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A new species of the genus *Coulteria* (Leguminosae) in the Tehuacan-Cuicatlan Valley, Mexico

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Abstract

A taxonomic review of *Coulteria* (Leguminosae) species present in the flora of Tehuacan-Cuicatlan Valley was carried out as part of the treatment of the subfamily Caesalpinioideae of this area. *Coulteria rosalindamedinae* is described and illustrated as a new species, it is endemic from the study area, and morphologically related to *C. pumila*. A comparative table, photographs of *C. rosalindamedinae* and *C. pumila*, are presented as well as key for their taxonomic identification.

Resumen

Se realizó una revisión taxonómica de las especies de *Coulteria* (Leguminosae) presentes en la flora del Valle de Tehuacán-Cuicatlán, como parte del tratamiento de la subfamilia Caesalpinioideae de esta área. *Coulteria rosalindamedinae* se describe e ilustra como una nueva especie, es endémica al área de estudio y morfológicamente relacionada a *C. pumila*. Se presenta una tabla comparativa, fotografías de *C. rosalindamedinae* y *C. pumila*, así como una clave para su identificación taxonómica.

Keywords: *Brasilettia*, *Caesalpinia*, Caesalpinioideae, *Guaymasia*, Oaxaca, Puebla

Introduction

Coulteria (Kunth in Humboldt, Bonpland & Kunth 1824: 258) descr. emend. Sotuyo *et al*. (2017: 34) is a neotropical genus which belongs to the subfamily Caesalpinioideae De Candolle (1825: 473). This genus was considered part of *Caesalpinia* group Polhill & Vidal (1981) which was later classified into several genera, Lewis (2005).

Phytochemical and molecular studies suggested that *Coulteria* form a monophyletic group, which has been resolved and recognized in recent studies (Kite & Lewis 1994, Gagnon *et al*. 2013, Gagnon *et al*. 2016).

After its publication, Britton & Rose (1930) considered nine species of *Coulteria* under the genera *Brasilettia* (De Candolle 1825: 481-482) Kuntze (1891: 164) and *Guaymasia* Britton & Rose (1930: 322). Sotuyo *et al*. (2017) published a synopsis that included new names, synonyms and a species key of *Coulteria*, they consider a genus with distribution across Central America, México and some parts of South America, and recognized seven species of *Coulteria*, five of which occur mainly in Mexico.

Some *Coulteria* species have been treated in regional floristic studies of Mexico under the genus *Caesalpinia* sensu lato. McVaugh (1987) in his treatment of *Caesalpinia* Linnaeus (1753: 380) for the Flora Novo-Galiciana considered eleven species for the area, of these only *Caesalpinia platyloba* Watson (1886: 425-426) is currently recognized in the genus *Coulteria*; Flores (1990) carried out a study of the Caesalpinioideae subfamily in the state of Morelos where he considered four species of *Caesalpinia* sensu lato, of these only *Caesalpinia platyloba* belongs to genus *Coulteria*. Dávila *et al*. (1993) considered seven species of *Caesalpinia* sensu lato in the Tehuacan-Cuicatlan Valley, of which three are now recognized under the genus *Coulteria*. Rzedowski & Calderon (1997) considered three species of *Caesalpinia* for the Flora del Bajio, of these, only *Caesalpinia pringlei* (Britton & Rose 1930: 322) Standley (1933: 40) is recognized in *Coulteria*. The present work is the result of a review of the genus *Coulteria*, for the Flora of the Tehuacan-Cuicatlan Valley, Mexico, as part of the treatment of the Caesalpinioidea subfamily in this area.

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Material and methods

The study area is in the Tehuacan-Cuicatlan Valley, which corresponds to the SW of Puebla and NW of Oaxaca, Mexico, between the coordinates: latitude 17°15'-19°00' and longitude 96°45'-97°55' (Fig. 1).

This study was based on the examination of all the collections corresponding to species of *Coulteria* in the area, specimens of *Caesalpinia* and *Guaymasia* Britton & Rose (1930: 322) as well as the isotypes of *Brasilettia pringlei* (1930: 322) and *B. velutina* Britton & Rose (1930: 322) all of them seen in the MEXU herbarium, as well as the holotype (digitized in JSTOR Global Plants and stored in K herbarium) of *Caesalpinia gracilis* Bentham ex Hemsley (1878: 9) which was given as a synonym of *Guaymasia pumila* Britton & Rose (1930: 322), these collections are currently combined into the genus *Coulteria*. The morphological description of the new species was based on measurement and comparison of vegetative and floral organs of specimens, which were dissected in the herbarium, under a stereomicroscope (NIKON SMZ745T), and photographed using a digital microscope camera (AMSCOPE 5.1 MP MU500). The elaboration of the geographical distribution map of *Coulteria rosalindamedina*, was based on INEGI 2018a; INEGI 2018b; CONAMP 2019. The morphological terminology was based on the glossaries of Moreno (1984) and Harris & Harris (1995). The concept of species adopted in this work is that of taxonomic species, which is based on a morphological criterion, discussed by Valencia (1991). We agree with the definition of species by Nixon and Wheeler (1990) "The smallest aggregation of populations (sexual) or lineages (asexual) diagnosable by a unique combination of character states in comparable individuals (semaphoronts)", although our context in this study is strictly taxonomic.

Results

We recorded two species of *Coulteria* in the Tehuacan-Cuicatlan Valley: *Coulteria velutina* (Britton & Rose 1930: 322) Sotuyo & Lewis (2017: 41) and a second, that does not correspond to any of the recognized species of this genus, and which is described here. *Coulteria rosalindamedinae* R. Torres, A. Saynes & P. Tenorio *sp. nov*., is related to *Coulteria pumila* (Britton & Rose 1930: 322) Sotuyo & Lewis (2017: 40). Both of them are similar in: type of habit, pinna number, arrangement, size and shape of leaflets, abaxial sepal indumentum, and size of legume, but the two can be clearly distinguished by the morphological characters discussed here.

Taxonomy

Identification key to the *Coulteria pumila, C. rosalindamedinae* and *C. velutina.*

1. Trees up to 3 m high, rarely shrubs; basal leaflets 1.6–3.8(–4.4) × 1.0–2.3(–3.3) cm ovate, to widely ovate, apex slightly obtuse to slightly acute, terminal leaflets (2.3–)3.1–4.5(–7.6) × 1.3–3.0(–4.1) cm, elliptic..... *Coulteria velutina* (México and Central America).
1. Shrubs to 0.4–2.5 m high, rarely up to 3 m or more; basal leaflets (0.7–)0.9–1.5 × (0.5–)0–9–1.3(–2.6), orbicular to elliptic, apex obtuse, terminal leaflets (0.9–)1.0–3.2 × 0.5–2.1(–2.9), elliptic, widely obovate to suborbicular.
2. Pairs of leaflets 3–4, upper indumentum of leaflets glabrous, lower glabrous to scarcely strigulose; petiole glabrous to scarcely pubescent; pedicels 12–15 mm long, rarely less, articulated to 3/4 of its length..... *Coulteria pumila* (Sonora).
2. Pairs of leaflets 4–6, upper and lower indumentum of leaflets tomentulose; petiole lanulose; pedicels 2.0–3.5 mm long, articulated near the apex..... *Coulteria rosalindamedinae* (Oaxaca and Puebla).

Coulteria rosalindamedinae R. Torres, A. Saynes & P. Tenorio *sp. nov.* (Fig. 2)

Coulteria rosalindamedinae is similar to *C. pumila*, but differs by the leaf rachis lanulose (vs. glabrous), upper and lower indumentum of basal leaflet tomentulose (vs. upper glabrous; lower glabrous to scarcely strigulose), basal leaflets with cordate base (vs. rounded to abtuse), terminal leaflets elliptic (vs. widely obovate to suborbicular), petiole lanulose (vs. glabrous to scarcely pubescent); inflorescence with ca. 26 flowers (vs. ca. 5–8 flowers), rachis lanulose (vs. strigulose), longer pedicel (1.2–) 2.0–3.5 (–4.5) mm (vs. (3.6–) 12–15 mm), articulated near the apex (vs. ¾ of its length), lanulose whitish (vs. scarcely pubescent not whitish), adaxial petal slightly fleshy (vs. membranaceous), claw 1.0-2.4 × 0.2–0.9 mm (vs. (1.0–) 2.0–3.1 × 0.5–0.9 mm) , scarcely pubescent (vs. sericeous); legume oblong-elliptic (vs. obovate) (figs. 3 and 4).

Type:—MEXICO. Oaxaca: Distr. Coixtlahuaca; Municipality Tepelmeme, Agua El Tule, ladera E de Cerro Verde, 25 april 1988, *R. Torres C. 12096 & P. Tenorio L.* (holotype MEXU, isotypes BM, ENCB, K, MEXU, MO, NY, OAX, P, UAMIZ, XAL).

Shrub 0.35–1.0(–5.0) m high, erect to semi-prostrate; young branches lanulose, yellowish to ferruginous, old branches strigulose or scarcely lanulose to glabrous; stipules early deciduous, 0.8–1.8 × 0.2–0.7 mm, narrowly lanceolate to triangulate; petiole (1.2–)1.5–5.4 cm, lanulose; leaves bipinnate, pinnae (1–)2–3 pairs, (2.9–)4–6 (–6.9) cm long, rachis (1.6–)2–6(–6.8) cm long, lanulose, leaflets (3–)4–6 pairs, opposite, basal pair (0.7–)0.9–1.2(–1.4) × (0.7–)0.9–1.2(–1.4) cm, orbicular, base cordate, apex obtuse to rounded, rarely obcordate, upper and lower surface tomentulose, terminal leaflets, 1.0–2.6(–2.8) × (0.5–)0.7–1.5(–1.9) cm, elliptic, base oblique, apex rounded, rarely obcordate, upper and lower surface tomentulose. Inflorescences racemose, (2–)5–26 flowers, (2.0–)3.0– 7.5(–8.4) cm long, axillary, rachis lanulose; bracts (1.1–)1.4–1.7(–2.1) × (0.7–)1.0–1.5 mm, widely ovate, cymbiform, lanulose with hairs white and ferruginous; flowers hermaphroditic and others with apparently non-functional gynoecium (functionally andromonoecious), floral buds, 1.1–5.5(–6.0) × (0.7–)1.0–3.5 mm, clavate to obovate, lanulose, white, yellowish; pedicels (1.2–)2.0–3.5(–4.5) mm long, articulated near to apex, lanulose whitish; calyx red with 5-heteromorphic sepals, 1-abaxial (4.4–)5.5–7.0(–7.2) × (1.8–)2.0–5.0 mm, obovate, lanulose, to scarcely tomentose, hairs white, punctate, cucullate, laciniate, yellowish glandular segments, 2-lateral and 2-adaxial (2.1–)2.5–5.5(–6.7) × (0.8–)1.5–3.0 (–3.6) mm, oblong-lanceolate, oblong-ovate, laciniate with yellowish glandular segments, lanulose; hypanthium 2–2.5 × 3–3.5 mm, infundibuliform, lanulose; corolla with 5-subsymmetric yellow petals, clawed, 2-abaxial and 2-lateral (2.0–)3.0–7.0(–8.0) mm long (including the claw), lamina 2.3–4.0 × 1.7–2.8 mm, obovate to suborbicular, membranaceous, scarcely pilose in the margin, punctuate, claw 0.4–2.0 × 0.2–0.4 mm, 1-adaxial 4.0–6.0 mm long (including the claw), slightly fleshy, reflexed, lamina 2.3–2.8 × 1.7–2.8 mm, obovate, conduplicate, scarcely pubescent in the margin, punctate, claw 1.0–2.4 × 0.2–0.9 mm, scarcely pubescent; fertile stamens 10, free, ca. 3.5 mm long, 5 slightly longer, ca. 4.5 mm long, filaments dilated in the base ca. 0.7 mm, pubescent; anthers 0.5–0.9 × 0.3–0.7 mm, slightly basifixed, widely elliptic to suborbicular; ovary 3.0–7.5 × ca. 2.9 mm (the ones that seem functional), tomentose, style 0.3–2.5 mm long, stigma ca. 0.3 mm diameter, clavate. Legume 3.7–7.2 × 1.9–3.2 cm, oblong-elliptic, tomentulose, persistent style, 0.2–1.2 mm long, stipe (0.3–)0.5–1.4 cm long, legume peduncle 5.0–6.0 (–10) mm long; seeds ca. 1.0 × ca. 0.9 cm, suborbicular, reddish.

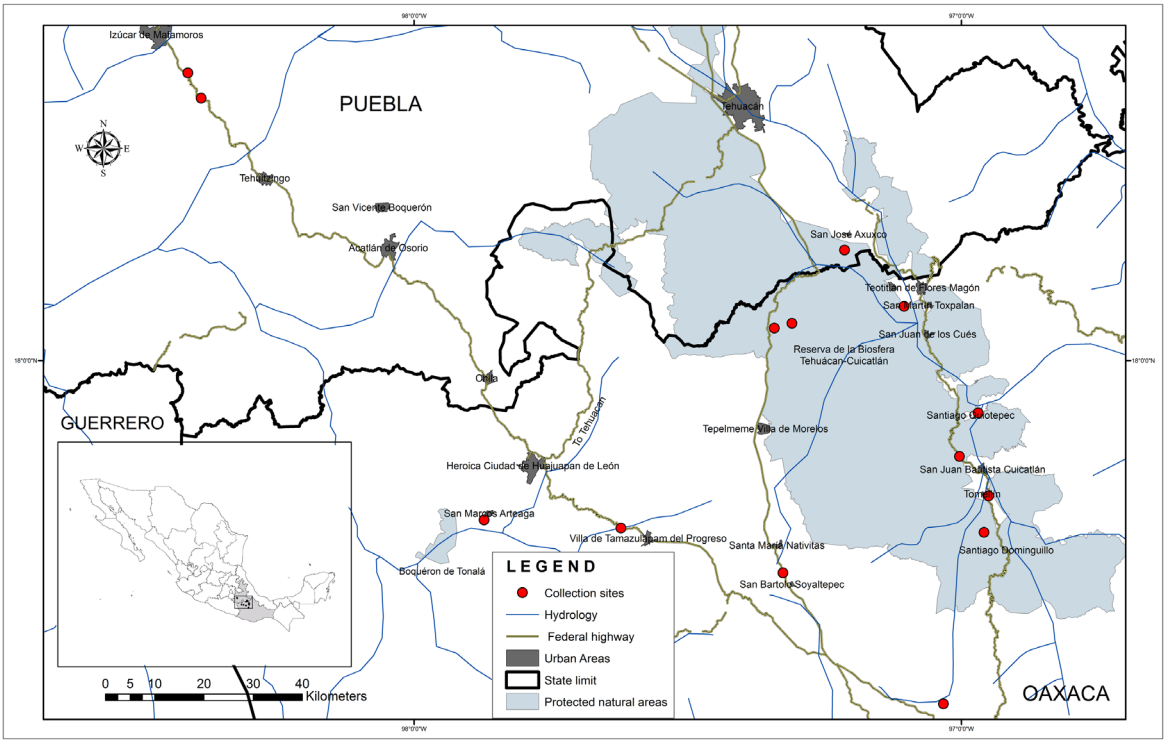

FIGURE 1. Geographical distribution of *Coulteria rosalindamedinae* (INEGI 2018a; INEGI 2018b; CONAMP 2019).

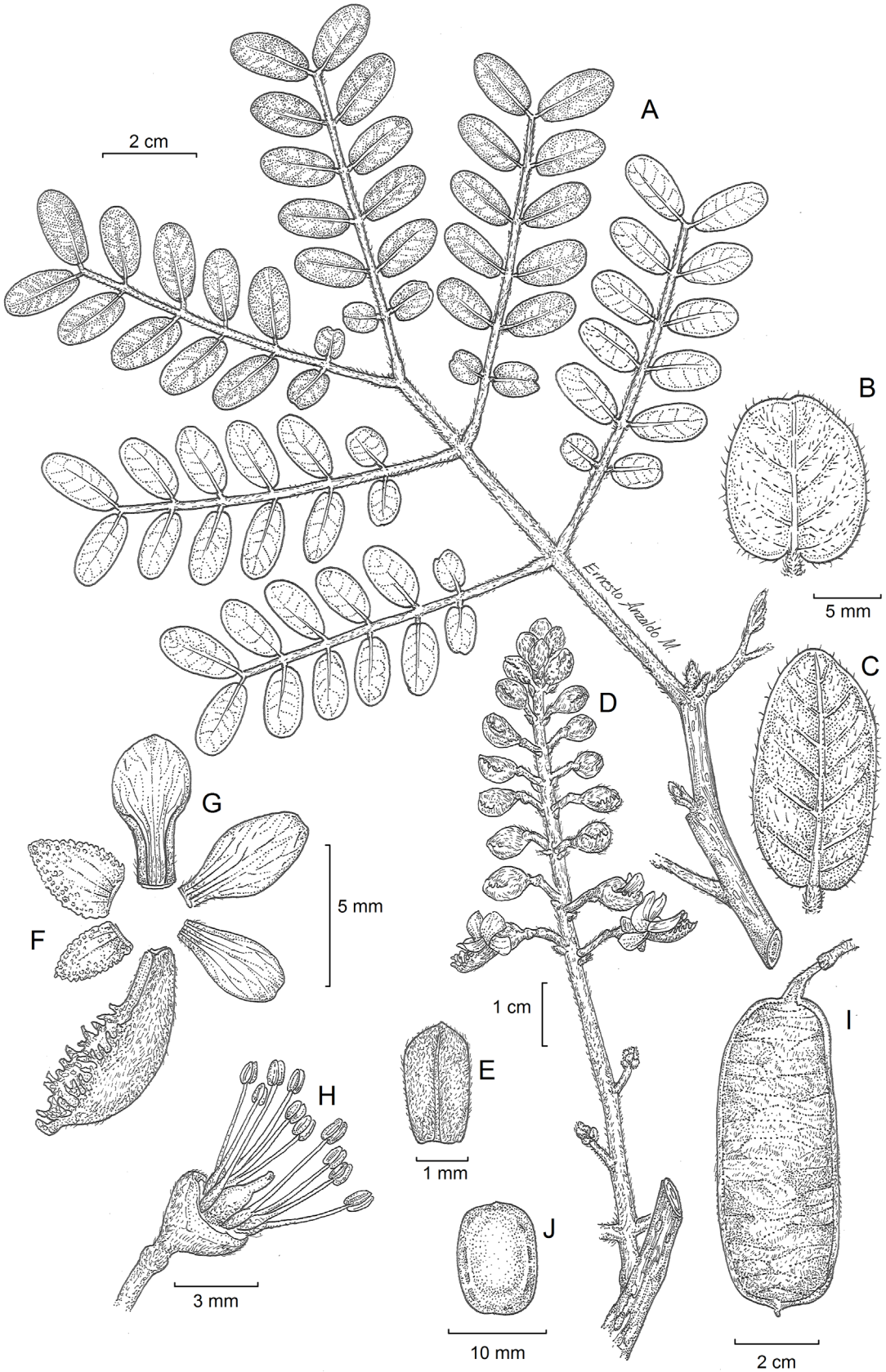

FIGURE 2. *Coulteria rosalindamedinae*. A. Branch; B. Basal leaflet; C. Terminal leaflet; D. Inflorescence; E. Bract; F. Sepals adaxial, lateral, and abaxial; G. Petals adaxial, lateral, and abaxial; H. Functionally male flower; I. Legume; J. Seed. (A-C, based on *R. Torres C. 12096 & P. Tenorio L.*, MEXU; D-H, based on *E. Ortíz-Bermúdez 309,* MEXU; I-J based on A. *Salinas T. 4292, G. Flores & E. Martínez*, MEXU. Illustration by Ernesto Anzaldo Medero).

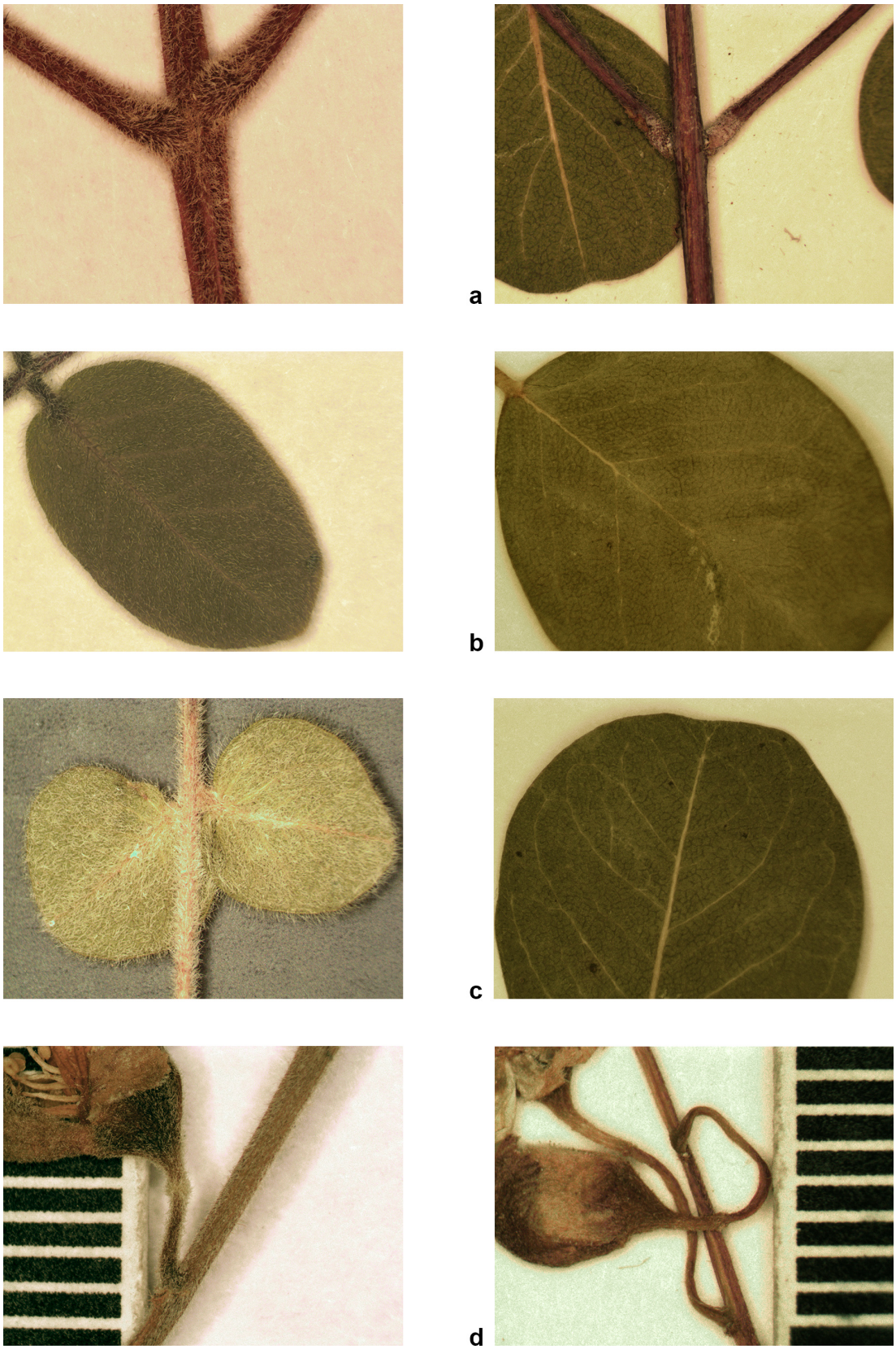

FIGURE 3. Morphological differences. *Coulteria rosalindamedinae*. A. Leaf rachis indumentum; B. Adaxial indumentum of leaflets; C. Abaxial indumentum of leaflets; D. Length (mm) and articulation level of pedicel. (A–C, based on *R. Torres* C. *12096 & P. Tenorio L.*, and D, based on *E. Ortíz 309*, MEXU). *Coulteria pumila*: a. Leaf rachis indumentum; b. Adaxial indumentum of leaflets; c. Abaxial indumentum of leaflets; d. Length (mm) and articulation level of pedicel. (a–c, based on *Nabhan 5192,* MEXU, and d, based on *Saucedo 357,* MEXU).

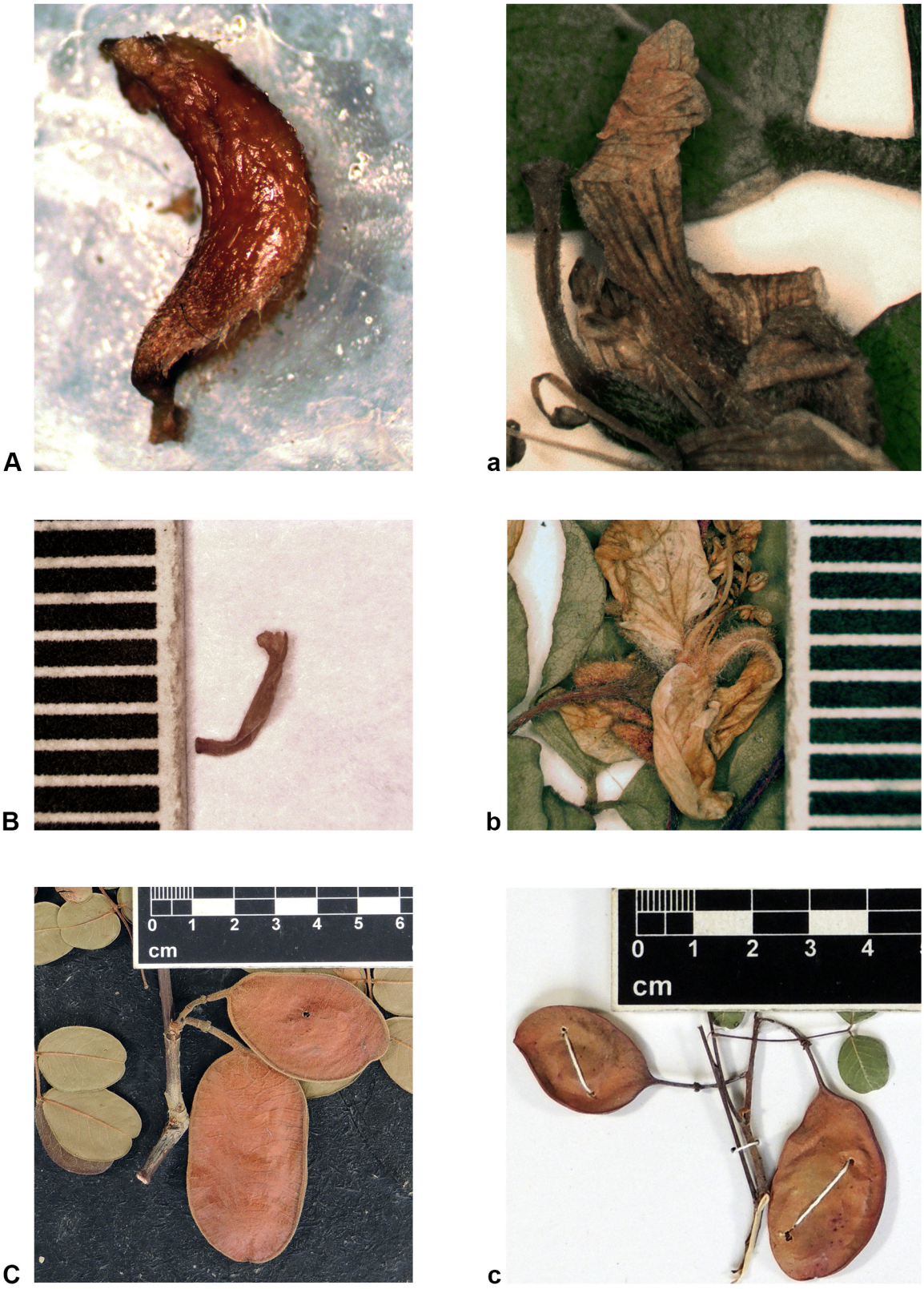

FIGURE 4. Morphological differences. *Coulteria rosalindamedinae*. A. Adaxial petal succulence; B. Length, width (mm) and indumentum of claw of the abaxial and lateral petals; C. Legume shape, length of stipe and legume peduncle. *Coulteria pumila*. a. Adaxial petal succulence; b. Length, width (mm) and indumentum of claw of the abaxial and lateral petals; c. legume shape and length. (A–B, based on R. Torres C. 12096 *& P. Tenorio L.*; C, based on *A. Salinas T. 4292*, MEXU, a, based on *González 13*; b, based on *Saucedo 357*; c, based on *Nabhan 5192* MEXU).

TABLE 1. Data comparing the new species, *Coulteria rosalindamedinae,* and *C. pumila*.

Characters	*Coulteria rosalindamedinae*	*Coulteria pumila*
Leaf rachis indumentum	Lanulose	Scarcely pubescent to glabrous
Indumentum of leaflets	Upper and lower tomentulose	Upper glabrous; lower glabrous to scarcely strigulose
Number flowers/inflorescence	5–26	5–8
Indumentum of inflorescence rachis	lanulose	Scarcely strigulose
Pedicel length (mm)	(1.2–) 2.0–3.5 (–4.5)	(3.6–) 12–15
Pedicel articulation level	Near the apex	Articulated to ¾ of its length
Pedicel indumentum	Lanulose whitish	Scarcely pubescent no whitish
Adaxial petal succulence	Slightly fleshy	Membranaceous
Length and width of abaxial and lateral petals lamina (mm)	2.3–4.0 × 1.7–2.8	4.5–7.0 × 2.4–6.5
Indumentum of abaxial and lateral petals lamina (mm)	Glabrous to scarcely pubescent	Pubescent
Length and width of claw of the abaxial and lateral petals (mm)	0.4–2.0 × 0.2–0.4	(1.0–) 2.0–4.3 × 1.0–1.5
Indumentum of the claw of the adaxial petal	Scarcely pubescent	Sericeous
Length and width of legume (cm)	3.7–7.2 × 1.9–3.2	2.6–3.9 × 1.6–2.2
Legume shape	Oblong-elliptic	Obovate
Legume stipe length (mm)	0.3–1.4	5.0–9.0
Legume peduncle length (mm)	5.0–6.0 (–10)	8–10

Distribution and habitat:—*Coulteria rosalindamedinae* is endemic in the states of Oaxaca and Puebla in the Tehuacan-Cuicatlan Valley. It occurs in vegetation of deciduous tropical forest, near at 1590 m elevation (Fig. 1).

Additional material examined:—MEXICO. Oaxaca: District Coixtlahuaca; Municipality Tepelmeme Villa de Morelos, Concepción Buenavista, base del Cerro Pluma, base del Cañón del Puente Santa Lucía, aproximadamente sobre el km 99-100, carretera Tehuacán-Oaxaca (cuota), 5 July 1994, *J. L. Panero 4037* & *I. Calzada* (MEXU). Ibid.; Ibid., subida del Cacalosuchil, Cerro Verde, 6 August 1984, *P. Tenorio L. 6929* & *C. Romero* (MEXU). Ibid.; Ibid., Agua El Tule, ladera E Cerro Verde, 29 May 1985, *P. Tenorio L. 8885, C. Romero* & *E. Martínez* (MEXU). Ibid.; Ibid., Loma de la Cueva, subida a Loma Sotol al NE de Nahuizapa, 18° 03’ N; 97° 17’ W, 6 December 2001, *P. Tenorio L. 21601*, *L. Alvarado* & *L. Kelly* (MEXU). Distr. Cuicatlán; Municipality San Juan Bautista Cuicatlán, 3.8 km al S de San José El Chilar, 17° 41’ 11’’ N; 96° 57’ 31’’ W, 30 Sepember 2002, *J. P. Abascal 188a* & *188b, J. Calónico, C. Cruz* & *E. San Pedro* (MEXU). Ibid.; Ibid., 16 km al SE de Dominguillo, por la carr. Tehuacán-Oaxaca, 29 agosto 1980, *F. Chiang F-1805 et al.* (MEXU). Ibid.; Ibid., 16 km al SE de Dominguillo, 11 km al NW de Tonaltepec, entre Cuicatlán y Telixtlahuaca, 5 May 1980, *F. G. Medrano F-1085 V. Jaramillo, J. L. Villaseñor, P. Ruiz* & *S. Singer* (MEXU). Ibid.; Ibid., 5 km al SE de Cuicatlán, por la desviación a San Pedro Ocotipac, 27 August 1980, *F. G. Medrano F-1569, F. Chiang, V. Jaramillo, J. L. Villaseñor, P. Ruiz* & *S. Singer* (MEXU). Ibid.; Ibid., “Cerro Virgen de Guadalupe”, 6 km al N de Cuicatlán, por la carretera 131, y 10 km al W, por la terracería que va a San Pedro Jocotipac, 17° 47’ N; 97° 02’ W, 19 August 1987, *A. Salinas T. 4292 G. Flores* & *E. Martínez* (MEXU). Ibid.; Ibid., 6 km al N de Cuicatlán, y 10 km al W, por la terracería que va a San Pedro Jocotipac, 17° 47’ N; 97° 02’ W, 7 May 1988, *A. Salinas T. 4708-a* & *E. Petterssen* (MEXU). Distr. Huajuapan; Municipality San Marcos Arteaga, 3 km al S de San Marcos Arteaga, 17° 44’ N; 97° 52’ W, 29 April 1993, *E. Ortíz-Bermúdez 309* (MEXU). Distr. Nochixtlán; Municipality Asunción Nochixtlán, 6 km al N de Tonaltepec, 6 August 1977, *M. Sousa S.* 7787, O. Téllez, *B. Ludlow* & *M. & R. Sousa* (MEXU). Distr. Teotitlán; Municipality San Antonio Nanahuatipa., Cerro La Mina, al SE de San Antonio Nanahuatipa, 18° 06’ N; 97° 09’ W, 5 September 2001, *P. Tenorio L. 20471, L. Alvarado* & *E. Martínez* (MEXU). Ibid.; Municipality Santa María Tecomavaca, brecha a San Pedro Ixcatán, SW de Tecomavaca, *I. Trejo s/n* (MEXU). Distr. Teposcolula. a 25 km al SW de Huajuapan de León, 15 April 1976, *M. Sousa 5457, O. Téllez* & *A. S. Magallanes* (MEXU). Puebla. Municipality Izúcar de Matamoros, 10 mi SE of Izúcar de Matamoros on Rte 190, 1 June 1986, *M. Luckow 3265b* & *M.* Lavin (MEXU, TEX). Ibid., 9 km al SE de Izúcar de Matamoros, 30 April 1976, *M. Sousa S. 5714, O. Téllez* & *A. S. Magallanes* (MEXU). Municipality San José Miahuatlán, Cerro Tepetroje, aprox. 6 km al S-SO de Axusco, 18° 12’ N; 97° 12’ W, 4 October 1986, *A. Salinas T. F-3584* & *P. Solís S.* (MEXU). Ibid., Cerro Tepetroje, aprox 6.5 km al S-SE de Axusco, 18° 12’ N; 97° 12’ W, 28 June 1987, *A. Salinas T. F-4064* (MEXU).

Phenology:—Collected in flower from April to May, and in fruit from April to December.

Etymology:—The name of this species is dedicated to Rosalinda Medina Lemos, Mexican botanist, she has done remarkable work as an editor and taxonomist of the Flora del Valle de Tehuacán-Cuicatlán, México.

Discussion:— In the phylogeny of the *Caesalpinia* group (Gagnon *et al*., 2016), the genus *Coulteria* is recognized by three main clades, one of them is represented by *Coulteria. pringlei* (Britton & Rose 1930: 322) Contreras, Sotuyo & Lewis. (2017: 39) *C. velutina*, and *C. pumila*.

Morphological similarities and differences of the latter with *C. rosalindamedinae*, were discussed in the diagnosis and the comparative table. *Coulteria pringlei* is different from *C. rosalindamedinae* because it has basal leaflets 1.6–3.0 (–4.4) × 1.0–2.3 (–3.3) cm, ovate to widely ovate, apex rounded to obcordate, terminal leaflets (2.5–) 3.1–4.5 (–7.6) × 1.3–3.0 (–4.1) cm, ovate to elliptic, pedicels 4.0–6.5 mm; legume 4.0–7.3 × 1.6–2.9 cm, oblong-obovate. *C. rosalindamedinae* has basal leaflets (0.7–) 0.9–1.2 × (0.7–) 0.9–1.2 cm, orbicular, apex obtuse to rounded, terminal leaflets 1.0–2.6 (–2.8) × (0.5–) 0.7–1.5 (–1.9) cm, elliptic, apex rounded, pedicels (1.2–) 2.0–3.5 (–4.5) mm long, legume 3.7–7.2 × 1.9–3.2 cm, oblong-elliptic, and *Coulteria velutina* is different from *C. rosalindamedinae* because it has basal leaflets 1.6–3.8 (–4.4) × 1.0–2.3 (–3.3) cm, ovate, to widely ovate, apex slightly obtuse to slightly acute, terminal leaflets (2.3–) 3.1–4.5 (–7.6) × 1.3–3.0 (–4.1) cm, elliptic, pedicels ca. 1.5 cm long; legume 9–11.5 × 2.0–3.0 cm, oblong to elliptic.

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