes torulose, dehiscent, 5–6 valvate, transversely septate, apex 3 to 4(–10) mm long; seeds more or less rhomboid, many, black, 1–3 mm (Fig. 2).

Specimens examined: **MÉXICO. Sinaloa:** a 2 Km del ejido La Campana, km 25 carr. Culiacán Guamuchil, municipio de Culiacán, *Leobardo Chávez Montes y Fco. Javier Niebla Armenta 124* (UAS); carr. Culiacán-Los Mochis, Km 19, al NE hacia el Cerro La Chiva, *J. A. Prado V. y V. Llamas A. 201* (UAS); pie del Cerro El Tule, lado W, orilla de la brecha a la torre de microondas, ca. 5 km de Culiacán, municipio de Culiacán, *Rito Vega. 7295, Hipólito Aguiar H., Cenón Aguirre C. y Ricardo Ceballos B.* (UAS); carretera internacional a Costa Rica Km 5, municipio de Culiacán, *Salomé Ochoa Avalos y Germán A. Bojórquez B. 162* (MEXU); El Camichín, a 3 km al poniente de Guadalupe de los Reyes, municipio de Cosalá, *Rito Vega 3487, Germán Bojórquez y Alejandro Hernández* (CHAPA, UAS); 5 mi S of Mazatlan, *D. Bates, O. Blanchard y P. Fryxell 1543* (ENCB).

This species is originally from India and Malaysia, with pantropical distribution where it is appreciated for its fiber (jute).

Corchorus olitorius can be distinguished from the rest of the species in Mexico by being a semishrub 1–2 m, with the stem and leaves glabrous and the inferior border of the leaves with two very long appendices, as well as by the linear capsule, which is thick and glabrous with five valves. It is known from the Pacific Coastal Plain, in the state of Sinaloa, where it grows on the edges of cultivated fields, the banks of roads, in tropical deciduous forest and in thorn forest, on alluvial soils and thin and stony soils, at altitudes that vary between (30–)50 and 700 m. Its presence in America has been reported since the latter part of the XIX century in most of the region of the Caribbean and Brazil (Ricardo et al. 1995; Schumann 1886).

From very early times *Corchorus olitorius* was cultivated as edible in Africa and the Middle East, while as a textile plant it was broadly domesticated in India (Simmonds 1979). Well known as jute, it is presently cultivated in the west of Bengal, Bangladesh, Burma, Nepal, China, Malaysia, and Sri Lanka (Maiti 1995). With the same objective it was introduced into Brazil and Cuba at the end of the 19th century, and in the latter country it has become naturalized in the western part (Schumann 1886; Ricardo et al. 1995; Rodríguez 2000). In Argentina its presence may be more recent (Dimitri & Rial 1952).

This species occurs in Africa in grassland and savannas, and diverse uses are attributed to it there, such as paper production and the extraction of indus-

trial alcohol (Irvine 1961; Edmons 1990). In India, the seeds are used as a purgative and an infusion of the leaves is used as a tonic (Bhandari 1978).

Corchorus trilocularis L. Syst. Nat. ed. 12, 2:369.1767. (**Figs. 1, 3**). TYPE: protologue ARABIA: *Forsskal* s.n. (LINN 691.2) type info. fide Flora of Tropical East Africa (2001).

Corchorus aestuans Forssk, Fl. Aegypt. Arab. 101. 1775. non L.

Corchorus serraefolius DC., Prodr. 1:504. 1824.

Corchorus fruticulosus Vis, Flora 20:443. 1837

Corchorus triflorus Bojer, Hort. Maurit. 43. 1837.

Corchorus asplenifolius E. Mey. non Burch. ex Harv. & Sond., Fl. Cap. 1:229. 1860.

Corchorus somalicus Gandoger, Bull. Soc. Bot. France 69:348 1922

Corchorus rigidiusculus Domin, Biblioth. Bot. 89:381.1926

Vernacular names in other countries, taken from the literature.—apoik, lumere, teke (Africa); hardikaket, kagle-ki-tambaku, karak (India).

Herbs, procumbent to ascending, up 50 cm tall; branchlets moderately covered with pilose pubescence; leaves simple, petioles 3–20 mm long with simple hairs, stipules 2–3(–7) mm long; blades narrowly ovate or linear, (2.5–)4–9(–13) cm long and 0.6–3.0 cm wide, base obtuse or broadly cuneate never with a pair of teeth prolonged, margin dentate or crenate, sometimes with a pair of basal teeth upwardly prolonged 5(–10) mm, apex obtuse or acute, upper surface with scattered simple hairs, lower surface with simple hairs frequently on midvein and secondary veins; inflorescence leaf-opposed, solitary at nodes, geminate or ternate, peduncles and pedicels 1–2(–4) mm long, bracts up 33 mm long, ciliate; sepals 5, linear, (4–)5.5–(–6.3) mm long and 10 mm wide, pilose outside, constricted toward base; petals 5, obovate, (4–)5–(6–)7 mm long and 20–25 mm wide, minutely ciliate on margin; stamens 20–30; ovary cylindrical, 3-locular, 3 mm long, shortly pubescent, stigma fimbriate; capsule torulose without winged and only one apex straight, (2.5–)3.0–5.5(–7) cm long and (1–)2.5–3 mm wide, 3-valvate, pubescence of short simple and fasciculate or palmate hairs, the latter not perceptible without magnification, at maturity more or less glabrous, apex straight, acuminate, valves partially transversely septate adaxially; seeds more or less rhomboid, dark brown to black, 0.8–1 mm diameter.

Specimens examined: **MÉXICO. Chiapas:** Mirador for Chicoasen Dam along road to Tuxtla Gutierrez to the Chicoasen, Municipio San Fernando, *Breedlove* 41494 (MEXU). **Veracruz:** Barranca de Pachuquilla, a 2 km al SO de dicha población, municipio de Puente Nacional, *M. E. Medina A. y M. Ortiz D.* 702 (XAL); Paso de la Milpa, municipio de Actopan, *F. Ventura A.* 18001 (ENCB, XAL); Cerro del Brujo, 3 km al N de Jacomulco, municipio de Jalcomulco, *G. Castillo Campos y P. Zamora C.* 8757 (XAL); Al NW de Jalcomulco, entre Tuzamapan y Jalcomulco, municipio de Jalcomulco, *G. Castillo-Campos, et al.* 8347 (XAL); El Hatito, carretera de terracería El Hatito-Caño Prieto, municipio de Paso de Ovejas, *J. E. González H.* 184 (XAL); Mata de Caña, municipio de Puente Nacional, *F. Ventura A.* 10706 (ENCB). **PANAMÁ. Provincia Los Santos:** Las Trancas-Guararé, *Alcibiades Velázquez* 24 (MEXU).

Corchorus trilocularis resembles *C. orinocensis* in its herbaceous habit and the size of the leaves. However, *C. trilocularis* is distinguished by the presence of small sepals and petals and the fimbriate stigma; by the ovate-lanceolate leaf

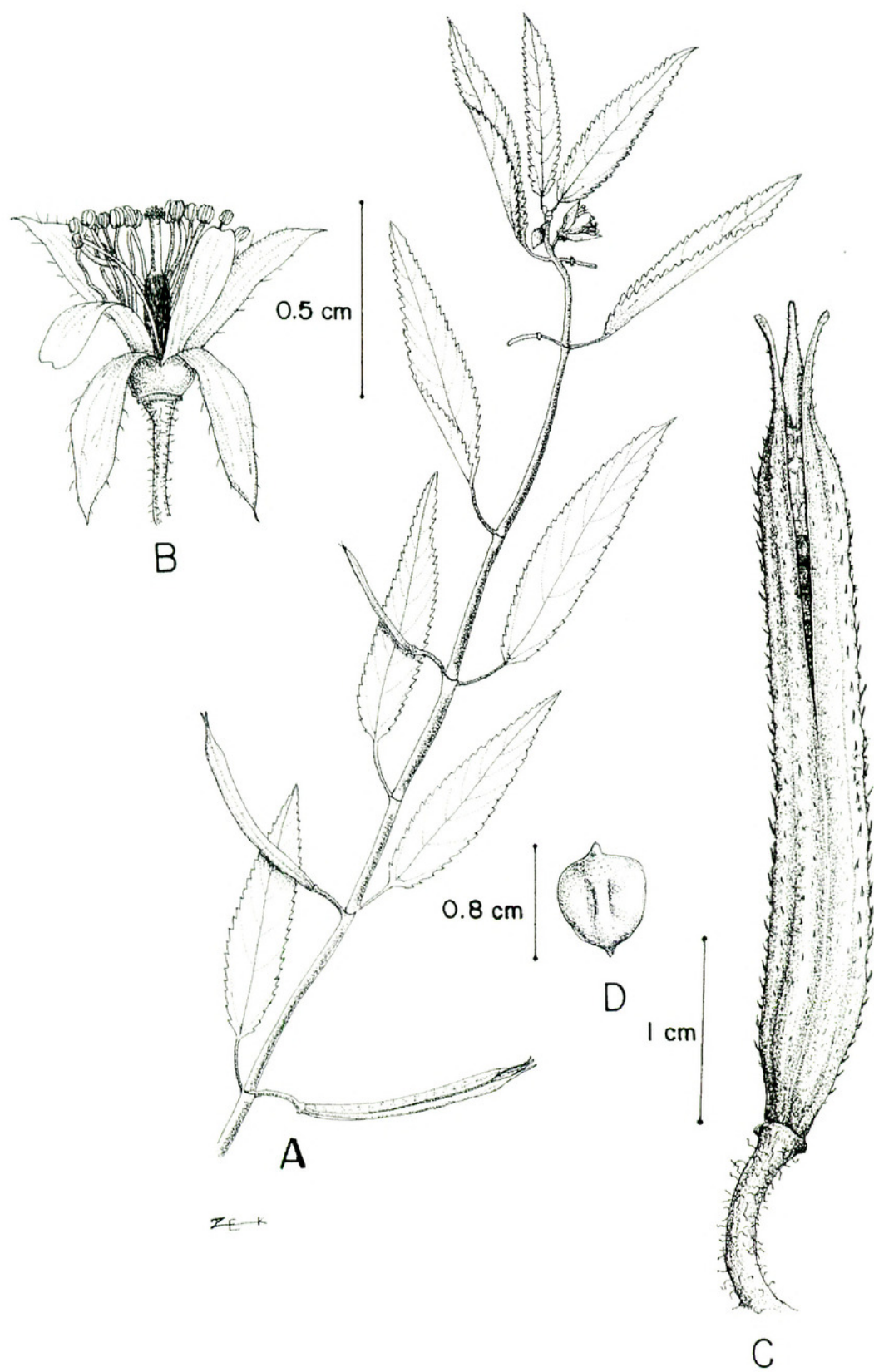


FIG. 3. *Corchorus trilocularis* L. **A.** Branch with leaves, buds and fruits; **B.** Mature flower, seen laterally; **C.** Lateral view of the fruit; **D.** Seeds. (based on A. Velázquez 24)

blade (linear-lanceolate in *C. orinocensis*); and, most remarkably, by its three-valved fruits with pubescence of simple and fasciculate or palmate hairs, the latter extremely small and imperceptible at first look (Fig. 3), as opposed to the two-valved fruits with only simple hairs found in *C. orinocensis*.

The presence of *Corchorustrilocularis* in America has not been established previously with certainty, because specimens with two or three-valved fruits have been identified as *Corchorus orinocensis*. In the earlier works of Macbride (1956) for Peru and Robyns (1964) for Panama, the descriptions of *Corchorus orinocensis* correspond to three-valved material.

In the revision of the Neotropical species of the genus *Corchorus*, Tiliaceae, Martínez (1981) assigned Ecuadorian specimens to *Corchorustrilocularis*.

In the revision of the family Tiliaceae for the Flora of the Guyanas, Jansen and Meijer (1995) have concluded that only the two-valved specimens should be assigned to *C. orinocensis* based on Kunth's 1823 description.

Corchorustrilocularis is widely distributed in Africa, Asia, and Australia, including in the xerophytic regions of Arabia and India (Bhandari 1978; Edmons 1990). At present there is no clear indication of the date of arrival in the Americas. In Mexico it has been collected in the states of Chiapas and Veracruz, in disturbed areas of deciduous and semi-deciduous tropical forest and in Panama in tropical rain forest.

Although *Corchorustrilocularis* is of little economic importance, it is used at the domestic level; for example, in Africa, the leaves are used in traditional medicine to reduce swellings; an infusion of leaves and branches is used to produce an alcoholic drink; the seeds are used for certain stomach disorders and to induce vomiting; and it is used as an ornamental plant and as food for livestock (Edmons 1990).

CONCLUSIONS

With these two new reports of *Corchorus*, the number of species known for Mexico rises to six. *Corchorus olitorius* is presently known only from Sinaloa, although its presence in the region of the Caribbean and South America as a useful plant has long been known. Its origin in the Indo-Malay region and its discovery in the Pacific coastal plain in Mexico leads to the supposition that trade of agricultural products, mainly seeds with Oriental countries, has been the route of introduction of the species into Mexico.

In Mexico *Corchorustrilocularis* behaves as weed adapted to the disturbed conditions in southern Mexico, in dry and sub-humid warm vegetation types and in cloud mountain forest. In the Old World it is a characteristic species of the arid zones of Africa, Arabia, and India, in areas of cultivations, grasslands, savannas, and xerophyllous shrubs, while it is also present in the warm-humid zones of India and Australia. Its presence in the Ecuador and part of Central America leaves unanswered questions about this apparently disjunct distribution.

In the specimens of *C. trilocularis* collected in Mexico and Central America, we observe that the pubescence of the mature capsule is of simple and fasciculate trichomes similar to specimens collected in Australia (Halford 1995). Specimens collected in Africa present mature capsules with simple and palmate trichomes (Edmons 1990).

It seems likely that more intensive collection in Mexico, Mesoamerica, and South America will lead to a more definite hypothesis as to the manner and route of introduction of the species into the New World, including whether the introduction is recent or ancient.

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