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Primulina sichuanensis var. *pinnatipartita* (Gesneriaceae), a remarkable new variety from Chongqing, China

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Abstract

Here, we describe and illustrate *Primulina sichuanensis* var. *pinnatipartita*, a new variety from southwestern China. This new variety is primarily distinguished from the type variety, *P. sichuanensis* var. *sichuanensis*, by its pinnatipartite leaf blade, a rare character in the genus *Primulina*. We show the morphological features of this new variety with illustrations and photographs.

Introduction

The recently recircumscribed genus *Primulina* Hance (1883: 169), comprises a monophyletic group of perennial herbs (Wang *et al.* 2011, Weber *et al.* 2011), and is often associated with karst landscapes from southern China and northern Vietnam (Wang *et al.* 1998, Li 2005, Wei *et al.* 2010). This genus has recently attracted considerable attention from botanists who have elucidated many aspects of its diversity and geography through field investigations. *Primulina* has doubled its richness in the past few years, from about 100 species in 2011 to nearly 200 today (Weber *et al.* 2011, Xu *et al.* 2017). As numerous new species have been added to *Primulina*, morphological characteristics that were previously rare in the genus are now more widely recognized within it. For example, only four species with yellow flowers were known to occur before 2011, while fourteen species with yellow flowers have now been described (Ma *et al.* 2017, Yang *et al.* 2017a, 2018). Similarly, the curved corolla tube was neglected in the genus before it was described in *P. curvituba* B.Pan, L.H.Yang & M.Kang in Yang *et al.* (2017b: 578). These ongoing discoveries in *Primulina* demonstrate that its diversity is still not well understood and suggest that further floristic surveys of Gesneriaceae are needed (Möller *et al.* 2016).

In December 2016, Xi-Le Zhou posted pictures of an unknown *Primulina* species with pinnatipartite leaves on the website of the Chinese Field Herbarium (CFH), and Li-Hua Yang suggested that it may be a new species. To understand more about this putative new taxon, we conducted field surveys in its native habitat in August 2017 and May 2018, respectively, and collected flowering and fruiting specimens. Additionally, in January 2018, one of the authors, Fang Wen, found the same taxon near to the type locality and brought several living individuals to the Gesneriad Conservation Centre of China (GCCC). Using collections and observations from field surveys, we conducted a detailed morphological comparison of this putative new taxon and its similar species. We also reviewed the literature on species of *Primulina* (Wang *et al.* 1998, Li 2005, Wei *et al.* 2010) and examined herbarium specimens at IBK, IBSC, KUN and PE. Based on all available data, we consider this taxon as a new variety of *P. sichuanensis* (Wang 1984: 16) Mich. Möller & A.Weber in Weber *et al.* (2011: 784).

Taxonomic treatment

Primulina sichuanensis var. *pinnatipartita* H.H.Kong & L.H.Yang, var. nov. (Fig. 1–2, 3A–E)

Diagnosis:—Differs from *Primulina sichuanensis* var. *sichuanensis* by its narrowly ovate to elliptic and pinnatipartite leaf blades (vs. broadly ovate to elliptic and repand-crenate to denticulate) and narrow-lanceolate bracts (vs. broadly ovate).

Type:—CHINA. Chongqing municipality, Qianjiang District, Shihui Town, elevation ca. 650m, 29°32'55.77"N, 108°38'49.35"E, growing on moist rock surfaces beneath an evergreen forest canopy, 2 June 2018 (flowering), Li-Hua Yang and Hang-Hui Kong, YLH578 (holotype: IBSC0831158!, isotypes: IBK!, IBSC0831157!, IBSC0831159!, IBSC0831160!).

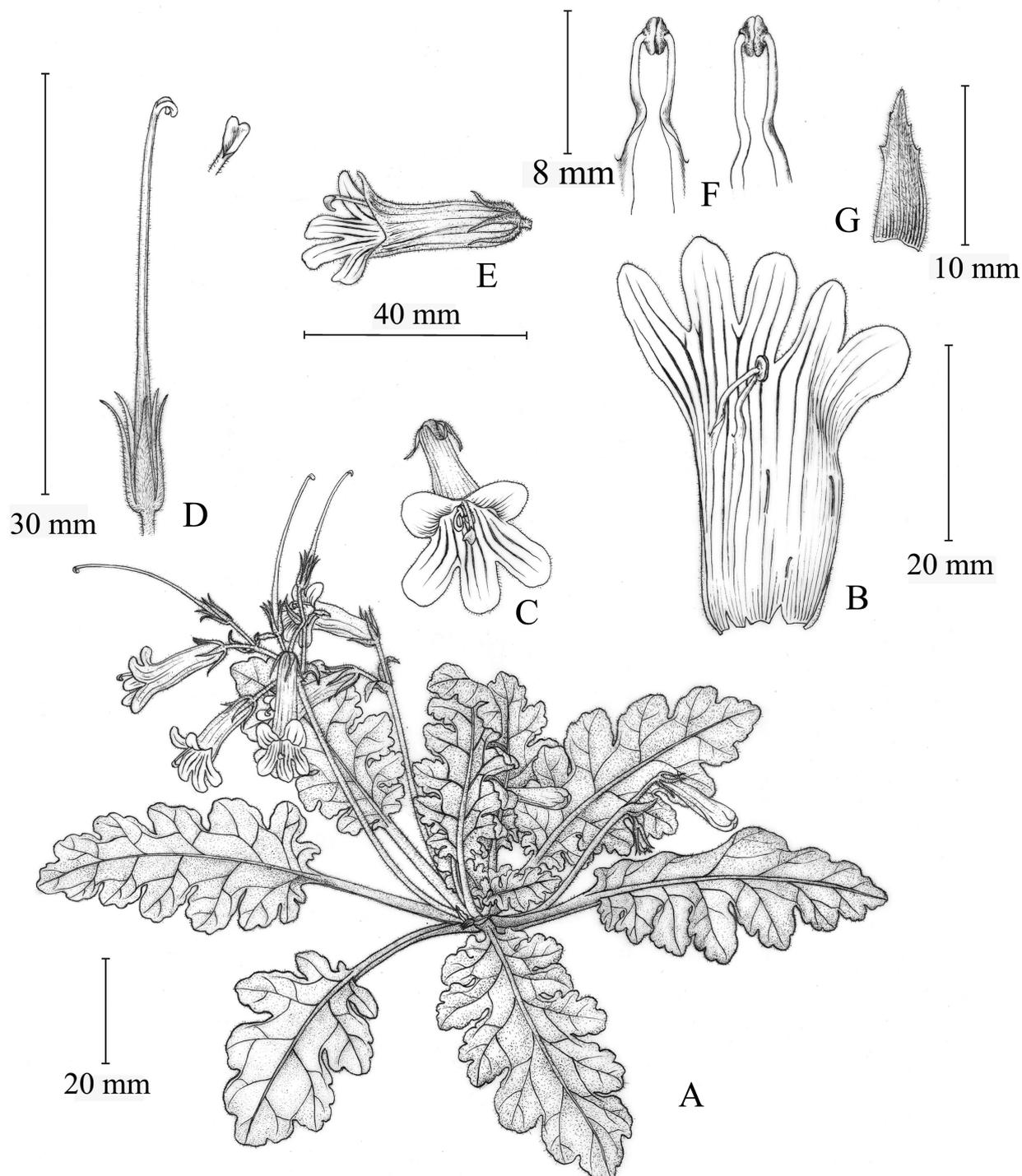


FIGURE 1. Illustrations of *Primulina sichuanensis* var. *pinnatipartita*. (A) habit, (B) opened corolla, showing stamens and staminodes, (C) flower in front view, (D) pistil and stigma, (E) flower in side view, (F) stamens, (G) bract. Drawn by Yun-Xiao Liu based on cultivated individual collected from its type locality.

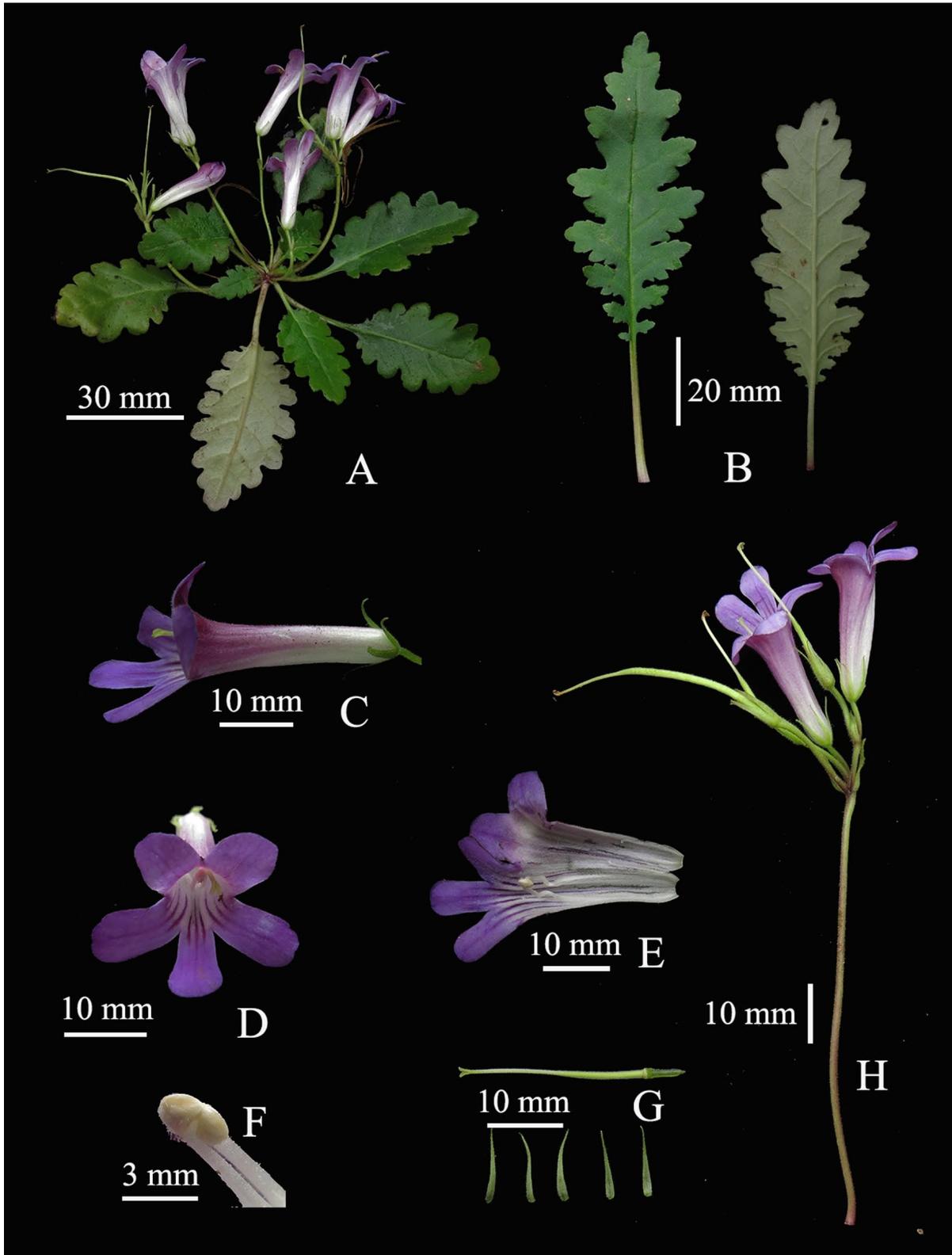


FIGURE 2. Photographs of *Primulina sichuanensis* var. *pinnatipartita*. (A) habit, (B) leaf, (C) flower in side view, (D) flower in front view, (E) opened corolla, showing stamens and staminodes, (F) anther, (G) pistil and calyx lobes, (H) cyme. Photo by Li-Hua Yang at its type locality.



FIGURE 3. *Primulina sichuanensis* var. *pinnatipartita* (A–E) and *P. sichuanensis* var. *sichuanensis* (F–I) in the wild (their type locality). (A) habitat, (B, F) habit, (C, G) flower in front view, (D, H) flower in side view, (E, I) bract. Photo by Li-Hua Yang at their type locality.

Perennial herb. Rhizomatous stem subterete, 8–15 mm long, 5–8 mm in diameter. Leaves 8–12, basal, opposite decussate; petiole 20–50 × ca. 3 mm, puberulent; leaf blade slightly fleshy when fresh, thinly chartaceous when dried, narrowly ovate to elliptic, 45–80 × 20–30 mm, both surfaces puberulent, apex subacute, base cuneate, margin pinnatipartite, lobes 4–8 pairs, each narrowly oblong to triangular, serrate or dentate; lateral veins 4–6 on each side, abaxially conspicuous, adaxially inconspicuous. Cymes 3–6, axillary, 4–8-flowered; peduncles 4.5–10 cm long, densely puberulent; bracts 2, opposite, narrow-lanceolate, 8–12 × 2–3 mm, margin inconspicuously denticulate or entire, apex acute, outside densely puberulent, inside glabrescent. Pedicel 8–12 mm long, densely puberulent. Calyx 5-parted to near base, lobes lanceolate-linear, 8–10 × ca. 1.5 mm, outside densely puberulent, inside glabrescent, margin entire. Corolla purple-red with several purple stripes at the throat of the tube (white at tube base), 40–45 mm long, outside puberulent, inside glabrescent; corolla tube funnellform-tubular, 23–28 mm long, 6–8 mm in diameter at the throat, 5–7 mm in diameter at the base; limb distinctly 2-lipped; adaxial lip 2-parted, lobes oblong, 10–12 × 7–9 mm, apex rounded; abaxial 3-lobed, lobes narrowly oblong, 12–15 × 6–8 mm, apex rounded. Stamens 2, adnate to 13–16 mm above the corolla tube base; filaments linear, 7–9 mm long, white, geniculate near middle, sparsely puberulent; anthers elliptic, fused by entire adaxial surfaces, ca. 3 mm long, abaxially covered with a few short hairs; staminodes 3, lateral ca. 3 mm long, adnate to ca. 10 mm above the corolla tube base, middle one ca. 2 mm long, adnate to ca. 5 mm above the corolla tube base. Disc annular, ca. 1 mm in height. Pistil 28–32 mm long, ovary cylindrical, 14–16 mm long, ca. 1 mm in diameter, densely puberulent; style ca. 14–16 mm long, densely glandular-pubescent and puberulent; stigma 1, its upper lobe lacking, lower lobe obtuse-trapeziform, apex 2-lobed, ca. 2 mm long, ca. 1.5 mm wide. Capsule linear, ca. 25–30 mm long, densely pubescent.

Phenology:—This new variety flowers from May to June and produces fruits from July to October.

Etymology:—This specific epithet is derived from the pinnatipartite leaf blade.

Vernacular name:—Chinese: 深裂叶报春苣苔 (Shēn Liè Yè Bào Chūn Jù Tái)

Distribution and habitat:—Only three populations of this new variety have been found. One population comprises the type locality and another population is one kilometer away along a river. The third population occurs ca. 20 kilometers from the type locality. Among all populations, we observed ca. 800 mature individuals in total, and these grow on moist and shady rock surfaces within evergreen forests.

At present, *P. sichuanensis* includes two varieties, var. *pinnatipartita* and var. *sichuanensis*. This species is a narrowly endemic species and occurs at the southeastern of Chongqing municipality, China (Fig. 4). The two varieties under *P. sichuanensis* with a parapatric distribution, but no overlap (Fig. 4).

Notes:—Our careful observations on living plants and dry specimens of the two varieties of *P. sichuanensis* revealed no other essential morphological differences between them except for their distinction of leaf shape and margin and bract shape (the detailed morphological comparison is provided in Table 1). In preliminary phylogenetic analyses, we also found that *P. sichuanensis* var. *pinnatipartita* and *P. sichuanensis* var. *sichuanensis* are sisters (Xu *et al.*, unpublished). The similarity of floral characters, close phylogenetic relationship and related geographical distribution between these two varieties indicate that they may have speciated recently from a common ancestor or are undergoing speciation, and we deem it reasonable to treat them as two varieties under the same species.

It worth noting that parted or compound leaves were previously rare in *Primulina*. At the end of 2011, only two species were known with parted leaf blade margin, i.e., *Primulina bipinnatifida* (Wang 1981: 26) Y.Z.Wang & J.M.Li in Wang *et al.* (2011: 60) and *P. pinnatifida* (Handel-Mazzetti 1934: 8) Y.Z.Wang in Wang *et al.* (2011: 62), and only one species with compound leaves, *P. pinnata* (Wang 1984: 25) Y.Z.Wang in Wang *et al.* (2011: 62). In recent years, several more species with parted or compound leaves were described, such as *P. multifida* B.Pan & K.F.Chung in Xu *et al.* (2012: 170), *P. cardaminifolia* YanLiu & W.B.Xu in Xu *et al.* (2013: 19), *P. zhoui* F.Wen & Z.B.Xin in Xin *et al.* (2018: 54) and *P. huangii* F.Wen & Z.B.Xin in Xin *et al.* (2018: 57). The discovery of *P. sichuanensis* var. *pinnatipartita* dramatically change the variation range of leaf blade (from denticulate to pinnatipartite) within the species *P. sichuanensis*, indicating that the leaf division is variable between and within species in the genus *Primulina*. The other significant finding of this work is that bract shape can also remarkably change (from broadly ovate to narrow-lanceolate) within a species in the genus *Primulina*.

Additional specimen examined:—CHINA. The same locality as the holotype, 29 October 2017 (Fruiting), Hang-Hui Kong *et al.*, CQQJ02 (IBSC!); Chongqing municipality, Qianjiang District, Jinxi Town, elevation ca. 700 m, 12 January 2018, Fang Wen *et al.*, WF180112-11 (IBK!).

TABLE 1. Morphological comparison of *Primulina sichuanensis* var. *pinnatipartita* and *P. sichuanensis* var. *sichuanensis*.

Characters	<i>P. sichuanensis</i> var. <i>pinnatipartita</i>	<i>P. sichuanensis</i> var. <i>sichuanensis</i>
Leaf blade shape	narrowly ovate to elliptic	broadly ovate to elliptic
Leaf blade size	45–80 × 20–30 mm	29–115 × 15–65 mm
Leaf blade margin	pinnatipartite	repand-crenate to denticulate
Lateral veins	4–6	3 or 4
Bract shape	lanceolate-linear	broadly ovate
Bract size	8–12 × 2–3 mm	9–21 × 5–12 mm

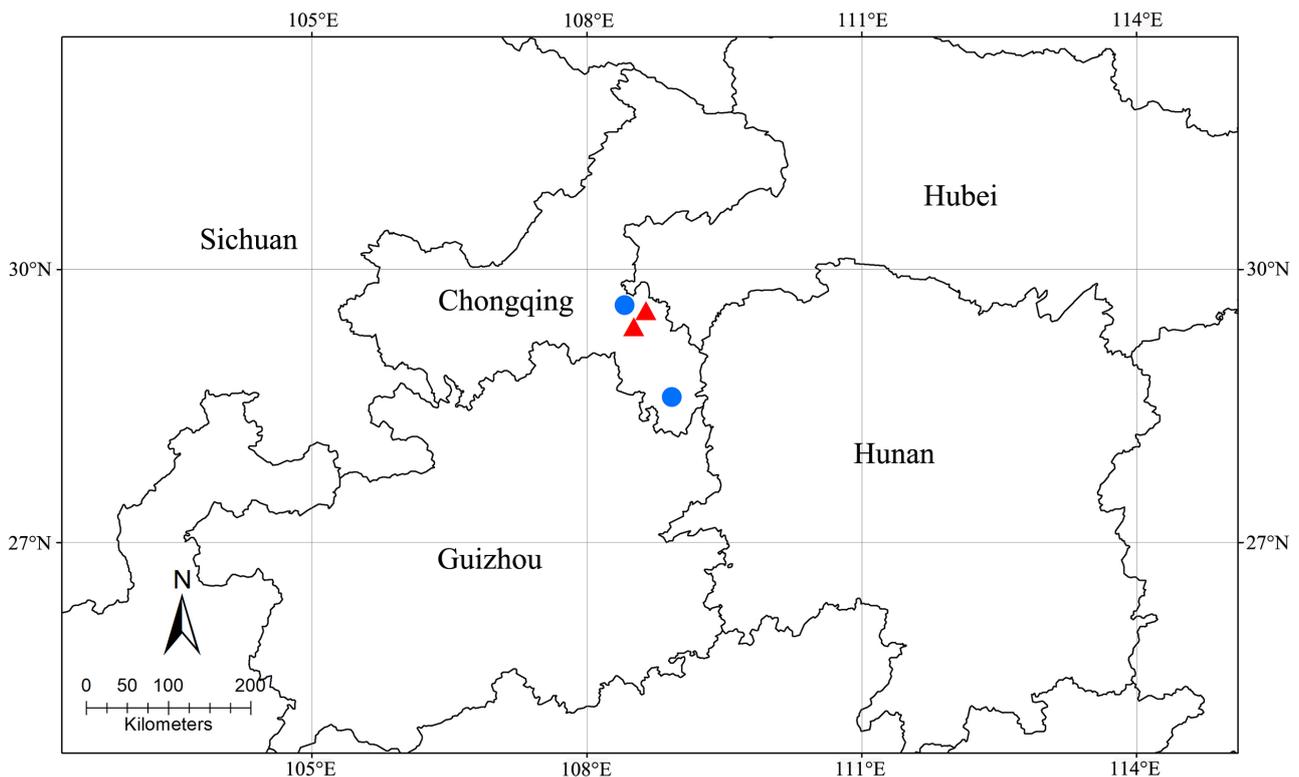


FIGURE 4. Geographical distribution of *Primulina sichuanensis* var. *pinnatipartita* (triangle) and *P. sichuanensis* var. *sichuanensis* (dot).

Acknowledgments

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