

Stachys harkerae (Lamioideae, Lamiaceae), a new species from western Mexico

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Stachys harkerae sp. nova from western Mexico is characterized by its indumentum on stems, leaves and inflorescences composed of tiny glandular-capitate hairs, hirsute stems, and calyces relatively long-toothed surrounding corolla tube, which is rose to pale rose-orangish, exannulate inside and with the tube 6.7–8.2 mm long. *Stachys harkerae* is most similar to *S. bigelovii* but differs in having profusely hirsute stems, slightly larger leaves, shorter corolla tubes and a shorter lower corolla lip. It also differs in distribution and habitat; *Stachys harkerae* is adapted to wetter and warmer conditions below 1450 m a.s.l., whereas *S. bigelovii* occupies xeric environments, usually above 2200 m a.s.l. An identification key to *Stachys* in western Mexico is provided.

Stachys (tribe Stachydeae; Scheen *et al.* 2010) has approximately 300 species. The distribution is subcosmopolitan, but the genus is nearly absent in Australia and New Zealand (Nowicke & Epling 1969, Bhattacharjee 1980, Harley *et al.* 2004, Dündar *et al.* 2013). *Stachys* is a taxonomically complicated group since most of its members are difficult to delineate and a stable infrageneric classification is still lacking (Epling 1934, Turner 1994a). Phylogenetic analyses have indeed demonstrated it is not a monophyletic group but an assemblage of intermixed lineages from other genera of subfamily Lamioideae (*Chamaesphacos*, *Haplostachys*, *Phlomidostema*, *Phyllostegia*, *Prasium*, *Sideritis*, *Stenogyne*, *Suzukia* and *Thuspeinanta*) and it does not conform with any of the classification systems previously proposed (Lindqvist & Albert 2002, Scheen *et al.* 2010, Roy *et al.*

2013). The above highlights the need of more studies and a comprehensive revision that would help to clarify species relationships and build a robust classification.

Stachys is not as diverse in the Americas as other labiates, such as *Hyptis* s. lato and *Salvia*, with more than 250 species both (Epling 1933b, 1938, 1939b, 1949, Harley *et al.* 2004), but it is also a frequent element in regional floras (*see* for example Pool 2012). Epling (1934) registered 77 species in the New World, 22 of them in Mexico. Since Epling's work, 17 new species have been added to the list for Mexico (Ramamoorthy 1983, Rzedowski & García-Zúñiga 1984, Rzedowski & Calderon de Rzedowski 1988, 1995, Turner 1994a, 1994b, 1995, Pool 2007). Turner (1994b) enumerates 35 and Martínez-Gordillo *et al.* (2013) 41 species in Mexico. The discordance partially results from the different taxonomic cir-

cumscriptions; this also shows that the genus in Mexico is in need of a thorough revision.

During a survey of the labiates growing in western Mexico several new species were discovered, most of them having already been published elsewhere (González-Gallegos & Castro-Castro 2012, 2013, González-Gallegos *et al.* 2012a, 2012b, 2013, 2014, Iltis *et al.* 2012, García-Peña & González-Gallegos 2013, González-Gallegos 2013, González-Gallegos & Vázquez-García 2013). Among the findings there was a *Stachys* from western Mexico that differs from all other described species and with an unusual ecological and geographical distribution. I realized this was an undescribed species after preparing an inventory of Lamiaceae for this region based on registers recovered from literature (mainly Epling 1933a, 1933b, 1934, 1939a, 1939b, 1939c, 1940, 1941, 1944, 1947, 1948, 1949, 1951, 1960, Lint & Epling 1945, McClintock & Epling 1946, Epling & Mathias 1957, Epling & Játiva 1963, 1966a, 1966b, 1968, Irving 1980, Espejo & Ramamoorthy 1993, Turner 1994a, 1994b, 2008, 2009a, 2009b, 2011a, 2011b, Berumen-Cornejo 2006), examination of herbarium specimens (CIIDIR, CHAPA, CIMI, CREG, ENCB, F, GUADA, Herbario de la Universidad Autónoma de Nayarit, Herbario de la Universidad Autónoma de Zacatecas, HUAA, HUMO, IBUG, IEB, INEGI, MEXU, MICH, UC, WIS, XAL, XALU and ZEA) and fieldwork. I collected and processed specimens according to the guidelines by Lot and Chiang (1986). I examined the morphology of the new species and I assessed morphological affinities using identification keys and comparing the plants with descriptions provided in the cited literature, and by comparison with type specimens of similar species. As a result, I describe and illustrate this new species. In addition, I provide an identification key to the species that occur in the same region.

Stachys harkeræ* J.G. González, *sp. nova
(Fig. 1)

TYPE: Mexico. Jalisco, Guadalajara: barranca del Río Santiago, 200–300 m al N de la cascada de Oblatos y 800–900 m al SE de la presa Colimillas, 20.698°N, 103.270°W, 1403 m, 1 May 2014 J. G. González-G. 1592 & V. Quintero-F. (holotype IBUG; isotypes HUAA, IEB, MEXU, ZEA). — PARA-

TYPES: Mexico. Jalisco. Guadalajara: barranca de Oblatos, 900 m, 1979 J.M. González-C. *s.n.* (IBUG); barranca de Oblatos, a 2 km de la barranca, 1982 Ambroz-C. 33 (IBUG); barranca de Oblatos, 1330–1360 m, 1985 R. Cuevas-G. 869 (IBUG); barranca de Huentitán por el camino a la hidroeléctrica hacia los baños de Oblatos, 1300–1400 m, 2007 J.G. González-G. *et al.* 3 (IBUG). Zacatecas. García de la Cadena: 1.5 km E de García de la Cadena, 1981 J.L. Robles-G. 1210 (IBUG).

ETYMOLOGY: I dedicate the species to Mollie Harker, who is specialized in the Asteraceae and floristics and has explored intensively a portion of barranca del río Santiago north of Guadalajara City, where the new taxon is found. She is also an inspiring person that has motivated students to get immersed into studying the Mexican flora. I first collected this species during a collecting trip guided by her.

Perennial herb, stems erect, square in cross-section, 40–50(–100) cm long, hirsute (spreading non-glandular hairs, ca. 1 mm long, disposed mainly on angles) and covered with tiny glandular-capitate hairs, pubescence denser at nodes; fragrant with a slightly citric scent. Leaf with petioles 7.5–20.5(–33.2) mm long (or sometimes decurrent onto petiole, such these are indistinguishable), hirsute and covered with tiny glandular-capitate hairs; leaf blade deltoid to triangular-ovate 3–6.6(–9.1) × 1.6–4.4(–6) cm, apex acute to acuminate, base cuneate to attenuated or subcordate to truncate and then abruptly cuneate, margin serrate to crenate, both surfaces hirsute and puberulent, with tiny glandular-capitate hairs. Flowers arranged in axils of upper leaves, these very gradually reduced in size toward apex, 5–14 floral nodes, each 6-flowered, stem between floral nodes hirsute, puberulent, covered with tiny glandular-capitate hairs and sessile glands. Floral bract (term used here to designate foliose structure at base of each pedicel) linear, 1–1.9 mm long, persistent, hirtellous. Flowers with pedicels 0.5–1.3 mm long, hispidulous and with tiny glandular-capitate hairs shorter than eglandular ones; with two opposite bracteoles at one quarter of its length, 1–1.5 mm long. Calyx tube (from calyx base to beginning of calyx teeth) 4.3–5.3 mm long, 2.9–4.6(–5) mm wide at throat, hispidulous, puberulent and covered with tiny glandular-capitate hairs outside, interior surface of calyx teeth hirsute and with glandular-capitate hairs inside, rest glabrous; teeth triangular at base and linear-spinescent at apex, 3.5–4.3(–6.2) mm long. Corolla tube pale rose or pale rose-orange, short pilose with hairs concentrated on upper

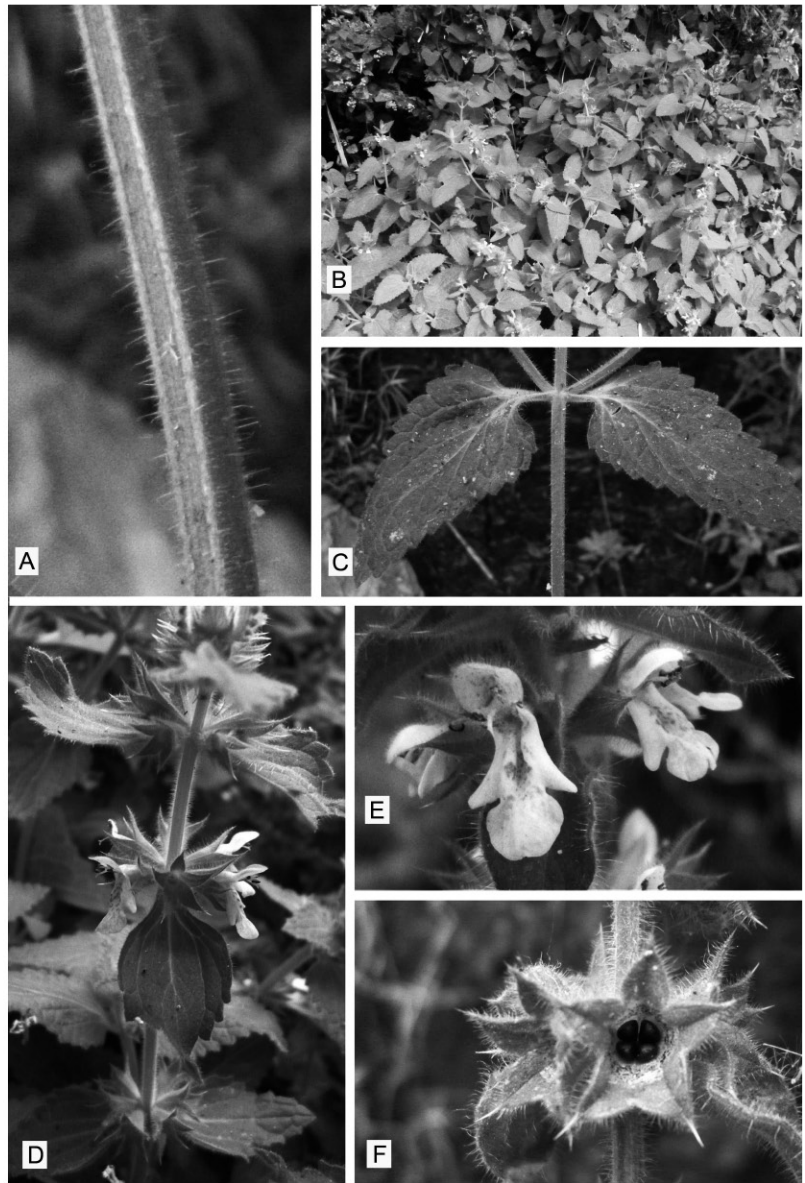


Fig. 1. Morphological characters of *Stachys harkerae* (from the type population). — **A:** Stem internode showing pubescence. — **B:** Habit of the plants. — **C:** Leaves. — **D:** Inflorescence and flowers in lateral view. — **E:** Corolla in frontal view. — **F:** Calyx with mature mericarps inside.

lip, short pilose in apical ventral portion inside; tube 6.7–8.2 × 2.4–3.8 mm, exannulate inside; upper lip 2.6–4.2 mm long, lower lip 5.1–6.5 × 4.2–5.2 mm. Stamens exserted from tube; filament of anterior stamens 3.2–3.8 mm long, filament of posterior stamens 4.2–5.1 mm long, short pilose toward base and with glandular-capitate hairs; theca 0.4–0.8 mm long. Style 8.8–9.7(–11.5) mm long, glabrous to sparsely short pilose, 2-branched at apex, branches acute at apex. Mericarp lenticular to obovoid, sometimes

trigonus, 1.5–1.9(–2.2) × 1.3–1.8 mm, black to dark brown, smooth to granulose and glabrous.

DISTRIBUTION, HABITAT AND PHENOLOGY. *Stachys harkerae* is an endemic species from western Mexico, in the states of Jalisco and Zacatecas (Fig. 2). It inhabits tropical deciduous forests, subtropical shrub and secondary vegetation at 900–1450 m a.s.l. It co-occurs with *Ageratum corymbosum*, *Bursera* aff. *grandifolia*, *Fraxinus uhdei*, *Guazuma ulmifolia*, *Havardia acatlense*, *Heliocarpus terebenthinaceus*, *Henrya insularis*,

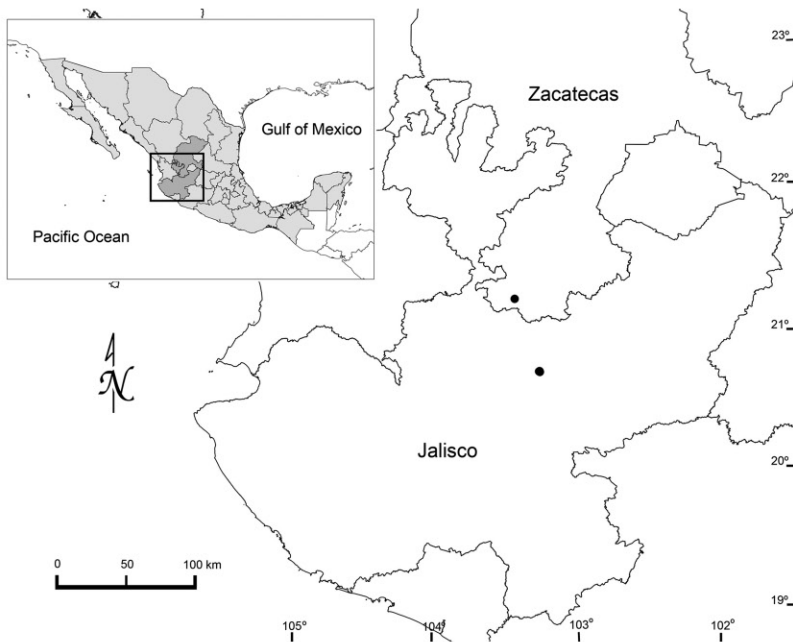


Fig. 2. Distribution map of *Stachys harkeræ*. The localities at which the species has been collected are indicated with black dots.

Lysiloma acapulcense, *Ricinus communis*, *Serjania triquetra*, *Sida rhombifolia*, *Solanum nigrescens* and *Sonchus oleraceus*. It commonly grows on creek margins or otherwise in humid, shady places, usually with numerous weedy species. It flowers and fruits from November to May.

Stachys harkeræ fits into group II (part of an artificial assemblage of perennial herbs with deltoid-ovate leaves, corolla tube 6–15 mm long, exannulate inside and exserted stamens from corolla tube) according to Epling's (1934) identification key, being most similar to *S. bigelovii*. They share the following characters: size and habit, erect stems, not rooting at lower nodes, stems and leaves covered with glandular-capitate hairs, calyx of similar size, exannulate corolla inside, stamens exserted from corolla tube, and mericarp shape and size. However, *S. harkeræ* has profusely hirsute stems (vs. pilose to hirtellous), slightly larger leaves, 3–6.6(–9.1) $\times$ 1.6–4.4(–6) vs. 2.4–3 $\times$ 1.1–1.7 cm, shorter corolla tubes (6.7–8.2 vs. 10–12 mm) and a shorter lower corolla lip (5.1–6.5 vs. 7.4–8 mm). Their habitats are also different. *Stachys bigelovii* grows in dry environments including thorny scrub, xeric scrublands and grasslands, and at higher elevations (1590–)2200–2700 m a.s.l.; furthermore, *S. bigelovii* has a much broader

distribution, extending from the southern United States to the Mexican Plateau.

If Turner's (1994) identification key is followed, *Stachys harkeræ* is morphologically similar to *S. bigelovii* and *S. pilosissima*. *Stachys harkeræ* can be distinguished from *S. pilosissima* because the latter has shorter calyx teeth [2–3.3 vs. 3.5–4.3(–6.2) mm], larger corolla (8.8–11.8 $\times$ 3.8–4.9 vs. 6.7–8.2 $\times$ 2.4–3.8 mm) and an annulate corolla tube with a dense ring of hairs inside at 1–1.5 mm from the base (vs. exannulate). In addition, *S. pilosissima* grows above 2100 m a.s.l. in forests, grasslands and secondary vegetation.

Stachys harkeræ also resembles the Old World species *S. arvensis* (which is casually introduced in parts of North and South America). However, *S. harkeræ* can be distinguished from *S. arvensis* by its hirsute stems (vs. sparsely puberulent to pilose), longer calyx (less than 4 vs. more than 5 mm), longer calyx teeth (less than 2 vs. more than 3.4 mm), longer corolla tube (less than 4 vs. more than 6.5 mm) annulate inside (vs. exannulate), and a longer upper corolla lip (less than 2 vs. more than 2.5 mm). Moreover, *S. harkeræ* is a perennial plant, whereas *S. arvensis* is an annual.

Stachys harkeræ has a restricted and distinctive range, being found within the Río Santiago

basin and tributary streams north of Guadalajara and southernmost portions of río Cuixtla basin, under 1450 m a.s.l. It is known from four locations in Jalisco and one in Zacatecas. The localities in Jalisco are very close to each other so they might constitute a single population. Hence, the species should be considered rare. However, the Río Santiago basin is large (almost 300 km of an intricate assemblage of ravines with favorable conditions for *S. harkeræ*) and most of it is remote and remains unexplored. Before assessing the conservation status of the species, it is necessary to study localities along Río Santiago to uncover all populations of the species and to have a clear picture of its geographical range, population density and to collect evidence of potential threats to the species.

Identification key to *Stachys* species in western Mexico

NOTE: *Stachys pacifica* does not appear in the key because it is considered a synonym of *S. coccinea*; an issue that will be treated in a future publication.

1. Corolla red to orange or rarely rose, tube 15.5–21 mm long *S. coccinea*
1. Corolla white, rose, lilac, magenta, violaceous or rarely red, tube less than 15 mm long 2
2. Corolla white, pale rose or pale lilac; corolla tube and calyx (including teeth) less than 6.5 mm long 3
2. Corolla magenta, pale rose, pale rose-orange to dark rose; corolla tube mostly more than 7 mm long, calyx (including teeth) more than 7 mm long 4
3. Flowers subtended by reduced ovate to ovate-lanceolate leaves; leaf blade deltoid, ovate-triangular to ovate-oblong or ovate-lanceolate, without glandular-capitate hairs; floral node 6–12-flowered; pedicel 0.6–1.6 mm long; corolla tube (2.5–)4–4.8(–5.9) mm long, annulate or hemi-annulate inside toward base; upper lip 1–2.2 mm long, lower lip 2–4.8 mm long. Plants widely distributed in Mexico *S. agraria*
3. Flowers subtended by reduced linear leaves; leaf blade triangular-lanceolate to narrowly lanceolate, with glandular-capitate hairs; floral node 2(–6)-flowered; pedicel 1.2–2.2 mm long; corolla tube 4.8–6.2 mm long, exannulate inside; upper lip (2.7–)3.5–4.2 mm long, lower lip 4.9–7 mm long. Plants endemic to Jalisco in the vicinity of El Salto de Juanacatlán *S. aristata*
4. Calyx, floral axis, petiole and leaf blade generally without glandular-capitate hairs (or scarcely glandular within the inflorescence); leaf blade glabrous or with some appressed hairs. Plants from Sierra de Manantlán (Jalisco) and Tancitaro (Michoacán) *S. manantlanensis*
4. Calyx, floral axis, petiole and, often, also leaves, covered with tiny glandular-capitate hairs; leaf blade densely

- hirsute, hispidulous to pilose and with glandular-capitate hairs. Plants from barranca del Río Santiago and vicinity, Nevado de Colima or Altiplano Mexicano 5
5. Corolla tube less than 9 mm long. Plants growing under 1450 m a.s.l. *S. harkeræ*
 5. Corolla tube more than 9 mm long. Plants growing above 2000 m elevation 6
 6. Stems hirtellous to pilose and covered with tiny glandular-capitate hairs; calyx teeth 4–4.3 mm long; corolla tube exannulate inside; filament of posterior stamens 3.5–4 mm long. Plants (in western Mexico) restricted to Aguascalientes, Zacatecas and Nayarit *S. bigelovii*
 6. Stems hirsute and covered with tiny glandular-capitate hairs; calyx teeth 2–3.3 mm long; corolla tube annulate inside at 1–1.5 mm from the base; filament of posterior stamens (4.2–)5.1–5.9 mm long. Plants (in western Mexico) restricted to Colima and Jalisco ... *S. pilosissima*

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