Phytotaxa 737 (2): 063–067
https://www.mapress.com/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.737.2.1

Re-evaluation of the morphology and distribution of the newly described species *Tirpitzia meiguensis* (Linaceae)

HONG CHEN[1,2,3], QIANG LUO[1,4] & YING YUAN[1,2,5*]
[1]*College of Agricultural Sciences, Xichang University, Xichang 615013, Liangshan Prefecture, Sichuan, China*
[2]*Panxi Crop Improvement Key Laboratory of Sichuan Province, Xichang University, Xichang 615013, China*
[3] *xcc20200152@xcc.edu.cn; https://orcid.org/0000-0002-7745-9069*
[4] *luoq72@sina.com; https://orcid.org/0000-0001-5043-2539*
[5] *179122670@qq.com; https://orcid.org/0000-0002-2237-3452*
**Correspondence: 179122670@qq.com*

Abstract

Tirpitzia meiguensis, a species described in 2023, is the focus of this study. Based on botanical resource surveys conducted in the areas surrounding its type locality, detailed dissection and observation revealed several diagnostic characteristics: its corolla is white, occasionally tinged with pale pink (vs. uniformly white in congeners); the number of stigmas ranges from 3 to 5 (vs. 4–5); and between the fertile stamens, there is either a single linear-lanceolate staminode or a staminode with 2–3 teeth (vs. consistently 3-toothed). In addition to its type locality in Meigu County, this species has also been recorded in neighboring Zhaojue County, suggesting that its existing population size may be considerably larger than previously reported. This paper provides supplementary description of the surface papillae of the flowering branches and discussion on the reduction of seed wings in *T. meiguensis*, aiming to offer foundational data for a better understanding of the evolutionary systematics within the genus.

Key words: macromorphology, plant anatomy, Sichuan Province, supplementary description

Introduction

The genus *Tirpitzia* Hallier (1921) is a small taxon within the Linaceae DC. ex Perleb (1818) family. Prior to 2023, it comprised only three species, which are subshrubs to small trees (Suksathan & Larsen 2006, Liu & Zhou 2008). Subsequently, a team from the Sichuan Academy of Forestry discovered a subshrubby, herbaceous plant on Huangmaogeng Mountain in Meigu County, Liangshan Prefecture, Sichuan Province, southwestern China. Through morphological study, specimen examination, and ITS sequence analysis, it was confirmed as a new member of *Tirpitzia*, i.e., *T. meiguensis* D.J.Xie & R.B.Zhang (Xie *et al*. 2023). This discovery filled the gap in the distribution of *Tirpitzia* species in Sichuan Province. According to the original description, *T. meiguensis* has a white corolla, 4–5 stigmas, and tridentate staminodes, and was reported to be restricted to the aforementioned type locality on the upper slopes of the mountain.

In August 2025, during a national forest germplasm resource collection survey across several counties in eastern Liangshan Prefecture (including Meigu County), we found that *T. meiguensis* also occurs on a valley slope in Meigu County and along a national highway in neighboring Zhaojue County, beyond its previously known type locality. Moreover, we observed broader morphological variation in traits such as corolla color, stigma number, and staminode morphology. These findings are reported herein, highlighting the importance of floristic and morphological studies for the correct identification of plant taxa (Hornung-Leoni & Sosa 2005, Di Pietro *et al.* 2016, Engels *et al.* 2020, Ben Mahmoud *et al.* 2024), with important consequences on the proper conservation of plant diversity (Wagensommer *et al.* 2020, Perrino *et al.* 2022, Wagensommer 2023).

Accepted by Enrico Vito Perrino: 18 Dec. 2025; published: 9 Jan. 2026

Material & Methods

The species was identified as *T. meiguensis* through field morphological observations and consultation of the published literature (Xie *et al.* 2023). Preliminary photographs were taken to document its habitat, plant form, leaves, and flowers. In the laboratory, both long-styled and short-styled flowers were dissected and examined. The observations included stamen number, stigma number, and the relative lengths of the pistils and stamens. Detailed images of the stems, leaves, and floral organs were subsequently captured using a camera equipped with a macro lens, and necessary measurements were taken.

Collected specimens

CHINA. Along a provincial route (S307), Luoeyigan Town, Meigu County, Liangshan Prefecture, Sichuan Province, gravel-rich / rocky slope in the river valley, 28.107053°N, 103.027129°E, August 22 2025, 1377 m a.s.l, Hong Chen, Qiang Luo & Ying Yuan, 20250300070 and 20250300071 (fl. and fr., XIAS!); along a national route (G348), Qingheng Town, Zhaojue County, Liangshan Prefecture, Sichuan Province, associated with herbs and shrubs, 28.105592°N, 102.995330°E, 1521 m a.s.l, August 22 2025, Hong Chen, Qiang Luo & Ying Yuan, 20250300072 (fl. and fr., XIAS!).

Results and discussion

Morphology and distribution:—Based on field investigations, anatomical dissection, and macro-observation, the morphological and distributional differences of *T. meiguensis* from the original description (type specimens), along with supplementary descriptions, are summarized in Table 1 and illustrated in Fig. 1. These findings suggest that this species may exhibit a broader range of variation in floral color, stigma number, and staminode morphology than previously recognized. A white corolla is one of the diagnostic characteristics distinguishing the genus *Tirpitzia* from the related genus *Reinwardtia* Dumortier (1822) for Chinese Linaceae plants (Liu & Zhou 2008). Based on the findings of this study, this key feature in identification keys may require appropriate modification. Actually, *T. bilocularis* Suksathan & Larsen (2006) from Thailand also has pink corolla. Stigma numbers as low as 3 (range 3–5) were observed, which aligns with the condition in the closely related genus *Reinwardtia* (stigmas 3–4). While some staminodes were 2–3-toothed, somewhat similar to *T. bilocularis* (2-4-toothed), others exhibited a linear-lanceolate form alternating with the five fertile stamens, a morphology consistent with the other two congeneric species, *T. sinensis* (Hemsl.) Hallier (1921) and *T. ovoidea* Chun et How ex Sha (1982). Notably, the upper parts of the flowering branches often bear nearly transparent papillae, a feature not previously reported in the descriptions of any genus or species within the Linaceae (Rogers 1966, Suksathan & Larsen 2006, Liu & Zhou 2008, Yang *et al*. 2017, Yılmaz 2018, Tugay & Ulukuş 2019, Xie *et al*. 2023), described here for the first time. Compared to the other three congeneric species, a key characteristic of *T. meiguensis* is its lack of seed wings, a result supported by our observations. However, seeds dissected from young fruits clearly show wing-like structures (Fig. 1 R). The presence of seed wings is widely regarded as an adaptive trait that enhances seed dispersal (Horn *et al*. 2001; Lentink *et al*. 2009) and may represent an ancestral trait within *Tirpitzia*, retained in the three taller, closely related species. In contrast, *T. meiguensis* has evolved a nearly prostrate plant form, where winged seeds would offer limited advantage for long-distance dispersal. Consequently, the wings have become reduced, although their developmental vestiges persist in early stages.

Habitat:—This study confirms that *T. meiguensis* is adapted to sunny slopes, roadside embankments in valleys, and thrives within shrublands, grasslands, or areas with sparse surrounding vegetation.

Conservation status:—*Tirpitzia meiguensis* possesses a wider distribution, more populations, and a larger number of individuals than previously assumed. Its probable occurrence in the type locality and surrounding similar habitats warrants confirmation through more extensive field surveys. It was previously attributed to the threat category Critically Endangered (CR), due to its distribution limited to the type locality, a single location, and the threats affecting the type locality. The discovery of more populations and a wider distribution allow to re-evaluate the conservation status of the species (Orsenigo *et al.* 2016). Therefore, according to the IUCN (2024) categories and criteria, we assess the species as Endangered, EN B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v).

TABLE 1. Morphological and distributional differences of *T. meiguensis* observed in this study compared to the original description.

Item	This study	Original description
Surface texture of flower branches	the upper parts bear nearly transparent papillae	not mentioned
Corolla color	Mostly white, occasionally pale pink	White
Stigma number	3–5	4–5
Staminodes shape	linear-lanceolate, or 2–3-toothed	3-toothed
Seed morphology	With a wing-like structure in seeds of early stages, wingless at maturity	Without a membranous wing
Distribution region	Meigu County and Zhaojue County, Sichuan Province	Meigu County, Sichuan Province
Habitat	River valleys and hillslopes, 1300–1600 m a.s.l.	Upper part of hillslopes, 1480 m a.s.l. (type specimen)

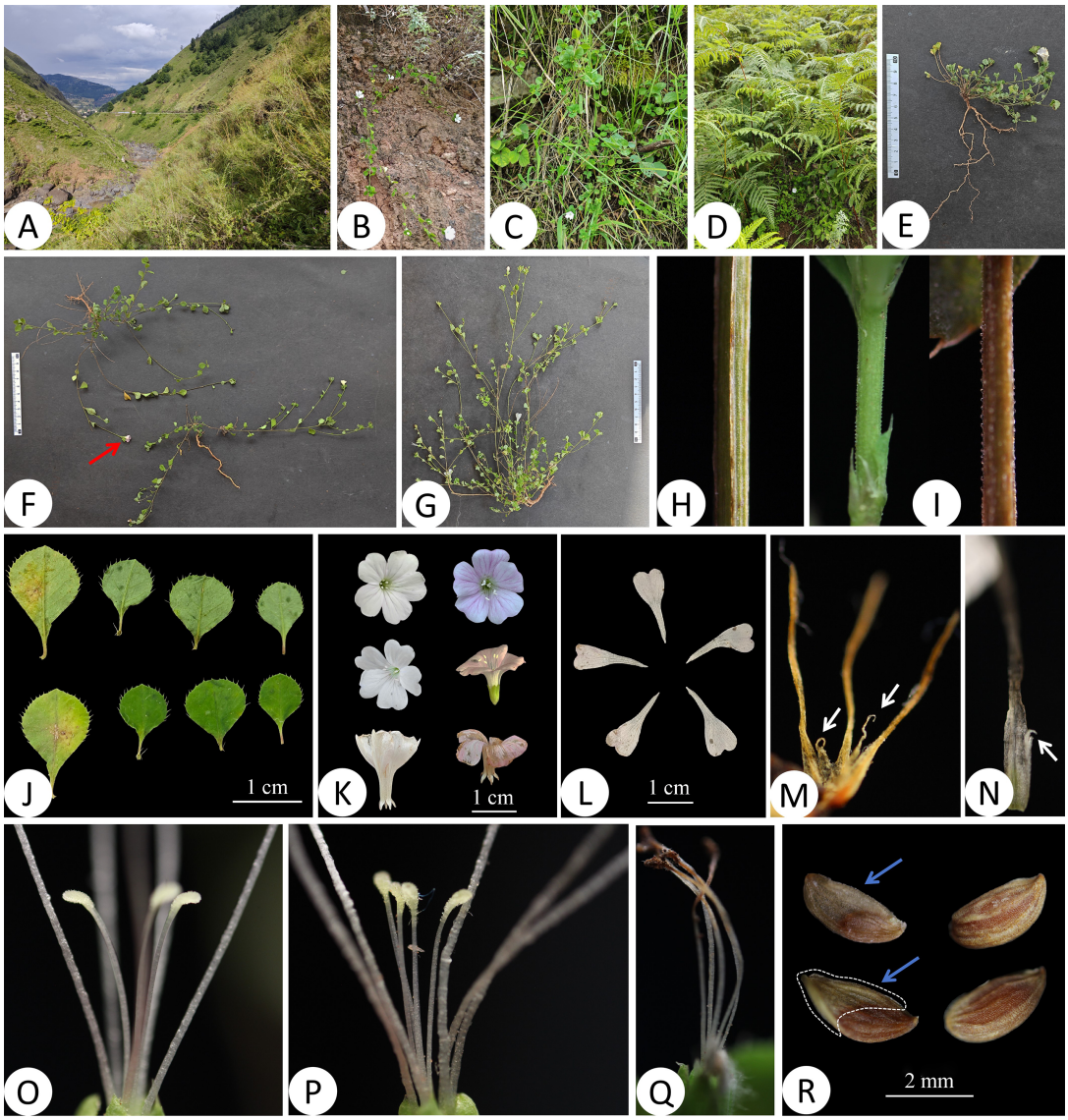

FIGURE 1. Habitat and morphological characters of *T. meiguensis* observed in the present study. A: Habitat (broad scale); B–D: Habitat (small scale): E–G: Habit (The red arrow in Figure F indicates a pale pink flower); H: Main stem (showing longitudinally ridges); I: Upper part of a flower branch (showing papillae, left: from a living plant, right: from a specimen); J: Leaves (top: abaxial side, bottom: adaxial side); K: Corolla (left: white flower, right: pale pink flower); L: Petals; M: linear-lanceolate staminodes (arrows); N: 2-toothed staminode (arrow); O–Q: Stigmas (3, 4 and 5 stigmas, respectively); R: Seeds (left: immature seeds, the wing-like tissue is indicated by blue arrows and, in the bottom seed, is also enclosed by a dashed line, right: mature seeds).

Acknowledgements

This study was fundamentally supported by the In-school Development Fund of Panxi Crop Improvement Key Laboratory of Sichuan Province (XNFZ2108, XNFZ2208), and the Doctoral Research Initiation Project of Xichang University (YBZ202101). The authors appreciate Prof. Tingxing Hu of Sichuan Agricultural University and Assoc. Prof. Zhitie Luo of Xichang University for paying continuous attention to this study.

References

Ben Mahmoud, K., Mezzapesa, G.N., Abdelkefi, F. & Perrino, E.V. (2024) Nutritional value and functional properties of an underexploited Tunisian wild beet (*Beta macrocarpa* Guss.) in relation to soil characteristics. *Euro-Mediterranean Journal for Environmental Integration* 9: 705–720. https://doi.org/10.1007/s41207-024-00468-5

Di Pietro, R., Di Marzio, P., Medagli, P., Misano, G., Silletti, G.N., Wagensommer, R.P. & Fortini, P. (2016) Evidence from multivariate morphometric study of the *Quercus pubescens* complex in southeast Italy. *Botanica Serbica* 40 (1): 83–100. https://doi.org/10.5281/zenodo.48865

Dumortier, B.C.J. (1822) *Reinwardtia*. *In*: *Commentationes botanicae*, Vol. 19.

Engels, M.E., Dias, D.C. & Koch, A.K. (2020) Increased morphological variation and a new record of *Vanilla labellopapillata* (Orchidaceae) from the Mato Grosso State, Brazil. *Phytotaxa* 472 (1): 63–68. https://doi.org/10.11646/phytotaxa.472.1.8

Hallier, H.J.G. (1921) *Beihefte zum botanischen Centralblatt* Abt. 2, Systematik 39 (2): 5.

Horn, H.S., Nathan, R. & Kaplan, S.R. (2001) Long-distance dispersal of tree seeds by wind. *Ecological Research* 16: 877–885. https://doi.org/10.1046/j.1440-1703.2001.00456.x

Hornung-Leoni, C. & Sosa, V. (2005) Morphological variation in *Puya* (Bromeliaceae): an allometric study. *Plant Systematics and Evolution* 256: 35–53. https://doi.org/10.1007/s00606-005-0302-z

IUCN (2024) Guidelines for using the IUCN red list categories and criteria. Version 16. Prepared by the Standards and Petitions Committee. Available from: https://www.iucnredlist.org/resources/redlistguidelines (accessed 11 December 2025)

Lentink, D., Dickson, W.B., van Leeuwen, J.L. & Dickinson, M.H. (2009) Leading-edge vortices elevate lift of autorotating plant seeds. *Science* 324: 1438–1440. https://doi.org/10.1126/science.1174196

Liu, Q.R. & Zhou, L.H. (2008) Linaceae. *In*: Editorial Committee of Flora of China (ed.) *Flora of China*. Vol. 11. Science Press, Beijing, pp. 34–38.

Perleb, C.J. (1818) Linaceae. *In*: *Versuch über die Arzneikräfte der Pflanzen verglichen mit den aüsseren Formen und der natürlichen Klasseneintheilung derselben*. pp. 107.

Orsenigo, S., Bacchetta, G., Calevo, J., Castello, M., Cogoni, D., Gennai, M., Licht, W., Montagnani, C., Perrino, E.V., Pinna, S.M., Silletti, G.N., Vela, E., Viciani, D., Vidali, M., Wagensommer, R.P., Zappa, E. & Fenu, G. (2016) Global and Regional IUCN Red List Assessments: 1. *Italian Botanist* 1: 61–85. https://doi.org/10.3897/italianbotanist.1.8647

Perrino, E.V., Tomaselli, V., Wagensommer, R.P., Silletti, G.N., Esposito, A. & Stinca, A. (2022) *Ophioglossum lusitanicum* L.: New Records of Plant Community and 92/43/EEC Habitat in Italy. *Agronomy* 12: 3188. https://doi.org/10.3390/agronomy12123188

Rogers, C.M. (1966) Sclerolinon, a new genus in the Linaceae. *Madroño* 18 (6): 181–184.

Sha, W.L. (1982) A new species of *Tirpitzia*. *Guihaia* 2 (4): 189–190.

Suksathan, P. & Larsen, K. (2006) A new species of *Tirpitzia* (LINACEAE) from Thailand. *Thai Forest Bulletin (Botany)* 34: 201–205. [https://li01.tci-thaijo.org/index.php/ThaiForestBulletin/article/view/24218]

Tugay, O. & Ulukuş, D. (2019) *Linum aksehirense* (sect. Dasylinum, Linaceae), a new species from Central Anatolia (Turkey). *PhytoKeys* 136: 23–34. https://doi.org/10.3897/phytokeys.136.46477

Wagensommer, R.P. (2023) Floristic studies in the light of biodiversity knowledge and conservation. *Plants* 12 (16): 2973. https://doi.org/10.3390/plants12162973

Wagensommer, R.P., Medagli, P., Turco, A. & Perrino, E.V. (2020) IUCN Red List Evaluation of the Orchidaceae endemic to Apulia Region

(Italy) and considerations on the application of the IUCN protocol to rare species. *Nature Conservation Research* 5 (Suppl.1). https://doi.org/10.24189/ncr.2020.033

Xie, D.J., Li, J.X., Peng, S.M., Deng, T., Wei, R.X., Dou, Q.L. & Zhang, R.B. (2023) *Tirpitzia meiguensis* (Linaceae), a new species from southwest Sichuan (China). *Phytotaxa* 626 (1): 51–59. https://doi.org/10.11646/phytotaxa.626.1.6

Yang, B., Zhou, S-S., Maung, K.W. & Tang, Y-H. (2017) *Reinwardtia glandulifera* (Linaceae), a new species from Kachin State, northern Myanmar. *Phytotaxa* 316 (3): 297–300. https://doi.org/10.11646/phytotaxa.316.3.10

Yılmaz, Ö. (2018) *Linum ayliniae* (Linaceae), a new species from west Anatolia, Turkey. *Novon* 26 (2): 174–179. https://doi.org/10.3417/2018078