

**TRIFOLIUM HICKEYI (FABACEAE), A NEW SPECIES  
IN THE *T. AMABILE* COMPLEX  
FROM MEXICO AND GUATEMALA**

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**ABSTRACT**

**Trifolium hickeyi** Ahlquist & Vincent, **sp. nov.**, is described from central and southern Mexico, from the states of Chiapas, Jalisco, México, Michoacán, Oaxaca, Puebla, and Veracruz, and from Guatemala. It can be distinguished from other members of the *Trifolium amabile* complex by a number of vegetative and reproductive characters much larger in size than those observed in other species. The most notable are the very long peduncles, over 8 cm long, and the glabrous ovaries.

Within *Trifolium amabile* Kunth, Zohary and Heller (1984) recognized five varieties in their monograph of the genus (var. *amabile*, var. *hemsleyi* (Lojac.) Heller & Zohary, var. *longifolium* Hemsl., var. *mexicanum* (Hemsl.) Heller & Zohary, and var. *pentlandii* Ball). Research by Ahlquist (2012) did not support recognition of these varieties, which had also been questioned by Zohary and Heller as well as McVaugh (1987), who questioned the circumscriptions of the Mexican taxa. Analyses of the *T. amabile* complex have revealed a new species, *T. hickeyi* (Fig. 1), which is similar to *T. rhombeum* S. Schauer (*T. amabile* var. *mexicanum* of Zohary & Heller). It is an exceptional species, growing to a height of 8 dm or more, with large leaflets between 1.4 cm and 4.6 cm long, stipules ranging from 2 cm and 4 cm long, peduncles measuring over 8 cm long, and glabrous ovaries. The new species is described and illustrated below.

**TRIFOLIUM HICKEYI** Ahlquist & Vincent **sp. nov.** **TYPE: MEXICO. Michoacán.** Morelia, Rincón prise d'eau, 16.698°, -101.187°, 1950 m, 14 Apr 1910, *G. Arsène 5483* (holotype: ILL!; isotypes: BM!, GH!, NY!). Figure 1.

**Plants** perennial. **Roots** large, woody, 3.3–11.8 mm in diameter. **Stems** prostrate to decumbent or ascending, 1.2–7.8+ dm long, 1–4.5 mm in diameter, internodes and nodes glabrous to moderately pubescent. **Leaves** trifoliate, ± uniform in size throughout. **Stipules** narrowly triangular to triangular, 1.95–3.75 × 0.2–0.85 cm, glabrous adaxially and abaxially, margins entire to weakly serrate, glabrous–sparsely pubescent, apices acute. **Petioles** 0.55–10.7 cm long, glabrous to sparsely pubescent. **Petiolules** 0.5–4 mm long, glabrous to moderately pubescent. **Leaflets** lanceolate-elliptic, occasionally rhombic, glabrous adaxially, glabrous to moderately pubescent along midribs abaxially, glabrous to sparsely pubescent abaxially on outer halves of lateral leaflets, bases acute, margins variably serrate, often with short, straight teeth alternating with larger, curved teeth, glabrous to sparsely pubescent, apices rounded to acute, weakly mucronulate, terminal leaflets 1.35–4.6 × 0.55–1.85 cm. **Peduncles** 7.6–21.1 cm × ≤2 mm, glabrous to moderately pubescent. **Inflorescences** axillary, racemose to umbellate, 0.95–2.6 × 1.6–2.6 cm. **Flowers** 17–50, each subtended by a linear triangular

bract, in 2–5 whorls. **Pedicels** 0.7–3.6 mm long, glabrous to sparsely pubescent. **Calyx** 3.9–7.4 mm long, tubes 2.6–4.1 mm in circumference, glabrous to sparsely pubescent, lobes narrowly triangular, 3–6 × <1 mm, glabrous to sparsely pubescent abaxially, margins entire, sparsely to moderately pubescent, apices acuminate. **Petals** white to yellowish white. **Banner petals** obovate, 6–9.6 × 3.8–6.3 mm. **Wing petals** 5.5–8.2 mm long, asymmetrically clawed, claws 1.1–2.1 × ≤0.5 mm, laminae spatulate, 4.2–6.2 mm long, 1.7–2.9 mm wide at widest point, 0.9–1.4 mm wide at narrowest point, bases shortly auriculate to truncate, auricles acute, margins entire, apices rounded. **Keel petals** 4.5–6.6 mm long, asymmetrically clawed, claws 1.4–2.4 × ≤0.6 mm, laminae spatulate, 3–4.2 mm long, 1.5–2 mm wide at widest point, 0.9–1.5 mm wide at narrowest point, bases truncate, margins entire, apices rounded. **Stamens** diadelphous, connate filaments 3.7–5.6 × 1.1–1.6 mm, fused for 50–70% of their length, free filaments 2.1–4.4 × ≤0.2 mm. **Pistils** sessile, ovaries 1.3–3.5 × 0.4–1.6 mm, glabrous, styles 1.7–2.9 × ≤0.3 mm, glabrous, ovules 2. **Legumes** laterally compressed, 3.3–5.2 × 1.9–2.7 mm. **Seeds** 2, mitten-shaped, light brown to dark brown, occasionally dark-speckled, 1.7–2.2 × 1.2–1.6 mm.

**Additional collections examined. Guatemala. Chimaltenango.** Chichavac, 14.8°, -90.98°, 2550 m, flowers greenish white, Nov 1930, *Skutch* 88 (MICH, US). **Huehuetenango.** Vicinity of San Mateo Ixtatán, Sierra de los Cuchumatanes, 15.8°, -91.4°, 3100 m, flowers dull whitish, 31 Jul 1942, *Steyermark* 49895 (F, NY, US). **San Marcos.** San Pedro Sacatepéquez, Aldea Chamác, 14.969°, -91.756°, 2200 m, hierba prostrada, muy abundante, 26 Aug 1992, *Véliz* 92.2418 (MO). **Mexico. Chiapas.** Laguna Jusnajav, 16 km NE of Comitán, 16.380°, -92.038°, 1758 m, 29 Aug 1945, *Alexander* 1265 (MICH, NY). **Guanajuato.** Mpio. Acámbaro, La Cieneguilla, zona de cultivo, terreno plano, 21.075°, -100.175°, 1775 m, hierba abundante, 18 Aug 1985, *Rubio* 69 (XAL). **Jalisco.** Sierra del Tigre, 2 mi NE of Mazamitla, gently sloping wet meadow-like areas in pine forest zone, 19.883°, -102.983°, 2100 m, abundant, mostly past flower, flowers cream color, 23 Sep 1952, *McVaugh* 13186 (MICH). **México.** Mpio. Tepotzoltan, cerca de la Presa de Concepción, orilla de arroyo, 19.717°, -99.223°, 2400 m, flor blanquecina, 7 Aug 1966, *Rzedowski* 22885 (ASU, MICH). **Michoacán.** Morelia, 19.7°, -101.2°, 1950 m, 1 Aug 1912, *Arsène* 8323 (B, NY, P); Mpio. Villa Morelos, alrededores de El Fresno, orilla de una acequia, 20.026°, -102.882°, 2250 m, planta herbácea perenne, flores de color crema, 30 Aug 1987, *Rzedowski* 44278 (MICH). **Oaxaca.** Ixlán de Juárez, E-facing slopes, mountains along Route 175, 12 km N of Ixlán de Juárez on road to Valle Nacional, in forest of pine and deciduous trees, open sun, gravelly soil, 17.439°, -96.474°, 2500 m, abundant, flowers white, 26 Jul 1956, *King* 2043 (MICH); Mpio. Santiago Juxtlahuaca, senda hacia la torre de microondas de El Manzanal, entrada por Santa Rosa-San Miguel Cuevas, bosque de *Pinus-Quercus*, suelo café rocoso, 17.225333°, -98.054611°, 2225 m, hierba de 60 a 70 cm de alto, flor blanca, planta de regular abundancia, 12 Sep 1996, *Calzada* 21326 (MO); Tlacolula, a 16 km al NNE de Díaz Ordaz, o sea a 6 km al S de Cuajimaloya, Distr. Tlacolula, veg. alterada de encinar, 17.070°, -96.4°, 2670 m, herbacea perenne, arrocetada, flores blancas con rosa, 7 Aug 1977, *Sousa* 7822 *et al.* (MICH, NY); 110 km by road S of Teotitlán on road to Oaxaca, oak forest, 16.2°, -96.6°, 2180 m, decumbent from taproot, flowers yellowish green, 11 Oct 1983, *Anderson* 13019 (MICH); Cumbre de Ixtepec, 16.57°, -95.1°, 60 m, Sep 1942, *Liebmann* 4928 (C, US). **Puebla-Oaxaca.** San Luis Tultitanapa, Cerro Verde, near Oaxaca, 18.1°, -97.3°, 1400 m, Jul 1908, *Purpus* 3228 (GH, NY, US). **Puebla-Veracruz.** Orizaba, 19°, -97.2°, 4500 m, 1856, *Botteri* 704 (NY, P).

*Trifolium hickeyi* is named in honor of mentor and colleague R. James Hickey, professor emeritus and former chair of the Department of Botany at Miami University.

*Trifolium hickeyi* is found primarily in central and southern Mexico in the states of Chiapas, Jalisco, México, Michoacán, Oaxaca, Puebla, and Veracruz, and in Guatemala (Fig. 2). It has been collected in oak-pine forests and on grassy slopes, wet meadows, ditches, and roadsides with gravelly to rocky soil; 1400–4500 meters in elevation.

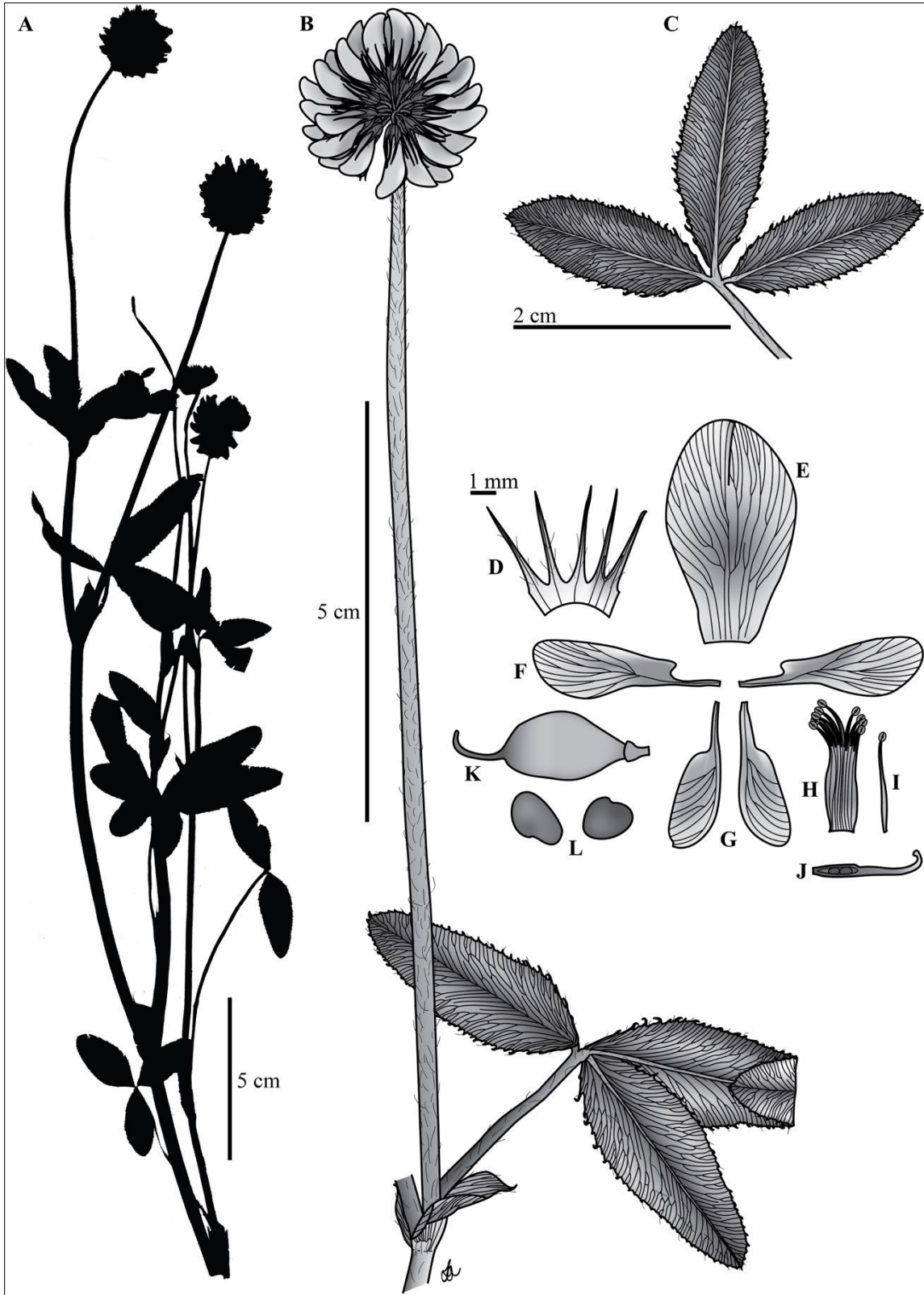


Figure 1. *Trifolium hickeyi* (from the holotype). A. Habit silhouette. B. Fertile branch. C. Abaxial leaf surface. D. Sepals. E. Banner petal. F. Wing petals. G. Keel petals. H. Connate stamens. I. Free stamen. J. Ovary. K. Legume. L. Seeds.



Figure 2. Distribution of *Trifolium hickeyi* in Mexico and Guatemala.

*Trifolium hickeyi* exhibits many characters observed in the *T. amabile* species complex, including a perennial life cycle, woody roots, and habit and pubescence characters. The new species differs from *T. rhombeum* as in the couplet below.

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|--|---------------------------|
| 1. Stipules 8–17 mm long; peduncles 3–8 cm long; ovaries sparsely to densely pubescent | <b>Trifolium rhombeum</b> |
| 1. Stipules 19–38 mm long; peduncles 7–21 cm long; ovaries glabrous                    | <b>Trifolium hickeyi</b>  |

Overall, *T. rhombeum* is rather pubescent — the ovaries are sparsely to densely pubescent distally and occasionally along the suture. The glabrous ovaries of *T. hickeyi* distinguish it from all other members in the *T. amabile* complex.

*Trifolium hickeyi* is identified by a number of vegetative and reproductive characters well outside of the size range of the other members of the species complex. Over 87% of the characters examined in this study in a student's t-test were significantly different at  $\alpha=0.05$  when compared with *T. amabile* var. *amabile* (Ahlquist 2012). When compared with *T. rhombeum*, over 57% of characters were statistically significant at  $\alpha=0.05$  (Ahlquist 2012).

Within *Trifolium hickeyi* there is a clinal grade from north to south in leaflet morphology. The specimens at the northern end of the range have rhombic leaflets similar to those of *T. rhombeum*; all other characters are consistent with the southern specimens of *T. hickeyi*.

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