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Two new species of the genus *Indigofera* (Papilionoideae, Leguminosae) from central Mexico

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Abstract

Two new species of *Indigofera* from central Mexico are described and illustrated. *Indigofera sousae*, from northwestern Michoacán, is related to *I. constricta* known in the Mexican states of Sinaloa to Guerrero. *Indigofera uniseminalis*, from northeastern Guanajuato, is similar to *I. sphaerocarpa*, reported from southwestern United States and northwestern Mexico, and to *I. jaliscensis*, of the Sierra Madre Occidental and the Transmexican Volcanic Belt.

Resumen

Se describen e ilustran dos especies nuevas de *Indigofera* del centro de México, *Indigofera sousae* del noroeste de Michoacán e *Indigofera uniseminalis* del noreste del estado de Guanajuato. La primera se relaciona con *I. constricta*, conocida de los estados de Sinaloa a Guerrero y la segunda se asemeja a *I. sphaerocarpa*, registrada del suroeste de Estados Unidos y del noroeste de México, así como a *I. jaliscensis*, de la Sierra Madre Occidental y del Eje Volcánico Transversal.

Key words: *Indigofera*, central Mexico, sect. *Indigofera*, sect. *Tetragonocarpae*

Introduction

Indigofera L. (1753: 751) is one of the largest genera of the Papilionoideae and among those of easy recognition in spite of the absence of exclusive characters. It includes usually erect shrubs and herbs, most often covered with dolabriform (appressed and fixed at or near the middle) hairs; the leaves are almost always odd-pinnate with strigose leaflets at least beneath; the flowers are rather small and arranged in dense to moderately loose axillary spikes or racemes; the corollas are evidently papilionaceous, red, reddish or pink, with wide-clawed petals, both standard and keel being externally strigose; the anthers are mucronate to apiculate; the fruits are most often elongate, but sometimes almost globose, always with tannin-bearing endocarp. It comprises ca. 700 species, mainly native to Africa and Asia. In America, about 45 species are registered, most of them in North and Central America. The genus is mainly occurring in tropical deciduous forests, *Quercus* forests, xerophytic scrubs, and grasslands. Various species are used to produce dyes (indigo) and medicines, as forage, food, ornamentals, and for erosion control (Schrire 2005). About 31 species occur in Mexico (Cruz & Sousa 2017). In the area designated in the publications of Flora del Bajío y de Regiones Adyacentes (states of Guanajuato, Querétaro, and northern Michoacán) nine species of this genus have been found. Two of them are new to science and are described herein.

Material & Methods

The new species were identified as such during the examination of *Indigofera* collections from México, mainly from the states of Guanajuato, Querétaro and northern Michoacán, as part of the preparation of a treatment of the genus *Indigofera* (Papilionoideae, Leguminosae) for the Flora del Bajío y de Regiones Adyacentes. Specimens of the following Herbaria were examined: Herbario del Centro Regional del Bajío (IEB), Instituto de Ecología, A.C., Herbario Nacional de México (MEXU), Instituto de Biología, UNAM, Herbario de la Escuela Nacional de Ciencias Biológicas (ENCB), IPN. Type specimens of *Indigofera* spp. were examined in images from JSTOR Global Plants (2018).

Taxonomy

Indigofera sousae Rzed. & R. Grether, sp. nov. (Fig. 1)

Frutex ca. 1 m altus; folia 7–9 cm longa, stipulis 4–6.5 mm longis, foliolis (9–)11–13 ellipticis ad oblongis 11–22 mm longis, 4–8 mm latis, utrinque strigosis; racemi spiciformes densi ad 10 cm longi, pedicellis 1–1.5 mm longis, floribus ascendentibus; calyx 4–5 mm longus segmentis ad 2.5 mm longis valde inaequalibus; corolla brunneo-rubra 7–8 mm longa; fructus lineares ascendentes 2.5–4 cm longi, 3–4 mm lati, strigosi; semina 8–12 cubiformia 2–3 mm longa griseo-nigrescentia.

Type:—MÉXICO. Michoacán: municipio de Churintzio: Cerro Zináparo, 3.5 km al SE de Churintzio, 20°07'N, 102°02'W, selva baja caducifolia, 29 August 1992 (fl, fr), *I. Trejo 2543* (holotype MEXU).

Shrubs ca. 1 m high, densely branched; branches strigose with dolabriform trichomes, glabrescent, purplish-brown; leaves 7–9 cm long, stipules subulate, 4–6.5 mm long, persistent, petioles 1.2–1.5 cm long, leaflets (9–)11–13, elliptic to oblong, opposite, 11–20(–22) mm long, 4–8 mm wide, acute to rounded and mucronate at apex, cuneate at base, membranous, densely strigose, with dolabriform trichomes and glaucous on both surfaces, petiolules 1.5–2 mm long, stipels subulate to triangular, 0.4–1 mm long; inflorescences in spiciform racemes, dense with numerous flowers, axis strigose, up to 10 cm long in flower and 14 cm long in fruit, frequently longer than leaves, pedicels 1–1.5 mm long, flowers ascendent; calyx campanulate, 4–5 mm long, segments 1.5–2.5 mm long, narrowly triangular, of unequal length, strigose outside, persistent in fruit; corolla 7–8 mm long, reddish-brown when dry, standard 7–8 mm long, 4.5–5 mm wide, elliptic, sessile, base attenuate, strigose on abaxial surface, wings 5.5–6 mm long, ca. 1.5 mm wide, glabrous, keel almost as long as standard, sparsely strigose on abaxial surface, its petals 6–6.5 mm long, ca. 1.5 mm wide, fused in upper portion, with spur at midpoint ca. 1 mm long, and basal portion free, claw ca. 1 mm long; stamens 6–7 mm long, anthers basifixed, ca. 1 mm long, mucronate; ovary ca. 4 mm long, strigose, style curved, glabrous, stigma capitate; fruits maturing simultaneously with leaves, linear, biconvex, ascending, straight to slightly curved, 2.5–4 cm long, 3–4 mm wide, blunt but apiculate at apex, valves brown, with prominent venation, margins ochre when ripe, strigose with dolabriform trichomes, endocarp papery, mottled, forming false cross septa; seeds (6–)8–12, cuboid, 2–3 mm long, 1.5–2.2 mm wide, 1.5–2 mm thick, dark gray.

Discussion:—The new species resembles *I. constricta* Rydberg (1923: 145) in its flowers and ascending fruits, in the elliptic to oblong leaflets, strigose on both surfaces, and the strigose calyx, as well as in the habitat in tropical deciduous forest. However, *I. constricta* var. *constricta* extends to tropical subdeciduous forests at low altitudes, while *I. constricta* var. *deorum* McVaugh (1987: 540) occurs in cloud forests, at elevations of ca. 1000 m. Table 1 indicates the main differences between these two species. *Indigofera constricta* var. *deorum* needs further study to determine its status at the infraspecific or specific rank (McVaugh 1987, Lievens 1992).

On the basis of the many flowered racemes, the short pedicels, the long and narrowly triangular calyx segments, the linear, biconvex pods with (6–)8–12 seeds, this new species is assigned to sect. *Tetragonocarpae* Wight & Arn. (1834: 203), which has been recognised in the preliminary infrageneric treatment of *Indigofera* by Schrire (1995: 228); in that treatment, sect. *Mucronatae* Rydberg (1923: 138), including *I. constricta*, was placed in the synonymy of sect. *Tetragonocarpae*.

Habitat:—*Indigofera sousae* is known only from the type locality and seems to represent a narrow endemism in northwestern Michoacán. Concerning the elevation of the locality of *I. sousae*, it is important to mention that the label of the type specimen indicates 440 m. However, this should be considered a mistake, since the town of Churintzio is located at about 1800 m and the summit of Cerro Zináparo attains 2300 m.

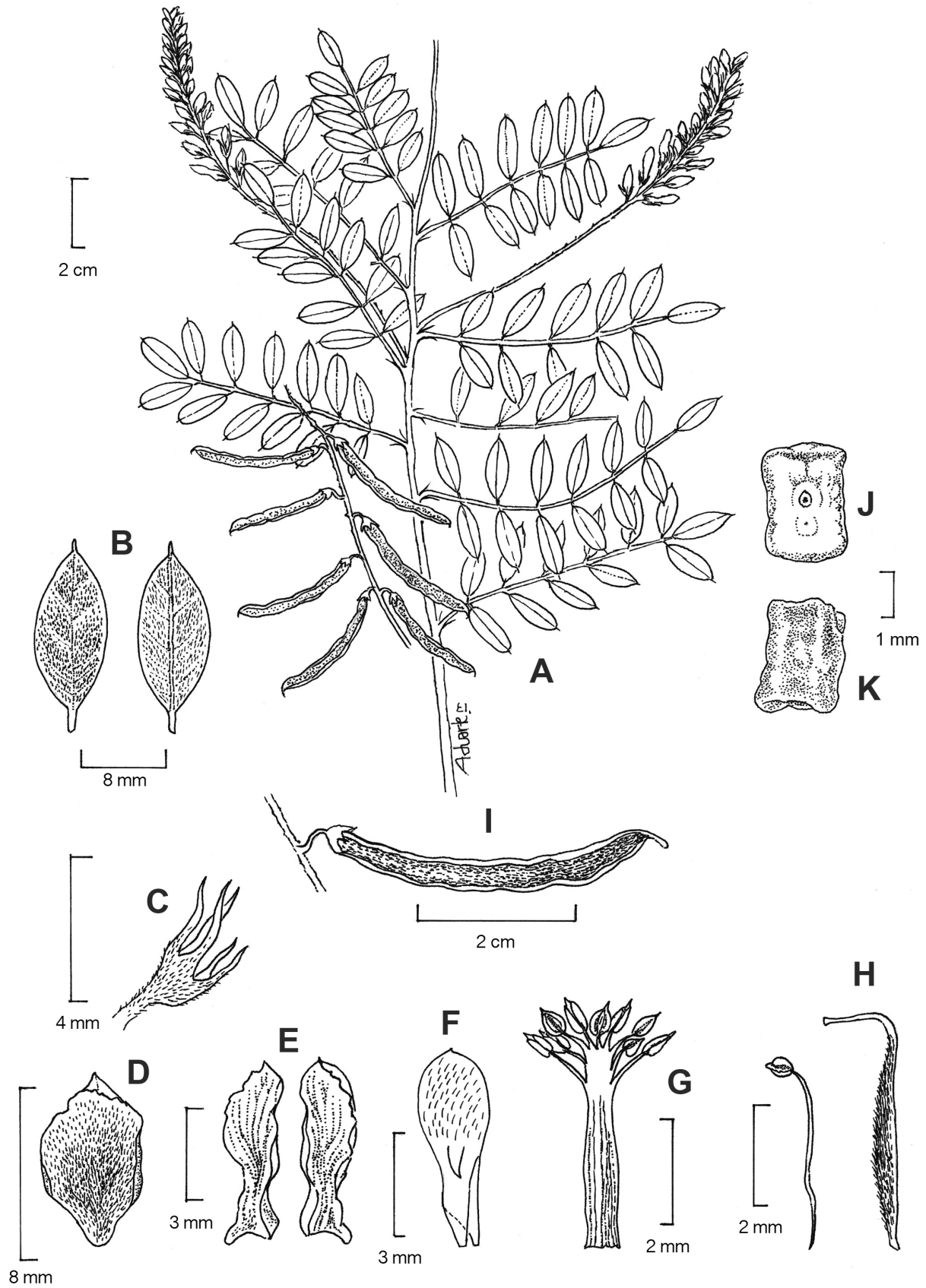


FIGURE 1. *Indigofera sousae*. A. Flowering branch and rachis with fruits. B. Leaflet, adaxial and abaxial views. C. Calyx. D. Standard, abaxial view. E. Wings. F. Keel, abaxial view. G. Androecium. H. Gynoecium and vexillary stamen. I. Legume with persistent calyx. J. Seed, ventral view. K. Seed, dorsal view. A–K drawn from *I. Trejo* 2543 (MEXU). Illustration by Anabel Duarte.

Phenology:—The plant has been collected with flowers and fruits in August.

Etymology:—The name of the species is dedicated, in sincere posthumous homage, to the extensive accomplishments of Dr. Mario Sousa Sánchez, an outstanding Mexican specialist in the study of the family Leguminosae. His work in this area of science transcends botanical knowledge of this country reaching global dimensions.

TABLE 1. Main differences between *I. sousae* and *I. constricta**.

Characters	<i>I. sousae</i>	<i>I. constricta</i> var. <i>constricta</i>	<i>I. constricta</i> var. <i>deorum</i>
Stipules			
length (mm)	4–6.5	1.5–2.5	1–1.5
Leaflets			
No.	(9–)11–13	7–9(–13)	13–15
length (cm)	1.1–2(–2.2)	2–5	0.8–1.5
width (mm)	4–8	(10–)15–25(–35)	2–4(–5)
Racemes	dense	lax	lax
Calyx segments			
length (mm)	1.5–2.5	0.4–0.5	0.3–0.5
Fruit			
width (mm)	3–4	2–2.4	1.5–2
apex	blunt	elongated in a beak	acute, with a beak
beak length (mm)		1–2	1–1.5
Known geographic distribution	NW Michoacán	Sinaloa to Oaxaca	Nayarit and Michoacán
Known elevation range (m)	ca. 2000	0–700	600–1000

*Examined specimens of *Indigofera constricta* var. *constricta* and *I. constricta* var. *deorum* are listed in Appendix 1.

Indigofera uniseminalis Rzed. & R. Grether, *sp. nov.* (Fig. 2)

Frutex vel herba perennis ad 1 m alta; caules plerumque non ramosi; folia numerosa dense instructa 5–9 cm longa, foliolis (19–)23–35 linearibus ad oblongis 7–13(–17) mm longis, 1.5–4(–4.5) mm latis, supra glabris, subtus strigosis; racemi spiciformes (5–)9–16 cm longi floribus numerosis deflexis; calyx campanulatus ca. 1.5 mm longus dense strigosus; corolla aurantiaca 6–6.5 mm longa, vexillo strigoso, carina ad apicem strigosa; fructus plerumque numerosi ovoidei, subsphaerici vel ellipsoidei, 3.5–5 mm longi, strigosi monospermi.

Type:—MÉXICO. Guanajuato: municipio de Victoria, Puerto de Trancas, 2000 m, matorral arbustivo, 14 August 1990 (fl, fr), *E. Ventura* & *E. López* 8538 (holotype IEB, isotype MEXU).

Shrub or herbaceous plant ligneous in the base, 0.8–1 m high; stems generally not ramified, angled, densely strigose with fine dolabriform trichomes less than 0.3 mm long, glabrescent; foliage dense and crowded; leaves commonly numerous, 5–9 cm long, stipules triangular, 1 mm long, persistent, petioles 1–1.5 cm long, leaflets (19–)23–35, linear to oblong, apical one frequently oblanceolate, opposite, 7–13(–17) mm long, 1.5–4(–4.5) mm wide, apex obtuse to truncate and mucronulate, base cuneate, membranous, glabrous on adaxial face, strigose with dolabriform trichomes on abaxial face, petiolules 0.8–1 mm long, stipels triangular, 0.3–0.4 mm long; inflorescences in axillary spiciform racemes (5–)9–16 cm long, frequently longer than leaves, moderately dense and with numerous flowers, axis strigose, bracts triangular-subulate, 0.5–1 mm long, strigose, early deciduous, pedicels 1–1.5 mm long, strigose; flowers deflexed in anthesis, calyx campanulate, ca. 1.5 mm long, densely strigose with dolabriform trichomes, teeth triangular, ca. 0.5 mm long, corolla orange, standard 6–6.5 mm long, 4–4.5 mm wide, obovate, sessile, base attenuate, densely strigose with dark brown dolabriform trichomes on abaxial face, folded, wings 3–5.5 mm long, 1–1.5 mm wide, glabrous, keel strigose on upper portion with white and brown dolabriform trichomes, as long as the standard, its petals ca. 6 mm long, ca. 2 mm wide, fused in upper portion, with spur at midpoint ca. 0.5 mm long, free at base, claw ca. 1 mm long; androecium 5.5–7 mm long, anthers basifixed, ca. 0.5 mm long, mucronulate; ovary strigose with 1 ovule, style curved, glabrous, stigma capitate; fruits commonly numerous, ovoid, subglobose or ellipsoid, reflexed, 3.5–5 mm long, apex apiculate, beak 1.5–2.5 mm long, pericarp hard and thick, green when fresh, brown when dried, strigose, but margins glabrous; seed 1, globose to reniform, 2.5–2.6 mm long, 2–2.3 mm wide, 1.5–1.6 mm thick, testa light brown.

Discussion:—On account of its ellipsoid to subglobose one-seeded fruits, this new species resembles *I. sphaerocarpa* A. Gray (1853: 37) and *I. jaliscensis* Rose (1905: 310). Main differences among the three species are indicated in Table 2.

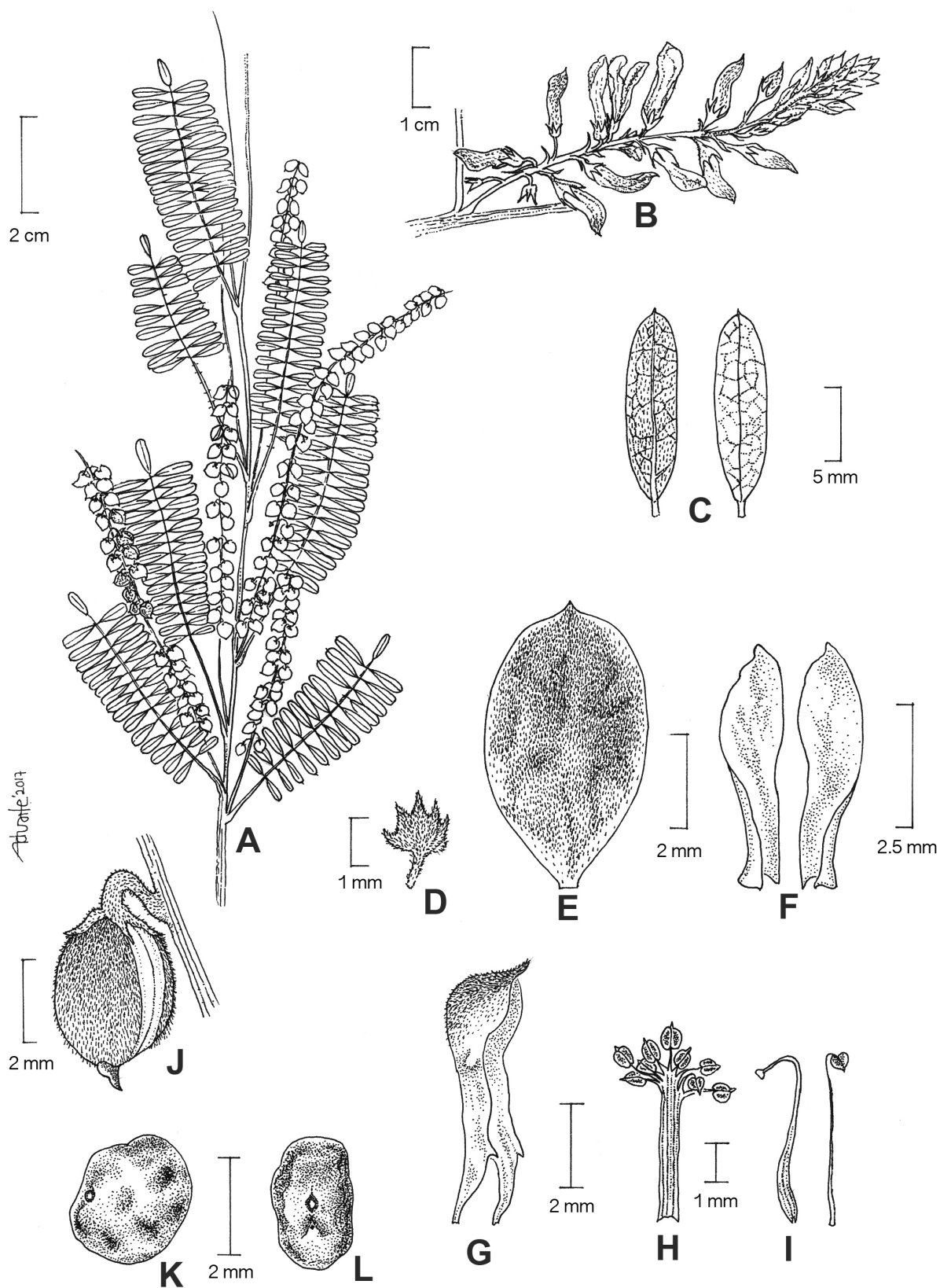


FIGURE 2. *Indigofera uniseminalis*. A. Fruiting branch. B. Inflorescence. C. Leaflet, abaxial and adaxial views. D. Open calyx. E. Standard, abaxial view. F. Wings. G. Keel. H. Androecium. I. Gynoecium and vexillary stamen. J. Legume with persistent calyx. K. Seed, lateral view. L. Seed, ventral view. A, J–L drawn from *J. Rzedowski 41553* (IEB); B–I drawn from *E. Ventura y E. López 8538* (IEB). Illustration by Anabel Duarte.

TABLE 2. Main differences among *I. uniseminalis*, *I. sphaerocarpa*, and *I. jaliscensis**

Characters	<i>I. uniseminalis</i>	<i>I. sphaerocarpa</i>	<i>I. jaliscensis</i>
Foliage density	very pronounced	moderate to pronounced	moderate
Leaflets			
No.	(19–)23–35	13–17(–23)	(11–)19–23(–31)
width (mm)	1.5–4(–4.5)	3–7	3–10
indumentum on the upper face	absent	absent	strigose
Flower			
length (mm)	6–6.5	6–7	3.5–4
colour	orange	salmon red	dark red
Known geographic distribution	NE Guanajuato	Arizona, New Mexico, Chihuahua, Sonora	Sinaloa to Guerrero

*Examined specimens of *Indigofera sphaerocarpa* and *I. jaliscensis* are listed in Appendix 2.

Indigofera uniseminalis is assigned to sect. *Indigofera*, according to the preliminary infrageneric treatment of the genus by Schrire (1995: 223), where he included sect. *Dispermae* Rydberg (1923: 138) as a synonym. This latter group comprised species with 1–3(–4) seeded pods.

Habitat:—*Indigofera uniseminalis* is an uncommon plant growing in oak forests, pine-oak forests, and in the secondary vegetation nearby. As far as we know, its geographic distribution is restricted to the Sierra Gorda of northeastern Guanajuato, where it occurs at elevations of 1800–2000 m.

Phenology:—The plant blooms in July and August and it has been collected with fruits in July and October.

Etymology:—The name of the species refers to the one-seeded fruits.

Additional specimens examined (paratypes):—MÉXICO. Guanajuato: municipio de Victoria, Mesas del Tigre, 1800 m, matorral arbustivo, 17 August 1990 (fl, fr), *E. Ventura & E. López 8594* (IEB); municipio de Victoria, 13 km al W de Xichú, sobre la carretera a San Luis de la Paz, 1800 m, cañada con vegetación de encinar, 30 October 1986 (fr), *J. Rzedowski 41553* (ENCB, IEB); municipio de Xichú, Agua Zarca del Pinal, 2000 m, bosque de encino-pino, 15 October 1987 (fr), *R. Santillán 482* (IEB, MEXU, UAMIZ).

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References

- Cruz Durán, R. & Sousa S., M. (2017) Cuatro especies nuevas de *Indigofera* (Leguminosae, Papilionoideae) para la Flora de México. *Brittonia* 69 (3): 347–358.
<https://doi.org/10.1007/s12228-017-9472-6>
- Gray, A. (1853) *Plantae Wrightianae Texano-Neo-Mexicanae* II. *Smithsonian Contributions to Knowledge* 5: 5–119.
- JSTOR Global Plants (2018) *JSTOR Global Plants Database*. Available from: <https://plants.jstor.org> (accessed July 2018)
- Lievens, A.W. (1992) *Taxonomic treatment of Indigofera L. (Fabaceae, Faboideae) in the New World*. Dissertation for Ph.D., Louisiana State University, Baton Rouge, USA, 376 pp.
- Linnaeus, C. (1753) *Species Plantarum* 2. Laurentii Salvii, Holmiae, pp. 561–1200.
- McVaugh, R. (1987) *Indigofera*. *Flora Novo-Galiciana* 5: 536–551.
- Rose, J.N. (1905) Studies of Mexican and Central American Plants 4. *Contributions from the United States National Herbarium* 8 (4): 281–339.
- Rydberg, P.A. (1923) Fabaceae, tribe 7. Indigofereae. *North American Flora* 24: 137–153.
- Schrire, B.D. (1995) Evolution of the tribe Indigofereae (Leguminosae-Papilionoideae). In: Crisp, M. & Doyle, J.J. (Eds.) *Advances in Legume Systematics 7: Phylogeny*. pp. 161–244.
- Schrire, B.D. (2005) Tribe Indigofereae. In: Lewis, G.P., Schrire, B., Mackinder, B. & Lock, M. (Eds.) *Legumes of the World*. The Royal Botanic Gardens, Kew, Richmond, pp. 361–365.
- Wight, R. & Arnott, G.A.W. (1834) *Prodromus florum Indiae orientalis*. Palbury, Allen & Co. London, pp. 198–205.

Appendix 1. Selected specimens of *Indigofera constricta* used for morphological comparison with *I. sousae*.

Indigofera constricta Rydberg var. *constricta*

MÉXICO. Sinaloa: municipio de Rosario, Cacalotán, El Icabal, 200 m, s.f., *J. González Ortega 1032* (MEXU). Nayarit: 1–1.5 mi above La Cucaracha, 12–13 mi S of Las Varas, 300–400 m, 20 September 1960, *R. McVaugh 19210* (MEXU); Bahía de Banderas, Cerro Calozo, 4 km del cruceo Higuera Blanca, carretera Cruz de Huanacastle-Punta Mita, 30 m, 20°45'47.9"N, 105°28'54.7"O, 26 November 1997, *R. Ramírez-Delgadillo et al. 4695* (MEXU); municipio del Nayar, 12 km al NW de Jesús María, camino a la Mesa del Nayar, cerca del puente, en cañada, 970 m, 22°10'N, 104°35'O, 28 September 1989, *G. Flores & P. Tenorio 1515* (ENCB). Jalisco: municipio La Huerta, camino a la Estación de Biología, UNAM, Chamela, 1 December 1976, *J.A.S. Magallanes 272* (MEXU). Guerrero: Acuitlapan, 21 August 1943, *R.T. Clausen & G. Aguirre 6040* (MEXU). Morelos: municipio Tlaquiltenango, 2 km al NW de Quilamula, camino a Valle de Vázquez-Quilamula, 1070 m, 18°30'05"N, 99°01'01"W, 5 July 1986, *G. Flores et al. 35* (MEXU). Oaxaca: 37 km al NE de Huajuapán de León, 4 November 1980, *O. Téllez & J. Simmons 4031* (ENCB).

Indigofera constricta Rydberg var. *deorum* McVaugh

MÉXICO. Nayarit: municipio de Tepic, 3 km de la carretera El Izote-V. Carranza, camino a Cuarenteño, 1058 m, 21°30'10"N, 104°58'30"O, 19 October 1994, *G. Flores-Franco et al. 4326* (MEXU). Michoacán: municipio de Aquila, 3 km al E de Maroata camino a Pómaro, 21 October 1985, *J.C. Soto et al. 11226* (MEXU).

Appendix 2. Selected specimens of *Indigofera sphaerocarpa* and *I. jaliscensis* used for morphological comparison with *I. uniseminalis*.

Indigofera sphaerocarpa A. Gray

MÉXICO. Sonora: Arroyo Hondo, 11.5 km E of El Kipor, 4 km W of Chihuahua border on Mex. 16, 1460 m., 25 September 1997, *A.L. Reyna & T.R. Van Devender 97-1397* (MEXU). Chihuahua: municipio Guachochi, Humirá, 58 km brecha Creel-Guachochi, 1750 m, 9 October 1982, *P. Tenorio & C. Romero de T. 1996* (MEXU); municipio Guachochi, north side of bridge over Río Urique, south of Humirá in lower pine-oak forest zone, ca.1650 m, 10 October 1973, *R.A. Bye Jr. 5417* (MEXU); base de la Sierra de la Campana, 80 km al N de Chihuahua, 19 October, 1974, *J. Rzedowski 32298* (ENCB).

Indigofera jaliscensis Rose

MÉXICO. Jalisco: hillsides near Guadalajara, 26 September 1908, *C.G. Pringle 10820* (ENCB). Michoacán: municipio de Santa Clara del Cobre, Agua Verde, a 3 km de Copándaro, en el Lago Zirahuén, 2100 m, 4 October 1980, *M. González 598* (MEXU); municipio de Santa Clara del Cobre, 1 km al S de Copándaro, 2 March, 1986, *J. Rzedowski 39532* (ENCB, IEB); municipio de Morelia, vertiente norte del Pico Azul, cerca de San José de las Torres, 26 January 1997, *J. Rzedowski 53335* (IEB).