

Potentilla asterotricha (Rosaceae) is a mysterious narrowly local endemic of China from Gansu province

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This study provides new data on *Potentilla asterotricha*, a species endemic to China. The species was described in Gansu province without specific information on locations, collectors, or date of collection. It is not given in “Flora of China”. Additional herbarium materials we discovered in KUN, PE and WUK allowed us to significantly expand the information about this enigmatic taxon. It turned out that its classic habitat is Erlang Mountain in the south of Gansu province in Min County. Based on the presence of stellate hairs in the pubescence, *P. asterotricha* is assigned here to the section *Fasciculato-pilosae*. The closest species to it is *P. acaulis*, from which it differs in the presence of pinnate leaves in the basal rosette. Photos of the leaf blade and pubescence of *P. asterotricha* under a microscope, as well as a scanned image of its herbarium specimen, are presented. The map shows the distribution of the taxon under study and its putative parent species. The southern border of the *P. acaulis* range has been identified.

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<http://zoobank.org/4654B080-998C-43BB-B19C-DE8975044EB0>

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Keywords

China North-Central, endemism, *Fasciculato-pilosae*, new data, *Potentilla*

Introduction

The phylogenetically complex *Potentilla* L. (Dobes and Paule 2010; Persson et al. 2020; Xue et al. 2024) has about 300 species in the narrow sense (Kechaykin et al. 2021). In “Flora of China” this

genus is accepted in a broad sense (including *Argentina* Hill, *Dasiphora* Raf., *Drymocallis* Fourr. ex Rydb. and *Sibbaldianthe* Juz.) and is represented by 86 species (Li et al. 2003). However, in less than 10 years, the number of *Potentilla* s. l. in China has almost doubled. Thus, the famous researcher of the tribe Potentilleae Sweet J. Soják lists 161 species, of which 29 are endemic (Soják 2012). Among the endemic species he identified, 20 are native to Sichuan and Yunnan, confirming the conclusions of Huang et al. (2011). The data presented above indicate that the territory of China is one of the centers of speciation and species diversity of *Potentilleae*. In this regard, the study of *Potentilla* endemism in China remains relevant.

Endemic plants are a specific and integral part of any flora, and multilateral studies of these species play an important role in the analysis of floras (Zhang et al. 2022). Endemics that arose in conditions of isolation and live in small areas are carriers of a unique gene pool and thus serve as primary objects of protection (Huang et al. 2016). Meanwhile, in the flora of China, several *Potentilla* endemics are known only based on original descriptions, and their herbarium materials are represented only by type specimens. We devoted this study to one of these species called *P. asterotricha* Soják, a narrowly local endemic from Gansu province, missed in “Flora of China”, and about which there was no additional information for more than 20 years after its original description.

Materials and methods

The material for the analysis was samples of *P. asterotricha* stored in the Herbariums KUN, PE, PR and WUK. Acronyms are adopted according to the “Index Herbariorum” (Thiers 2023). Morphology of individual parts was studied, and the corresponding photographs were taken using a Carl Zeiss Discovery V8 stereoscopic microscope. We also used the ArcGIS 10.6 to visualize the geographic distribution of *P. asterotricha* and its related species (*P. potaninii* and *P. acaulis*). The occurrence records of these three species were accessed from the Chinese Virtual Herbarium (<http://www.cvh.ac.cn/>) and the Global Biodiversity Information Facility (<https://www.gbif.org/>). Then, we removed coordinates that outside the species’ native range recorded in Plants of the World Online (<https://powo.science.kew.org/>). The filtered distribution data are listed in Suppl. material 1: Table S1.

Result

Taxonomic treatment

Potentilla asterotricha Soják, Preslia 64(3): 214, fig. 2/32, 1993.

Type: *Potentilla asterotricha* sp. n. Habitat: China, prov. Gansu. Legit: sine coll. (holotype: PR616286!).

According to protologue: “Typus: China, Gansu – sine collectore et loco proprio, PR” (Soják, 1992, p. 214).

The reason why the type of material of *P. asterotricha* without detailed label data ended up in the PR Herbarium is unknown. However, J. Soják points out that another specimen of *P. asterotricha*, identified as *P. acaulis*, is kept in Beijing and has a full herbarium label (Soják 1992: 214). Why the author did not quote this sample is also unknown. In the PE Herbarium we were able to find one herbarium specimen identified by Yü and Li in 1975 as *P. acaulis*. Specimens of this plant collected in Gansu province were found to be identical in morphology to *P. asterotricha* from PR. The sample label data is written in Chinese. Perhaps it was this Beijing sample that J. Soják had in mind. According to the International Code of Nomenclature of Algae, Fungi and Plants (Shenzhen Code), this sample should be considered as the original material (Turland et al. 2018: Art. 9.4). Below is a full quote from the sample label translated into English, as well as the barcode number and a link to

access the scanned image.

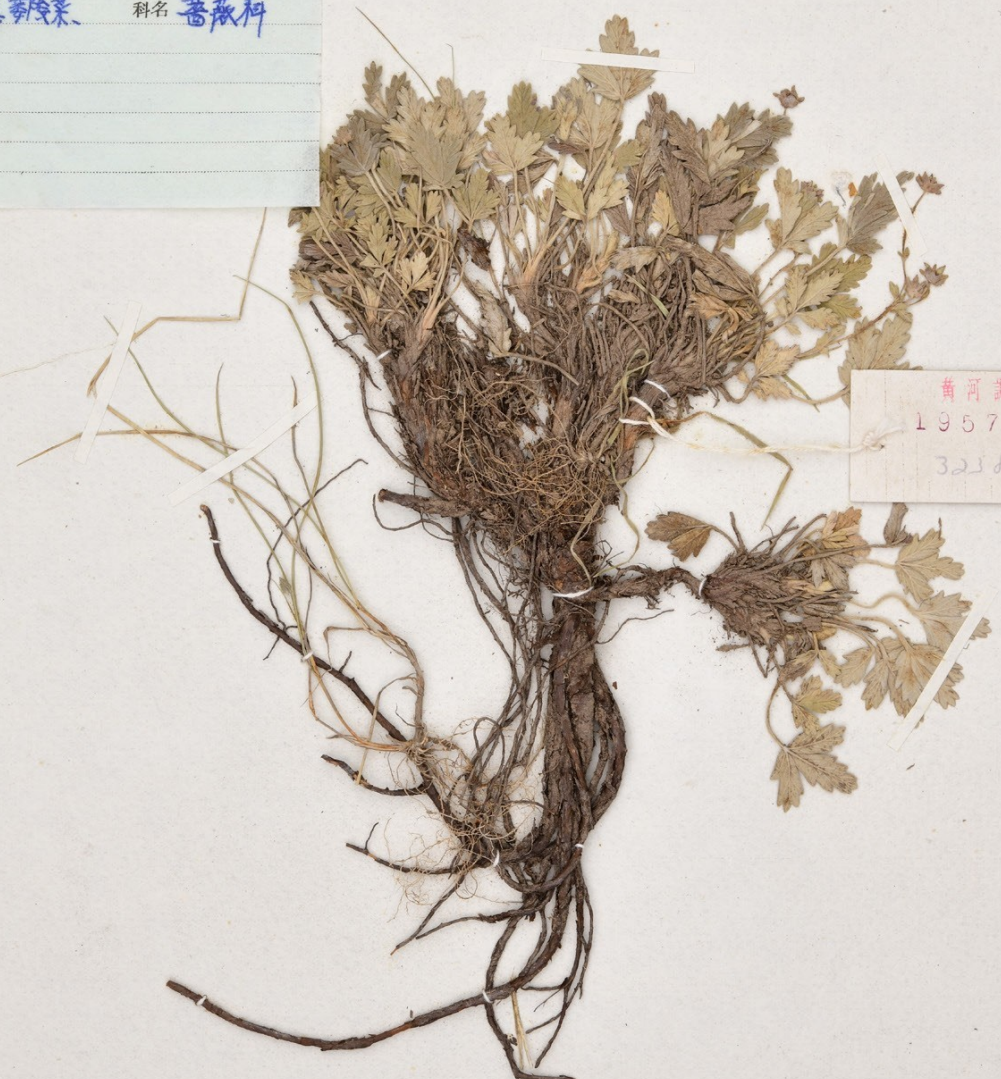
Original specimen: Gansu, Min County, Erlang Mountain. Habitat: mountain slope and bushwood, alt. 2400 m; herb, flower: yellow; collected date: 1957.05.26; collector: Tao River Expedition (a group of people who investigate the plant near Tao river, a tributary of the upper reaches of the Yellow River in China) (PE00828054!, <https://www.cvh.ac.cn/spms/detail.php?id=f0ef743a>).

In addition, we were able to find herbarium specimens with identical labels in KUN (KUN609126!) (Fig. 1) and WUK (WUK0091483). Based on new materials studied, we supplement the morphological description of *P. asterotricha* and present it below.

Low-growing perennial plant with a well-branched caudex (with numerous particulates). Generative shoots are shortened, 4–7 cm long, with 1–3 reduced leaves. Basal leaves are 1.5–4 cm long, mixed with trifoliolate and pinnate. Pinnate leaf blades have two pairs of lateral leaflets (Fig. 2A). Terminal leaflets of basal leaves 0.7–1.5 cm long with 2–5 teeth on each side. Petioles and stems are covered with long (0.5–1 mm) bristly straight and curved, as well as short (0.1–0.3 mm) soft straight and curved hairs. All leaves are greyish-greenish on top, densely covered with appressed simple hairs mixed with stellate ones; below are grayish-whitish with dense felt pubescence (stellate hairs are difficult to distinguish). The inflorescence is loose with 2–4 flowers, about 1 cm in diameter. Calyx densely covered with simple and stellate hairs. The central ray of stellate hairs is much longer (about 0.34 mm) than the other rays (Fig. 2B). Petals are about 5 mm long and longer than the sepals. Anthers 0.5–0.7 mm long. Styles is subterminal, 1.1–1.2 mm long, slightly widened at the base. Achenes are unknown.

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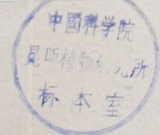
採集人 冰河隊 3238 1957年 5月 26日
及號數
產地 甘肅 岷縣 金蓮山
環境 山坡、灌木叢中
海拔 2400 性狀 草本 體高
胸高直徑 樹皮
葉
花 黃色
果實
土名 烏莖葎菜 科名 薔薇科
學名
附記



黃河調查隊
1957年
3238



KUN No. 0609126



Potentilla acutis L.
定名人 S.Y. Wu 1961.5.27年 月 日

Figure 1. Herbarium specimen of *P. asterotricha* (KUN609126).

Potentilla asterotricha Soják was described as closely related to *P. acaulis* L. from a collection in Gansu province, China, but differing from it in having pinnate leaf blades with two pairs of lateral leaflets (Fig. 2A). Stellate hairs of *P. asterotricha* are clearly visible on the calyx and along the edges of leaflets (Fig. 2B). According to J. Soják, this plant is of hybridogenic origin, with one of its parents being certainly *P. acaulis*, and the other, perhaps, *P. potaninii* Th. Wolf (Soják 1992). Both putative parent species are widely distributed in China and are found in Gansu province (Li et al. 2003) (Fig. 3). Unfortunately, the age of the herbarium material (more than 65 years) does not allow us to conduct a high-quality molecular study to confirm or refute the hypothesis about the hybridogenic nature of *P. asterotricha*. However, based on the presence of stellate hairs, we can assign it to the section Fasciculato-pilosae Kamelin. This section includes about 10 taxa, distributed only in Eurasia and having pubescence of stellate hairs (e.g., *P. acaulis*, *P. boreo-caucasica* Kechaykin, *P. cinerea* Chaix ex Vill., *P. incana* G. Gaertn., B. Mey. & Scherb.) (Kamelin 2001).

Distribution and ecology

After the initial description, *P. asterotricha* was, for some reason, not listed for the Flora of China (Soják 2007; Li et al. 2003; Zhang and Li 2007), but was only listed only in the key for definition in “Notes on *Potentilla* XXVIII” (Soják 2012: 32). The type specimen kept in the PR gave no indication of its exact geography. Thus, for the first time, we present here the specific location of this rare national endemic of China.

The species was found in China North-Central in the south of Gansu province in Min County, where its classic habitat is Erlang Mountain in the Tao River basin. It turned out that the southern border of the range of *P. acaulis* also lies within this territory (Fig. 3). Specimens of *P. asterotricha* were collected among mountain slopes and bushes at an altitude of 2400 m a.s.l. (according to herbarium labels). This is consistent with the ecology and altitudinal zonation of *P. acaulis* and *P. potaninii* according to Li et al. (2003). Apart from four herbarium specimens from KUN, PE, PR and WUK, no collections of *P. asterotricha* have been found to date.

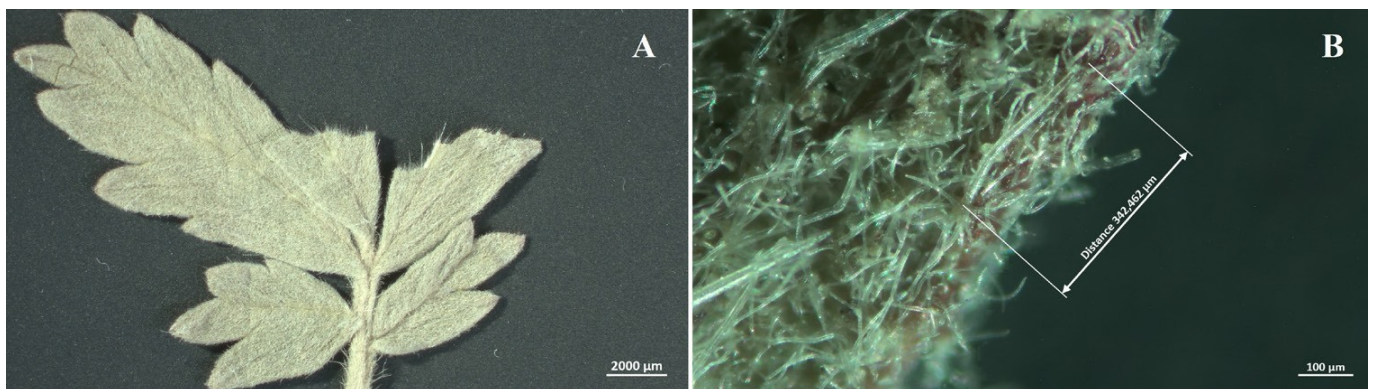


Figure 2. Pinnate basal leaf (A) and stellate hair with marked central ray (B) of *P. asterotricha*.

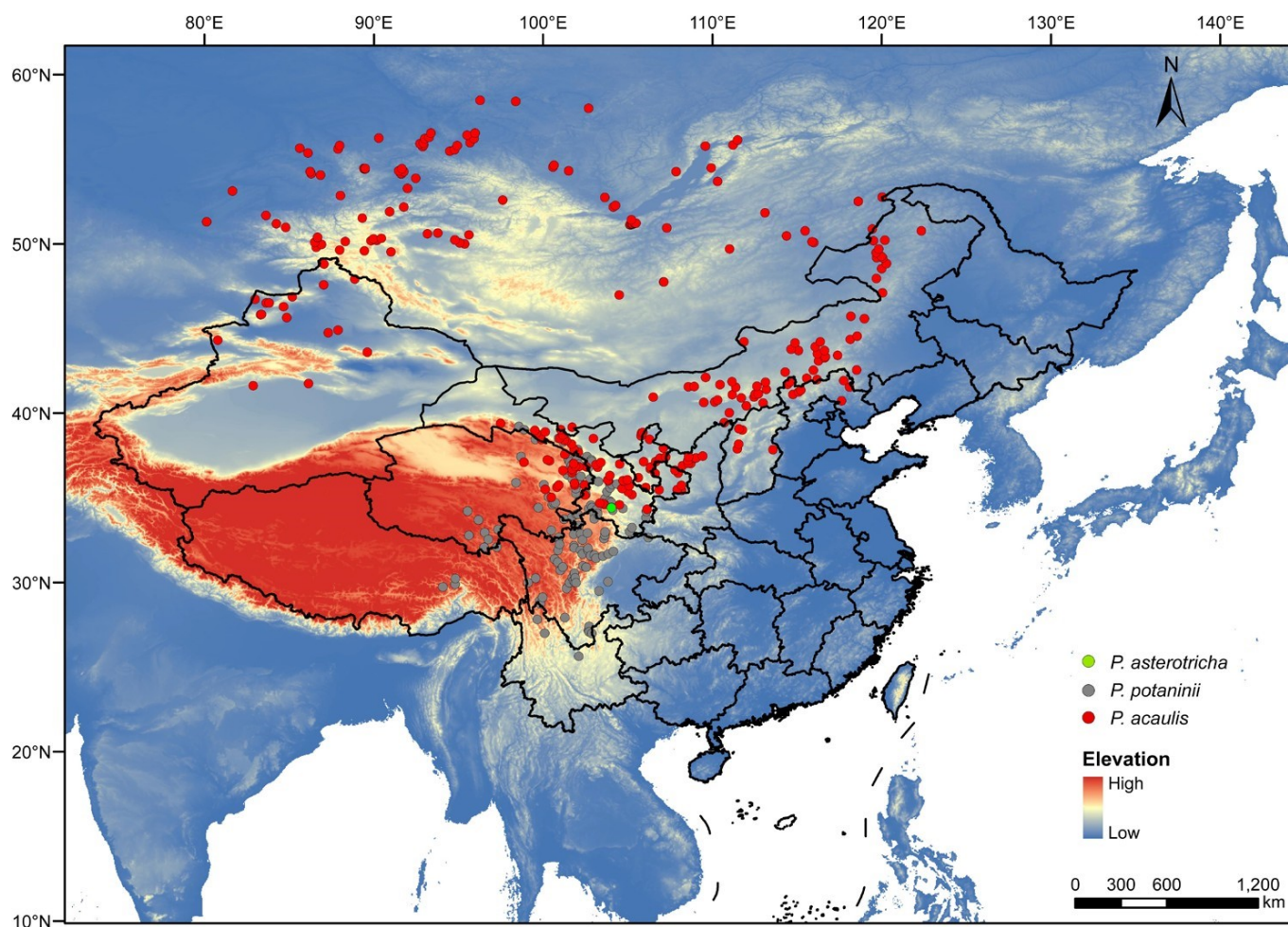


Figure 3. Distribution map of *P. acaulis*, *P. asterotricha* and *P. potaninii*. The black line is the province boundary of China.

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References

Eriksson T, Persson NL, Smedmark JEE (2022) What is *Potentilla*? A phylogenybased taxonomy for *Potentillinae* (Rosaceae). *Taxon* 71: 493–505. <https://doi.org/10.1002/tax.12679>

Huang J-H, Chen J-H, Ying J-S, Ma K-P (2011) Features and distribution patterns of Chinese endemic seed plant species. *Journal of Systematics and Evolution* 49: 81–94. <https://doi.org/10.1111/j.1759-6831.2011.00119.x>

Huang JH, Huang JH, Liu CR, Zhang JL, Lu XH, Ma KP (2016) Diversity hotspots and conservation gaps for the Chinese endemic seed flora. *Biological Conservation* 198: 104–112. <https://doi.org/10.1016/j.biocon.2016.04.007>

Kamelin RV (2001) *Potentilla* L. In: Tzvelev NN (Ed.) *Flora Europaeae Orientalis*. Peace and Family, Publishers of St. Petersburg Chemical-Pharmaceutical Academy, St. Petersburg, 10: 394–452. [In Russian]

Kechaykin AA, Shmakov AI, Gregor T, Paule J, German DA (2021) (2820) Proposal to conserve the name *Potentilla* (Rosaceae: Potentilleae) with a conserved type. Taxon 70: 680–681. <https://doi.org/10.1002/tax.12517>

Li C-L, Ikeda H, Ohba H (2003) *Potentilla*, *Comarum*, *Sibbaldia*, *Chamaerhodos*, *Fragaria*, and *Duchesnea*. In: Wu Z, Reven P (Eds) Flora of China. Missouri Botanical Garden Press, St. Louis, 9: 291–339.

Persson N, Toresen I, Andersen HL, Smedmark JEE, Eriksson T (2020) Detecting destabilizing species in the phylogenetic backbone of *Potentilla* (Rosaceae) using low-copy nuclear markers. AoB Plants 12: plaa017. <https://doi.org/10.1093/aobpla/plaa017>

Sojak J (1992) Notes on *Potentilla* XIII. Further new taxa from Asia. Preslia 64(3): 211–222.

Soják J (2007) *Potentilla* (Rosaceae) in China. Notes on *Potentilla* XIX. Harvard Papers in Botany 12: 285–324. [https://doi.org/10.3100/1043-4534\(2007\)12\[285:PRICNO\]2.0.CO;2](https://doi.org/10.3100/1043-4534(2007)12[285:PRICNO]2.0.CO;2)

Soják J (2012) *Potentilla* L. (*Rosaceae*) and related genera in Asia (excluding the former USSR), Africa and New Guinea. Notes on *Potentilla* XXVIII. Plant Diversity and Evolution 130(1–2): 7–157. <https://doi.org/10.1127/1869-6155/2012/0130-0060>

Thiers B (2023) Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff. New York Botanical Garden's Virtual Herbarium [online]. Available from <https://sweetgum.nybg.org/science/ih/> [accessed 1 November 2023]

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159 [online]. Available from <https://www.iapt-taxon.org/nomen/main.php> [accessed 1 November 2023]

Xue TT, Janssens SB, Liu BB, Yu SX (2024) Phylogenomic conflict analyses of the plastid and mitochondrial genomes via deep genome skimming highlight their independent evolutionary histories: A case study in the cinquefoil genus *Potentilla* sensu lato (*Potentilleae*, Rosaceae). Molecular Phylogenetics and Evolution 190: 107956. <https://doi.org/10.1016/j.ympev.2023.107956>

Zhang XX, Ye JF, Laffan SW, Mishler BD, Thornhill AH, Lu LM, Mao LF, Liu B, Chen YH, Lu AM, Miller JT, Chen ZD (2022) Spatial phylogenetics of the Chinese angiosperm flora provides insights into endemism and conservation. Journal of Integrative Plant Biology 64: 105–117. <https://doi.org/10.1111/jipb.13189>

Zhang Y, Li P (2007) Studies on the Genus *Potentilla* L. in Gansu Province. Journal of Hexi University 23: 60–69. [In Chinese]

Supplementary material 1

Table S1. The distribution data of *Potentilla acaulis*, *Potentilla potaninii* and *Potentilla asterotricha*

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Data type: table

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