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## *Henckelia inaequalifolia* (Gesneriaceae), a new species from Sichuan, China

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### Abstract

*Henckelia inaequalifolia*, a new species in the genus *Henckelia* of the family Gesneriaceae is described here. The detailed morphological description, photographic illustration and geographical distribution of the new species are provided. Its morphological affinities between related species are also discussed in this paper.

**Keywords:** flora of Sichuan, taxonomy, morphology, solitary axillary flower

### Introduction

Based on molecular and morphological evidence, Weber *et al.* (2011) remodeled the genus *Henckelia* Spreng. (1817: 402) to include 56 species formerly placed under *Henckelia* sect. *Henckelia* A. Weber & B.L. Burtt (1998: 334), *Chirita* sect. *Chirita* Wood (1974: 131) [excluding species belonging to *Damrongia* Kerr ex Craib (1918: 364)] and the monotypic genus *Hemiboeopsis* W.T. Wang (1984: 397). After intensive field investigations in recent years, the re-circumscribed *Henckelia* currently comprises 74 species, which are distributed in Sri Lanka, India, Bangladesh, Nepal, Bhutan, S China, Myanmar, N Vietnam, N Laos, and N Thailand (Weber *et al.* 2011, Middleton *et al.* 2013, Janeesha & Nampy 2020, Nampy *et al.* 2021, Shi & Yang 2021). In China, a total of 25 species of this genus have been recorded, with four species recently described, i.e., *H. xinpingsensis* Y.H. Tan & Bin Yang in Yang *et al.* (2019: 196), *H. nanxiheensis* Lei Cai & Z.L. Dao in Cai *et al.* (2019: 152), *H. multinervia* Lei Cai & Z.L. Dao in Cai *et al.* (2019: 155) and *H. connata* X.Z. Shi & Li H. Yang (2021: 2).

In recent years, we carried out intensive field investigations of Gesneriaceae in China. During a field work in August 2020, an unknown species with slender fruit found at Hongya County, Sichuan Province, caught our attention. Therefore, we further collected flowering specimens in April 2021, and done detailed morphological observations in field. Additionally, we studied the relevant literature (Wood 1974, Wang *et al.* 1998, Weber & Burtt 1998, Li & Wang 2004, Wei *et al.* 2010, Weber *et al.* 2011, Sirimongkol *et al.* 2019, Janeesha & Nampy 2020) and specimens housed in CDBI, HITBC, IBK, IBSC, KUN and PE, and consulted web databases (Kew Herbarium: <http://apps.kew.org/herbcat/navigator.do>; Royal Botanical Garden Edinburgh Herbarium: <https://data.rbge.org.uk/search/herbarium/>; Natural History Museum: <https://data.nhm.ac.uk/>). All these results together confirmed that the plants found in Sichuan represent a new species of *Henckelia* as described below.

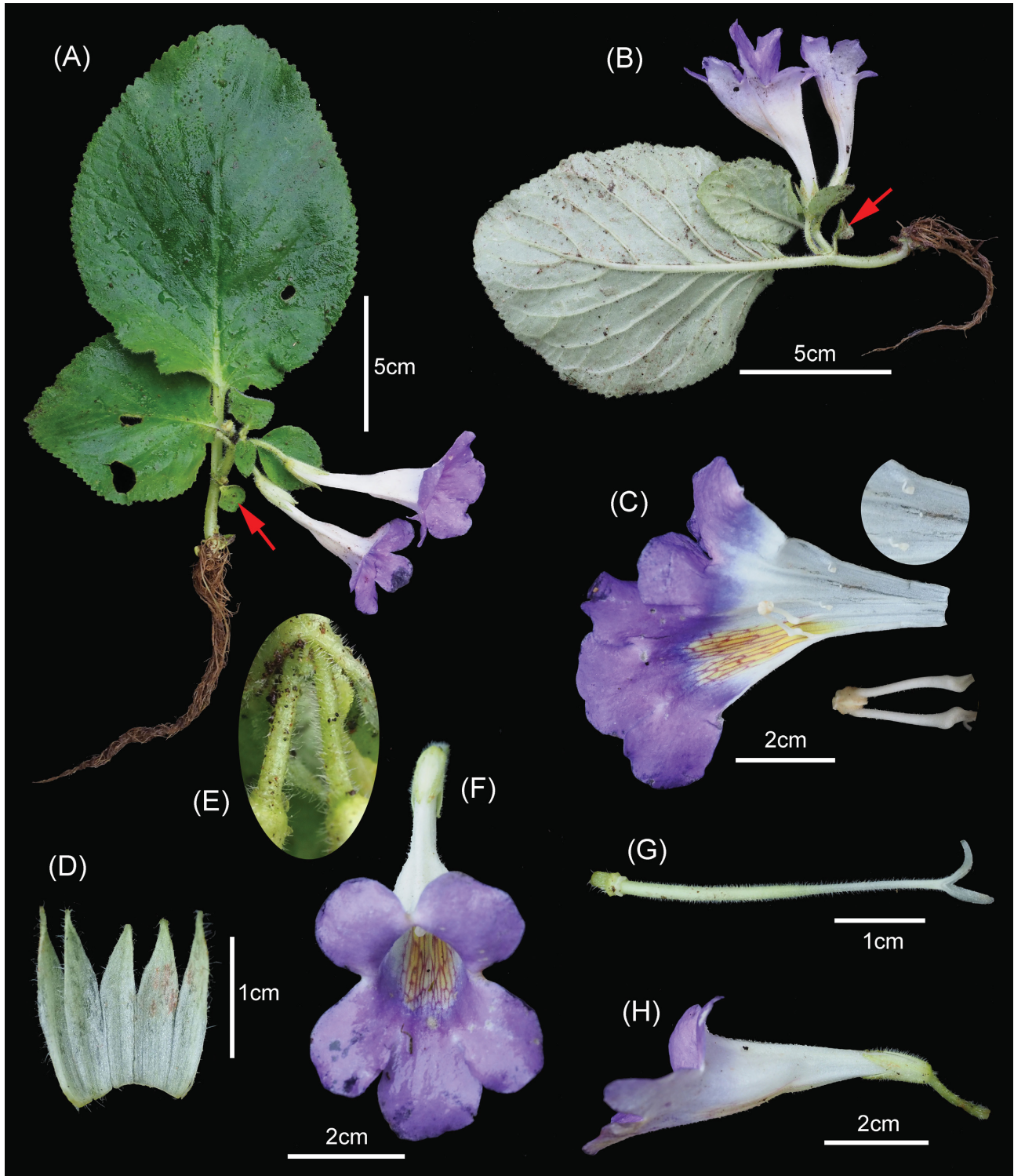
### Taxonomic treatments

*Henckelia inaequalifolia* Li H. Yang & X.Z. Shi, *sp. nov.* (Figs. 1, 2 and 3A–E)

**Diagnosis:**—The new species mainly differs from *Henckelia bifolia* (D. Don) A. Dietr. (1831: 574) by its stem [often 2 (rarely 1 or 3) internodes; the lower most internode is obvious and the internode above the large pair of leaves is gradually weak vs. 1 obvious

internode], petiolate leaf (vs. sessile), and solitary axillary flowers without bracts [vs. 1–2 (rarely 3)-flowered cymes with 2 bracts]. The new species also resembles *H. amplexifolia* Sirim. in Sirimongkol *et al.* (2019: 45), but differs from the latter by its asexual reproduction habit (with resting shoots at the base of stem vs. with bulbils on the stolon), petiolate leaf (vs. sessile), solitary axillary flowers without bracts (vs. 3–9-flowered cymes with 2 bracts), and infundibuliform and 4.5–5 cm long corolla tube (vs. campanulate, ca. 0.5 cm long).

**Type:**—CHINA. Sichuan Province: Hongya County, Yupingshan, alt. 1128 m, 29°46'21.46"N, 103°11'26.53"E, 19 April 2021, *Li-Hua Yang & Xi-Zuo Shi YLH1184* (holotype: IBSC-0865764!; isotypes: IBSC-0865765!, IBSC-0865766!).



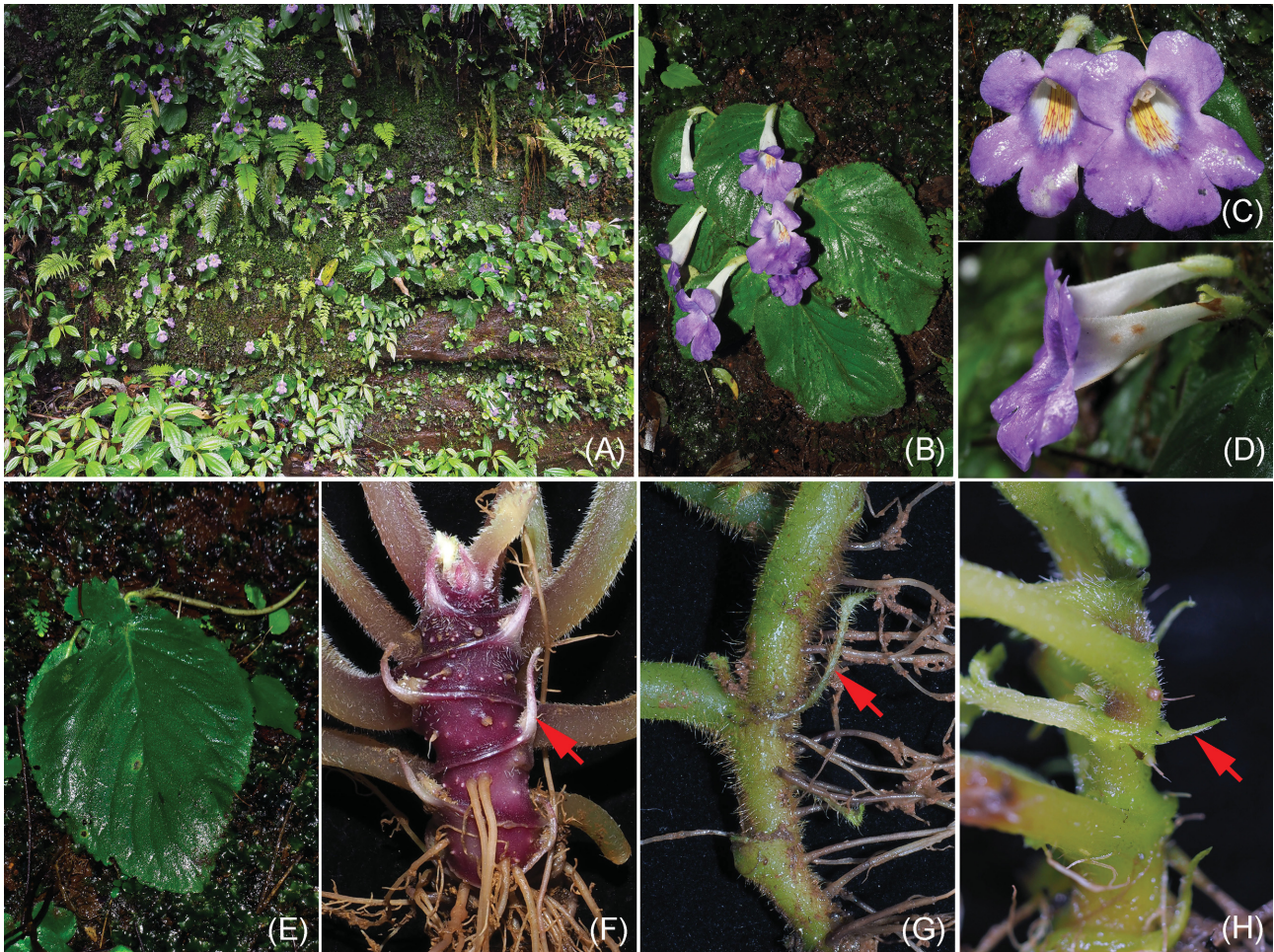
**FIGURE 1.** *Henckelia inaequalifolia* Li H. Yang & X.Z. Shi. (A) habit, (B) habit from below, (C) opened corolla showing stamens and staminodes, (D) calyx, (E) pedicel of the solitary flower, (F) flower in oblique front view, (G) pistil, (H) flower in side view. Red arrows show the small leaves. All photos were taken from the type locality by Li-Hua Yang.





FIGURE 2. Holotype (IBSC-0865764) of *Henckelia inaequalifolia* Li H. Yang & X.Z. Shi.





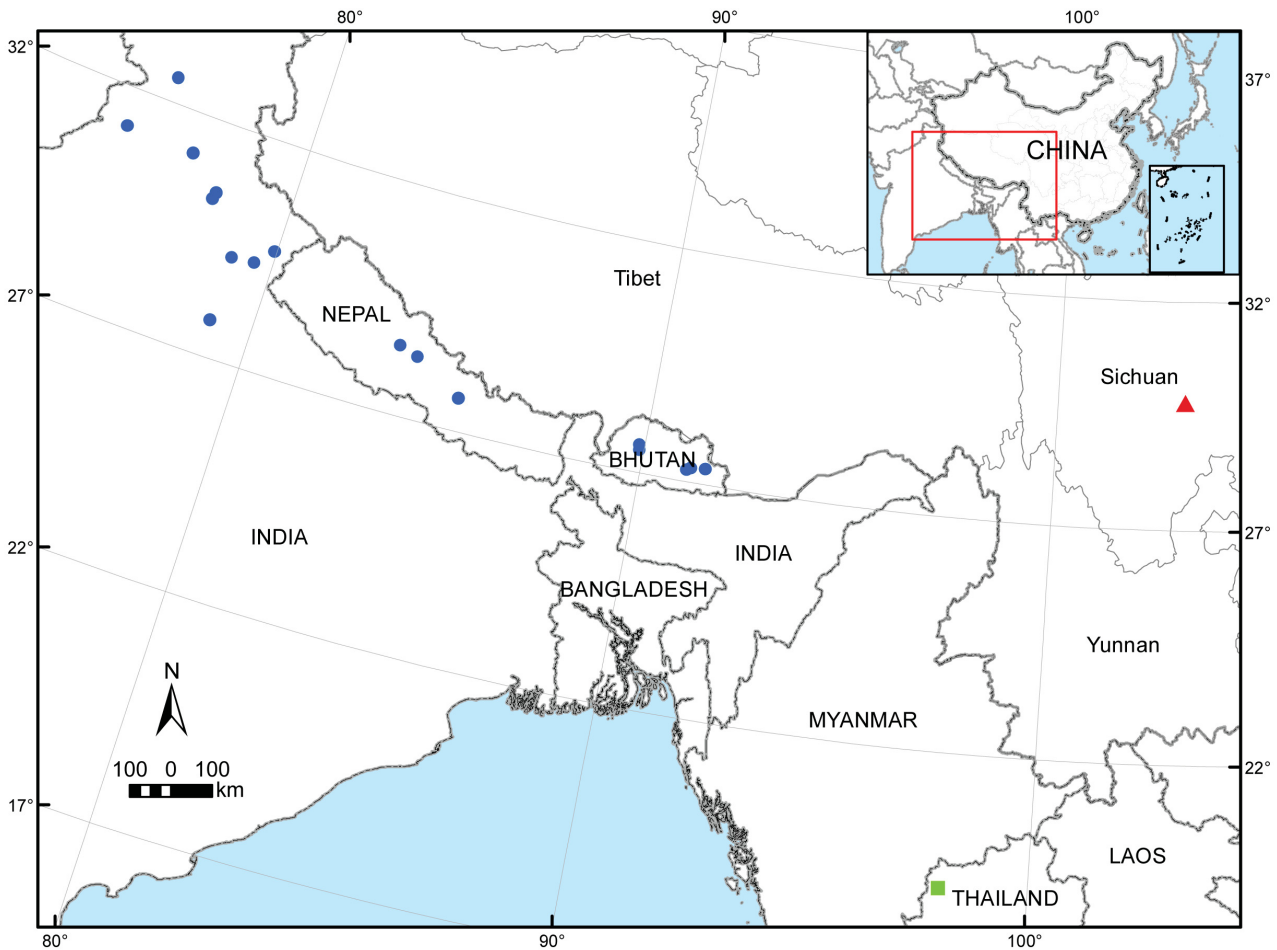
**FIGURE 3.** *Henckelia inaequalifolia* Li H. Yang & X.Z. Shi. (A–E) and three other species (F–H) with a small lanceolate leaf at the opposite position of a large one. (A) habitat, (B) flowering plants in nature, (C) flower in front view, (D) flower in side view, (E) fruiting plant, (F) *H. fruticicola* (H.W. Li) D.J. Middleton & Mich. Möller, (G) *H. speciosa* (Kurz) D.J. Middleton & Mich. Möller, (H) *H. grandifolia* A. Dietr.. Red arrows show the small leaves. Photos of *H. inaequalifolia* were taken from its type locality, and photos of *H. fruticicola*, *H. speciosa*, and *H. grandifolia* were taken from greenhouse of SCBG. All photos were taken by Li-Hua Yang.

Perennial herbs, caulescent, with resting shoots at the base of stem in winter; stem erect, cylindrical, often 2 (rarely 1 or 3) internodes; the lowermost internode 2–4 cm long; the internode above the large pair of leaves is gradually weak. Leaves opposite, 1–3 pairs; the bottom pair of leaves have the largest leaf and are extremely unequal in size; small leaf blade 1–1.5 × 1–1.2 cm, or sometimes absent; the larger leaf blade oval, 12–14 × 8–10 cm, adaxially pubescent, abaxially pubescent along veins, lateral veins 6–8 on each side of midrib, margin serrate, base cordate to orbicular; petioles pubescent, 2–2.5 cm long. Cymes reduce to solitary axillary flowers; pedicels pubescent, 1.5–2 cm long, ca. 0.2 cm in diameter. Calyx 5-lobed, fused into a tube for half of length; lobe narrowly triangle to broadly lanceolate, 1.3–1.6 × 0.3–0.5 cm, apex acuminate, margin entire, outside pubescent, inside glabrous. Corolla 6–7.5 cm long; corolla tube white, with a larger yellow spot and a network of reddish stripes at throat, infundibuliform, 4.5–5 cm long, 1.2–1.5 cm in diameter at throat, outside pubescent, inside glabrous; limb blue-purple, distinctly 2-lipped; adaxial lip 2-lobed, lobes semicircular, 1.2–1.5 × 1–1.2 cm, apex rounded, abaxial lip 3-lobed, lobes broadly oblong, 1.5–1.8 × 1.2–1.5 cm, apex rounded. Stamens 2; filaments adnate to ca. 2.5 cm above corolla tube base, strongly geniculate just under middle, swollen at bend, twisted in lower half, sparsely pubescent near the top; anthers coherent face to face, ca. 4 × 3 mm, sparsely glandular pubescent. Staminodes 3, glabrous; lateral staminodes 2, ca. 4 mm long, and central staminode ca. 1 mm long. Pistil 4.5–5 cm long; stigma chiritoid, deeply 2-lobed, ca. 6 mm long; style ca. 12 mm long, pubescent; ovary 2.5–3 cm long, densely pubescent; disc annular, ca. 1 mm in height. Capsule linear, 11–15 cm long, pubescent.

**Phenology:**—Flowering April to May, and fruiting from June to August.

**Etymology:**—The specific epithet is based on the extremely unequal-sized leaves in a pair of this new species.

**Vernacular name:**—The Chinese mandarin “Bu Deng Ye Han Ke Ju Tai” (不等叶汉克苣苔).



**FIGURE 4.** Geographic distribution of *Henckelia inaequalifolia* Li H. Yang & X.Z. Shi (triangle), *H. amplexifolia* Sirim. (square) and *H. bifolia* (D. Don) A. Dietr. (dots).

**Distribution and habitat:**—At present, this new species is only known from the type locality (Fig. 4), and ca. 200 mature individuals were found here. The plants were found growing under evergreen broad-leaved forests along a brook on moist rocks.

**Discussion:**—*Henckelia inaequalifolia* is similar to *H. bifolia* and *H. amplexifolia* in its habit and unequal size of leaves; however, these three species can be distinguished from each other by a combination of characters summarized in table 1. Additionally, the character, solitary axillary flower, of this new species is the first report in the genus *Henckelia*. Actually, the reduction of the cymes to solitary flowers is also uncommon in the whole family Gesneriaceae and only occurred in few New World genera (Weber 2013), such as *Gloxinia* L' Hér., *Gloxiniopsis* Roalson & Boggan, *Smithiantha* Kuntze and *Diastema* Benth.

Interestingly, the unequal size of the leaves also appears in some other species of *Henckelia*, such as *H. speciosa* (Kurz) D.J. Middleton & Mich. Möller in Weber *et al.* (2011: 777), *H. fruticosa* (H.W. Li) D.J. Middleton & Mich. Möller. in Weber *et al.* (2011: 775) and *H. grandifolia* A. Dietr. (1831: 576). However, the gross morphology of the new species shows obvious differences to the latter three species. For these three species, *H. speciosa*, *H. fruticosa* and *H. grandifolia*, previous morphological observations based on dry specimens revealed an alternate phyllotaxis (Wood 1974, Wang *et al.* 1998). Nevertheless, our study using living materials shows that all these three species actually possess opposite phyllotaxis, with a small lanceolate leaf at the opposite position of a large one (Fig. 3F–H). Our study also offers a caution to the alternate phyllotaxis described in some other species, such as *H. lachenensis* (C.B. Clarke) D.J. Middleton & Mich. Möller in Weber *et al.* (2011: 776) and *H. repens* (Bedd.) A. Weber & B.L. Burt (1998: 354). Further detailed morphological observations are needed to address this question. Our study highlights the necessity of field investigation and morphological observation based on living materials for the good taxonomy in Gesneriaceae (Chen *et al.* 2020, Shi & Yang 2021).

**Additional specimen examined (paratypes):**—CHINA. Sichuan Province: Hongya County, the same locality as types, 13 August 2020, Li-Hua Yang *et al.* YLH1112 (IBSC-0865088!, IBSC-0865089!, IBSC-0865087!).



**TABLE 1.** Morphological comparison between *Henckelia inaequalifolia*, *H. bifolia* and *H. amplexifolia*.

Characters	<i>H. inaequalifolia</i>	<i>H. bifolia</i>	<i>H. amplexifolia</i>
Habit	with resting shoots at the base of stem	no data	with bulbils on stolon
Stem	often 2 (rarely 1 or 3) internodes; the lowermost internode is obvious and the internodes above the large pair of leaves is gradually weak	1 obvious internode	often 2 (rarely 1 or 3) internodes; the lowermost internode is obvious and the internodes above the large pair of leaves is gradually weak
Stolon	absent	absent	present
Petiole	petiolate	sessile	sessile
Cymes	reduce to solitary axillary flowers; bract absent	1–2 (rarely 3)-flowered; bracts 2	3–9-flowered; bracts 2
Calyx lobes	without claw	without claw	with claw
Corolla color	limb blue-purple; corolla tube white, with a larger yellow spot and a network of reddish stripes at tube throat	limb blue-purple; corolla tube white, with two yellow stripes at tube throat	both of limb and corolla tube are white
Corolla tube	infundibuliform, 45–50 mm long	infundibuliform, 30–50 mm long	campanulate, ca. 5 mm long
Pistil length	4.5–5 cm long	2.2–2.9 cm long	1.2–1.3 cm long
Fruit length	11–15 cm long	no data	1.2–2 cm long
Distribution	central Sichuan, China	Himalaya mountains	northern Thailand

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