
A New Species of *Epimedium* (Berberidaceae) with 24 Chromosomes from Guizhou, China

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ABSTRACT. The new species *Epimedium yinjiangense* M. Y. Sheng & X. J. Tian (Berberidaceae) is described from Guizhou Province, China. It is similar to *E. acuminatum* Franch. but differs in its chromosome count of $4n = 24$, as well as in its leaves, flowers, and inflorescences.

Key words: China, *Epimedium*, Guizhou, IUCN Red List, tetraploid.

Barrenwort is a perennial plant of the genus *Epimedium* L. (Berberidaceae), known in Chinese as Yinyanghuo, Xianlinpi, and Yangheye (Xie & Sun, 2006); it is known in traditional Chinese medicine to be effective in strengthening the kidneys and curing rheumatism and is widely used for the treatment of osteoporosis, hypertension, and coronary heart disease (Guo & Xiao, 1999), as well as to strengthen immunity and prevent dementia. Icarin flavonoids from *Epimedium* have been shown to inhibit the growth of cancer cells (Zhang et al., 2002; Xie & Sun, 2006). There are more than 60 species of *Epimedium* worldwide, distributed from the Mediterranean region, through western Asia, and into China and Japan (Ying, 2002). The center of diversity for the genus is in China (Ying, 2002), and 52 taxa of *Epimedium* were reported as native to China (Guo et al., 2008). The genus has been divided into two subgenera, with four sections that are determined geographically (Stearn, 2002). Species native to China are grouped within *Epimedium* sect. *Diphyllon* (Kom.) Stearn, as is the new species assigned here.

During field investigations and herbarium studies, two collections of *Epimedium* from Yinjiang County, Guizhou Province, were found to subtly differ morphologically, with distinct inner sepals and a tetraploid chromosome count unlike other *Epimedium* in China. Based on review of the taxonomic literature, including the *Flora of China* (Ying et al., 2011), as well as cytological studies, we conclude that these specimens represent a new species.

Epimedium yinjiangense M. Y. Sheng & X. J. Tian, sp. nov. TYPE: China. Guizhou: Tongren, Yinjiang, Taozizhai, nearby brooks in valley, 1300 m, 28°02'E, 108°42'15"N, 5 Mar. 2004, M. Y. Sheng 040308 (holotype, GNUG; isotype, N). Figures 1, 2A, B.

Haec species *Epimedio acuminato* Franch. affinis, sed ab eo foliis crasse carnosis (non coriaceis) abaxialiter glabris (non dense pilosis), pedunculis et pedicellis glabris (non sparse villosis), sepalis interioribus albis (non pallide roseis) margine corrugatis atque chromosomatum numero tetraploideo (non diploideo) differt.

Perennial herbs, 40–60 cm tall; rhizomes rigid, tuberculate, shoots creeping, 6–10 mm diam.; stems erect, terete, fistulose, smooth, 4–8 mm diam. Leaves basal and cauline, trifoliate; leaflets thick, fleshy, ovate to narrowly ovate, 4.1–5.6 × 2.1–2.7 cm, adaxially smooth, abaxially glabrate, bases deeply cordate, the terminal leaflet with equal, rounded lobes, the lateral leaflets oblique with outer lobes larger and rounded, inner lobes also rounded at base, margins finely spinose-serrate, apex long acuminate. Fertile stems with 2 trifoliate, opposite leaves; panicle 30- to 50-flowered, 15–25 cm, with lower peduncles loosely 4- to 8-flowered, glabrous; pedicels 3–4.5 cm. Flowers large, 2–4 cm diam.; outer sepals 4, obovate, 4–5.5 × 3–4 mm, caducous; inner sepals ovoid to widely ovoid, occasionally narrowly so, white, occasionally light mulberry-purple, 10–18 × 7–11 mm, margin corrugated; petals incurving, a little longer than inner sepals, spurred, the calcar or spur slender, elongate, incurved or slightly so, 13–20(–25) mm, white or light mulberry-purple; stamens yellow, ca. 4.5 mm; anthers ca. 3.2 mm, valvate, revolute. Capsule ca. 2 cm; style long rostrate, persistent; seeds numerous.

Distribution and habitat. *Epimedium yinjiangense* is endemic to northwestern Guizhou Province in China and is known only from the area of the type locality. Specimens of *E. yinjiangense* were collected

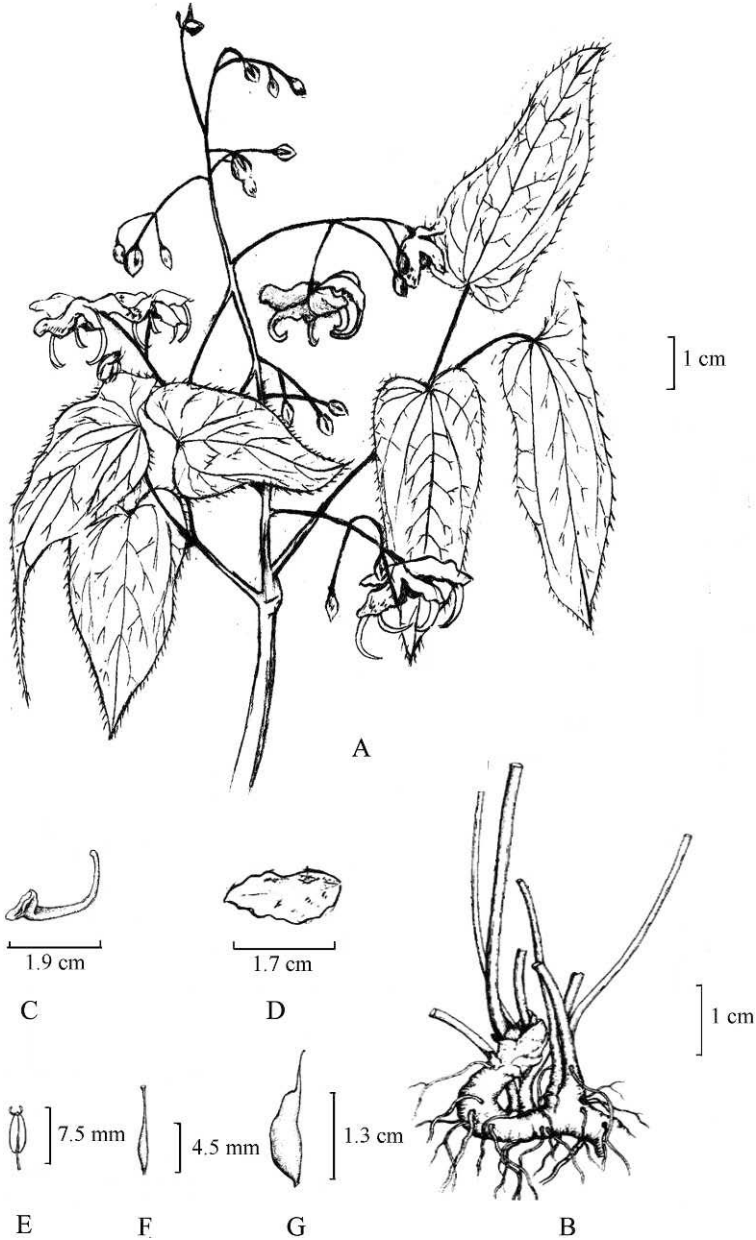


Figure 1. *Epimedium yinjiangense* M. Y. Sheng & X. J. Tian. —A. Fertile plant. —B. Rhizome. —C. Spurred petal. —D. Corrugate inner sepal. —E. Stamen. —F. Pistil. —G. Fruit. A–F drawn from the holotype *M. Y. Sheng 040308* (GNUG); G drawn from the paratype *M. Y. Sheng 20080509* (GNUG).

from damp, swampy soils, in shaded forest undergrowth near brooks, from 1000 to 1300 m.

IUCN Red List category. The plant populations at the two type localities consisted of about 1100 individuals, and the locations are vulnerable to the effects of human activities. As such, it should be considered Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001). Additional ecological and

biological studies are needed to determine effective conservation measures.

Phenology. Flowering specimens of *Epimedium yinjiangense* were collected in March, and flowering and fruiting specimens were collected in May.

Etymology. The epithet of the new species is taken from the type locality in Yinjiang County, Guizhou Province, China.

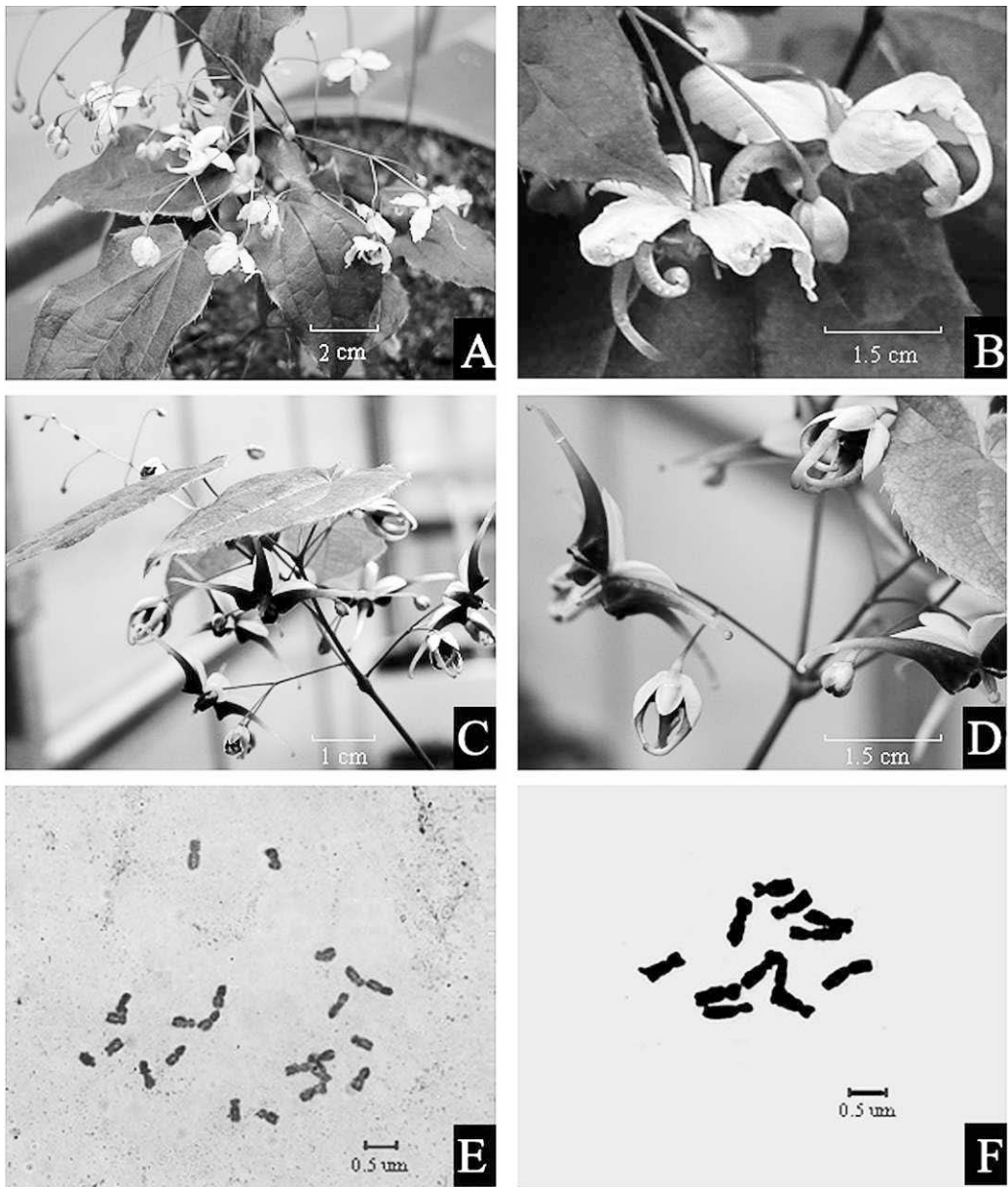


Figure 2. —A, B. Fertile plants of *Epimedium yinjiangense* M. Y. Sheng & X. J. Tian cultivated at the Institute of Plant Genetics and Breeding, Guizhou Normal University. —C, D. Flowers of *E. acuminatum* Franch., photographed in a greenhouse of the Institute. —E. Chromatids of *E. yinjiangense* stained with Giemsa stain, indicating $4n = 24$. —F. Chromatids of *E. acuminatum*, indicating $2n = 12$.

Relationships. *Epimedium yinjiangense* is similar to *E. acuminatum* Franch. (Fig. 2C, D) in that both taxa are tall perennial herbs with tubercular rhizomes, with basal and cauline trifoliolate leaves, large leaflets and flowers, a panicle with many flowers, two sepal whorls, and spurred petals. The new species clearly differs from *E. acuminatum* in its thick, fleshy leaflets glabrous on both surfaces, the white inner sepals with

corrugate margins, and the glabrous peduncles. The leaflets of *E. acuminatum* are leathery with short hairs on the abaxial surface, the inner sepals are light pink with smooth margins, and the peduncles are covered with long pubescent hairs.

Cytological observations of *Epimedium yinjiangense*, with karyotypes sampled from root tips (Fig. 2E), indicate that *E. yinjiangense* is tetraploid ($4n =$

24). This differs from previous reports for other species in *Epimedium*, all of which have been diploids, with $2n = 12$ (*E. perralderianum* Coss., *E. sempervirens* Nakai ex F. Maek. [Tanaka & Takahashi, 1981]; *E. acuminatum*, *E. alpinum* L., *E. diphyllum* Lodd., *E. grandiflorum* C. Morren, *E. koreanum* Nakai, *E. leptorrhizum* Stearn, *E. myrianthum* Stearn, *E. pubigerum* C. Morren & Decne., *E. sagittatum* (Siebold & Zucc.) Maxim., *E. sempervirens*, *E. trifoliolotobinatum* (Koidz.) Koidz. [Takahashi, 1989]; *E. acuminatum*, *E. alpinum*, *E. borealiguizhouense* S. Z. He & Y. K. Yang, *E. davidi* Franch., *E. franchetii* Stearn, *E. myrianthum*, *E. pubigerum*, *E. sagittatum*, *E. simplicifolium* T. S. Ying, *E. sutchuenense* Franch., *E. wushanense* T. S. Ying [Sheng & Chen, 2007a, 2007b, 2008]; *E. brevicornu* Maxim., *E. enshiense* B. L. Guo & P. G. Xiao, *E. flavum* Stearn, *E. franchetii*, *E. ilicifolium* Stearn, *E. leptorrhizum* Stearn, *E. mikinorii* Stearn, *E. myrianthum*, *E. platypetalum* K. I. Mey., *E. pseudowushanense* B. L. Guo, *E. pubescens* Maxim., *E. sagittatum*, *E. sagittatum* var. *glabratum* T. S. Ying, *E. sutchuenense*, *E. wushanense*, *E. zhushanense* K. F. Wu & S. X. Qian [Zhang et al., 2008]).

Stearn (2002) established the most comprehensive classification system of *Epimedium*. In his monograph, he arranged the genus into two subgenera, subgenus *Epimedium* and subgenus *Rhizophyllum* (Fisch. & C. A. Mey.) Stearn, based mainly on whether or not the flowering stem has leaves. Stearn divided the subgenus *Epimedium* into four sections, according to their geographic distribution and infrageneric relationships. Among these four sections, members of section *Diphyllum* were all endemic to China, and this section was further subdivided into four series: series *Campanulatae* Stearn, series *Davidianae* Stearn, series *Dolichocerae* Stearn, and series *Brachycerae* Stearn. These series were established on the basis of corolla characteristics such as petal type, the form and relative size of the inner sepals and petals, and flower dimensions. Referring to the classification scheme in Stearn (2002), *E. yinjiangense* is assigned to *Epimedium* sect. *Diphyllum* ser. *Dolichocerae*, which corresponds to the infrageneric assignment of the related *E. acuminatum*.

Paratypes. CHINA. **Guizhou:** Yinjiang, 1000 m, 9 May 2008, M. Y. Sheng 20080509 (GNUG); Jiangkou, 1100 m, 10 May 2008, M. Y. Sheng 20080510 (GNUG).

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