



Waltheria glabribracteata (Byttnerioideae, Malvaceae), a new species with elongate-plumose stigmas from South America

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Abstract

A new *Waltheria* species (Malvaceae) is described and illustrated here. *Waltheria glabribracteata* is known from ecotone areas in Brazil and Bolivia and can be readily distinguished from other *Waltheria* species by its bracts which are glabrous on the adaxial surface. This study presents a description of the new taxon, taxonomic comments, a distribution map, conservation status and an illustration.

Keywords: Ecotone, Glabrous bracts, Hermannieae, Malvales, Taxonomy

Introduction

Waltheria Linnaeus (1753: 673) is a genus of Byttnerioideae (Malvaceae) characterized by herbaceous, subshrubby to shrubby habits, stipules present, axillary or terminal inflorescences, heterostyly, bracts surrounding two sessile flowers, plane petals, five stamens, with filaments connate into a staminal tube and only one carpel. The stigma in *Waltheria* is called penicillate, and in Saunders (1993) its morphology was used to classify species into groups, especially Mexican ones. The four types of stigmas found in *Waltheria* are fan-plumose, elongate-plumose, clavate and filiform and species are categorized according to the size and disposition of the stigmatic branches (or papillae) on the style.

The genus comprises approximately 60 species, 53 of them restricted to the Americas (Saunders 2011). Brazil is considered the main diversity center for *Waltheria*, with 24 species (Coutinho & Alves 2019, Saunders 2007, Silva-Coutinho *et al.* 2019), Schumann (1886) and Saunders (1995a, unpublished) have prepared the most comprehensive taxonomic studies of the genus for the country. However, Saunders work was never published. After these studies, some new data have come out and the genus has become better known mainly in northeastern and southeastern Brazil (Amorim *et al.* 2009, Amorim 2012; Cruz & Esteves 2009; Saunders 1995b). In addition to Brazil, in South America the genus has been taxonomically studied in the Venezuelan Guayana (Saunders 2005), Venezuela (Rondón 2008, Rondón & Campos 2007), Paraguay (Saunders 2007) and Argentina (IBONE 2018). However, knowledge about the genus is still incipient for Bolivia, where only five species are recorded (Saunders 1995a, unpublished).

During the preparation of the taxonomic study about Brazilian *Waltheria* species by the first author, a new species from Brazil and Bolivia was discovered in herbarium collections.

Methods

This study was based on the analysis of the collections at ASE*, CEN, CTES, EAC, EAN, ESA, HCDAL, HPISF, HST [Sérgio Tavares Herbarium of the Universidade Federal Rural de Pernambuco; no indexed], HTSA*, HUVA, IPA, INPA*, JPB, MAC, MBM, MOSS, MUFAL, PEUFR, R, RB, RN, RFA, SI, SJRP, SP, SPF, UB, UFP, UFRN, UEC, UPCB; acronyms follow Thiers 2019; *digital images). Morphological studies were carried out under a stereomicroscope. Morphological terminology follows Harris & Harris (2001) and Radford (1998), and the type of

stigma is according to Saunders (1993). The distribution map was made by QGIS, version 3.0.1, with coordinates extracted from exsiccate labels or, when absent, based on data from Google Earth. The conservation status is assessed based on IUCN (2012) criteria and was also analyzed using the GeoCat Tool (Bachman *et al.* 2011).

Taxonomic treatment

Waltheria glabribracteata T.S. Coutinho & M. Alves, *sp. nov.* (Figure 1).

Type:—BRAZIL. Mato Grosso: Vila Bela da Santíssima Trindade, Serra de Ricardo Franco, topo da Cachoeira do Jatobá, 650 m elev., 14°55'06''S, 60°04'36''W, 21 March 2014, *M.F. Simon, G. Pereira-Silva, J.L. Barros, M. Mendonza & T.S. Reis 2232* (holotype: CEN!, isotype: RB!, NY [digital image!]).

Diagnosis:—*Waltheria glabribracteata* is morphologically close to *Waltheria rotundifolia* Shrank (1828: 65), differing by its discoloured leaf blades (*vs.* concolorous), glabrous adaxial surface of the bracts (*vs.* pilose), lanceolate to ovate bracts (*vs.* linear), calyx 6–7 mm long (*vs.* 4–5 mm long), oblanceolate and glabrous corolla lobes (*vs.* spatulate and sericeous), and elongate-plumose stigmas in longistylous flowers (*vs.* fan-plumose).

Description:—Shrubs 0.80–1.80 m tall. Branches terete, strigose, the trichomes stellate and sessile; trunk not resinous, not lenticellate. Stipules ca. 4 × 0.7 mm, lanceolate, adaxial surface pubescent, abaxially scabrous, the apex acute, the margins ciliate. Leaves simple, alternate, spirally arranged; petioles 0.7–1 × 0.26–0.36 cm, compressed, scabrous, the trichomes similar to those on the branches; leaf blades 5.3–8 × 4–7.5 cm, circular to oblate, discoloured, chartaceous to subcoriaceous, strigose, the trichomes stellate and sessile; venation actinodromous, 7–8 pairs of secondary veins, 2 basal, tertiary veins reticulate, the base cordate, the apex rounded to truncate, the margins irregularly and finely serrate, teeth 2.2–3 × 1–1.5 mm. Inflorescences cymose, axillary, the peduncle 5–20 mm long, strigose; bracts 4, 3–3.5 × 0.9–2.2 mm, lanceolate to ovate, the apex acute to acuminate, adaxial surface glabrous, abaxial sericeous, longitudinally nerved. Flowers potentially distylous, ca. 9 mm long, sessile, in pairs, surrounded by bracts. Calyx 5-merous, gamosepalous, 6–7 × 3.2–3.5 mm, 10-ribbed, externally sericeous, trichomes stellate, internally glabrous, pubescent on the free lobes, trichomes simple, lobes free, 2–3.2 × 1.1–1.7 mm, the apex acute to acuminate; veins not reaching the margins; nectary ca. 0.3 mm long, on the base of the internal surface. Corolla 5-merous, gamopetalous, yellow, tube ca. 1.8–2 mm long, claw 1–1.4 mm long, limb ca. 6–7.5 × 2.2–2.5 mm, oblanceolate, glabrous, the apex rounded. **Longistylous form:** stamens 3.8–5.5 mm long, staminal tube adnate to corolla, ca. 3.5 mm long, glabrous, free filaments 0.5–1.1 mm long, papillate, anthers dithecous, 1.2–1.3 mm long, dehiscence longitudinal; pistil ca. 6–7 mm long, the ovary 1.5 × 0.8 mm, sericeous, the style 3.2 mm long, tortuose basally, pubescent, the stigma 1.5–2.1 × 0.8 mm, penicillate, elongate-plumose. **Brevistylous form:** not observed. Capsule ca. 4 × 3 mm, obovoid, membranaceous on the lower third, chartaceous on the upper third, the dehiscence loculicidal, sericeous, the trichomes concentrated apically, long-simple and short-stellate, the apex truncate; seed 1, ca. 2.8 × 1.7 mm, obovoid, glabrous, black, brownish basally, crenulate at the base.

Etymology:—The specific epithet refers to the glabrous adaxial surface of the bracts, a unique character among *Waltheria* species.

Distribution and Habit:—*Waltheria glabribracteata* is known from a few collections in Brazil (Mato Grosso state, in the municipality of Vila Bela da Santíssima Trindade) and Bolivia (Santa Cruz department, province of José Miguel de Velasco) (Figure 2). In both countries, *W. glabribracteata* is found in protected areas within the Serra Ricardo Franco State Park (Brazil) and Noel Kempff Mercado National Park (Bolivia), which are on the border of both countries.

The species occurs in transitional vegetation among Amazonian forest, *Cerrado* and Pantanal (Killeen 1998, IBGE 2004), at 600 to 900 m elevation.

In Serra Ricardo Franco State Park, this is the first record of the genus *Waltheria* (speciesLink 2019), whereas in Noel Kemp National Park, *W. glabribracteata* occurs sympatrically with *W. indica* Linnaeus (1753: 673) and *Waltheria* sp., erroneously identified as *W. polyantha* Schumann (1886: 60), however, this latter species is restricted to Minas Gerais state in Brazil.

Phenology:—Collected with flowers in March to May and August, fruits in May.

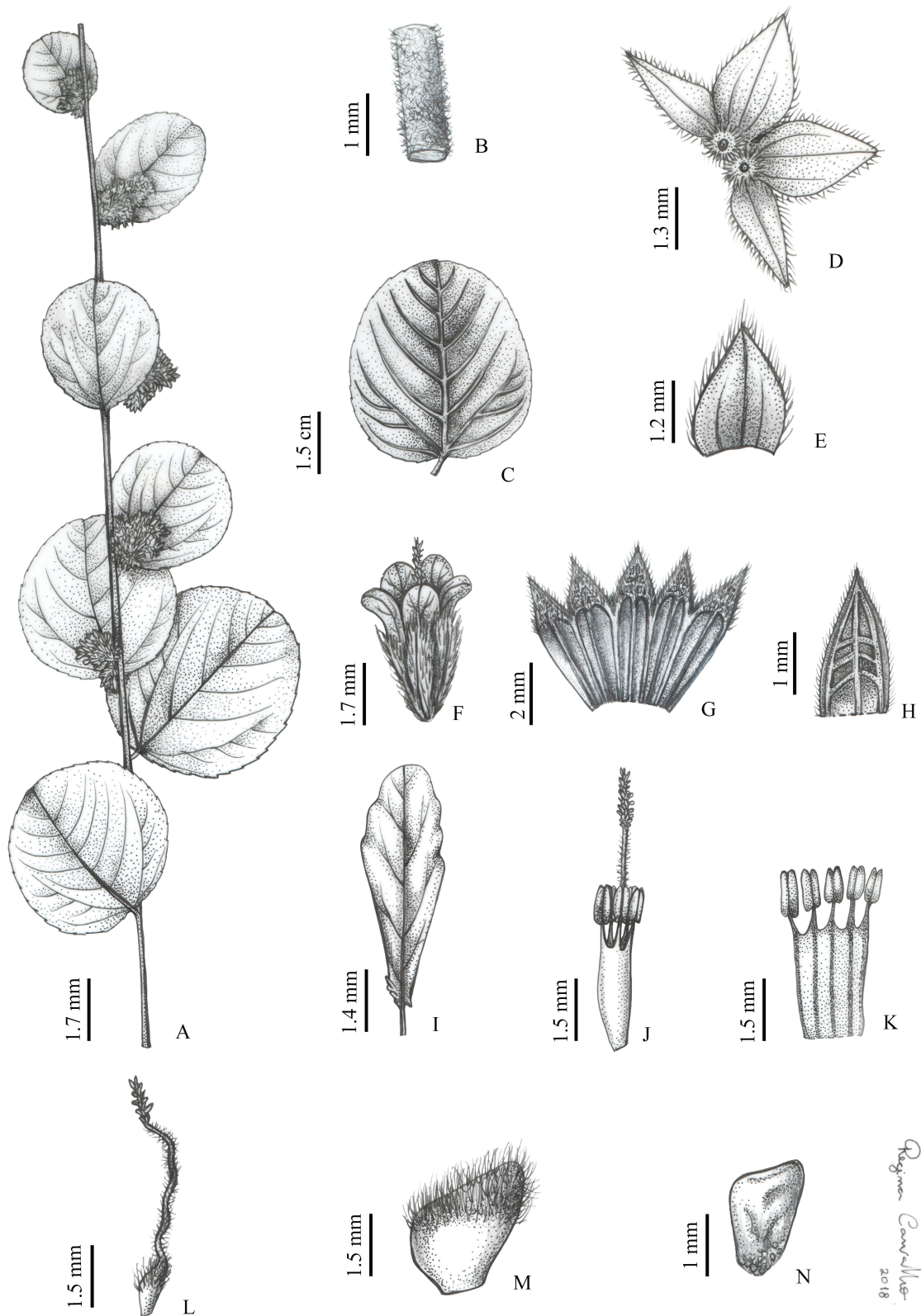


FIGURE 1. *Waltheria glabribacteata*. A. Flowering branch. B. Detail of the branch and indumenta. C. Adaxial surface of the leaf blade. D. Bracts with two flowers removed. E. Adaxial surface of the bract. F. Flower. G. Internal view of the calyx. H. Free lobe of the calyx with trichomes removed. I. Corolla lobe. J. Staminal tube and stigma elongate-plumose. K. Internal view of the staminal tube. L. Pistil. M. Capsule. N. Seed. (A–N: M.F. Simon et al. 2232).

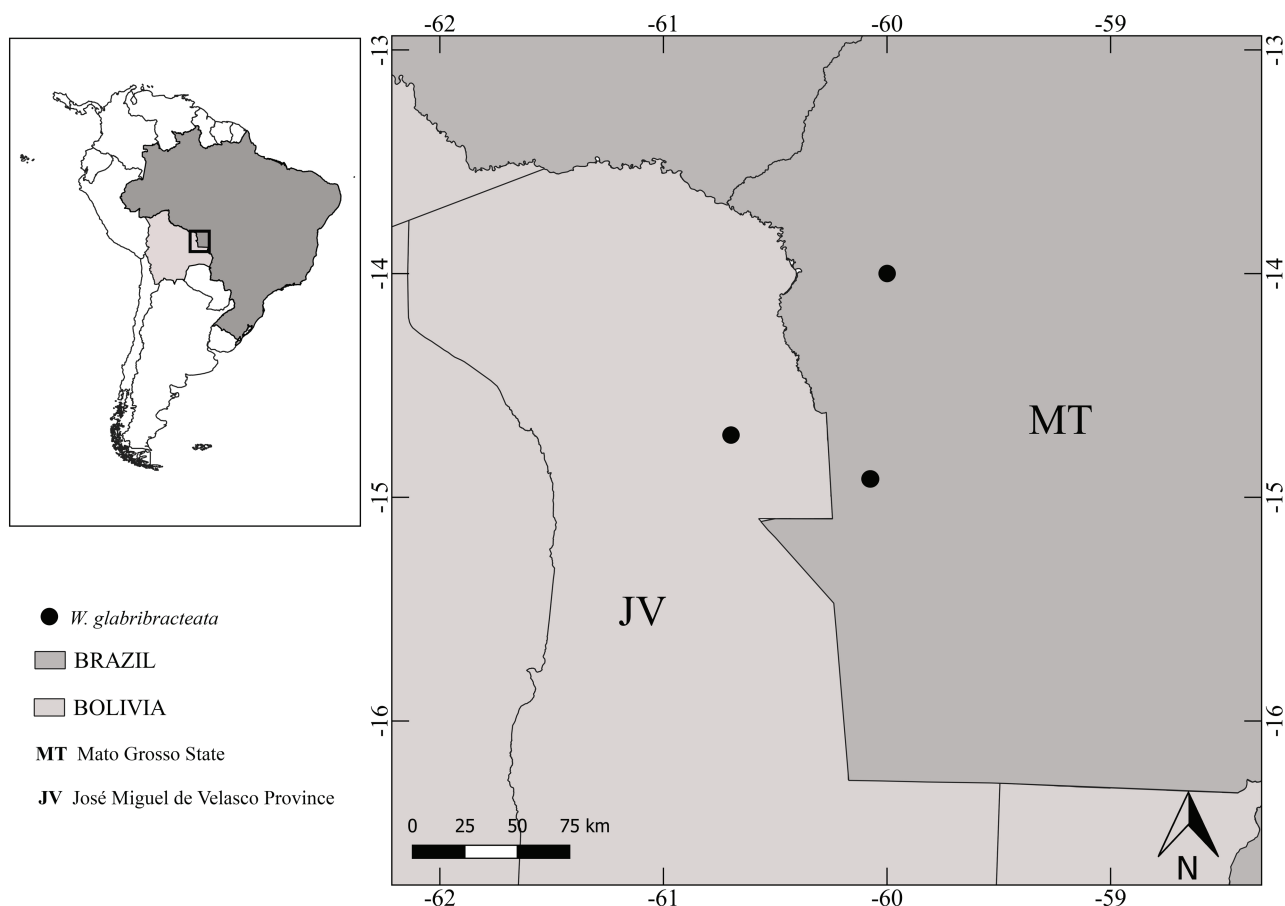


FIGURE 2. Geographic distribution map of *Waltheria glabribracteata*.

Conservation status:—*Waltheria glabribracteata* is known only from a few collections in the two localities previously indicated. The State Park Serra de Ricardo Franco is officially a fully protected area comprising ca. 158,000 ha. However, the locality is also the target of deforestation for cattle breeding, as well as exploitation of its natural resources. These anthropogenic actions may cause a decrease in population size in the short term, promoting ultimately the total elimination of these individuals. Because of this, *W. glabribracteata* should be classified as Critically Threatened (CR), B1b (i, ii, iii, iv), C2a (i), according to GeoCat data and IUCN Criteria 2012 (IUCN 2019).

Additional specimens examined (Paratypes):—BOLIVIA. Santa Cruz, José Miguel de Velasco, 21 April 1993, T.J. Killeen 5413 (CTES!). BRAZIL. Mato Grosso, Vila Bela da Santíssima Trindade, Córrego da Cascata, 18 August 1997, G. Hatschbach, A. Schinini & E. Barbosa 66985 (MBM!); topo da Cachoeira do Jatobá, 14°55'06"S, 60°04'26"W, 17 May 2013, J.E.Q. Faria, M.R.V. Zanatta & D. Villarreal 3484 (RB!, UB!); Serra Ricardo Franco, 15°S, 60°W, 22 March 1978, P.G. Windisch 1739 (RB!, UEC!); *ibidem*, 25 May 1978, P.G. Windisch 1939 (CTES!, RB!, UEC!).

Discussion:—*Waltheria glabribracteata* can be recognized mainly by the fact that it is the only species of the genus having bracts with a glabrous adaxial surface (Fig. 1d-e). In the taxonomic revision of *Waltheria*, Saunders (1995a, unpublished) cites the adaxial surface of the bracts of *Waltheria collina* Schumann (1828: 63) as “essentially glabrous but with 1–2 branched trichomes... and sessile glandular trichomes”, so in this species cannot be considered glabrous, but sparsely pilose according to our own data. Regarding its morphology, the new species shares with *Waltheria rotundifolia* the stellate and sessile trichomes, the leaf blade shape, with finely serrate margins, but differs by its pedunculate inflorescences (*vs.* sessile to subsessile in *W. rotundifolia*), lanceolate to ovate bracts (*vs.* linear), glabrous adaxial surface of the bracts (*vs.* pilose), glabrous corolla lobe apex (*vs.* densely ciliate) and elongate-plumose stigma (*vs.* fan-plumose) (Table 1). Comparing with *Waltheria ackermanniana* Schumann (1886: 61), *W. glabribracteata* is similar in the strigose indument, pedunculate inflorescences and circular leaf blades (in some individuals), however the latter species can present a broad variation of leaf blade shape, varying from elliptical, widely elliptical, circular to ovate (Table 1). However, *W. glabribracteata* lacks glandular trichomes (*vs.* present in *W. ackermanniana*), glabrous adaxial surface of the bracts (*vs.* sparsely pilose), bracts not exceeding 3.5 mm long (*vs.* reaching 12.5 mm long) and elongate-plumose stigma (*vs.* fan-plumose). Other characters are shown in Table 1.

Concerning geographic distribution, *Waltheria glabribracteata* is allopatric to *W. rotundifolia* and *W. ackermanniana*. While *Waltheria grabribracteata* is restricted to Mato Grosso state (Brazil) and Santa Cruz department (Bolivia), *W. rotundifolia* occurs in Mexico and Brazil (restricted to the Northeast region - Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia states), while *W. ackermanniana* was previously restricted to the states of the Bahia, Minas Gerais and Rio de Janeiro, and here in this study it is also recorded in Pernambuco state (Coutinho *et al.* 335 and Coutinho *et al.* 344, UFP herbarium).

TABLE 1. Morphological and geographic comparison among *Waltheria glabribracteata* and other morphologically similar species. (Morphological results are based on longistylous-form flowers measured in our own results).

Character/Species	<i>W. glabribracteata</i>	<i>W. ackermanniana</i>	<i>W. rotundifolia</i>
Trichomes on the branches	Stellate	Stellate and glandular	Stellate
Leaf blade shape	Circular to oblate	Elliptical to widely elliptical, circular or rarely ovate	Ovate, widely ovate to very widely ovate or circular
Peduncle length (mm)	5–20	1–5	2–4
Adaxial surface of bracts	Glabrous	Sparsely pilose (stellate and glandular, sessile trichomes)	Pilose (stellate trichomes)
Bract shape	Lanceolate to ovate	Narrowly triangular	Linear
Bract size (mm)	3–3.5 × 2–2.2	4–12.5 × (0.2–0.5)0.6–1.5	3.5–4.5 × 0.3–0.7
Calyx size (mm)	6 × 3.5	(4.7)5.5–7 × 2.2–3.5	4–5 × 2–2.8
Corolla lobe size (mm)	6 × 2.2	2.8–5 × 1.3–1.8	2.7–4.8 × 1–1.6
Corolla lobe shape	Oblanceolate	Oblong	Spatulate
Corolla lobe apex indument	Glabrous	Ciliate	Ciliate
Stigma shape	Elongate-plumose	Fan-plumose	Fan-plumose
Capsule size (mm)	4 × 3	2.5–3 × 1.7–2.2	1.7–2.3 × 1.7–2
Geographic distribution	Bolivia and Brazil	Brazil	Mexico and Brazil

According to Silva-Coutinho *et al.* (2019), seven species of the *Waltheria* occur in the Mato Grosso state. *Waltheria glabribracteata* differs of them specially by circular to oblate leaf blade and absence of trichomes on the adaxial surface of the bracts.

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