ARPHA Preprints

PENSOFT

PREPRINT

Author-formatted, not peer-reviewed document posted on 05/10/2022

DOI: https://doi.org/10.3897/arphapreprints.e95944

Impatiens nayongensis (Balsaminaceae), a new species from Guizhou, China

Yi Chen, Bai-qiu He, Mei-Jun Li, Rongxin Huang, Xin-xiang Bai

Disclaimer on biological nomenclature and use of preprints

The preprints are preliminary versions of works accessible electronically in advance of publication of the final version. They are not issued for purposes of botanical, mycological or zoological nomenclature and ***are not effectively/validly published in the meaning of the Codes***. Therefore, nomenclatural novelties (new names) or other nomenclatural acts (designations of type, choices of priority between names, choices between orthographic variants, or choices of gender of names) ***should NOT be posted in preprints***. The following provisions in the Codes of Nomenclature define their status:

International Code of Nomenclature for algae, fungi, and plants (ICNafp)

Article 30.2: “An electronic publication is not effectively published if there is evidence within or associated with the publication that its content is merely preliminary and was, or is to be, replaced by content that the publisher considers final, in which case only the version with that final content is effectively published.” In order to be validly published, a nomenclatural novelty must be effectively published (Art. 32.1(a)); in order to take effect, other nomenclatural acts must be effectively published (Art. 7.10, 11.5, 53.5, 61.3, and 62.3).

International Code of Zoological Nomenclature (ICZN)

Article: 21.8.3: "Some works are accessible online in preliminary versions before the publication date of the final version. Such advance electronic access does not advance the date of publication of a work, as preliminary versions are not published (Article 9.9)".

ARPHA Preprints *Author-formatted, not peer-reviewed document posted on 05/10/2022* DOI: https://doi.org/10.3897/arphapreprints.e95944

Impatiens nayongensis (Balsaminaceae), a new species from Guizhou, China

Yi Chen [1], Bai-Qiu He [1], Mei-Jun Li[1], Rong-Xin Huang[1] and Xin-Xiang Bai [1,2,*]

[1] *College of Forestry, Guizhou University CN-5500251Guiyang China*

[2] *Qianxinan Academy of Agricultural and Forestry Sciences Xingyi 562400 CN-Xingyi China*

Corresponding author: Xinxiang Bai (254715174@qq.com)

Abstract

Impatiens nayongensis X.X.Bai & Y.Chen, sp. nov. from Guizhou Province, China, is described and illustrated here. *I. nayongensis* is most similar to *I. forrestii* and *I. piufanensis* in morphology. However, it is distinctive in its lower sepal broadly funnelform, hooked spur and being emarginate at the apex of the distal lobes of the lateral united petals. A detailed description, colour photographs and a provisional IUCN Red List assessment are provided. Its geographical distribution and morphology are also compared to similar species.

Keywords

Balsaminaceae，China，*Impatiens*，morphology，taxonomy

Introduction

The genus *Impatiens* L. (Linnaeus 1753) belongs to the Balsaminaceae family and consists of more than 1,000 species worldwide, located in the subtropics of the Old World with five centres of diversity, namely tropical Africa, Madagascar, south India and Sri Lanka, eastern Himalaya and Southeast Asia (Grey-Wilson 1980; Song et al. 2003). As *Impatiens* have great diversity in flower colour and flower morphology, they are considered as the "dicots counterpart of orchid" (Yuan et al. 2004). The genus *Impatiens* is an extremely difficult group in taxonomy. The morphological variation of flowers is extremely rich and the information that specimens can carry is limited. Therefore, field investigation is an important way to accurately describe the genus and understand the variation range (Hooker et al. 1908a; Yu 2012). Yu et al. divided this genus into two subgenera: *I.* subgen. *Impatiens* S.X.Yu & W.Wang and *I.* subgen. *Clavicarpa* S.X.Yu & W.Wang, based on molecular and morphological evidence, with *I.* subgen. *Impatiens* being further divided into seven sections (Yu et al. 2016). According to statistics, there are 352 species of *Impatiens* in China, mainly distributed in Yunnan, Sichuan, Tibet, Guizhou and other provinces and most of them are endemic species with restricted distribution (Chen 2001; Yu 2012; Yuan et al. 2022). There are 69 species of *Impatiens* in Guizhou Province, with four new species

of *Impatiens* having been published since 2000 (Kuang et al. 2014; Peng et al. 2021; Yuan et al. 2022; Ren et al. 2022).

In 2021, during the investigation of wild *Impatiens* resources in Guizhou, China, we encountered a special *Impatiens* plant in Nayong County, Bijie City, which grows in shady and damp places under the forest. We collected botanical specimens and took colour photographs. We compared relevant specimens from adjacent regions (PE, KUN, GZTM, GACP, GZAC) and literature (Xiong and Luo 1989; Chen 2001; Chen et al. 2007; Yu 2012; Kuang 2015). After careful inspection, it was found that this species was different from the previously published taxa. We identified it as a new species and describe it here.

Materials and Methods

The morphological description of the new species is based on observations and measurements of fresh material and plant specimens in the field. The terms used for describing the flower structure follow those of Grey-Wilson (Grey-Wilson 1980). The specimens collected were meticulously examined and documented by line drawing.

Taxonomic treatment

***Impatiens nayongensis* X.X.Bai & Y.Chen, sp. nov.**

Figs. 1, 2 and Figs. 3 A-B

Type. China. Guizhou Province, Bijie City, Nayong County, *Davidia involucrata* Provincial Nature Reserve, Shamujing, 1980 m alt., 26°44′45.24″N, 105°15′32.73″E, 3 October 2021, *GTB 20211003* (holotype: GZAC!, isotype: GZAC!).

Description. Annual herb, 40-80 cm tall. Stems erect, glabrous, branched, with swollen nodes in lower part, with few supporting roots and many fibrous roots. Leaves alternate, petiolate, membranous, oval or oblong-lanceolate, lamina 8.5–11.5 × 3.5–5 cm, lateral veins 4–8 pairs, adaxial surface deep green, adaxially adpressed strigose, abaxial surface grey-green, glabrous, base cuneate, margin crenate, apex acuminate. Inflorescences axillary, 2-flowered, puberulent, 5–9 cm, shorter than leaves or as long as leaves; pedicels 1–2 cm long, bracteate at base or middle, bracts narrowly lanceolate, abaxial mid-vein puberulent. Flowers pinkish-purple, larger, 3.5–4 cm ; lateral sepals 2, elliptic, 7–9 mm long, 4-5 mm wide, apex acuminate, with a distinct mid-vein, inequilateral. Lower sepal broadly funnelform, ca. 2.5 cm long, violet striate, mouth obliquely upwards, base gradually narrowed into a hooked spur, spur ca. 9 mm long. Dorsal petal reniform, 1–1.2 cm long, 1.5–1.8 cm wide, abaxial mid-vein thickened, with a dorsal crest, apex long rostellate, puberulent， deep purple. Lateral united petals sessile, 2.2–2.5 cm long, violet striate, 2-lobed, the basal lobes oval, distal lobes large, oblong, auricle inflexed, emarginate at apex. Stamens 5,

filaments linear, anther pointed, ovary linear, apex beak pointed. Capsule clavate, seeds many, verrucosa.

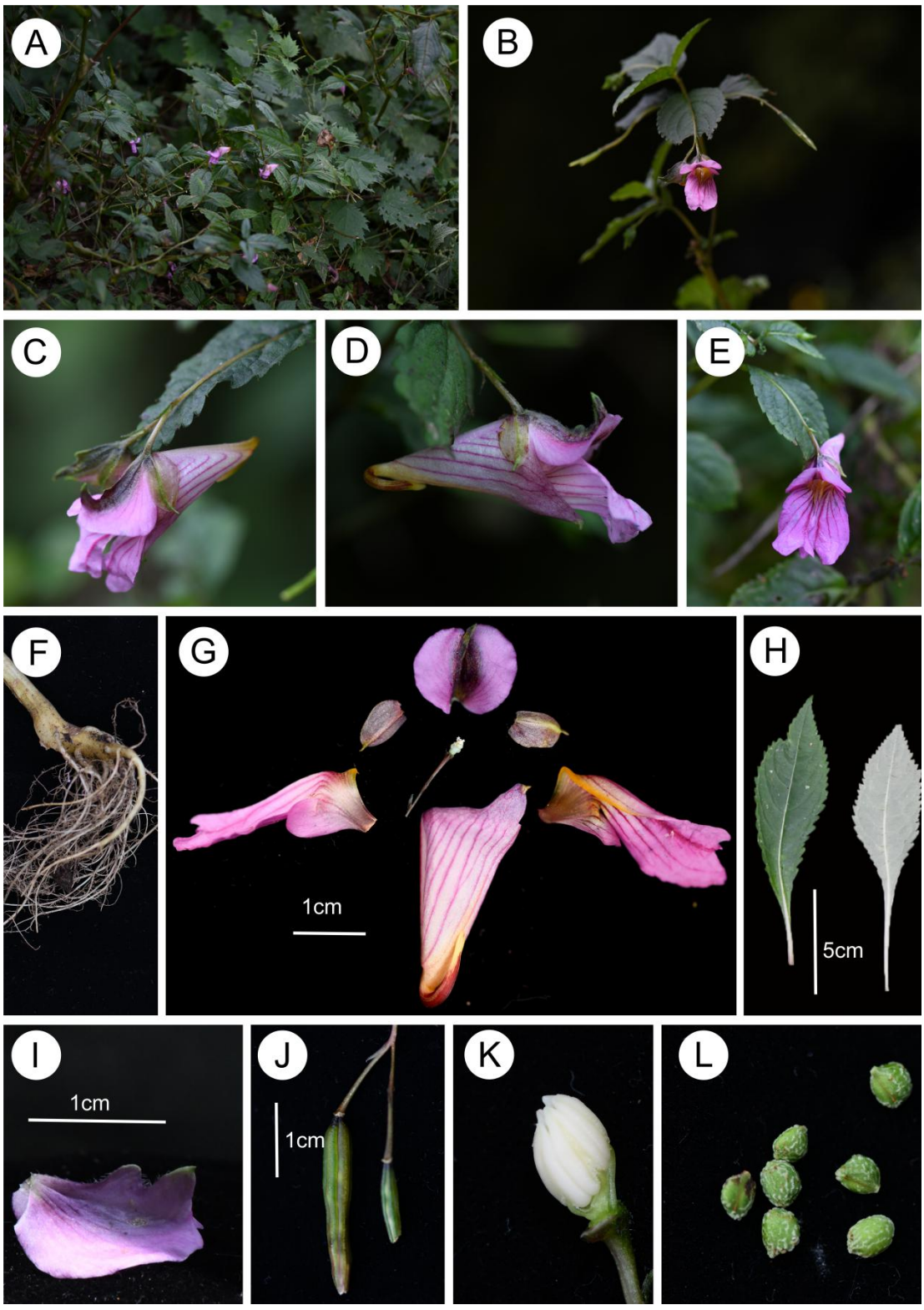

Figure 1. *Imaptiens nayongensis* **A** habit; **B** plant; **C** inflorescences; **D** flower in lateral view; **E** flower in face view; **F** root; **G** flower dissected; **H** leaves; **I** dorsal petal; **J** fruit; **K** anther; **L** seeds. Photos by Xin-Xiang Bai.

Diagnosis. This species is similar to *Impatiens forrestii* Hook.f. & W.W.Sm. in terms of its plant height, leaf morphology and short stiff adpressed hairs. However, it can be distinguished by lower sepal broadly funnelform, 2.5 cm long (vs. lower sepal saccate, 3 cm long), lateral veins, 4-8 pairs (vs. 8-9 pairs) and hooked spur, ca. 0.9 cm long (vs. incurved spur ca. 1 cm long).

Etymology. The specific epithet 'nayongensis' refers to the type locality, Nayong County, Bijie City, Guizhou Province, China. The Chinese name is given as "纳雍凤仙花".

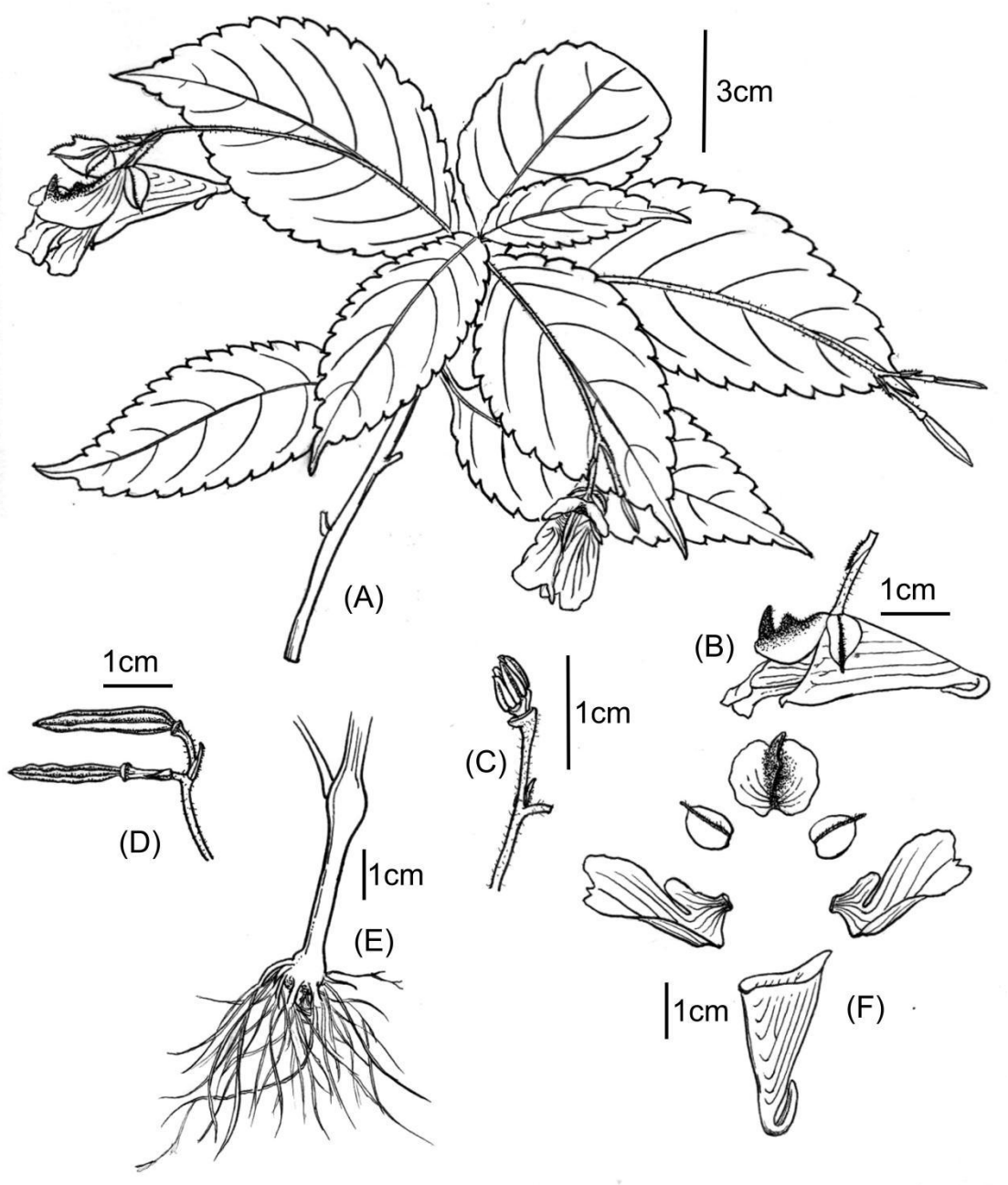

Figure 2. *Imaptiens nayongensis* **A** plant; **B** flower in lateral view; **C** anther; **D** fruit; **E** root; **F** flower dissected. Drawings by Yi Chen.

Distribution. *Impatiens nayongensis* has been observed in Bijie City, Guizhou Province with subpopulations in Nayong County and Dafang County. We found that it grows on the roadside under the forest in Shamujing, *Davidia involucrata* Provincial Nature Reserve, Nayong and it is distributed in a valley near the river in the Jiulong Mountain of Dafang.

Ecology. *Impatiens nayongensis* was collected at elevations of 1600-2000 m, in Shamujing, *Davidia involucrata* Provincial Nature Reserve. *Impatiens bodinieri* Hook. f., *Impatiens siculifer* Hook. f. (Balsaminaceae), *Urtica fissa* E. Pritzel, *Boehmeria nivea* (L.) Gaudich. and *Pilea notata* C. H. Wright (Urticaceae) were found to grow in the vicinity of this species.

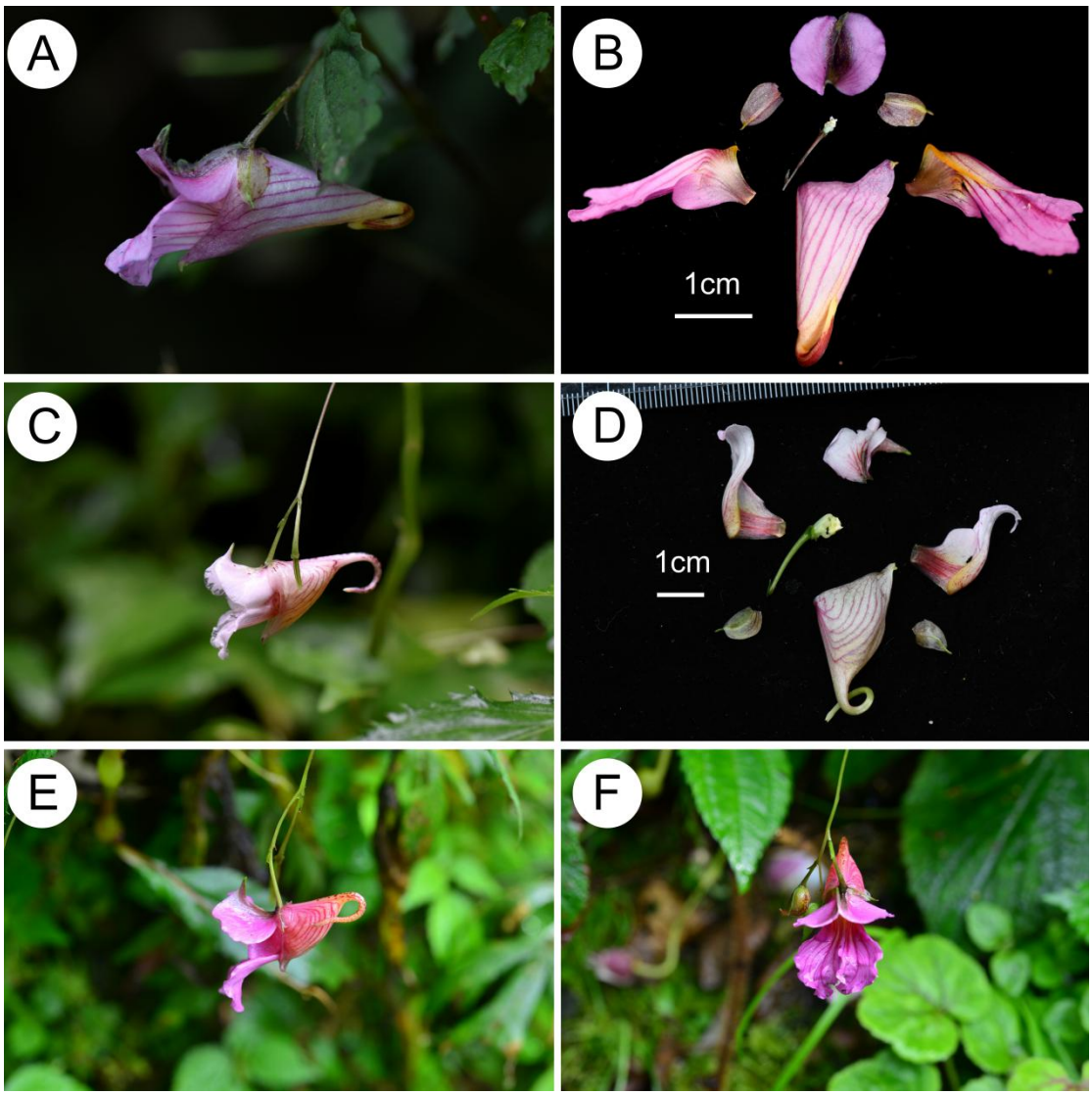

Figure 3. *Impatiens nayongensis* (**A-B**) **A** flower in lateral view; **B** flower dissected of *I. piufanensis* (**C-D**); **C** flower in lateral view; **D** flower dissected of *I. forrestii* (**E-F**); **E** flower in lateral view; **F** flower in face view.

Conservation status. This species is currently known from Bijie City, Guizhou Province, China with two subpopulations. Many individuals of *Impatiens nayongensis* were found in *Davidia involucrata* Provincial Nature Reserve. The ecological environment is well protected in this Nature Reserve. According to the IUCN Red List Categories and Criteria (IUCN 2019), it is assessed as Least Concern (LC).

Discussion

Impatiens nayongensis is most similar to *I. forrestii* and *I. piufanensis* in morphology. Their lateral sepals are all elliptic, with the apex acuminate and the apex long rostellate of the dorsal petal. However, *I. nayongensis* can be distinguished from other species by the lower sepal broadly funnelform, hooked spur and being emarginate at the apex of the distal lobes of the lateral united petals.

I. nayongensis is similar in floral morphology to *I. piufanensis* distributed in Guizhou. *I. nayongensis*, distributed in Wumeng Mountains, at an altitude of 1600-200 m, grows in the soil under forest, with shallow roots and no tubers. However, *I. piufanensis* grows usually on the rocky beach by the stream in the valley in Guizhou and its roots often have swollen tubers and the altitude of its habitat is less than 1000 m. *I. piufanensis* plants are low in height, generally no more than 50 cm. The surface of the seeds of *I. nayongensis* with verrucosa is obviously different from the smooth surface of the seeds of *I. piufanensis*. More detailed morphological dissimilarities between *I. nayongensis* and its related species are presented in Table 1.

Table 1. Comparison of morphological characteristics in *Imaptiens nayongensis*, *I. forrestii* and *I. piufanensis*.

Characters	*I. nayongensis*	*I. forrestii*	*I. piufanensis*
Plant height	40-80 cm	35-90 cm	20-40 cm
Underground tuber	absent	absent	present
Lateral veins	4-8 pairs	8-9 pairs	4-5 pairs
Leaf indumentum	adaxially adpressed strigose	adaxially adpressed strigose	spinose on veins
Leaf	oval or oblong-lanceolate	ovate-lanceolate or subelliptic	leaf blade ovate or ovate-lanceolate
Bract	narrowly lanceolate	ovate-lanceolate	narrowly lanceolate
Peduncles	5-9 cm	ca. as long as leaves or shorter	4-5 cm
Lateral sepals	elliptic, apex acuminate	obliquely ovate or suborbicular, apex mucronulate	elliptic, apex rostellate
Distal lobes	oblong, emarginate at apex	falcate-flabellate, apex obtuse	dolabriform, apex rounded
Lower sepal	broadly funnelform	saccate	funnelform

Spur	gradually narrowed into a hooked spur ca. 9 mm	abruptly narrowed into an incurved spur ca. 1 cm	narrowed into a curved slender spur
Seed surface	verrucosa	data not known	smooth

Acknowledgements

The authors are grateful to Chi Xiong, Zi-long Xu and Tao-hua Yuan for assistance with species identification and for providing valuable suggestions. The study was supported by the Taxonomic studies of wild Gesneriaceae in Guizhou Plateau (32260782) and the Survey of Wild Ornamental Plant Resources in Guizhou Province (701256192201).

References

Chen YL (2001) Balsaminaceae. In: Chen YL (Ed.) Flora Reipublicae Popularis Sinica (Vol. 47(2)), Sapindales. Science Press, Beijing, 1–243.

Chen YL, Akiyama S, Ohba H (2007) Balsaminaceae. In: Wu ZY, Raven PH, Hong DY (Eds) Flora of China (Vol. 12). Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 43–113.

Grey-Wilson C (1980) *Impatiens* of Africa. CRC Press, Rotterdam, 235 pp.

Hooker JD (1908a) Les espèces du genre Impatiens dans l'herbier du muséum de Paris. Nouvelles Archives du Muséum d'Histoire Naturelle, Paris, sér. 4, 10: 233–272.

IUCN (2019) Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Subcommittee. http://www.iucnredlist.org/documents/RedListGuidelines.

Kuang RP (2015) Study on the flora in Guizhousouthern Sichuan and phylogenetic problems of *Impatiens* L. PhD Thesis, Hunan Normal University, Changsha.

Kuang RP, Duan LD, Gu JZ, Cai XZ, Cong YY, Liu KM (2014) *Impatiens liboensis* sp. nov. (Balsaminaceae) from Guizhou, China. Nordic Journal of Botany 32: 463–467.doi: 10.1111/j.1756-1051.2013.00194.x.

Linnaeus C (1753) Species Plantarum 2. Laurentius Salvius, Stockholm, 937–938.

Peng S， Cong YY， Tian J， Zhang CF， Hu GW， Wang QF (2021) *Impatiens bullatisepala* (Balsaminaceae), a new species from Guizhou, China. Phytotaxa 500(3): 217–224. https://doi.org/10.11646/phytotaxa.500.3.5

Ren LY, Chen Y, Yuan TH, Huang RX, Li MJ, Bai XX (2022) *Impatiens bijieensis*

(Balsaminaceae), a new species from karst plateau in Guizhou, China. PhytoKeys 192: 1–10. https://doi.org/10.3897/phytokeys.192.77517

Song Y, Yuan YM, Küpfer P (2003) Chromosomal evolution in Balsaminaceae, with cytological observations on 45 species from Southeast Asia. Caryologia 56(4): 463–481. https://doi.org/10.1080/00087114.2003.10589359

Xiong YX, Luo YC (1989). Balsaminaceae. In: Li YK (Ed.) Flora of Guizhou, Vol. 7. Sichuan

Yu SX (2012) Balsaminaceae of China. Peking University Press, Beijing, 214 pp.

Yu SX, Janssens SB, Zhu XY, Lidén M, Gao TG, Wang W (2016) Phylogeny of *Impatiens* (Balsaminaceae): Molecular and morphological evidence into a new classification. Cladistics 32(2): 179–197. https://doi.org/10.1111/cla.12119

Yuan TH, Chen Y, Yu S, Ren LY, Huang RX, Li MJ, Bai XX (2022) *Imaptiens liupanshuiensis* (Balsaminaceae), a new species from Guizhou China. PhytoKeys 192:37-44. https://doi.org/10.3897/phytokeys.192.77269

Yuan TH, Li MJ, Ren LY, Huang RX, Chen Y, Bai XX (2022) A dataset on the diversity and geographical distributions of wild *Impatiens* in China. Biodiversity Science 30(5): 1-5. https://doi.org/10.17520/biods.2022019

Yuan YM, Song Y, Geuten K, Rahelivololona E, Wohlhauser S, Fischer E, Smets E, Küpfer P (2004) Phylogeny and biogeography of Balsaminaceae inferred from ITS sequences. Taxon 53(2): 391–403. https://doi.org/10.2307/4135617