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Triumfetta acahuizotlanensis (Malvaceae), a new tree species endemic of Guerrero, Mexico

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Abstract

Triumfetta acahuizotlanensis is herein described and illustrated as a new species from the state of Guerrero, Mexico. The new taxon can be identified by the presence of tetramerous flowers, four glands in the androgynophore and piriform fruit.

Resumen

Se describe e ilustra a *Triumfetta acahuizotlanensis* como una especie nueva del estado de Guerrero, México. El nuevo taxón se distingue de las especies conocidas del género por presentar flores tetrámeras, cuatro glándulas en el androginóforo y fruto piriforme.

Introduction

The genus *Triumfetta* L. (1753: 444) (Malvaceae: Tilioideae) (Bayer *et al.* 1999, APG III 2003) has a pantropical distribution with nearly 150 described species (Lay 1950, Meijer 2009). They occur in Mexico in limited areas and only some species extend up to the north of Central America, proposing the latter as a primary dispersal center (Lay 1950). The genus comprises 37 species in Mexico, 32 of wich are endemic, incluiding the ones of recent publication (Thomas & McVaugh 1978, Fryxell 1998, Fryxell & Guadarrama 2001, Gual-Díaz *et al*. 2001, Gual-Díaz & Chiang 2011), and 18 of which occur in the state of Guerrero (Lay 1950, Gual-Díaz 1998, Gual-Díaz *et al.* 2001). The genus is distinguished by the presence of an urceolate, ciliate androgynophore with glands, capsules often globose, indehiscent or bivalvate, with spinules on the whole surface and hyaline apices (Meijer 2009).

In the area of Acahuizotla, located in the Sierra Madre del Sur in the state of Guerrero, Mexico, a small tree population of the genus *Triumfetta* was found. This population of trees has a very branched and cymose inflorescence, tetramerous white flowers, a ciliate androgynophore with four glands, style inserted and a glabrate fruit with uncinate spinules covering the fruit surface. Because of this combination of morphological features, especially the presence of tetramerous flowers, these plants could not be placed among any of the known species of *Triumfetta*, therefore, we describe this as a species new to science.

Taxonomy

***Triumfetta acahuizotlanensis* González-Martínez, J. Jiménez Ram. & Rios-Carrasco**, *sp. nov*. **(Fig. 1, Fig. 2)**

It differs from all species of the genus *Triumfetta* in having tetramerous flowers with four glands on the androgynophore and a pyriform fruit.

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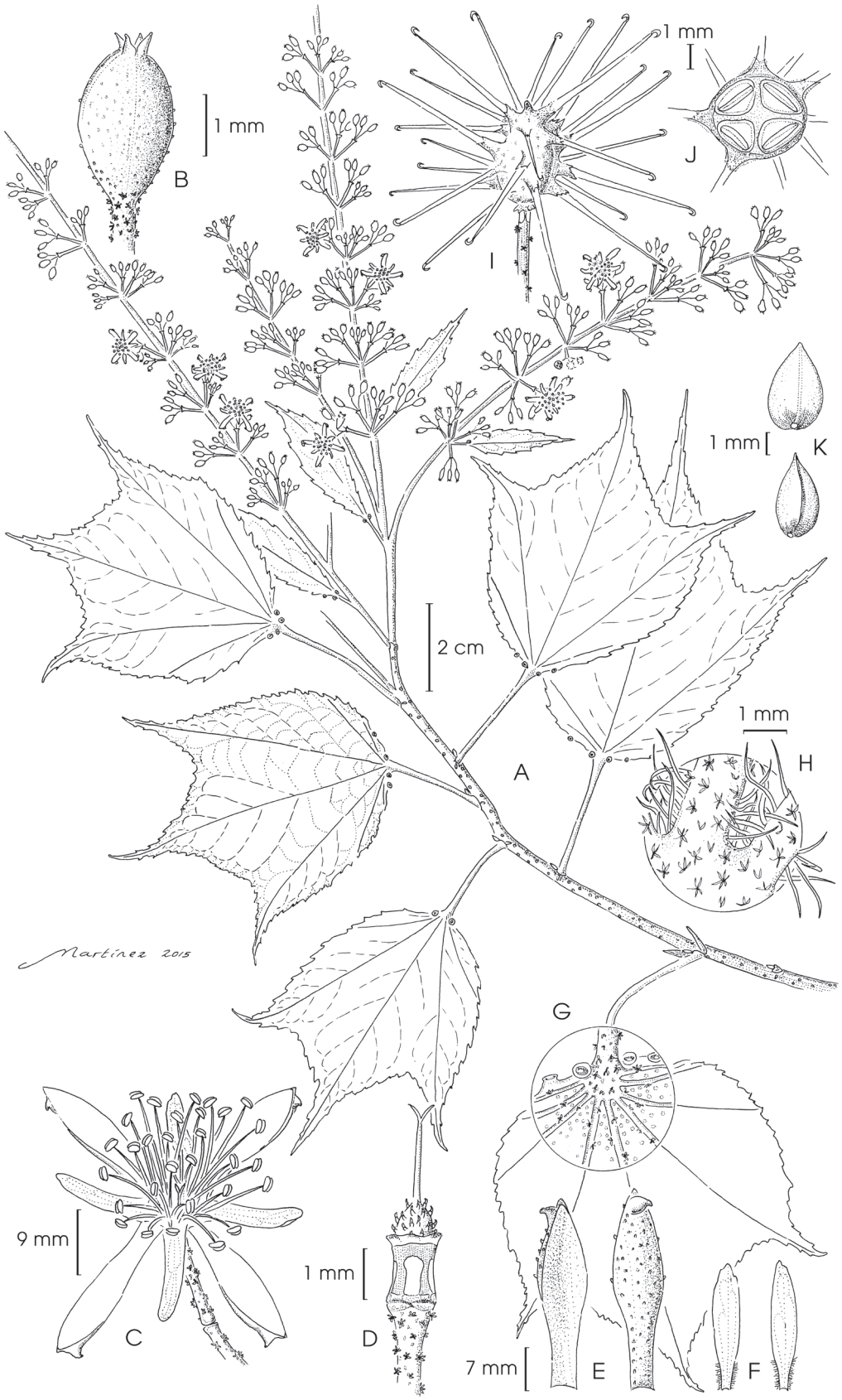

FIGURE 1. *Triumfetta acahuizotlanensis.* A) Plant habit, B) Floral bud with four subapical appendices, C) Tetramerous flower, D) Androgynophore and gynoecium, E) Sepals in ventral and dorsal view, F) Petals in ventral and dorsal view, G) Detail of the cupuliform basal glands, H) Detail of the simple trichomes at the base of the primary veins on the underside of the blade, I) Glabrate fruit with uncinate spinules, J) Cross-section of a fruit with four locules, K) Seeds in ventral and lateral view. (A-H based on *C.A. González-Martínez & S. Rios-Carrasco 588*; I-K based on *L. Lozada & J. Rojas 3707*; Illustration of César Adrián González Martínez).

Type:—MEXICO. **Guerrero**: Mochitlán: Acahuizotla, pasando el río Escondido, 822 m, 17°21'14.2"N, 99°27'6.3"W, 26 Septiembre 2014 (fl.) *C.A. González-Martínez & S. Rios-Carrasco 588* (Holotype: FCME, isotypes: FCME).

Trees 3–7 m tall, outer bark maculate light brown and dark brown. **Stems** brownish green while young, with abundant lenticels, glabrescent, short-stellate pubescence, yellowish white, with minute yellow-orange glands, the mature stems light brown to white-yellow, glabrescent, with rhomboid striations, and minute black glands when dried. **Leave** blade 3.8–13 × 3.5–11.2 cm, subquadrate, sometimes elliptic, equilateral, the margin serrate-dentate, trilobed at the apex, with divergent lateral lobes, the apices caudate, the base obtuse or cuneate with 2 basal teeth on each side with cupuliform glands, coriaceous, yellowish green, the upper side of leaves light green, young leaves with simple hairs, with minute whitish glands, the adaxial side of the mature blade light green, glabrate, the abaxial sides of the blade pale green, glabrate, midveins 5–7 (–9—in this case there are 2 basal inconspicuous nerves) which present minute yellow glands, on both the adaxial and abaxial sides of the blade, with scattered and short stellate trichomes, in addition to simple trichomes on the base of the underside, although they are scattered along the veins; petioles 1.1–9 cm × 0.5–1.7 mm, green or brownish red, with abundant minute yellowish glands, glabrescent or with sparse stellate trichomes; stipules lanceolate, 4.1–6.9 mm long, caducous, with abundant minute glands, simple and stellate trichomes sparse. **Cymes** highly branched, 6.8–20.5 cm long, terminal or axillary on the last leaf of the branch, the subtending leafy bracts, 2–5.4 × 0.4–1.9 cm, ovate-elliptic or lanceolate, the margin serrate-dentate, the apex caudate, the base attenuate or cuneate, with 1–4 cupuliform glands on the basal teeth; peduncles of dichasium 2.3–8.4 mm long, with short-stellate pubescence; pedicels (1-) 2.4–5.5 mm long, articulated at ¼ of the length above the base, with short-stellate pubescence; bracteoles at the base of the pedicels, membranous, ca. 0.4 mm long, brown-orange; dichasia (2-) 4-5 at each node, evenly scattered along the branches. **Flowers** bisexual, the buds cylindrical, 1.6–2.7 × 1.1–1.6 mm while in pre-anthesis; **calyx** tetramerous, sepals 5–5.9 × 1.1–1.4 mm, spathulate, green, the inner side glabrate, the outer side with minutely pubescent and sparse stellate trichomes and minute glands on the surface, the base truncate, the apex acute rounded with simple sub-apical appendices 0.4–0.5 mm long; **corolla** tetramerous, the petals 3.5–4.2 × 0.8–0.9 mm, spathulate, white, the margins with hyaline trichomes at the base, the apex acute-rounded or slightly oblique, the base truncate; **androgynophore** 0.9–1 mm long, with 4 glands, oblong, white-yellowish, ring of ca. 0.3 mm long, ciliate; **stamens** 30 the filaments white, filiform, 2–4.2 mm long, the anthers dithecal, 0.5–0.7 mm long, longitudinally dehiscent, versatile, with an orange spot at the point of attachment; **ovary** 0.6 × 0.4 mm, ovoid, white, muricate, with (3) 4 locules, 1 ovule per locule, spinules with white base and hyaline apex; **style** 1.4–1.7 mm long, inserted, the stigma bifid, with papillose glands. **Capsules** 2.1–3 mm diameter at maturity, indehiscent, pyriform, (3) 4 locular, all the surface with uncinated spinules, light brown to grey, with minute black glands, glabrate; spinules 22–26 (–30), 4–5.8 mm long, reddish-orange, hyaline at the apex, glabrate. **Seeds** 4, rarely 3, 2.8–3.2 × 1.4–2.2 mm, pyriform, one seed per locule, dark red at the base and black along the edges.

Distribution and Ecology:—This species has only been found in the area around Acahuizotla, in the municipalities of Chilpancingo de los Bravo and Mochitlán, in the state of Guerrero, Mexico. The habitat is tropical semi-deciduous forest, on the west slope of Cerro El Sombrerito and Cerro El Palmar. The population is reduced and scarce, although individuals are abundant at the base of Cerro El Sombrerito. It is associated with *Astronium graveolens* Jacq. (1760: 10) (Anacardiaceae), *Jacaratia mexicana* A.DC. (1864: 420) (Caricaceae) and *Peltogyne mexicana* Martínez (1960: 125–131) (Fabaceae). It flourishes in rocky soils and the leaves exhibit severe damage due to herbivory. It flowers from September to October and bears fruit in December-January.

State of conservation:—The population of *Triumfetta acahuizotlanensis* is very small and is conformed approximately by 50 mature individuals. Although its current status is threatened, due to deforestation, we observed several plants not greater than 1 m tall in open and perturbed places during the botanic expeditions carried out in 2014–2015, in Acahuizotla, Guerrero. Given this situation, it is herein proposed to include this taxon in the category *Critically Endangered* (criterion D) of the IUCN red list of threatened species (IUCN 2014). Moreover, greater attention is needed in the protection and conservation of the tropical semi-deciduous forest in Acahuizotla, as it is home for a vast richness of plant species, some of them endemic to this area, such as *Anotea flavida* (DC.) Ulbr. (1915: 109) (Malvaceae), *Louteridium rzedowskii* T.F. Daniel (1984: 91) (Acanthaceae), *Picramnia thomasii* González-Martínez & J. Jiménez Ram. (2015: 292-297) (Picramniaceae), *Desmopsis guerrerensis* González-Martínez & J. Jiménez Ram. (2016: 51–54) (Annonaceae), and *Pitcairnia flavescentia* Matuda (1966: 110–111) (Bromeliaceae). The exact distribution of *Triumfetta acahuizotlanensis* and of the mentioned endemic species is unknown, as the adjacent regions of Acahuizotla have not yet been fully explored, except for Rincón de la Vía, a region explored by Verduzco & Rodríguez (1995) who made a list of 498 vascular plant species, eventhough they do not register the mentioned endemic species.

FIGURE 2. *Triumfetta acahuizotlanensis.* A) Bark, B) Inflorescence, C) Infructescence, D) Leaf blade.

Additional specimens examined:—**MEXICO. Guerrero**: Chilpancingo de los Bravo: adelante del río, 800 m, 17°21’20.6’’N, 99°27’18.09’’W, 24 Enero 2014 (fr.) *L. Lozada & J. Rojas 3707* (FCME); cerca del río, 805 m, 17°21’17.57’’N, 99°27’17.12’’W, 18 Octubre 2015 (fl., fr.) *C.A. González-Martínez & S. Rios-Carrasco 996* (FCME); Acahuizotla, 806 m, 17°21’20.17’’N, 99°27’12.97’’W, 19 Diciembre 2015 (fr.) *C.A. González-Martínez & S. Rios-Carrasco 1007* (FCME); Mochitlán: pasando el río Escondido, 822 m, 17°21’14.2’’N, 99°27’6.3’’W, 23 Mayo 2015 *C.A. González-Martínez & S. Rios-Carrasco 959* (FCME).

Etymology:—The specific epithet *acahuizotlanensis* refers to the commune of Acahuizotla (*Aca-huitzoc-tla*, means “place of canes” or “sticks of sugarcane”) where it was discovered.

Remarks:—*Triumfetta acahuizotlanensis* differs from all known species of the genus in having tetramerous flowers and four glands in the androgynophore. Lay (1950) classifies the species of this genus in three series: *Geniculatae*, *Stellatae* and *Uncinatae*; *T. acahuizotlanensis* belongs to the series *Uncinatae* by the presence of uncinate spinules in the fruit, in turn, is located within the *Galeottiana* complex*,* whose species have glabrous fruits and inserted stigma below the anthers, unique characteristics that distinguish them from all other species of *Triumfetta*.

The *Galeottiana* complex comprises four species endemic to Mexico (Lay 1950, Gual-Díaz *et al*. 2001): *T. galeottiana* Turcz. (1859: 260), *T. guerrerensis* Gual, S. Peralta & Diego (2001: 14–17), *T. heliocarpoides* Bullock (1937: 293) and *T. paniculata* Hook. & Arn. (1841[1838]: 279).

The features of the fruit suggest that it is related to *T. heliocarpoides*, although the new species is a tree of 3–7 m tall (vs. small shrub of 1–1.5 m tall), with glabrate leaves on both surfaces (vs. pubescent with tufts of stellate trichomes), cosexual (vs. gynodioecious), sepals 5–5.9 mm long, (vs. 3–4 mm long), petals 3.5–4.2 mm long (vs. ca. 1 mm long), pyriform fruits of 2.1–3 mm diameter (vs. orbicular, ca. 2 mm diameter), light brown to grey with minute black glands (vs. dark brown to black with no glands), with 22–30 spinules 4–5.8 mm long, orange-red (vs. ca. 20 spinules 3–4 mm long, light brown), (3) 4 locular (vs. 3 locular, usually with one aborted locule).

The tetramerous flowers are a constant character within the population of *T. acahuizotlanensis*, therefore a circumscription of the genus is necessary in order to include both the species with tetramerous flowers and the species with pentamerous flowers. The presence of tetrameros flowers is less common in Malvaceae. However, *Heliocarpus* L. (1753: 448), the sister genus of *Triumfetta* according to Brunken & Muellner (2012), has both pentamerous and tetramerous flowers (Lay 1949). For this reason, proper phylogenetic studies should be made to understand the floral evolution of *Triumfetta.*

Key for the identification of the species of the *Galeottiana* complex (series *Uncinatae*)

A.	Fruits pubescent, stigma exserted above the anthers	*Triumfetta* spp.
-	Fruits glabrate, stigma inserted below the anthers	*Galeottiana* complex (1).
1.	Tetramerous flowers, pyriform capsules	*T. acahuizotlanensis*
-	Pentamerous flowers, globose capsules	2.
2.	Fruits 7.5–8.5 mm diameter, 5 locular, with ca. 280 spinules	*T. guerrerensis*
-	Fruits 2–6 mm diameter, 2–3 locular, with 20–75 spinules	3.
3.	Fruits 5–6 mm diameter, 2 locular, with ca. 75 spinules	*T. paniculata*
-	Fruits 2–4 mm diameter, 3 locular, with 20-40 spinules	4.
4.	Fruits 3–4 mm diameter, with 30–40 spinules	*T. galeottiana*
-	Fruits 2 mm diameter, with ca. 20 spinules	*T. heliocarpoides*

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