

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

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ABSTRACT

Trifolium sonorensis T.K. Ahlquist & Vincent, **sp. nov.**, is described from southern Arizona in the USA and the states of Chihuahua, Jalisco, Sinaloa, and Sonora in Mexico. It is distinguished from other members of the *Trifolium amabile* species complex by a suite of characters, primarily in the flowers.

In their monograph of the genus *Trifolium*, Zohary and Heller (1984) recognized five varieties within their circumscription of *Trifolium amabile* Kunth. A reexamination of the *T. amabile* species complex (Ahlquist 2012) has not supported the five varieties described by Zohary and Heller (1984). This has long been suspected, as noted by the monographers themselves as well as by McVaugh (1987), who called for a revision of the Mexican species. A closer analysis of *T. amabile* var. *amabile* sensu Zohary & Heller has revealed a new species, *T. sonorensis* (Fig. 1), which occurs in southern Arizona and in the Mexican states of Chihuahua, Sonora, Sinaloa, and Jalisco. Distinctions involve the lengths of sepal lobes, keel petal claw, and filament tube. The new species is described and illustrated below.

TRIFOLIUM SONORENSE T.K. Ahlquist & Vincent **sp. nov.** **TYPE: UNITED STATES. Arizona.** Cochise Co.: Huachuca Mountains, Garden Canyon. 31.49°, -110.32°, 1500m, 3 Sep 1928, G.J. Harrison 5768 with T.H. Kearney (holotype: ARIZ 92895!; isotypes: US 1435169!, US 1435168!). Figure 1.

Trifolium sonoranense shares many characters characteristic of the *T. amabile* species complex, including a perennial life cycle, its woody roots, its habit, and its pubescence characters. The new species differs from *T. amabile* in the following ways: in *T. amabile*, the keel petal claw length is 0.9–1.6 mm, the sepal lobe length is <3 mm, the connate filaments length is <3.6 mm; and the wing petal claw length is <1.5 mm, whereas in *T. sonorensis*, the keel petal claw length is 1.7–2 mm, the sepal lobe length is ≥3 mm, the connate filament length is >3.6 mm, and the wing petal claw length is >1.5 mm.

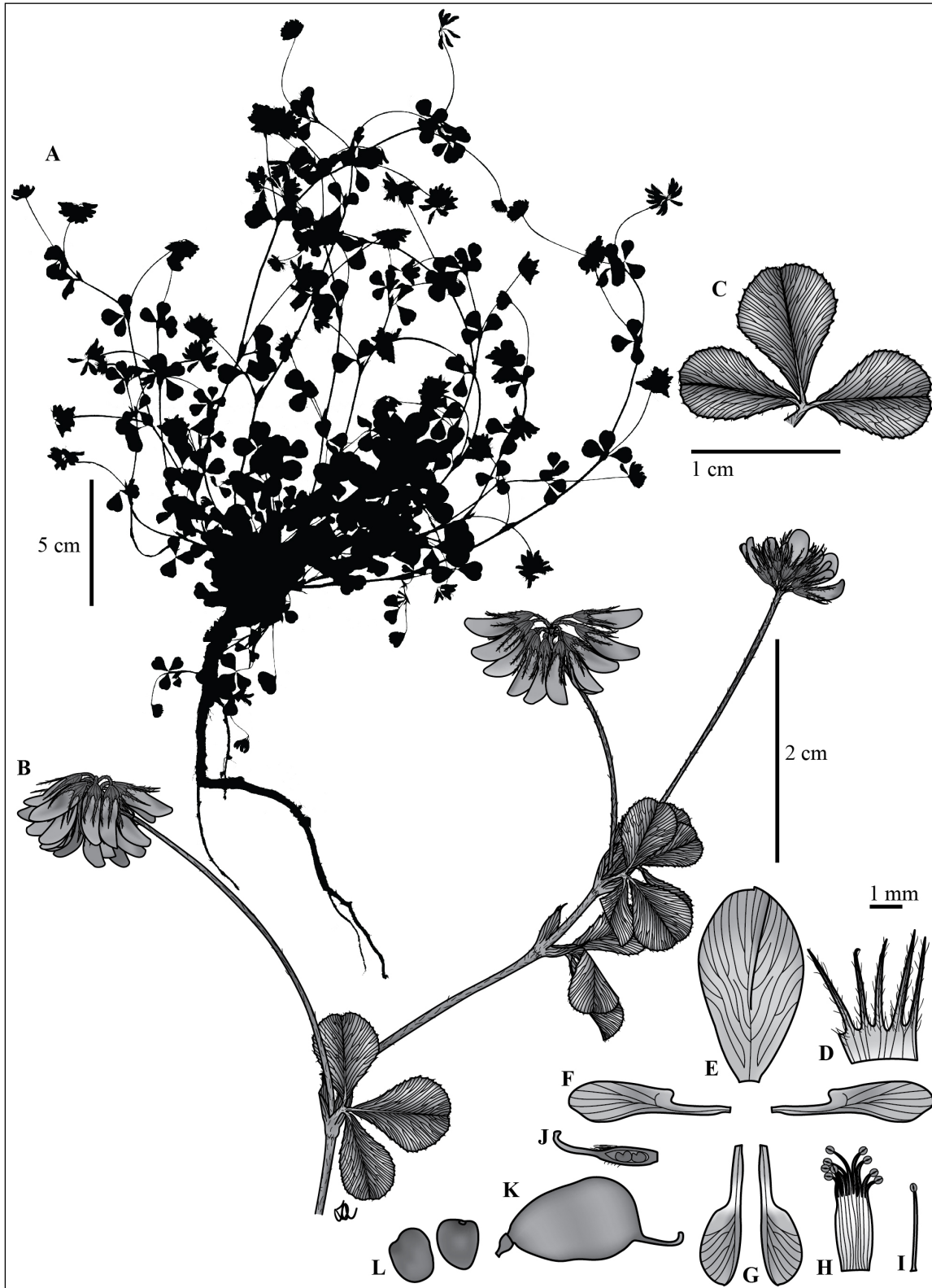


Figure 1. *Trifolium sonoreense* (from the holotype). A. Habit silhouette. B. Fertile branch. C. Abaxial leaf surface. D. Sepals. E. Banner petal. F. Wing petals. G. Keel petals. H. Connate stamens. I. Free stamen. J. Ovary. K. Legume. L. Seeds.

Plants perennial. **Roots** woody, 3.5–8 mm in diameter. **Stems** prostrate, 25–38+ cm in length, 0.8–1.5 mm in diameter, internodes sparsely–moderately pubescent, nodes moderately–densely pubescent. **Leaves** trifoliate, \pm uniform in size throughout. **Stipules** narrowly triangular, 6.7–16.5 mm \times 1.8–3.1 mm, glabrous adaxially, glabrous–sparsely pubescent abaxially, margins entire–weakly serrate, sparsely pubescent, apices acute. **Petioles** 2.5–50.5 mm \times <1 mm, moderately–densely pubescent. **Petiolules** 0.6–1.6 mm \times \leq 0.5 mm, sparsely–densely pubescent. **Leaflets** obovate–obcordate, glabrous adaxially, sparsely–moderately pubescent along midribs abaxially, glabrous–sparsely pubescent abaxially on outer halves of lateral leaflets, bases acute, margins weakly serrate–serrate, often with short, straight teeth alternating with larger, antrorsely curved teeth, sparsely pubescent, apices rounded–emarginate, weakly mucronulate, terminal leaflets 9.5–16.5 mm \times 6.8–11.5 mm. **Peduncles** 28–50 mm \times <1 mm, moderately–densely pubescent. **Inflorescences** axillary, racemose–umbellate, 8.5–15.5 mm \times 9–15.5 mm. **Flowers** 10–20, each subtended by a linear triangular bract, in 1–2 whorls. **Pedicels** 1.2–2.7 mm \times <0.5 mm, sparsely–densely pubescent. **Calyx** 3.3–5 mm long, tubes 2–3 mm in circumference, sparsely–densely pubescent, lobes narrowly triangular, 2.5–4 mm \times \leq 0.5 mm, sparsely–densely pubescent abaxially, margins entire, sparsely–densely pubescent, apices acuminate. **Petals** white–pink. **Banner petals** obovate, 5.3–6.5 mm \times 2.8–3.8 mm. **Wing petals** 4.5–5.3 mm long, asymmetrically clawed, claws 1.5–1.9 mm \times \leq 0.3 mm, laminae spatulate, 2.8–3.5 mm long, 1–1.5 mm wide at widest point, <1 mm wide at narrowest point, bases auriculate, auricles acute, margins entire, apices rounded. **Keel petals** 3.7–4.8 mm long, asymmetrically clawed, claws 1.7–2 mm \times <0.5 mm, laminae spatulate, 1–1.3 mm long, 0.8–1.3 mm wide at widest point, 0.9–1.3 mm wide at narrowest point, bases truncate, margins entire, apices rounded. **Stamens** diadelphous, connate filaments 3.1–4 mm \times 1.1–1.5 mm, fused for 50–56% of their length, free filaments 1.9–2.5 mm \times \leq 0.1 mm. **Pistils** sessile, ovaries 1.3–3.1 mm \times 0.4–1.4 mm, moderately–densely pubescent distally and occasionally along suture, styles 1.3–2 mm \times \leq 0.2 mm, glabrous, ovules 2. **Legumes** laterally compressed, 4.3–4.4 mm \times 2–2.7 mm. **Seeds** 2, globular–mitten-shaped, brownish orange–olive brown, occasionally dark-speckled, 1.2–1.7 mm \times 1.2–1.5 mm.

Additional collections examined. **Mexico. Chihuahua.** Mpio. de Temoschi, Nabogame, pine/oak/cypress forest, trailing, flowers pink, 28.5°, -108.5°, 1800m, 24 Aug 1988, *Laferrière 1771* (ARIZ). **Jalisco.** Forest of *Quercus* scattered with *Arbutus*, 14–18 km SW of Tequila on Volcán de Tequila, flowers pink, 20.788°, -103.847°, 2600m, 7 Nov 1974, *Breedlove 39248* (MICH). **Sinaloa.** Mpio. de Concordia, 1–2 km N of the Mazatlan to Durango road at Loberas, pine-oak forest, perennial, flowers white, 23.47°, -105.85°, 1850m, 2 Oct 1985, *Bartholomew 2551 et al.* (GH, NY). **Sonora.** El Llano on Mesa del Campanero (W of Yécora), uncommon herb, flowers white, 28.341667°, -109.031944°, 2100m, 16 Aug 1998, *Reina G. 98-958 et al.* (NY); Yecora, 9.5 km W of Maycoba on Mex. 16, oak woodland, uncommon herbaceous perennial on moist roadside, flowers pink, 28.408889°, -108.725°, 1495m, 7 Aug 2000, *Van Devender 2000-406 et al.* (ASU, MO, RSA). **United States. Arizona.** Cochise Co.: wet soil at streamside in woodland with *Juniperus deppeana*, *Pinus leiophylla*, NW 1/4, Sec. 15, T23S R19E, 31.4314°, -110.4007°, 1783m, 11 Aug 1990, *Bowers 3242 & McLaughlin* (ARIZ); Huachuca Mountains, Tanner Canyon, wet places near springs, 31.49°, -110.32°, 1500m, 24 Aug 1910, *Goodding 794* (ARIZ, NY, US); Bear Canyon, at junction of jeep trail with canyon bottom, about 2 km NE of canyon crossing with road from Parker Canyon Lake to Montezuma Pass, common in patches in moist soil, with grasses, on stream bank under *Platanus wrightii*, 31.3914°, -110.347°, 1770m, 26 Sep 1980, *Yatskievych 80-719* (ARIZ).

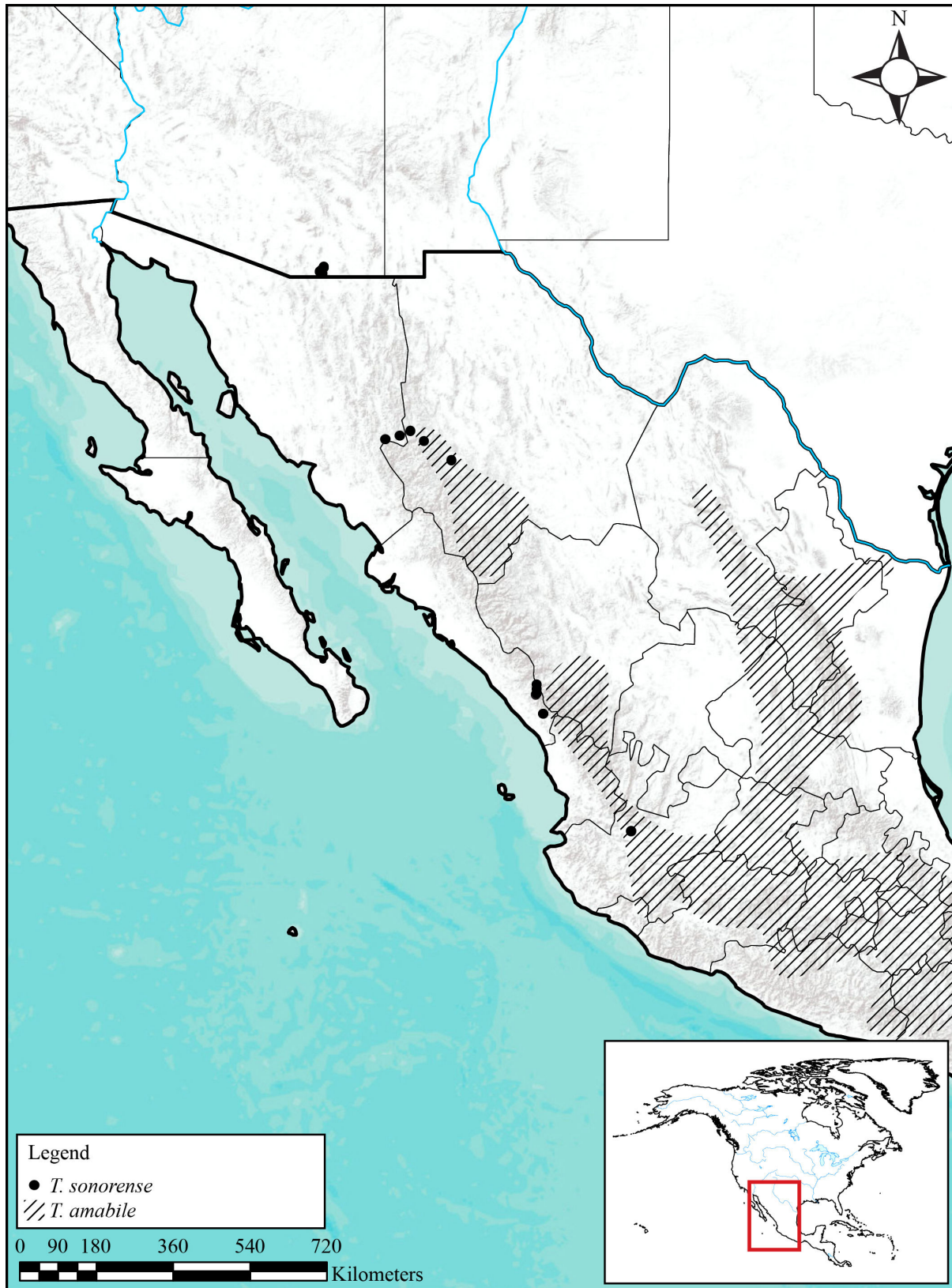


Figure 2. Distribution of *Trifolium sonoreense* compared with the general range of *T. amabile*.

Trifolium sonorensis is found largely in the Sonoran Desert of North America, but its range continues on eastward and southward. It has been collected in the state of Arizona in the USA and the states of Chihuahua, Jalisco, Sinaloa, and Sonora in Mexico (Fig. 2). Its habitat consists of open pine forests in canyons by stream banks or in moist soil from 1495 m to 2600 m in elevation.

Of the 50 characters observed in this study, over 42% of them were significantly different between *Trifolium amabile* and *T. sonorensis* shown by T-tests ($\alpha=.05$) run for each character (Ahlquist 2012). These include vegetative characters such as terminal leaflet size and petiole size, as well as floral characters. Among the most strikingly different are keel and wing petals, stamen, and sepals. The following key contrasts the distinguishing characteristics.

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|---|-----------------------------|
| 1. Keel petal claw length 0.9–1.6 mm; sepal lobe length <3 mm; connate filaments length <3.6 mm;
wing petal claw length <1.5 mm | Trifolium amabile |
| 1. Keel petal claw length 1.7–2 mm; sepal lobe length \geq 3 mm; connate filament length >3.6 mm;
wing petal claw length >1.5 mm | Trifolium sonorensis |

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