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Tillandsia tequilana (Tillandsioideae; Bromeliaceae), a new saxicolous species from Jalisco, Mexico

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Abstract

Tillandsia tequilana, a new species from the state of Jalisco, Mexico, is described and illustrated. The proposed species is compared to *T. aguascalientensis*, *T. moronesensis*, and *T. schusteri*, taxa with some morphological similarities. *Tillandsia tequilana* differs from these species in the shape and size of the leaf sheath, spikes and floral bracts, in the shape of the sepals, and also in the flowering time. Images and a distribution map of the new species are included.

Key words: Endemic, Monocots, Pacific Lowlands, Poales, saxicolous

Resumen

Tillandsia tequilana, una nueva especie del estado de Jalisco, México es descrita e ilustrada. La especie propuesta se compara con *T. aguascalientensis*, *T. moronesensis* y *T. schusteri*, taxa con algunas similitudes morfológicas. *Tillandsia tequilana* difiere de estas especies en la forma y tamaño de la vaina foliar, de las espigas y de las brácteas florales, en la forma de los sépalos, así como en la temporada de floración. Se incluyen imágenes y un mapa de distribución de la nueva especie.

Palabrasclave: Endemismo, Monocotiledóneas, Poales, saxícola, Tierras Bajas del Pacífico

Introduction

Tillandsia Linnaeus (1753: 286) is classified in the subfamily Tillandsioideae (Givnish *et al*. 2007; Smith & Downs 1977) and is distributed from southern United States to Northern Argentina, with the largest number of species in Mexico, Peru, Brazil, Ecuador, and Bolivia (Ulloa Ulloa *et al*. 2017). *Tillandsia* is characterized by the actinomorphic to rarely zygomorphic corolla, the petals free with or without basal appendages; the stamens and style included or exserted from the corolla; the filament bases not adnate to the petals; the stigma type simple-erect, simple-truncate, simple-patent, conduplicate-spiral, or convolvulate-blade; and the ovules usually appendiculate, rarely obtuse or subobtuse (Smith & Downs 1977; Barfuss *et al*. 2016).

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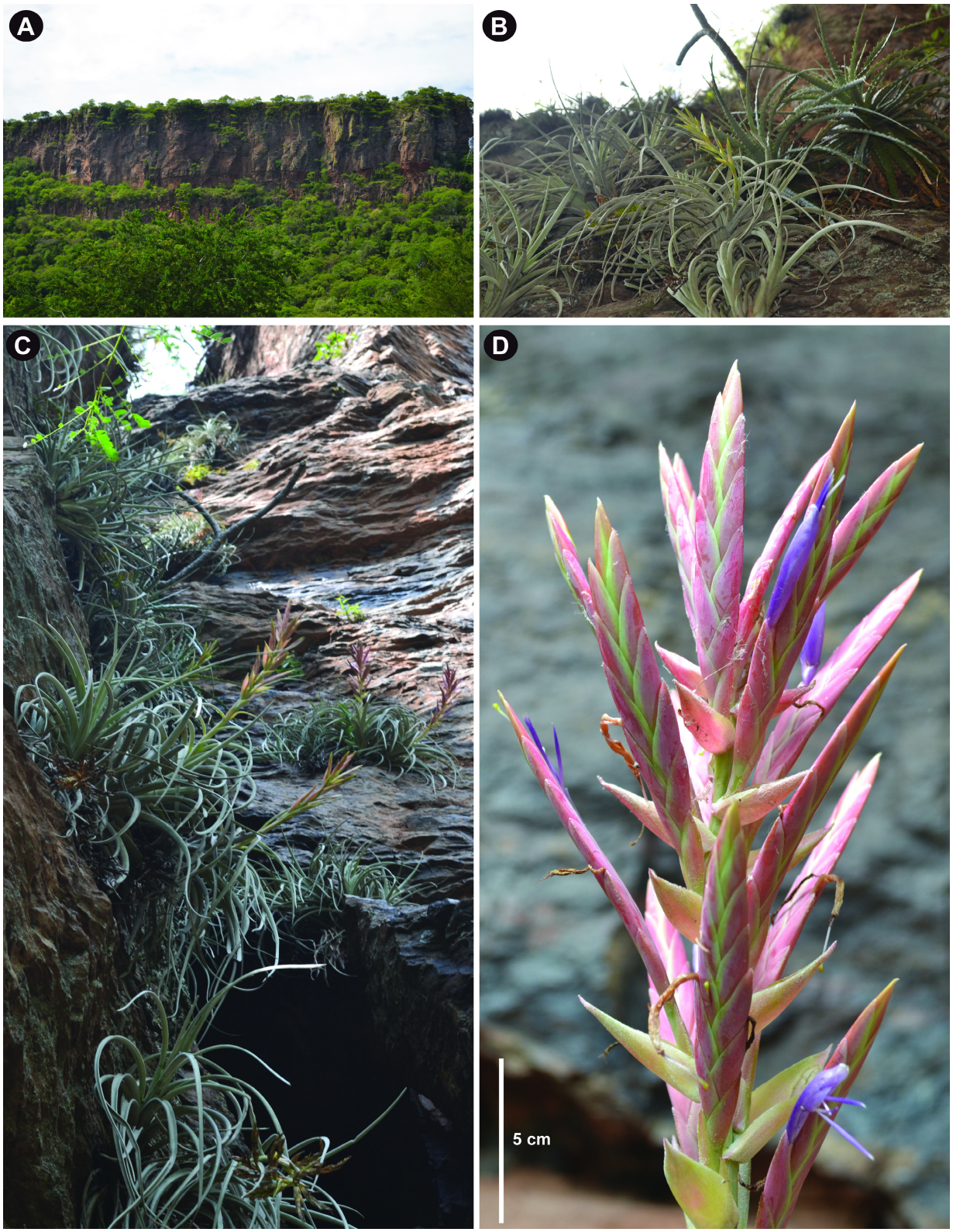

FIGURE 1. *Tillandsia tequilana* Hern.-Cárdenas, Flores-Arg., Espejo & López-Ferr. **A.** Cliffs of the cerro Chiquihuitillo. **B–C.** Plants at type locality. **D.** Detail of the inflorescences. (Photographs by R. Hernández-Cárdenas).

According to Gouda *et al*. (2024, continuously updated), the genus includes 791 species and 151 infraspecific taxa. In 2018, Espejo-Serna & López-Ferrari reported for Mexico 230 species of *Tillandsia*, 177 (77 %) endemic to the country. However, in the last years, six additional species have been described for Mexico: *T. queretaroensis* Ehlers (2017: 63), *T. joel-mandimboensis* Flores-Cruz *et al*. (2020: 277), *T. dichromantha* Hernández-Cárdenas *et al*. (2020: 82), *T. flavoviolacea* Gouda (2020: 64), *T. bernalensis* Hernández-Cárdenas *et al*. (2023: 92), and *T. chicoasena*

Hromadnik (2023: 114). Also, *T. ramireziana* Ancona *et al*. (2022: 13) and *T. vanhyningii* Beutelspacher & García-Martínez (2021: 21) were recognized at a specific level. Including those taxa, the Mexican states with the highest number of *Tillandsia* species are Oaxaca (113), Chiapas (79), and Guerrero (51) (Pulido-Esparza *et al*. 2004; Espejo-Serna *et al*. 2007; Espejo-Serna *et al*. 2017; Espejo-Serna & López-Ferrari 2018).

As a result of botanical explorations for the project Bromeliaceae of Mexico (Espejo-Serna & López-Ferrari 2018), we collected individuals of a *Tillandsia* species at the foothills of the mountain Chiquihuitillo, located in the municipality of Tequila, in the state of Jalisco. Initially, we thought that this plant could correspond to *T. aguascalientensis* Gardner (1984: 361), *T. moronesensis* Ehlers (2000: 117) or *T. schusteri* Rauh (1988: 214). However, a careful and detailed examination of the living material, herbarium specimens, type material, and the corresponding protologue of *T. aguascalientensis*, *T. moronesensis*, and *T. schusteri*, allowed us to determine that this plant should be considered as a new species that is here proposed.

Material & methods

The gathering and preparation of the specimens were carried out in accordance with Aguirre León (1986). The collected material was examined and measured, and descriptions were prepared. Measurements were taken from dried material. The morphological terms used in the descriptions were based on Brown & Gilmartin (1984), Radford *et al*. (1974), and Scharf & Gouda (2008). The type specimens were deposited at IBUG, MEXU, XAL and UAMIZ (acronyms according to Thiers 2024, continuously updated). We revised herbarium material of the genus *Tillandsia* deposited at FCME, HEID, HUAA, IBUG, IEB, MEXU, QMEX, UAMIZ, WU, and XAL. To ensure the status of the new species proposed, we reviewed the protologue, herbarium specimens, and type material of *T. aguascalientensis*, *T. moronesensis*, and *T. schusteri*, taxa with which *T. tequilana sp. nov.* shares morphological similarities (Appendix 1). We used the vegetation types proposed by Rzedowski (1978) and the biogeographic provinces proposed by Morrone *et al*. (2017).

Taxonomy

Tillandsia tequilana Hern.-Cárdenas, Flores-Arg., Espejo & López-Ferr., *sp. nov.* (Figs. 1, 2, 3. Table 1)

The new species is similar to *Tillandsia aguascalientensis* but differs in the shape (triangular to ovate *vs*. elliptic) and size of the leaf sheath (4.0–5.0 × 3.0–3.5 *vs*. 7.0–12 × 4.0–7.0 cm), in the shape (narrowly oblong *vs*. elliptic) and width (1.0–1.5 *vs*. 2.5–4.0 cm) of the spikes, in the shape (oblong to elliptic vs. lanceolate) and size (2.5–3.2 × 1.2–1.5 *vs*. 3.9–4.2 × 1.5–2.0 cm) of the floral bracts, and in the width of the sepals (0.4–0.5 *vs*. 0.9–1.1 cm).

TYPE**:**—MÉXICO. Jalisco: municipio de Tequila. Acantilados del cerro Chiquihuitillo (20°55’14”N, 103°49’14.7”W), 1,120 m, October 16, 2023, *R. Hernández-Cárdenas, A. Flores-Argüelles, S. Lara-Godínez & J. Carranza 2765* (holotype UAMIZ! (5x), isotypes IBUG!, MEXU!, XAL!).

Plants saxicolous, in flower 60–80 cm tall; *rosettes* acaulescent, falcate, 50–70 cm high, 15–25 cm in diameter, solitary or forming clumps of three to five rosettes. **Leaves** more than 20; *sheath* pale brown to pale yellow on both surfaces, triangular to ovate, 4.0–5.0 cm long, 3.0–3.5 cm wide, lepidote on both surfaces, not differentiate from the blade; *blade* pale green to gray, narrowly triangular, 50–70 cm long, 2.0–3.0 cm wide, long attenuate, densely cinereous-lepidote on both surfaces. **Inflorescence** terminal, erect, once branched, with 13–16 appressed to ascending spikes; *peduncle* pale green to pale yellow, terete, 18–25 cm long, 0.4–0.8 cm in diameter, glabrous, fully covered by the sheaths of the peduncle bracts, internodes 1.5–3.5 cm; *peduncle bracts* pale green to gray, foliaceous, gradually decreasing in size distally, exceeding the internodes, lepidote on both surfaces, imbricate; *axis* pale green to pale yellow, terete, 15–25 cm long, 0.3–0.5 cm in diameter, glabrous, internodes 1.0–3.0 cm long; *primary bracts* pale yellow with rose, pale brown to gray when dry, the sheath ovate, 3.0–5.0 cm long, 1.0–2.0 cm wide, the blade triangular to linear, gradually decreasing in size distally, the blade of the lower one exceeding the spike, the distal ones shorter than the spike, glabrous near the base and lepidote distally on both surfaces. **Spikes** distichously 4–8-flowered, flattened, narrowly oblong, 7.0–10.5 cm long, 1.0–1.5 cm wide; *stipes* terete, 1.0–2.5 cm long, 0.3–0.4 cm in diameter, glabrous, bracteate; *stipe bracts* 1–2, ovate, 1.5–2.0 cm long, 0.8–1.0 cm wide, hyaline at the margin, lepidote on both surfaces, nerved,

carinate; *rachis* green, pale brown when dry, terete, 1.0–1.5 mm in diameter, covered by the floral bracts, internodes 4.0–8.0 mm long; *floral bracts* green at the base, rose to pale red toward the apex and green at the margin when fresh, brown to pale yellow when dry, oblong to elliptic, 2.5–3.2 cm long, 1.2–1.5 cm wide, over four times longer than the internodes, exceeding the sepals, imbricate, acute, lepidote adaxially, glabrous abaxially to lepidote at the apex, nerved, carinate toward the apex. **Flowers** 6.0–6.5 cm long, appressed to the rachis, actinomorphic; corolla tubular, more slender at the base; *receptacle* 1.0–1.5 mm long; *sepals* green at the base, pale yellow with rose toward the apex, narrowly oblong, 20–26 mm long, 4.0–5.0 mm wide, acute, hyaline at the margin, the adaxial ones carinate, connate for 15–17 mm, the abaxial one ecarinate; *petals* white toward the base, violet in upper (exposed) part, narrowly oblanceolate to spathulate, 45–50 mm long, 8.0–10 mm wide, rounded at the apex, the apical margin slightly recurved, free, corolla apex constraining the filaments; *stamens* subequal, exserted; *filaments* free, twisted, white toward the base, violet distally, flat at the base, widening toward the apex, filiform, fleshy and subterete in the distal part, 47–55 mm long, 10–10.1 mm wide; *anthers* black, narrowly oblong to narrowly elliptic, 2.7–3.0 mm long, 1.0–1.3 mm wide, sub-basifixed; *ovary* green, narrowly conic to narrowly ovoid, 4.0–5.0 mm long, 2.5–3.0 mm in diameter; *style* white toward the base, violet distally, filiform, 5.0–5.5 cm long, 1.0–1.2 mm wide, equaling to exceeding the stamens; *stylar branches* light green, conduplicate-spiral, ca. 2 mm long. **Capsules** green, pale yellow when dry, oblong, 2.0–2.5 cm long, 0.5–0.8 cm in diameter; *seeds* pale brown, fusiform, 3–4 mm long; *coma* 1.0–1.3 cm long.

FIGURE 2. *Tillandsia tequilana* Hern.-Cárdenas, Flores-Arg., Espejo & López-Ferr. **A.** Detail of the spikes. **B.** Flower. **C.** Floral bract. **D.** Sepals. **E.** Petals. **F.** Stamens. **G.** Pistil. **H.** Fruit. (Photographs by R. Hernández-Cárdenas).

Distribution and habitat:—*Tillandsia tequilana* is so far known only from the type locality at the foothills of the mountain Chiquihuitillo, in the municipality of Tequila, in the state of Jalisco (Fig. 3) that pertains to the biogeographic province of the Pacific Lowlands (according to Morrone *et al*. 2017). The new species grows saxicolous on vertical rock walls with a predominant vegetation of tropical deciduous forest (according to Rzedowski 1978), with the presence of *Hechtia jaliscana* Smith (1964: 482), *Sideroxylon capiri* Pittier (1912: 462), and *Tillandsia capitata* Grisebach (1866: 255), and species of *Bursera* Jacq. ex L., *Lysiloma* Benth., and *Tradescantia* L. *Tillandsia tequilana* grows at elevations between 1,060 and 1,130 m a.s.l. and blooms from September to October.

Etymology:—Specific epithet refers to the municipality of Tequila, Jalisco, where the new species was discovered.

Paratypes:—MÉXICO. Jalisco: municipio Tequila. Acantilados del cerro Chiquihuitillo (20°55’14.0”N, 103°49’14.7”W), 1,120 m, October 16, 2023, *R. Hernández-Cárdenas, A. Flores-Argüelles, S. Lara-Godínez & J. Carranza 2773* (UAMIZ).

Observations:—The new species can be easily recognized by the rosette shape (falcate), the size (4.0–5.0 × 3.0–3.5 cm) and shape (triangular to ovate) of the leaf sheath, the indument of the leaf blade (densely cinereous-lepidote), the wide (1.0–1.5 cm) and shape (narrowly oblong) of the spikes, the shape (oblong to elliptic) and size (2.5–3.2 × 1.2–1.5 cm) of the floral bracts, and also for its bloom season (September to October). *Tillandsia tequilana* also shares some similarities with *T. moronesensis* and *T. schusteri*. However, *T. tequilana* differs from *T. moronesensis* in the shape of the rosette (falcate *vs*. infundibuliform), in the shape of the leaf sheath (triangular to ovate *vs*. elliptic), in the number of the spikes (13–16 *vs*. 15–13), in the width of the spike (1.0–1.5 *vs*. 2.0–2.4 cm), in the shape of the sepals (narrowly oblong *vs*. lanceolate), and in the flowering time (September to October *vs*. March). *Tillandsia tequilana* differs from *T. schusteri* in the shape of the rosette (falcate *vs*. infundibuliform), in the number of the spikes (13–16 *vs*.

4–6), in the length of the spike (7.0–10.5 *vs*. ca. 14 cm), in the color of the petals (violet *vs*. yellow with green), and in the flowering time (September to October *vs*. May), see also Table 1.

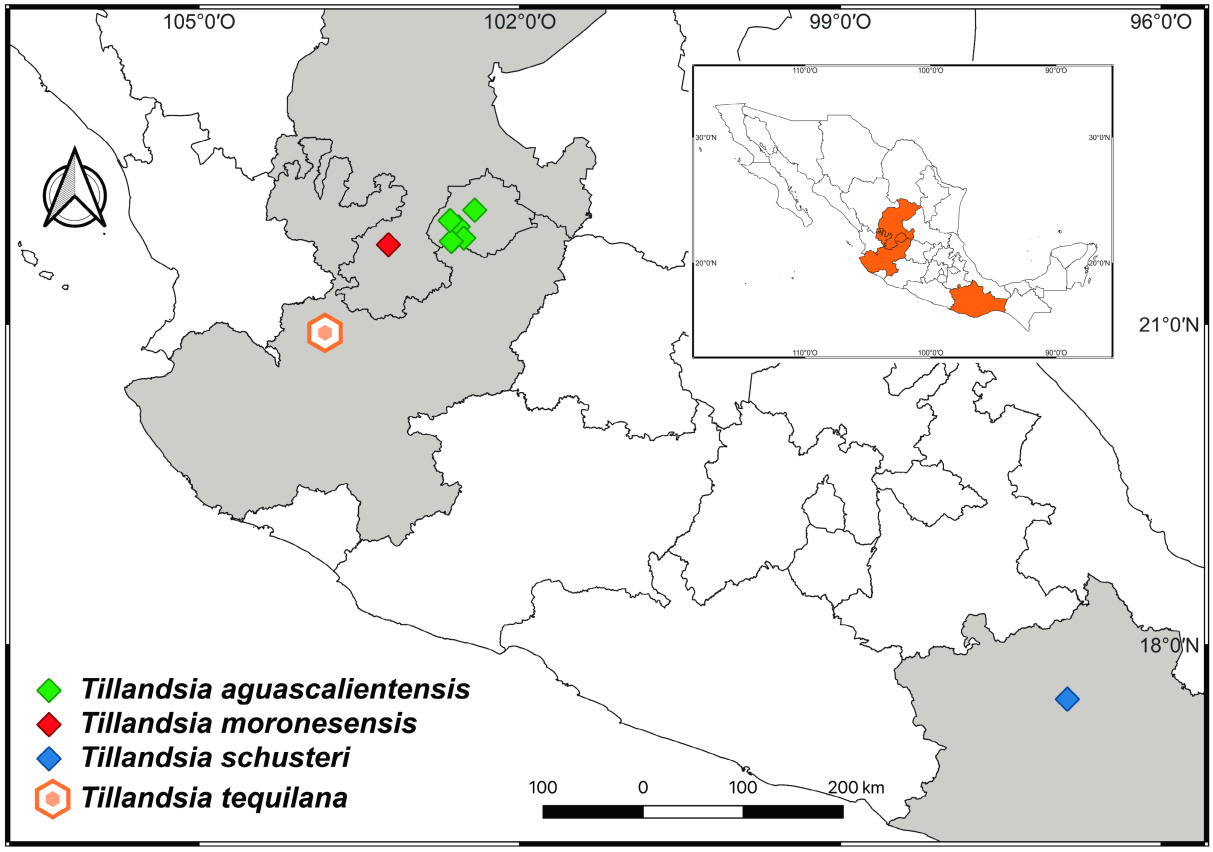

FIGURE 3. Distribution map of *Tillandsia tequilana* Hern.-Cárdenas, Flores-Arg., Espejo & López-Ferr., *T. aguascalientensis* Gardner, *T. moronesensis* Ehlers, and *T. schusteri* Rauh.

TABLE 1. Comparative characters of *Tillandsia tequilana* Hern.-Cárdenas, Flores-Arg., Espejo & López-Ferr., *T. aguascalientensis* Gardner, *T. moronesensis* Ehlers, and *T. schusteri* Rauh.

Characters	***T. tequilana***	***T. aguascalientesis***	***T. moronesensis***	***T. schusteri***
Rosette shape	falcate	infundibuliform	infundibuliform	infundibuliform
Leaf sheath	triangular to ovate; 4.0–5.0 × 3.0–3.5 cm	elliptic; 7–12 × 4–7 cm	elliptic; 22 × 10 cm	unknown; 4.0 × 3.5 cm
Leaf blade width (cm)	2.0–3.0	2.5–5.0	5.0	2.5
Sheath of the peduncle bracts	lepidote on both surfaces	glabrous	lepidote on both surfaces	lepidote on both surfaces
Spikes	13–16, narrowly oblong; 7.0–10.5 × 1.0–1.5 cm	10–12, elliptic; 10–13 × 2.5–4.0 cm	15–30, broadly lanceolate; 10–15 × 2.0–2.4 cm	4–6, narrowly oblong; up to 14 × 2.0 cm
Floral bract	oblong to elliptic; 2.5–3.2 × 1.2–1.5 cm	lanceolate; 3.9–4.2 × 1.5–2.0	elliptic; 3.0–3.3 × 1.5–1.8 cm	unknown; 3.5 × 1.5 cm
Petals	violet	violet	violet	yellow with green
Sepals	narrowly oblong; 2.0–2.6 × 0.4–0.5 cm	elliptic; 3.4–3.5 × 0.9–1.1	lanceolate; 3.0–3.3 × 0.7 cm	narrowly lanceolate; 2.8–3.0 × ? cm
Filaments length (cm)	4.7–5.5	5.1–6.3	6.0	Unknown
Anthers length (mm)	2.7–3.0	4.0	3.0	Unknown
Geographical distribution	Jalisco	Aguascalientes	Zacatecas	Oaxaca
Flowering time	September to October	February to March	March	May

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https://doi.org/10.1126/science.aao0398

APPENDIX 1. Specimen examined.

Tillandsia aguascalientensis C.S.Gardner. AGUASCALIENTES: *G. Adame-Raziel 809* (HUAA); *M. de la Cerda L. 7013* (HUAA); *G. García R. 3875* (HUAA); *3887* (HUAA); *5145* (HUAA); *J. Sierra Muñoz 282* (HUAA). ***Tillandsia moronesensis*** Ehlers. ZACATECAS: *R. Ehlers & K. Ehlers EM9202101* (WU). ***Tillandsia schusteri*** Rauh. OAXACA: *W. Schuster s.n.* (HEID).