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Full Length Research Paper

Hamelia veracruzana (Rubiaceae), a new species of central Veracruz, Mexico

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***Hamelia veracruzana* is described and illustrated as a new species of the genus *Hamelia*. This species grows in the region of Atoyac, central Veracruz, Mexico. This species shares similar traits with *Hamelia xorullensis* and *H. calycosa* of section *Amphituba*; however, it differs in the position, size and shape of leaves and stipules.**

Keywords: Rubiaceae, *Hamelia veracruzana*, Mexico.

INTRODUCTION

Hamelia Jacq. is one of the small and probably one of the taxonomically least complex genera in the family Rubiaceae; it comprises 14-18 species distributed in the world's tropical and neotropical regions (Borhidi, 2006, 2012; Dwyer, 1980; Lorence, 1999; Standley and Williams, 1975). Besides, *Hamelia* is one of the best represented genera in Mexico, with approximately eight species of trees and shrubs, five of which are located in Veracruz (Sosa and Gómez-Pompa, 1994) and two are endemic to Mexico (Borhidi, 2006; Elias, 1976). This country has been regarded as one of the distribution centers for this genus (Wernham, 1911).

The genus *Hamelia* is subdivided into two sections: *Hamelia* and *Amphituba* (Elias, 1976). These two sections can be easily differentiated: section *Hamelia* displays a strictly tubular corolla that never expands toward the apex, with red, orange or yellow flowers; section *Amphituba* has an infundibuliform corolla that expands either gradually or abruptly toward the apex, with yellow or orange flowers.

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MATERIALS AND METHODS

During the revision of the genus *Hamelia* for the Flora of Veracruz, a specimen was found under the name *Hamelia axillaris* Sw., determined by David H. Lorence; however, it was noted that this specimen had characters differing from those of *H. axillaris*.

In order to corroborate for differences with the *Amphituba* species already described, a matrix was elaborated that included 105 morphological dual-state traits for the eight species already described in this section, plus the traits of the specimen of questionable taxonomic status. The data were analyzed based on the presence/absence of traits with the unweighted pair group method with arithmetic mean (UPGMA) (Crisci and López, 1983) using the Multi Variate Statistical Package

(MVSP) ver. 3.1 (Kovach, 1999). Besides, a cluster analysis was conducted with the Jaccard index, where one represents a 100% similarity between species and zero, the difference or dissimilarity between them, i.e. species are completely different.

RESULTS

A similarity cluster or dendrogram for the nine species was drawn (Figure 1), showing that the questionable taxon (*H. veracruzana*) is related to *H. xorullensis* Kunth at a 0.25 similarity level and, in turn, these two taxa have a 0.16 similarity with other species in section *Anphituba*. These two species and *H. calycosa* Donn. Sm. form the most dissimilar cluster versus the rest of the species described in this section of the genus *Hamelia*. Differences with *H. axillaris* are also noticeable (Figure 1); this information led us to conclude that the specimen under the name of *H. axillaris* is a new taxon belonging to the genus *Hamelia,* section *Amphituba*.

The sierra de Atoyac, where the specimen of study was collected, is located in the municipality of Atoyac, in the center of the state of Veracruz. This area, which has been little explored, is covered by a medium semi-evergreen forest, where a new record of the genus *Chiococca* was reported (Acevedo and Castillo-Campos, 1986). Approximately 25 years ago, Acevedo (1988) collected abundant herbarium specimens from the sierra's medium semi-evergreen forest. That inventory included the *Hamelia* specimen with orange or yellow flowers, which based on the differences from the other taxa already described for section *Amphituba*, is considered to correspond to a species not yet described (Table 1 and Figure 1).

Hamelia veracruzana Cast.-Campos, sp. nov. (Figure 2).

Arbor 10 m alta; folia ternata inaequalia obovata 7.5-14.5 x 3.0-4.8 cm, 8 paribus nervorum lateralium; stipulae triangulares pilosae; inflorescentia cymosa dichasialis; flores aurantiaci vel lutei 2.3 cm longi, corolla tubulari pilosa ad apicem expansa, ad basem arcta.

Type: Mexico, Veracruz. Mun. Atoyac, Miraflores, 5 km NW of Atoyac, medium semi-evergreen forest, 850 m asl, September 20 1985, *R. Acevedo R.* 539 (holotype: XAL).

Etymology

The specific name refers to the state of Veracruz, where the specimen was found.

Description

Tree of 10 m in height; trunk with angled young branches that are densely-hairy, with brownish pubescence; internodes 4.5 cm long. Ternate leaves, unequal per node, usually obovate, 7.5-14.5 x 3.0-4.8 cm, entire margins, occasionally undulated, frequently filamentous; acuminate apex, cuneate base, upper leaf surface generally pustulate, glabrous, pilose to puberulent at the central vein, and the base of the leaf is frequently pilose. Hairy lower leaf surface, more densely in veins; camptodromous nervation with 8 pairs of lateral veins that are prominent in the lower surface and imprinted on the upper surface. Brown, densely hairy petiole, grooved in the upper surface, 15-25 mm x 1 mm (dry), triangular pilose stipules, 3.0-3.5 mm long. Inflorescence arranged as dichasium, cymose, including 2-3 fascicles, up to 36 flowers per inflorescence; main peduncle of 30 mm x 2 mm, densely pilose; secondary peduncle 20-25 mm x 0.5 mm, brown pedicels 3.0-5.6 mm x 0.2 mm, densely pilose; brown bracts 0.4 mm long, pilose; orange or yellow flowers, 2.3 cm long; brown tubular calyx, densely pilose, tube 2.8-3.0 mm x 1.2-1.6 mm, 5 lobes, 1.0 mm x 0.6 mm, entire margin, acute apex; tubular corolla with a tube of 13-20 mm x 1.6-4.5 mm in the middle portion, narrow at the base, with longitudinal rafes, corolla apex 9 mm wide, pilose, 5 lobes 3 mm x 2 mm, entire margin, rounded apex; orange style 14 mm x 0.3 mm; orange stigma 3.0 mm x 0.4 mm. The fruit is an immature berry, brown (almost black when dry), angled, pubescent, with a persistent calyx, sepals 1.0 mm x 0.4 mm, pedicels 1.6-3.0 mm x 0.4 mm, densely pilose.

Phenology

Hamelia veracruzana blooms in September and probably until November.

Habitat

Hamelia veracruzana is a rare species known only by a single collected specimen, despite the fact that several field trips were conducted to the type locality. This species is located in the canopy stratum of a medium semi-evergreen forest, which is currently in a good conservation status in the vicinity of Miraflores, a village in the sierra de Atoyac. This location is characterized by a warm, humid climate, with a mean annual temperature above 22°C (García, 1988). *H. veracruzana* is associated in the canopy stratum mainly with *Aphananthe monoica* (Hemsl.) J.-F. Leroy, *Astronium graveolens* Jacq., *Brosimum alicastrum* Sw., *Bursera simaruba* (L.) Sarg., *Cedrela odorata* L., *Ficus tuerckheimii* Standl., *Manilkara zapota* (L.) P. Royen, *Robinsonella mirandae* Gómez-Pompa and *Spondias mombin* L. The most common taxa in the shrub stratum are *Aphelandra deppeana* Schltdl. & Cham, *Desmopsis galeottiana* (Baill.) Saff., *Justicia aurea* Schltdl. and *Tournefortia calycosa* (Donn. Sm.) D. L. Nash. The herbaceous stratum is characterized by a

Table 1 Similarities and differences in the morphological characteristics of *Hamelia axillaris, H. calycosa, H. xorullensis* and *H. veracruzana.*

Characters		*H. axillaris*	*H. calycosa*	*H. xorullensis*	*H. Veracruzana*
Height in m		4	12	7	10
Leaves	Arrangement	Opposite, rarely ternate	Lower leaves opposite; upper ternate or quaternate	Ternate or opposite	Ternate and unequal
	Shape	Elliptical, slightly elliptical-usually obovate	Barely elliptical, elliptical-obovate	Elliptic, ovate-oblong, ovate	Obovate
	Length (cm)	5.2-17.5(-20.5)	4.0-12.5	4.5-12.5	7.5-14.5
	Width (cm)	2.2-6.8(-7.0)	1.2-3.8	2.5-4.6	3.0-4.8
	Pairs of veins	(6-)8-11	4-7	6-10	8
	Petiole length (cm)	1.0-4.5(-6.5)	0.6-1.7	1.0-1.3	1.5-2.5
Stipules	Form	Triangular	Subulate	Unequal, trilobed	Triangular
	Length (mm)	2-6	1.5-2.5	1.5-5	3.0-3.5
Inflorescence	Shape	Dichasium and scorpioid cymes	Scorpioid cymes	Scorpioid cymes	Dichasium and cymes
	Length (cm)	1.3-1.6	(1.8-)2.2-3.8	0.6-2.2	2.3
	Corolla tube length (mm)	11-13	18-22	2.5-4.5	13-20
Flowers	Apex width (mm)	4.5-6.0	8-12	--	9
Calyx Lobes	Length (mm)	0.9-1.0	3-5	1.5-2.5(-4)	1.0

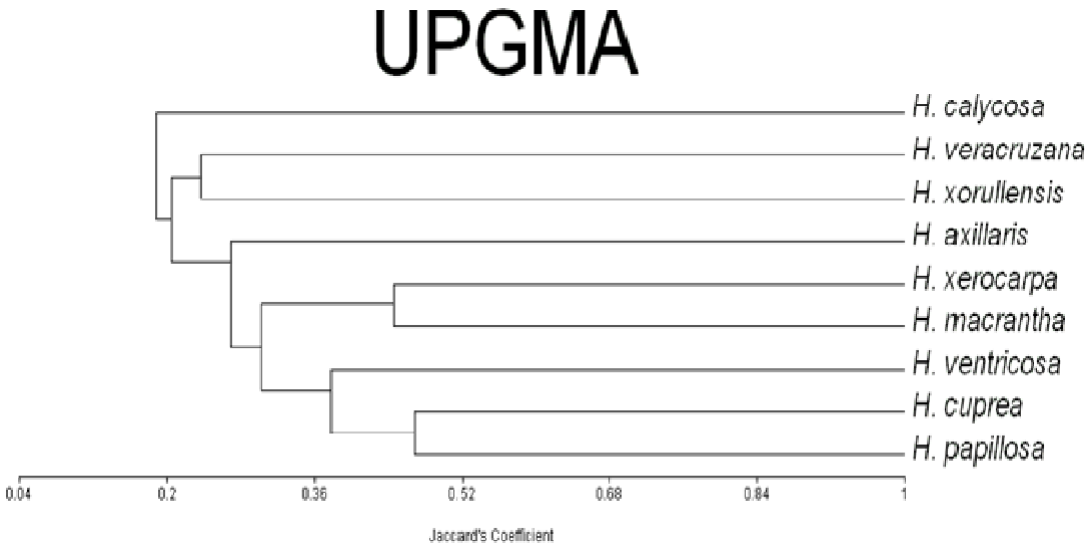

Figure 1 This figure shows the species that are more closely related to *Hamelia veracruzana,* and the dissimilarity of the latter with other species in the section *Amphituba* of the genus *Hamelia*.

diversity of palms, including *Chamaedorea elegans* Mart., *Ch. elatior* Mart., *Ch. oblongata* Mart, *Ch. sartorii* Liebm., *Ch. tepejilote* Liebm. and *Heliconia bourgaeana* Petersen (Acevedo, 1988).

Distribution

Despite extensive visits to other areas of medium semi-ervergreen forest *sensu* Miranda and Hernández X.

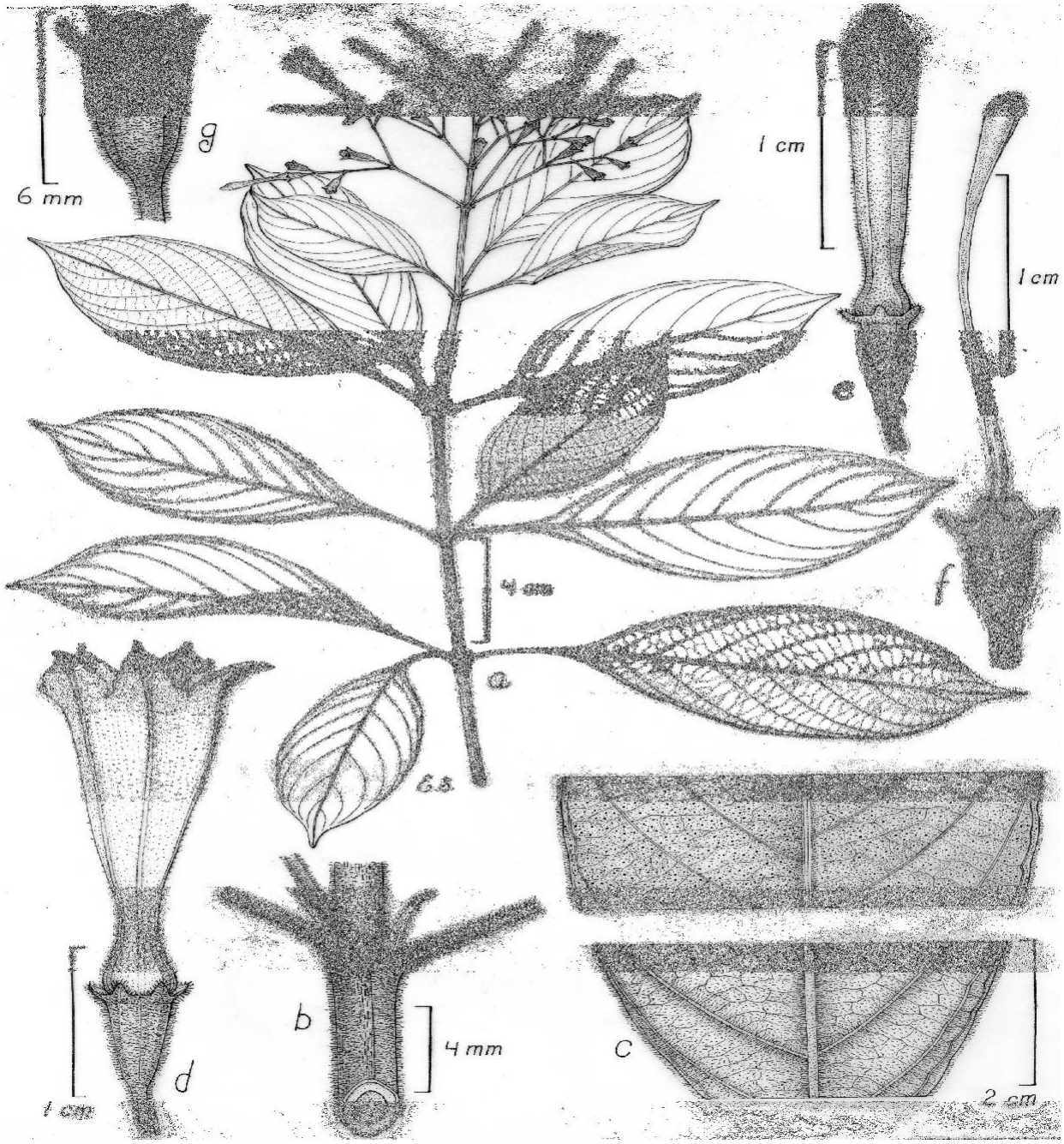

Figure 2 *Hamelia veracruzana* sp. nov. a. branch with inflorescence; b. internode pubescence and stipules; c. leaf, upper and lower surface; d. flower; e. flower bud; f. ovary, style and stigma, g. immature fruit. Illustration by Edmundo Saavedra.

(1963) in Veracruz, the single specimen collected to date restricts the distribution of the new species to the sierra de Atoyac medium semi-evergreen forest located at the center of the state of Veracruz, growing on limestone outcrops located northeast of Cordoba city. Therefore, this species is likely endemic to Mexico and, in particular, to the state of Veracruz.

Similar species

In the habitat where *Hamelia veracruzana* is located, it is associated with *H. calycosa*, one of the closest species to this new taxon. According to records and field trips, the sierra de Atoyac forest is home to the two *Hamelia* species that may be misidentified based on the color of

flowers and the size of trees. However, the new species, *Hamelia veracruzana,* is more closely related to *H. xorullensis*, a species endemic to Mexico distributed in the Pacific region. It is geographically relevant to highlight that *H. veracruzana* forms a well-defined group with the other species that is endemic to Mexico, *H. xorullensis*, and the relationship of this group with the other species of section *Amphituba, i.e. H. calycosa,* which is widely distributed. Figure 1 also depicts the group formed by the taxa endemic to the Caribbean (*H. cuprea* Griseb., *H. papillosa* Urb. and *H. ventricosa* Sw.), which make up a well-defined group, while *H. macrantha* Little and *H. xerocarpa* Kuntze, Central American species, also make a well-defined group and only *H. axillaris*, a species widely distributed in America, is relatively more isolated it is located between the two groups of Caribbean-Central American species and the Mexican species (Figure 1).

The new taxon, *H. veracruzana,* differs from *H. axillaris* by presenting ternate uneven leaves that are smaller, with a lower number of veins, smaller petioles and larger and more pilose flowers (Table 1). Another species that is very close to *H. veracruzana* is *H. calycosa,* as both are sympatric in the sierra de Atoyac medium semi-evergreen forest. However, *H. veracruzana* differs from *H. calycosa* in leaf size, number of lateral veins, petiole length, stipule shape and length, type of inflorescence, length of flowers, pilose indumentum and the width of the apex of the corolla. Considering flower size, *H. veracruzana* is placed between the two taxa (*H. axillaris* and *H. calycosa*), both of which belong to the section *Amphituba* (Table 1).

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