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Salvia huastecana (Lamiaceae), a new species from San Luis Potosí, Mexico

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Abstract

Salvia huastecana is described and illustrated as a new species. It is known from the municipality of Xilitla, San Luis Potosí, Mexico. This taxon belongs to *Salvia* sect. *Angulatae*, is similar to *S. albiflora* and *S. roscida* but it can be distinguished by a higher number of flowers per verticillaster (9–12), longer caducous bracts with long caudate apex, hirsute calyx with erect trichomes and white corolla, sometimes with the upper lip and margins of the lateral lobes of the lower lip light blue stained. Photographs of living plants and the illustration of the new species are provided.

Resumen

Se describe e ilustra como especie nueva a *Salvia huastecana*, conocida del municipio de Xilitla, San Luis Potosí, México. Este taxon pertenece a *Salvia* secc. *Angulatae*, es similar a *Salvia albiflora* y *S. roscida*, pero se distingue por presentar mayor número de flores por verticilastro (9–12), brácteas caedizas, más largas y con el ápice largamente caudado, cáliz hirsuto con tricomas erectos y corola blanca, en ocasiones con el labio superior y el margen de los lóbulos laterales del labio inferior teñidos tenuemente de azul. Se proporcionan fotografías de la planta en vivo y la ilustración de la nueva especie.

Introduction

The cultural and economic region called Huasteca is situated in the southern part of the northeast coastal plain of Mexico, it is a strip that partially crosses the states of Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Puebla and Veracruz (Fig. 3). In San Luis Potosí, the Huasteca (also called Huasteca Potosina) covers 18.3% of the state surface, and it includes part of the Sierra Madre Oriental with the broadest elevation ranges (Nicolás Pérez, San Martín, Sierra de Xilitla, Tamazunchale, Tanchipa and Temapache). In between these mountains there are extensive ravines, narrow valleys, and gorges covered with lush vegetation. To the east of the mountain ranges, low elevation hills and scattered mountains interrupt the plain, which maintain a slight inclination towards the east, up to the seaboard. The rainy climates dominate throughout most part of the area and the rain is abundant along the year, forming permanent streams, large and abundant rivers and numerous springs and lagoons that irrigate the land. The variation in altitude and the rough orography form a varying habitat mosaic of ecological and climatic conditions that support the occurrence of a high plant species diversity in the region (Bassols-Battalla *et al.* 1977, Calderón 1960).

The vast richness and uniqueness of the Sierra de Xilitla has attracted the attention of various collectors that have conducted sporadic botanical explorations in the area. As a result, in the last 57 years, 17 plant species have been described from this area (McVaugh 1963, Lundell 1964, Matuda 1966, Landry & Wilson, 1979, Hunziker 1980, Rollins 1993, Rzedowski, 1994, Rzedowski & Guridi-Gómez, 1998, Zamudio 2001, Pérez-Calix & Patiño-Siciliano 2009, Carrillo-Reyes *et al.* 2010, Galván & Zamudio, 2013, Bedolla-García & Zamudio 2015, 2017, Vázquez-García *et al.* 2015; Zamudio *et al.* 2018), which highlight the need to conduct exhaustive systematic botanical explorations in the region. In particular, for the genus *Salvia* Linnaeus (1753: 23) the recent botanical explorations conducted in Sierra de Xilitla have led to the description of two new species: *S. carranzae* Zamudio & Bedolla (2015: 36), and *S. guevarae* Bedolla & Zamudio (2017: 6).

In the fall of 2016, field samples in the mountains of Xilitla from an herbaceous *Salvia* specimen were collected

by the third author, and after the material was carefully examined, it was suggested that it was a new species. Due to the scarce material available, several field trips were conducted from 2017 to 2019 to collect more samples and identify new populations that will help to describe the species. At the same time the herbaria IEB, MEXU, QMEX and SLPM were consulted to search for additional herbarium specimens belonging to the new species, but none were found.

Taxonomy

Salvia huastecana Bedolla, Zamudio & H.Castillo-Gómez, *sp. nov.* (Figs. 1 and 2)

Salviae albiflorae et *S. roscidae* similis. Sed a priore differt inflorescentia cum 9–12 floribus in quoque verticillastro (vs. 5–9), bracteis floralibus longioribus (5.5–14 vs. 2.5–5.6 mm), apice longe-caudato (vs. acuto vel acuminato), caduco (vs. longe persistente); calyx hirsutus (vs. puberulus trichomatibus adpressus); et a altero differt corolla alba vel alba cum labio supero et labii inferi margine sublazulino (vs. albo).

Type:—MEXICO. San Luis Potosí: municipio de Xilitla, Miramar Viejo, 1465 m, 21°23'46"N, 99°2'44"W, 21 September 2019, S. Zamudio, Y. Rico & V. Reyes 17521 (holotype MEXU!; isotypes CIIDIR!, ENCB!, IEB!, IBUG!, MEXU!, QMEX!, SLP!, UAMIZ!, XAL!).

Perennial herb, stoloniferous, erect, 0.6–1.5 m tall, branching from the base. Stem quadrangular, canaliculate, puberulent, with short appressed retrorse trichomes, and scarce translucent punctiform glands that turn darker with age. Petiole thin, flexuous, 2.5–6(–11) cm long, pubescent with spreading trichomes. Leaf blade ovate to widely ovate, 6.5–13 × 4–9.5 cm, base rotund, truncate or slightly cordate, short-cuneate, margin serrate, apex acuminate, discolorous, upper surface bright green, sparsely puberulent to glabrescent with antrorse trichomes, lower surface pale green, puberulent with curved trichomes concentrated on the veins, margin ciliate. Inflorescence terminal and axillary, racemose, lax, 13–23 cm long, with 9–13(–18) verticillasters, 11–25 mm apart from each other, each one with 9–12 flowers, rachis puberulent, with retrorse trichomes. Bracts caducous, ovate, 5.5–14 × 3–4.5 mm, long-caudate, glabrous inside, slightly puberulent outside, ciliate, with 5–7 veins. Pedicel puberulent, 3–7 mm long. Calyx 6–8 × 3–4 mm, hirsute outside, with erect trichomes, 0.5–1.5 mm long, concentrated on the veins and with amber punctiform glands dispersed on the surface, strigulose inside; lips acute-acuminate, ± 1.5 mm long, the upper with 3 veins and entire. Corolla white, sometimes with the upper lip and the margin of the lateral lobes of the lower lip stained light blue, villous mainly on the upper lip, and with yellow punctiform glands, tube 6–7 × 2.8–3 mm, ventricose, invaginate, internally epapillate, upper lip galeate, 3.8–4.8 mm long; lower lip longer than the upper, 5–7 × 4.5–6 mm, extended, with three lobes, the middle emarginate and longer than the laterals. Stamens inserted close to the corolla throat, covered by the galea, filaments 1.9–2.1 mm long, connectives 4.8–6.7 mm long, with a short acute tooth just after the insertion with the filament, on the ventral portion, anthers 1.6–2.1 mm long, with 2 claviform staminodes, ±0.4 mm long. Style white, 10–12 mm long, apically bearded, with the branches slightly exserted, the upper branch longer than the lower, both white. Mericarps ellipsoid, triquetrous, 1.4–1.7 × 1–1.1 mm, brown, covered with reddish papillae.

Distribution and ecology:—Populations of the new species occur in two localities in the municipality of Xilitla, in the southern portion of San Luis Potosí (Fig. 3). It inhabits on limestone rock slopes with remnant elements of montane cloud forest with *Clethra pringlei* S.Watson, *Cnidocolus albidus* Lundell, *Myriocarpa* sp., *Podocarpus reichei* J.Buchholz & N.E.Gray, *Rhamnus capreifolia* Schldl. y *Saurauia* sp., in an elevation range from 1427–1465 m.

Etymology:—The specific epithet “huastecana” refers to the Huasteca region, seat of the Teenek or Huasteca culture that was established more than one thousand year ago in the southern portion of San Luis Potosí (Puig 1991), area in which the species was found.

Taxonomic comments:—*Salvia huastecana* can be placed in *Salvia* sect. *Angulatae* (Epling 1935: 67) Epling (1939: 234) of the subgenus *Calosphace* (Bentham 1833: 198) Epling (1939: 3), which is one of the most complex sections of the subgenus. There are some problems to define the species in this section, because most of them are very similar to each other and present difficulties in being distinguished. In the other hand, the morphological attributes that define the section are somewhat lax or with a wide range of variation (Epling 1939). Recent phylogenetical studies have shown that this section is paraphyletic, and their elements are separated in at least five different clades (Fragoso *et al.* 2018); as consequence, several authors have expressed the need to reevaluate *Salvia* sect. *Angulatae* (Bedolla & Zamudio 2015, Epling 1939, 1940, 1941, González-Gallegos *et al.* 2013). Nonetheless, the discovery of new species

in this section in Mexico has not ceased in recent years (González-Gallegos *et al.* 2012, 2013, Bedolla & Zamudio 2015).

Some attributes that allow *Salvia huastecana* to be placed in this section are: perennial herbaceous habit, ovate leaves with rotund, truncate, or short-cuneate base, acuminate apex, deciduous bracts, upper calyx lip with 3 veins, white corolla, ventricose, invaginated and epapillate tube, lower lip of the corolla longer than the upper one, stamens covered by the galea, and pubescent style.

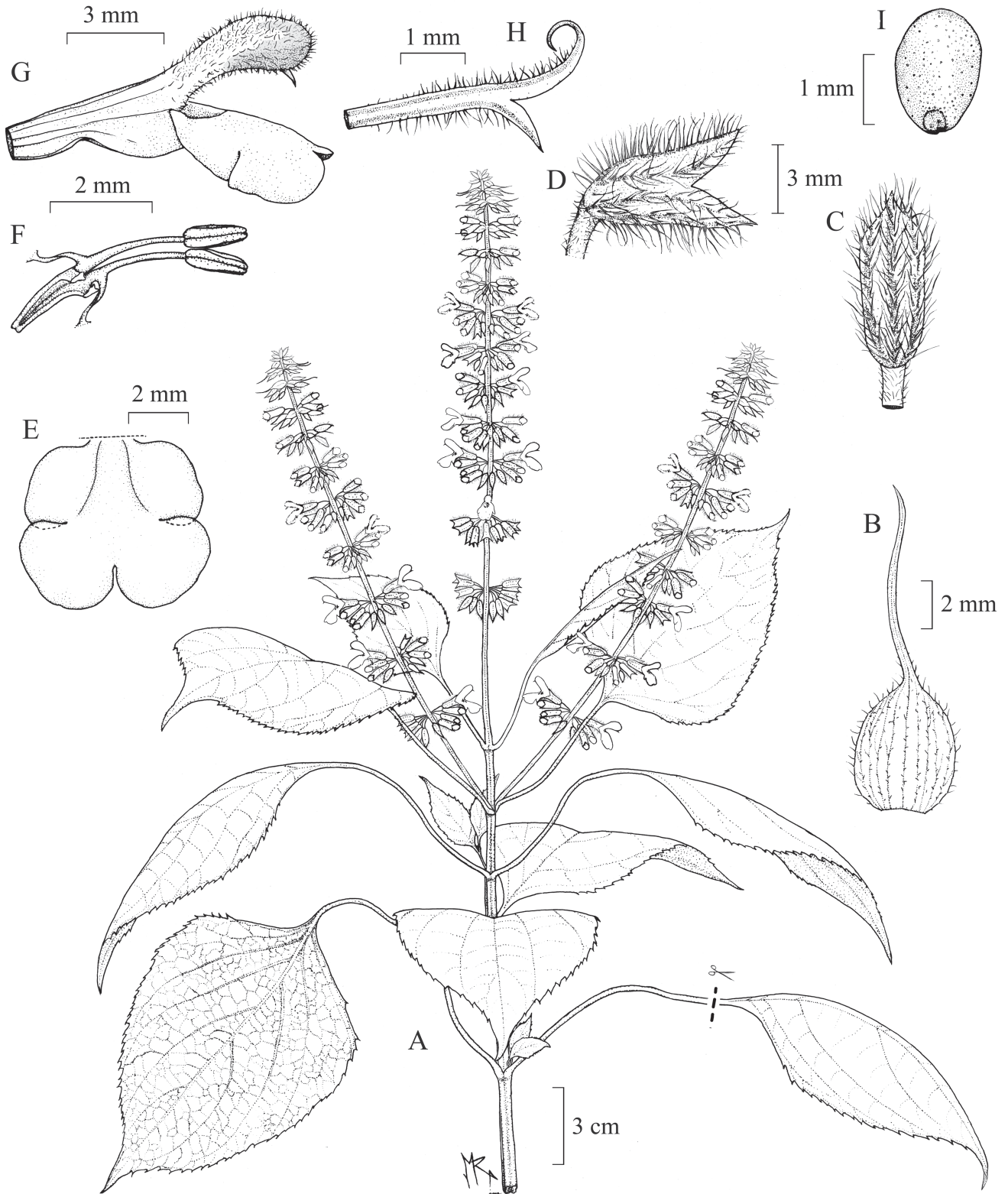


FIGURE 1. *Salvia huastecana*. A. Branch with inflorescences, B. Bract, C. Dorsal view of the calyx, D. Lateral view of the calyx, E. Frontal view of the lower lip of the corolla, F. Stamens, G. Lateral view of the corolla, H. Style, I. Mericarp. (based on *H.A. Castillo, P. Castillo L. & J. Reséndiz-E. 1935* (IEB!), illustrated by Manuel Ramírez Amezcua).



FIGURE 2. *Salvia huastecana*. A. Habitat, B. Lateral view of the corolla and conspicuous bracts, C. Detail of the pubescence of the calyx, D. Inflorescences (photographs taken by S. Zamudio and H.A. Castillo).

Of the approximately 51 species included in *Salvia* sect. *Angulatae*, the most similar to *Salvia huastecana* are *S. albiflora* Martens & Galeotti (1844: 76–77) and in lesser extent *S. roscida* Fernald (1900: 517), these species have not been evaluated phylogenetically. *Salvia huastecana* and *S. albiflora* are similar in the vegetative morphology, both are herbaceous with a very similar size, habit and pubescence; nevertheless, it differs because *S. huastecana* has 9–12 flowers per verticillaster (vs. 6–9 in *S. albiflora*), caducous bracts, 5.5–14 mm long (vs. late-falling, 2.5–4 mm), with long-caudate apex (vs. acute to acuminate apex), longer calyx 6–8 × 3–4 mm (vs. 3–5 × 1.5–2 mm), hirsute with erect trichomes (vs. puberulent with antrorse trichomes); among other characters shown in Table 1.

Salvia huastecana is slightly similar to *S. roscida* s.str., both are herbaceous with ovate leaves, puberulent to glabrescent inflorescences, 13–23 cm long. However, *S. huastecana* can be distinguished by having puberulent stem (vs. pilose with large, extended trichomes), petioles 2.5–6(–11) mm long (vs. 3–5 mm), puberulent rachis (vs.

pubescent with large, extended trichomes), caducous bracts, 5.5–14 mm long (*vs.* late-falling, 4.5–5.6 mm), with long-caudate apex (*vs.* acuminate), calyx 6–8 × 3–4 mm (*vs.* 6–6.7 × 2.2–2.5 mm), hirsute (*vs.* puberulent), corolla white, sometimes with the upper lip and the margin of the lateral lobes of the lower lip stained light blue (*vs.* blue); more differences are given in Table 1.

TABLE 1. Comparison between *S. huastecana* and similar species.

	<i>S. huastecana</i>	<i>S. albiflora</i>	<i>S. roscida</i>
STEM			
Pubescence	puberulent, with short trichomes	puberulent, with short trichomes	pilose, with large, spreading trichomes
LEAF			
Shape	ovate to widely ovate	ovate to rhombic	ovate
Size (cm)	6.5–13 × 4–9.5	3.5–7 (11) × 2.5–5 (8)	8.7–9 × 3.9–4.3
Base	rotund, truncate or slightly cordate, short-cuneate	cuneate	attenuate-spatulate
PETIOLE			
Length (cm)	2.5–6(–11)	1–5(–8)	3–5
Pubescence	pubescent	pubescent	glabrescent
INFLORESCENCE			
Length (cm)	13–23	15–30	15–23(–30)
No. of verticillasters	9–13(–18)	16–19	16–18
No. of flowers per verticillasters	9–12	6–9	5–8
Pubescence of rachis	puberulent	glabrescent	pubescent with large, spreading trichomes
BRACT			
Shape	ovate	ovate	ovate
Apex	long-caudate	acute to acuminate	acuminate
Size (mm)	5.5–14 × 3–4.5	2.5–4 × 1–2.4	4.5–5.6 × 3.9
Pubescence	puberulent	glabrescent to puberulent	glabrescent
Persistence	deciduous	late-falling	late-falling
CALYX			
Size (mm)	6–8 × 3–4	3–5 × 1.5–2	6–6.7 × 2.2–2.5
Pubescence	hirsute, with erect trichomes, 0.5–1.5 mm long, concentrated on the veins	puberulent with antrorse trichomes, ± 0.2 mm long, concentrated on the veins, sometimes these with the base widened and stained blue	puberulent with antrorse trichomes, ± 0.2 mm long, concentrated on the veins
COROLLA			
Color	white, sometimes with the upper lip and the margin of the lateral lobes of the lower lip stained light blue	white	blue
DISTRIBUTION	San Luis Potosí	Hidalgo, Veracruz	Durango

For comparison purpose, in this study, we decided to recognize *Salvia roscida* in a strict sense, based on the protologue and type specimens, because in recent years *S. fallax* Fernald (1910: 419) and *S. remissa* Epling (1939: 245) have been reduced to synonyms of *S. roscida* (González-Gallegos *et al.* 2016). However, we believe that this species complex still requires further study to define its situation.

Additionally, *Salvia albiflora*, *S. huastecana* and *S. roscida* have disjunct geographical distribution. *Salvia albiflora* is distributed in Chiapas and Veracruz (corroborated distribution with herbarium specimens); whereas, *S. roscida* is present in Durango, northwestern Mexico, and *S. huastecana* in the southern portion of San Luis Potosí (Fig. 3).

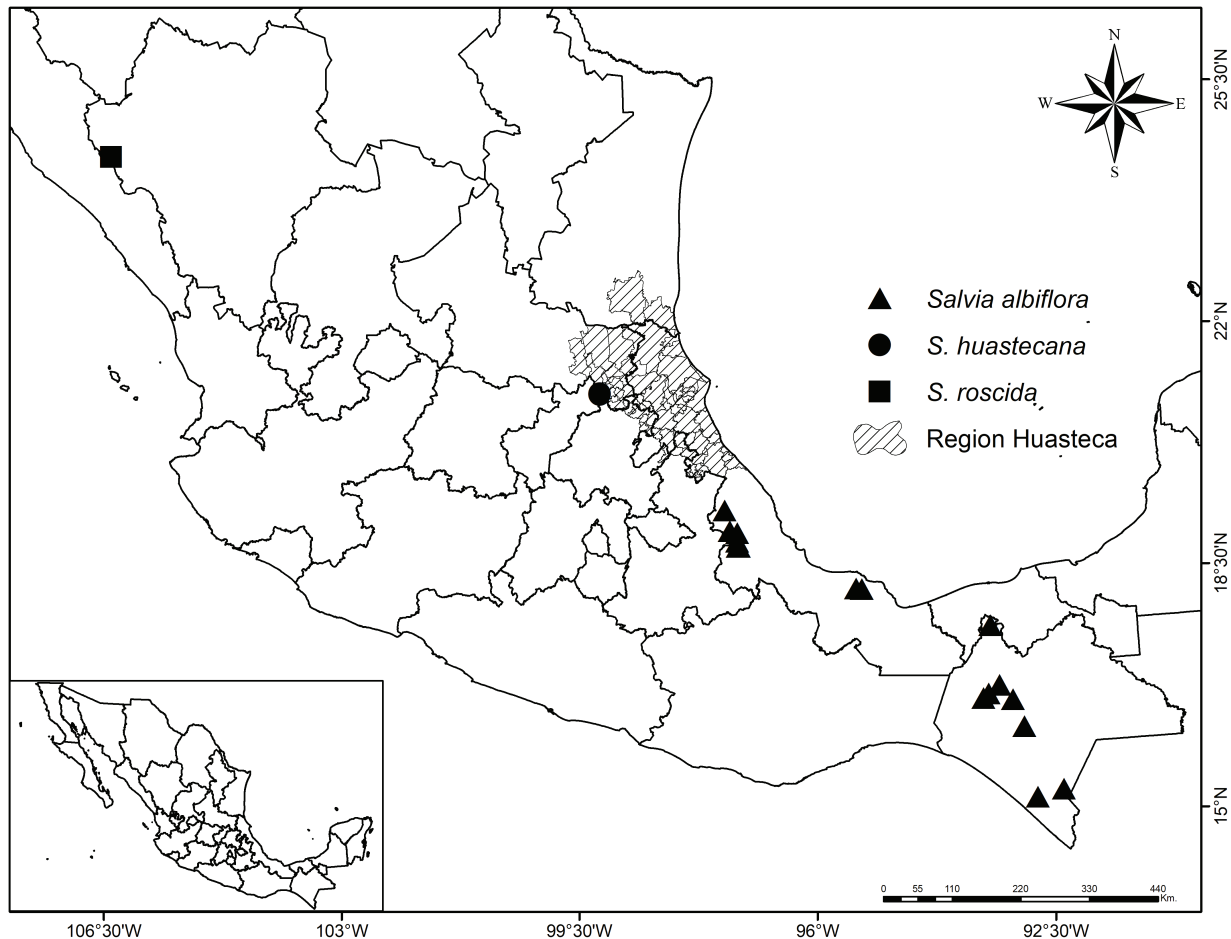


FIGURE 3. Distribution of *Salvia albiflora*, *S. huastecana* and *S. roscida*. The Huasteca region are delimited with diagonal stripes.

Only two other species of *Salvia* sect. *Angulatae*, *S. longispicata* Martens & Galeotti (1844: 73) and *S. tiliifolia* Vahl (1794: 7), are known from San Luis Potosí, but both are very different to the new species, these can be determined with the following key:

- 1 Corolla tube included in the calyx, leaves serrate with broad teeth, margin ciliated*S. tiliifolia*
- Corolla tube clearly exerted from the calyx, leaves serrate with narrow and sharp teeth, margin without cilia2
- 2 Inflorescences with 11–32 flowers per verticillasters, calyx hispidulous, corolla light blue or dark blue with nectariferous guides.*S. longispicata*
- Inflorescences with 9–12 flowers per verticillasters, calyx hirsute, corolla white, sometimes with the upper lip and the margin of the lateral lobes of the lower lip stained light blue, without nectariferous guides *S. huastecana*

Additional specimens examined (*Salvia huastecana* paratypes):—MEXICO. San Luis Potosí, municipality of Xilitla: 700 m al NW de la comunidad Cerro Quebrado, 1427 m, 21°24'39.4"N, 99°2'42.8"W, 21 September 2016, H.A. Castillo, P. Castillo-L. & J. Reséndiz-E. 1935 (IEB!, QMEX!); Miramar Viejo, 1465 m, 21°23'46"N, 99°2'44"W, 11 October 2018, S. Zamudio, B. Esquivel & C. Sánchez 17410 (IEB!).

Specimens examined:—*Salvia albiflora*. MEXICO. Chiapas, municipality of Chicoasén: mirador “Manos que Imploran”, 10 km al S de Chicoasén, 700 m, 8 November 1988, A. Reyes & G. Urquijo 1144 (MEXU!); municipality of San Fernando: Agua Escondida, 1020 m, 20 July 2010, A. López 1244 (MEXU!). Veracruz, municipality of Catemaco:

Playa Azul, 430 m, 12 May 1968, *G. Martínez 1682* (MEXU!); municipality of Cosautlán de Carvajal: Pesuapat, 1350 m, 18 April 1970, *F. Ventura 920* (MEXU!); municipality of Huatusco: 3 km al SW de Huatusco, 1400 m, 1 June 1979, *S. Avendaño & A. Benavides 321* (MEXU!); Río Seco, 1 km al SW de la carretera Huatusco-Coscomatepec, 1450 m, 30 August 1979, *S. Avendaño & G. Castillo 498* (MEXU!); municipality of Ixhuacán de los Reyes: camino de El Arenal a Ixhuacán de los Reyes, 1500 m, 15 July 1983, *H. Narave & F. Vázquez 843* (MEXU!); municipality of Las Minas: carretera Cruz Blanca a Las Minas, antes de llegar al cementerio de Romerillos, 22 August 1988, *C. Durán 583* (MEXU!); municipality of San Andrés Tuxtla: orilla de La Laguna Encantada, lado norte, 7 November 1975, *G. Shapiro 186* (MEXU!); municipality of Totutla: Axocuapan, 1350 m, 6 August 1977, *F. Ventura 14397* (MEXU!). *Salvia roscida*. MEXICO. Durango. Chacala, 5 March 1899, *E.A. Goldman 340* (NY!).

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