



A New Species of the Mexican *Tillandsia erubescens* Group (Bromeliaceae)

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Abstract

The *Tillandsia erubescens* group (Bromeliaceae) encompasses seven currently recognized species with reduced, pendulous inflorescences and endemic to pine-oak forests in the high mountains of Mexico. During the course of a taxonomic revision based on extensive study of herbarium specimens and detailed observations in the field, a new species of this group was discovered, which is described and illustrated here as *T. tecolometl*. The new entity belongs to a subgroup of species with purple corollas that also includes *T. andrieuxii*, *T. macdougallii*, *T. oaxacana* and *T. pseudooaxacana*. We present detailed morphological comparisons of the new species to the other species in the group with purple corollas, complemented with information on their habitat preferences, geographical distribution and phenology. An identification key to all the species with purple corollas belonging to the *Tillandsia erubescens* group is provided.

Introduction

The Neotropical genus *Tillandsia* Linnaeus (1753: 286) is the most species-rich genus of the pineapple family (Bromeliaceae Jussieu), comprising over 694 species and representing ca. 20% of the species diversity in the family (Gouda *et al.* continuously updated). *Tillandsia* is currently classified in the tribe Tillandsieae (subfamily Tillandsioideae) along with the traditionally recognized genera *Guzmania* Ruiz & Pavón (1802: 37), *Mezobromelia* Smith (1935: 151), *Racinaea* Spencer & Smith (1993: 152) and *Viridantha* Espejo (2002: 27–35, Barfuss *et al.* 2005). While *Guzmania* and *Mezobromelia* are known to form two distinct lineages, species of *Racinaea* and *Viridantha* are embedded in a largely unresolved clade also containing a number of *Tillandsia* species, indicating the paraphyletic or polyphyletic nature of *Tillandsia* (Barfuss *et al.* 2005).

Tillandsia is currently divided into six subgenera (Barfuss *et al.* 2005, Donadio *et al.* 2015), of which subgenus *Tillandsia* is the most diverse comprising over 269 species (sensu Gardner 1986). Gardner (1986) classified subgenus *Tillandsia* into five groups largely defined by characters of the corolla and androecium. She assigned most of the species to Group I, which was further divided into eight subgroups based on inflorescence architecture, and the shape of leaves and bracts. As defined by Gardner (1986), the species of Subgroup 8 of Group I, in the following referred to as the *Tillandsia erubescens* Schlechtendal (1844: 427–429) group, are characterized by inflorescences in which the branches are reduced to a single flower, with no floral bracts, and flowers oriented in a descendent position. Gardner (1986) included six species in the *Tillandsia erubescens* group: 1) *T. andrieuxii* (Mez 1896: 736) Smith (1937: 31); 2) *T. atrococcinea* Matuda (1977: 22–23); 3) *T. erubescens*; 4) *T. macdougallii* Smith (1949: 277–278); 5) *T. oaxacana* Smith (1949: 279–280); and 6) *T. quaquafloerifera* Matuda (1977: 23–24). Later, Ehlers (1989) considered *T. atrococcinea* as a synonym of *T. oaxacana* (Butcher & Gouda continuously updated, Ehlers 2006, Espejo-Serna *et al.* 2004), but this synonymy still requires further investigation. Subsequently, Espejo & López-Ferrari in Espejo-Serna *et al.* (2004: 53) raised *T. erubescens* var. *arroyoensis* Weber & Ehlers in Weber (1983: 604–607) to the rank of species as *T. arroyoensis* (Weber & Ehlers) Espejo & López-Ferrari; and Ehlers (2006: 92–95) described *T. pseudooaxacana*, a species morphologically similar to *T. oaxacana*.

A phylogenetic study based on 26 morphological characters and plastid DNA sequences of the *matK-trnK* region,

trnH-psbA intergenic spacer (IGS) and *trnD-trnT* IGS (Granados Mendoza 2008) showed that the species of the *Tillandsia erubescens* group, along with the species newly described here, form a monophyletic group. The species of the *T. erubescens* group are recognized mainly on the basis of the morphology of the inflorescence, which is a pendant spike with large laminate, caudate or apiculate floral bracts. These floral bracts are generally located next to the flowers. However, in a few individuals of *T. andrieuxii*, *T. erubescens* and *T. macdougallii*, a small, additional elliptic bract, here referred as supernumerary bract, is present between the flower and the floral bract (Gardner 1982, 1986, Smith & Downs 1977, C. Granados Mendoza, pers. obs.). Based on the recurring, although uncommon, presence of such supernumerary bracts and according to the conjunction and similarity criteria discussed by Patterson (1982) and de Pinna (1991), the floral bracts of the species of this group might be considered homologous to the primary bracts of other species of *Tillandsia* with neatly branching inflorescences.

A revision of living and herbarium specimens of the *T. erubescens* group led to the discovery of an undescribed species and the identification of several distinctive vegetative and reproductive characters that clearly distinguish it from their closest relatives. The new species, along with *T. andrieuxii*, *T. macdougallii* and *T. oaxacana* form a clade characterized by purple corollas, which is nested within the monophyletic *T. erubescens* group (Fig. 1, Granados Mendoza 2008). Here we formally describe and illustrate the new species and complement our description with information on habitat, geographical distribution and phenology; we also provide an identification key to all the species belonging to the *Tillandsia erubescens* group with purple corollas.

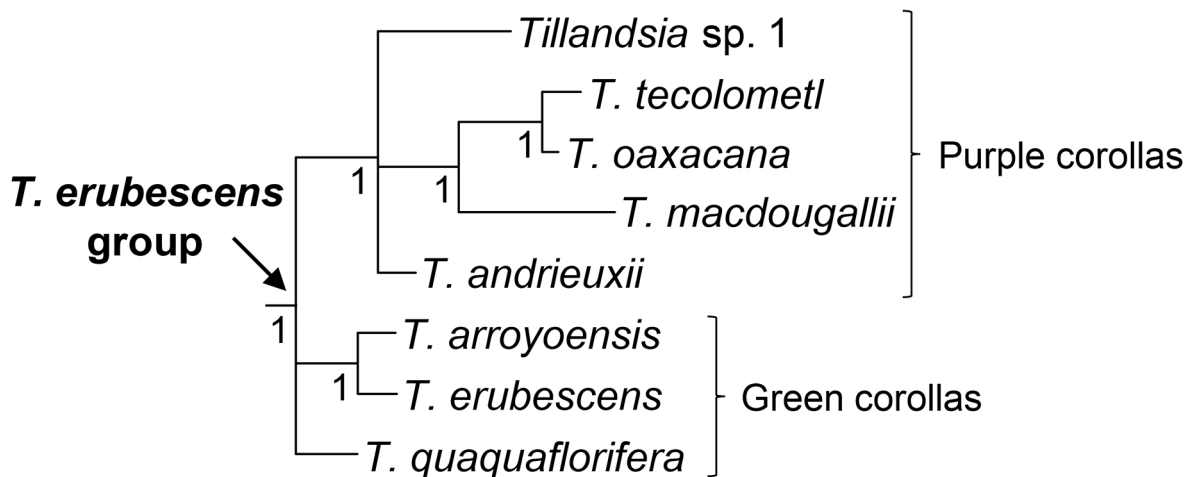


FIGURE 1. Phylogenetic relationships among the species of the *T. erubescens* group inferred by a Bayesian analysis of DNA sequences of three plastid markers (*matK-trnK* region, *trnH^{GUG}-psbA* IGS and *trnD^{GUC}-trnT^{GGU}* IGS) and 26 morphological characters (modified from Granados Mendoza 2008). Posterior probabilities are indicated below the respective branches.

Materials and methods

We studied living specimens of all species of the *T. erubescens* group with purple corollas, as well as dried specimens deposited in the following herbaria: ANSM, BH, CAS, CHAPA, CIIDIR, CU, ENCB, FCME, GH, GMS, IBUG, IEB, MEXU, MICH, MO, NY, QMEX, SEL, SERO, TEX, UC and WIS.

The description is based on 16 fertile herbarium specimens of the species referred in the following as *T. tecolometl* Granados, Flores-Cruz & Salazar. When possible, three measurements per structure were taken, e.g. three different leaves or bracts per herbarium specimen, selecting those structures located in the medial portion of the respective organ of the plant. Measurements of floral organs were based on dry flowers softened in hot water. The colours reported for reproductive structures were based on observation of living flowering plants. The new species was distinguished from previously known species with purple corollas by non-overlapping intervals in quantitative measurements and discrete differences in qualitative attributes. Additionally, habitat and distributions differences are reported. Descriptive terminology follows Scharf and Gouda (2008).

Taxonomic treatment

Artificial key to the species of the *Tillandsia erubescens* group with purple corollas

1. Leaf blades leathery, their abaxial surface covered by scales with appressed wing cells 2
2. Leaf sheaths broadly ovate; peduncle 2–3 cm long; inflorescence ovoidal, 6–8 × 2.8–4 cm; floral bract membranaceous, ovate; the blade-like apex 6.2–9 cm long; flowers completely covered by the sheathing part of the floral bract at anthesis except upper part of the petals, stamens and stigma; sepals strongly nerved, all ecarinate, acuminate; petals 3.9–4.3 cm long, linear-oblong, rounded; stamens roughly as long as the floral tube; filaments 3.8–4 cm long; style 2.7–3.5 cm long, somewhat shorter than the filaments; stigma yellowish white; ovary conical *T. pseudoaxacana*
2. Leaf sheaths broadly elliptic; peduncle 7.5–9 cm long; inflorescence subcylindrical, 9.5–12 × 4–8 cm; floral bract leathery, elliptic; the blade-like apex 4.2–5 cm long; flowers much exceeding the sheathing part of the floral bract at anthesis; sepals smooth, the adaxial ones carinate, acute; petals 5–6 cm long, oblanceolate, acute; stamens far exceeding the floral tube at anthesis; filaments 5.7–5.8 cm long; style ca. 6.2 cm long, exceeding the filaments; stigma purple; ovary ovoid *T. oaxacana*
1. Leaf blades fleshy, their abaxial surface covered by scales with patent wing cells 3
3. Inflorescence obovoid; sheathing part of the floral bract diverging from the rachis, exposing the rachis at anthesis; sepals and petals acuminate *T. macdougallii*
3. Inflorescence ellipsoid or fusiform; sheathing part of the floral bract converging towards the rachis, completely covering the rachis at anthesis; sepals and petals rounded or acute 4
4. Plant caulescent; leaf sheaths 1.4–2.5 × 0.9–1.6 cm, abaxial surface covered by scales with patent wing cells; inflorescence 4.5–6 × 1.7–1.8 cm, up to 6-flowered; floral bracts laterally compressed, membranaceous, acuminate, covered by scales with appressed wing cells; sepals 10–25 mm long, lanceolate; petals rounded; ovary narrowly ovoid *T. andrieuxii*
4. Plant acaulescent; leaf sheaths 5–10 × 2.5–5 cm, abaxial surface covered by scales with appressed wing cells; inflorescence (9–) 11.5–14.5 (–19) × 4–8 cm, more than 10-flowered; floral bracts spoon-shaped, fleshy, caudate, covered by scales with patent wing cells; sepals 33–46 mm long, ovate; petals acute; ovary cylindrical *T. tecolometl*

New taxon

Tillandsia tecolometl Granados, Flores-Cruz & Salazar, *sp. nov.* (Figs. 2–3, 4b)

Similar to *Tillandsia macdougallii* but differing in its longer, ovate to oblong leaf sheaths covered by scales with appressed wing cells; longer and fusiform inflorescence; ovate to oblong, spoon-shaped floral bracts, its sheathing part completely covering the rachis at anthesis; acute sepals; linear-oblong and acute petals; and cylindrical ovary.

Type:—MEXICO. Estado de México: municipio Temascaltepec, 500 metros sobre la desviación a Plan de Vigas que está en las Juntas, km 31 de la carretera la Puerta del Monte-Texcatitlán, 2894 m, 20 December 2006, C. Granados, M. Flores-Cruz & G. A. Salazar 415 (holotype: MEXU!).

Epiphytic *herbs*; mature shoot generally solitary, 18.7–31 (–42) cm in height including the inflorescence. *Leaves* shorter than the inflorescence, or rarely longer, fleshy; *sheaths* greenish brown with dark brown or purple margins, ovate to oblong, 5–10 × 2.5–5 cm, abaxial surface covered by scales with appressed wing cells; *blades* greyish green, narrowly triangular, 10.2–20.5 × 0.8–1.5 (–2.2) cm, margins involute, abaxial surface covered by scales with patent wing cells. *Peduncle* shorter than the leaves, or rarely longer, 8.5–22 × 0.2–0.4 cm, completely covered by bracts, tomentose; *peduncle bracts* fleshy, smooth, abaxial surface covered by scales with patent wing cells, sheathing part pink, ovate, 4–6.2 (–7.8) × 1.2–2.8 cm, blade-like apex pale pink, narrowly triangular, 4.5–9 (–12) × 0.2–0.6 cm, margins involute. *Inflorescence* simple, spicate, arcuate-pendulous, fusiform, (9–) 11.5–14.5 (–19) × 4–8 cm, with 10–15 flowers; *floral bracts* converging toward the rachis, completely covering the rachis at anthesis, fleshy, smooth, abaxial surface covered by scales with patent wing cells, salmon-pink, ovate to oblong, 3.5–7 (–8.2) × 1.4–3.2 cm, the proximal ones provided with a triangular blade-like apex, 1–2.8 × 0.1–0.3 cm, the distal ones acute. *Supernumerary bracts* not observed. *Flowers* spirally arranged, descending; *sepals* membranaceous, smooth, abaxial surface covered by scales with patent wing cells, tan with green centre on their proximal 1/2 and pink on the rest, ovate, acute, 3.3–4.6 × 1.3–2.2 cm, the adaxial ones slightly carinate, shortly connate at base (less than 4 mm); *petals* white on their proximal 5/8, purple with white margins above, linear-oblong, acute with reflexed margin at the apex, (5.4–) 6–6.5 × 0.6–0.9 cm; *stamens* exerted, unequal; *filaments* white, 5.4–7 cm long, elliptic in their upper cross-section, *anthers* dorsifixed, joined 1/3 from the base, yellow, 3–4 mm long, *pollen* yellow; *ovary* green, cylindrical, 7–15 × 2–4 mm, *style* exceeding the stamens, white, 5.5–6.6 cm long, *stigma* lilac, conduplicate-spiral. *Fruit* a capsule, 3.4 × 1.5 cm, beaked, *seeds* 13–18 mm long, coma 1–3 mm long.

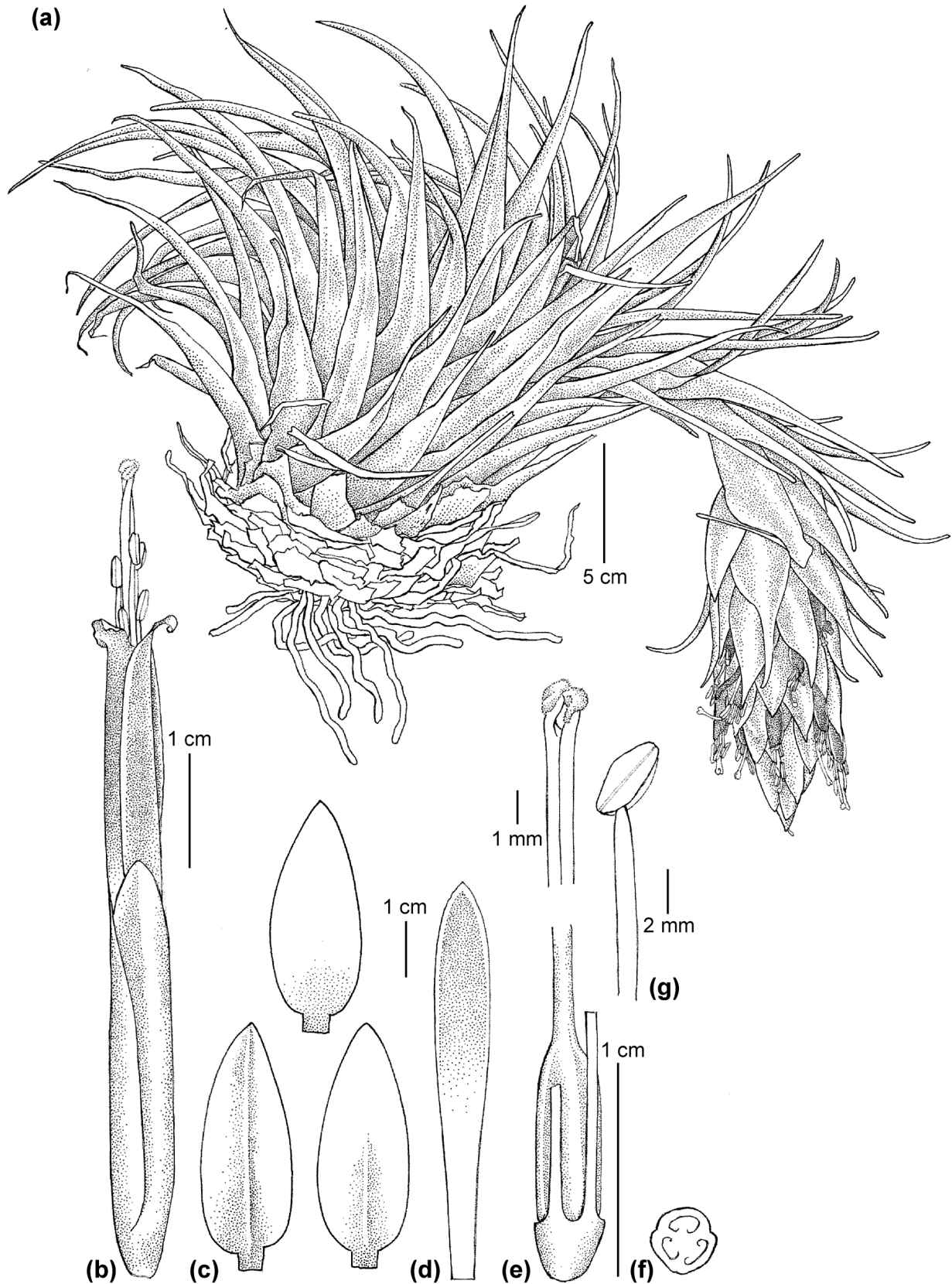


FIGURE 2. Illustration of *Tillandsia tecolometl* from C. Granados, M. Flores-Cruz & G. A. Salazar 415. (a) Habit. (b) Flower. (c) Sepals. (d) Petal. (e) Pistil. (f) Ovary cross section. (g) Stamen. Drawing by Elvia Esparza Alvarado.



FIGURE 3. (a)–(d) *Tillandsia tecolometl* (from the type locality in Temascaltepec, Estado de México). (a) Flowering plant. (b) Close-up of the inflorescence. (c) A solitary plant growing on *Pinus*. (d) Floral card showing flower parts.



FIGURE 4. Close-up of the inflorescences of (a) *Tillandsia macdougallii* (from Santa María Lachixío, state of Oaxaca) and (b) *Tillandsia tecolometl* (from the type locality in Temascaltepec, Estado de México).

Etymology:—The specific epithet refers to the vernacular name given to this species by local people in the Estado de México, which is derived from Náhuatl *tecolotl*, meaning owl, and *metl*, a plant of the genus *Agave*, perhaps alluding to the rosette of leaves suggesting agaves “perching” on the trees.

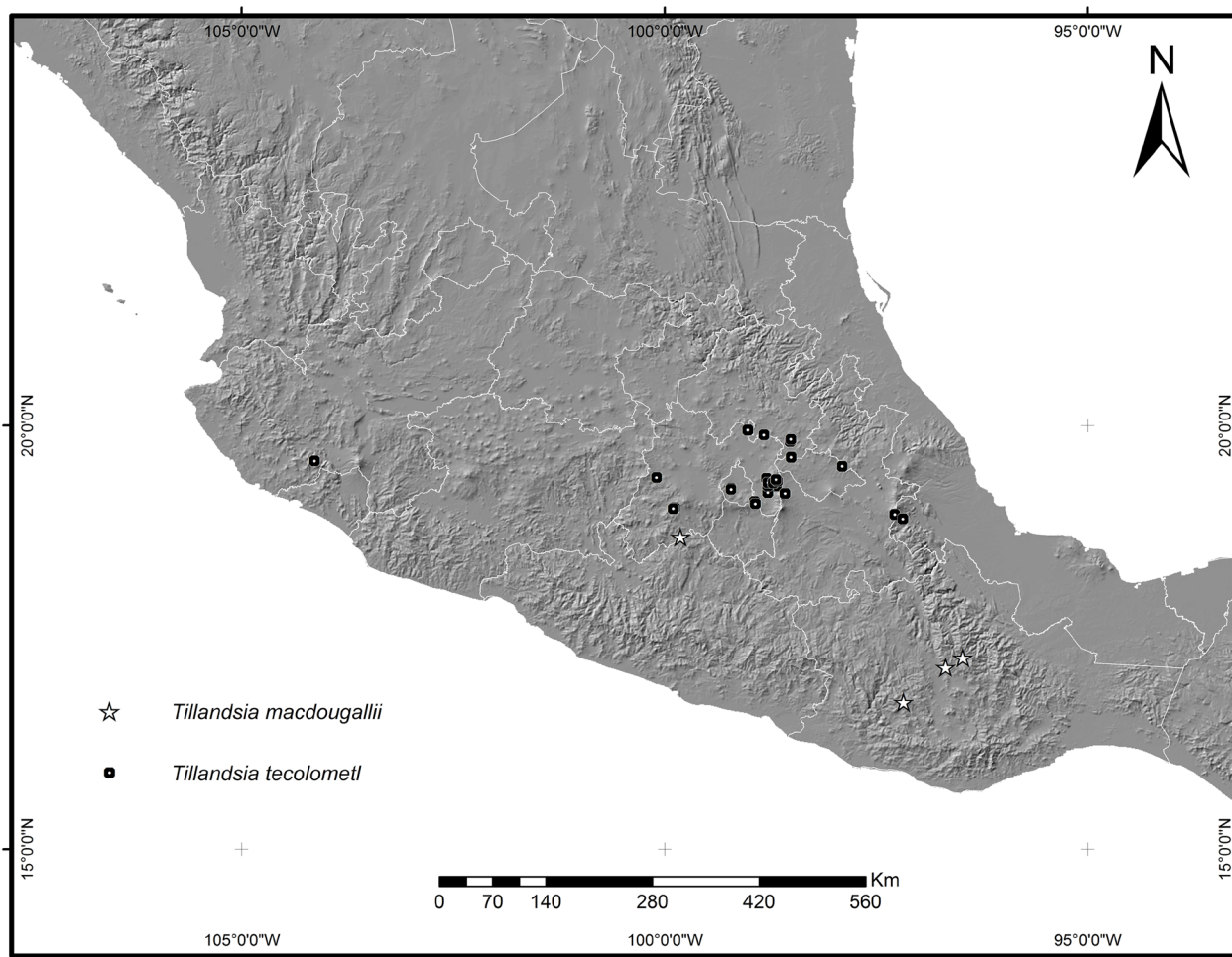


FIGURE 5. Known distribution of *T. tecolometl* (black rectangles with white centre) and *T. macdougallii* (white stars).

Distribution and habitat:—Endemic to Mexico (Mexico City, Durango, Estado de México, Hidalgo, Jalisco, Michoacán, Oaxaca, Puebla, Tlaxcala, and Veracruz; Fig. 5). Usually epiphytic on pine trees, but also found growing on oaks in mixed pine-oak forests at 2200–3300 m elev.

Phenology:—Flowering in the field from December to July, dehiscing fruits recorded in March.

Local uses:—At the type locality, local people use the floral bracts of this species to make a sort of whistle (Fig. 6).

Discussion:—*Tillandsia tecolometl* is easily distinguished from the other species of the *T. erubescens* group with purple corollas by its large, fusiform, many-flowered inflorescence with converging floral bracts toward the rachis, which completely cover the rachis at anthesis (Table 1). The new species can be confused in herbarium material with *T. macdougallii*, however several morphological differences clearly differentiate the two taxa (Table 1, Fig. 4). Furthermore, *T. tecolometl* is usually found growing on pines (rarely on oaks) and inhabits colder and taller pine-narrow-leaved oak forests often reaching higher elevations (2200–3300 m), whereas *T. macdougallii* grows indistinctly on pines and oaks in warmer, shorter pine-broadleaf oak forests at lower elevations (ca. 2400–2800 m). The new species is exclusively found along the Trans-Mexican Volcanic Belt, whereas *T. macdougallii* occurs on the Sierra Madre Oriental and Sierra Madre del Sur in the state of Oaxaca, with a single locality on the Trans-Mexican Volcanic Belt (Fig. 5). *Tillandsia tecolometl* is the sister species of *T. oaxacana* (Granados Mendoza 2008), but these two species can be easily separated by a number of differences indicated in Table 1.

Additional material examined (Paratypes):—MEXICO. Mexico City: Delegación Tlalpan, Volcán. Xitle, 2800 m, February 1952, *Matuda 26036* (MEXU!); subida del NE al Xitle, Pedregal de San Ángel, 17 February 1952, *Rzedowski 760* (MEXU!). Estado de México: municipio de Amecameca, San Pedro Nexapa, 2757 m, 28 October 2013 (cultivated at CUCIBROM, pressed 14 April 2015), *Flores & Juárez 1828* (MEXU!); municipio Coatepec Harinas, Cojones, 26 km sobre la desviación “La Puerta”, carr. Toluca-Almoloya de Alquisiras, 2950 m, 8 April 1993, *Flores-Cruz & Riveros 1013* (CHAPA!); municipio Iztapaluca, 2 km al W del Parque Nacional Zoquiapan, 3100 m, 2 November



FIGURE 6. (a)–(b) local use of *T. tecolometl*. The floral bracts of this species are used by local people for producing a kind of whistle.

1975, *Campos & Rivas 88* (ENCB!); estación experimental de investigación y enseñanza de Zoquiapan, 8 km al S de Río Frío, camino 4 al sur del entronque con camino 5, 3300 m, 18 March 1979, *Vega 584* (CHAPA!); 1 km al W de la Colonia Agrícola M. Ávila Camacho, 2900 m, 29 March 1981, *Rzedowski 37227* (ANSM!); municipio Jilotzingo, alrededores de Jilotzingo, 2600 m, 28 January 1996, *Flores-Cruz et al. 1255* (CHAPA!); municipio Juchitepec, Vihuilasco, 2800 m, 1 February 1976, *Ventura 938* (CIIDIR, ENCB!, MEXU!, NY!); 6 km al S de Juchitepec y 2 km sobre la desviación a Oaxtepec, km 29 de la carr. Juchitepec-Tepetlixpa, 2840 m, 19 January 1992, *Flores-Cruz & Riveros 675* (CHAPA!); 11 km al S de Juchitepec y 3 km sobre la desviación a Oaxtepec, 24 June 1995, *Flores-Cruz & Riveros 1090* (CHAPA!); municipio San José Villa Allende, en San Felipe, 13 km al SO de Villa Victoria, 2440 m, 28 January 1986, *Soto 11850* (MEXU!); municipio Tlalmanalco, 2 km al NE de Tlalmanalco, 2450 m, 5 December 1968, *Pineda 644* (ENCB!); municipio unspecified, kilómetro 47, Camino de Puebla, 2700 m, 12 November 1950, *Matuda 18854* (MEXU!); Llano Grande, Valle de México, 2800 m, 6 August 1950, *Matuda 18860* (MEXU!); Cerro Papayo, Río Frío, 3200 m, 22 February 1953, *Matuda et al. 28233* (ENCB!, MEXU!); Río Frío, Mex., 3000 m, 1 February 1975, *Matuda 38670* (MEXU!). Hidalgo: municipio Apam, 1 km al N. de la ex Hacienda de Chimalpa, 2200 m, 23 April 1981, *Hernández 5743*; municipio Tepeapulco, Tezontepec, 2600 m, 30 November 1975, *Ventura 638* (ENCB!); Cerro de Xihuingo, 2950 m, 30 December 1975, *Ventura 743* (ANSM!, ENCB!, FCME!, IBUG!); Cerro de Xihuingo, 2850 m, 23 March 1976, *Ventura 1204* (CHAPA!, ENCB!, MO!); 5 km al NW de San Jerónimo, 2800 m, 21 March 1964, *Rzedowski 18280* (CAS!, ENCB!, GMS!, MICH!, TEX!, WIS!). Jalisco: municipio unspecified, Sierra de Manantlán, 25–30 km. southeast of Autlán, along lumber-roads east of the road-crossing called “La Cumbre” between El Chante and Cuzalapa, 2750 m, 20–21 March 1965, *McVaugh 23146* (ENCB!, MEXU!, MICH!). Puebla: municipio unspecified, camino viejo a “Majadas”, San Juan Tetla, 3300 m, 11 October 1981, *Victoria s.n.* (ENCB!, MEXU!); San Manuel de la Sierra to San Andreas, 3200 m, 6 May 1938, *Balls B4452* (UC!); Río Frío, 3200 m, 6 April 1969, *Boege 1160* (MEXU!). Tlaxcala: municipio de Huamantla, bajando del Centro Vacacional Altamira (IMSS) hacia Huamantla, 2836 m, 9 february 2015, *Salazar et al. 9499* (MEXU!); municipio de Teolocholco, carretera de San Miguel Canoa (Puebla) al Parque Nacional la Malinche, 2692 m, 9 february 2015, *Salazar et al. 9495* (MEXU!); municipio Terrenate, 7 km al S de Terrenate, carr. Terrenate-Villa Real, 2925 m, 10 July 1992, *Flores-Cruz et al. 850* (CHAPA!); municipio

unspecified, hacia cerro Cuatlapauca, 26 March 1949, *Miranda 5219* (MEXU!). Veracruz: municipio unspecified, Vicinity of Orizaba, 2500 m, 2 December 1991, *Cathcart s.n.* (SEL!).

TABLE 1. Comparative characters of the species of the *Tillandsia erubescens* group with purple corollas.

	<i>T. pseudoaxacana</i>	<i>T. axacana</i>	<i>T. macdougallii</i>	<i>T. andrieuxii</i>	<i>T. tecolometl</i>
Leaves arrangement	rosulate	rosulate	rosulate	subrosulate	rosulate
Leaves consistency	leathery	leathery	fleshy	fleshy	fleshy
Leaf sheaths length	3–4.5 cm	3.5–7 cm	3–4.2 cm	1.4–2.5 cm	5–10 cm
Leaf sheaths width	2.5–4 cm	3.5–4.4 cm	2.3–2.6	0.9–1.6 cm	2.5–5 cm
Leaf sheaths flat shape	broadly ovate	broadly elliptic	broadly elliptic	oblong	ovate to oblong
Leaf sheaths abaxial indument	covered by scales with appressed wing cells	covered by scales with appressed wing cells	covered by scales with patent wing cells	covered by scales with patent wing cells	covered by scales with appressed wing cells
Leaf blade abaxial indument	covered by scales with appressed wing cells	covered by scales with appressed wing cells	covered by scales with patent wing cells	covered by scales with patent wing cells	covered by scales with patent wing cells
Peduncle length	2–3 cm	7.5–9 cm	9–10.5 cm	7.5–11 cm	8.5–22 cm
Inflorescence length (excl. peduncle)	6–8 cm	9.5–12 cm	8–10 cm	4.5–6 cm	(9–) 11.5–14.5 (–19) cm
Inflorescence width	2.8–4 cm	4–8 cm	2.8–4.5 cm	1.7–1.8 cm	4–8 cm
Inflorescence shape	ovoidal	subcylindric	obovoid	fusiform	fusiform
Number of flowers per inflorescence	9–15	ca. 13	8–11	2–6	10–15
Floral bract sheathing part flat shape	ovate	elliptic	elliptic	ovate	ovate to oblong
Floral bract sheathing part 3D shape	spoon-shaped	spoon-shaped	laterally compressed	laterally compressed	spoon-shaped
Floral bract consistence	membranaceous	leathery	fleshy	membranaceous	fleshy
Floral bract abaxial indument	covered by scales with appressed wing cell	covered by scales with appressed wing cells	covered by scales with patent wing cells	covered by scales with appressed wing cells	covered by scales with patent wing cells
Floral bract sheathing part orientation	converging, completely covering the rachis	converging, completely covering the rachis	diverging, exposing the rachis	converging, completely covering the rachis	converging, completely covering the rachis
Proximal floral bract apex	long caudate	caudate	caudate	acuminate	caudate
Proximal floral bract blade-like apex length	6.2–9 cm	4.2–5 cm	1.5–3.2 cm	0.1–0.2 cm	1–2.8 cm
Petals exposure at anthesis	nearly masked by the sheaths of the floral bracts	far exceeding the sheathing part of the floral bracts	far exceeding the sheathing part of the floral bracts	far exceeding the sheathing part of the floral bracts	far exceeding the sheathing part of the floral bracts
Sepals length	21–28 mm	22–27 mm	32–38 mm	10–25 mm	33–46 mm
Sepals flat shape	elliptic	elliptic	ovate	lanceolate	ovate
Sepals apex	acuminate	acute	acuminate	acute	acute
Sepals venation	strongly nerved	smooth	smooth	smooth	smooth
Sepals carination	ecarinate	the adaxial ones carinate	the adaxial ones slightly carinate	the adaxial ones slightly carinate	the adaxial ones slightly carinate
Petals length	3.9–4.3 cm	5–6 cm	5.2–6 cm	4–5.4 cm	(5.4–) 6–6.5 cm
Petals width	5–6 mm	5–7 mm	6–7 mm	6–7 mm	6–9 mm
Petals flat shape	linear-oblong	oblanceolate	oblanceolate	linear-oblong	linear-oblong
Petals apex	rounded	acute	acuminate	rounded	acute
Stamens relative length	enclosed, roughly as long as the floral tube	far exceeding the floral tube	far exceeding the floral tube	far exceeding the floral tube	far exceeding the floral tube
Filament length	3.8–4 cm	5.7–5.8 cm	6.1–6.5 cm	5.8–6 cm	5.4–7 cm
Filament color	white	white	white	white	white
Style/stigma position relative to the stamens	barely exceeding the filaments	distinctly exceeding the stamens	distinctly exceeding the stamens	distinctly exceeding the stamens	distinctly exceeding the stamens
Style length	2.7–3.5 cm	ca. 6.2 cm	ca. 5.2 cm	ca. 3.8 cm	5.5–6.6 cm
Style color	white	white	white on its proximal 3/5, purple above	white on its proximal 3/5, purple above	white
Stigma color	yellowish white	purple	purple	purple	purple
Ovary shape	conical	ovoid	oblong to ovoid	narrowly ovoid	cylindrical

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