Impatiens longiaristata

Subjects: Plant Sciences

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Impatiens longiaristata (Balsaminaceae), a new species from western Sichuan Province in China, is described and illustrated here based on morphological and molecular data. It is similar to I. longiloba and I. siculifer, but differs in its lower sepal with a long arista at the apex of the mouth, spur curved downward or circinate, and lower petal that is oblong-elliptic and two times longer than the upper petal. Molecular analysis confirmed its placement in sect. Racemosae.

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1. Introduction

Impatiens L. (Balsaminaceae) is one of the most species-rich genera of angiosperms with more than 1000 species [1][2]. It is mainly distributed in tropical and subtropical Africa, Madagascar, southern India and Sri Lanka, eastern Himalayas and Southeast Asia [3][4]. In contrast to the wide distribution of the genus, many *Impatiens* species are endemic to specific mountains or valleys. Most of the species are forest plants, usually growing in moist semi-shaded places, rarely in semi-arid places [2][5]. Flowers of *Impatiens* are zygomorphic and have a wide variety of morphology and colors [4][5]. The diversity of species has resulted in an extremely complex interspecific relationship in this genus. Since Hooker and Thomson [6] provided the first infrageneric classification for *Impatiens* based only on morphological data, several infrageneric classifications of the genus have been proposed in the last century [7][8][9]. However, all of these classifications were based on a few macromorphological characters only. Fortunately, phylogenetic studies using nucleotide sequences have made great contributions to our understanding of the evolutionary relationships of *Impatiens* in the last two decades [4][5][10][11][12][13]. Of these studies, the most notable is that in which Yu et al. [5] proposed a new classification based on phylogenetic and morphological evidence in 2016. They divided this genus into two subgenera: *I.* subgen. *Impatiens* and *I.* subgen. *Clavicarpa* S. X. Yu ex S. X. Yu & Wei Wang. *I.* subgen. *Impatiens* was further divided into seven sections, of which *I.* sect. *Racemosae* Hook. f. et Thomson was characterized by its inflorescences racemose, many-flowered; lateral sepals 2, rarely 4 with inner 2 reduced; capsule linear; and seed ovoid.

China is a hotspot for the distribution of *Impatiens* and has numerous balsam species, most of which are distributed in the southwest of the country. The Flora of China lists 227 species, of which 187 are endemic [14]. According to Du et al. [15], a total of 69 new taxa of *Impatiens* have been described in China between 2000 and 2019, and 13 new taxa [16][17][18][19][20][21][22][23][24][25][26][27][28] and three new records [28][29][30] have been published in the last two years, bringing the total species reported for China to nearly 290.

2. Results and Taxonomic Treatment

2.1. New Taxon

Impatiens longiaristata S. Peng, G. W. Hu & Q. F. Wang *sp. nov.* (**Figure 1**A–I, the LSID for the name is: 77219511-1).

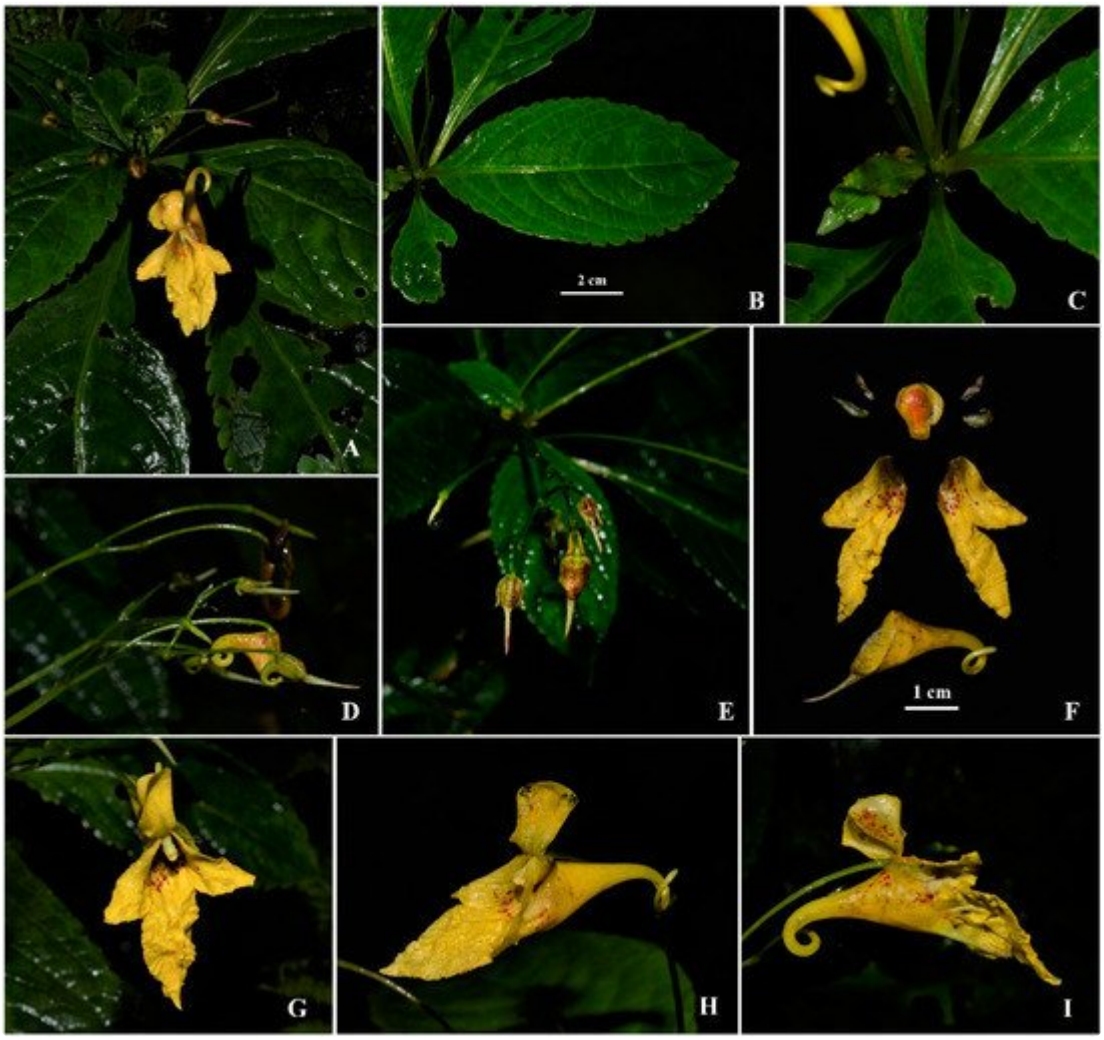

Figure 1. *Impatiens longiaristata* S. Peng, G. W. Hu & Q. F. Wang. (**A**) Habit, (**B**) Leaf, (**C**) Petiole, (**D**) Flower buds, (**E**) Inflorescence, (**F**) Flower anatomy, (**G**) Front view of flowers, (**H**,**I**) Lateral views of flowers (photographed by Shuai Peng).

Diagnosis: *Impatiens longiaristata* is similar to *I. longiloba* and *I. siculifer*, but can be distinguished by its lower sepal with a long arista (1 cm) appearance from the bud stage, spur curved downward or circinate, and lower petal that is oblong-elliptic, tip rounded, and two times longer than the upper petal.

Type: CHINA. Sichuan province, Shimian County, under a broad-leaved forest, 28°58′13″ N, 102°13′49″ E, elevation 2680 m, 1st September 2019, *Shuai Peng*, *Jia-Xin Yang* & *Jun-Jie Wang PS-0096* (holotype: HIB 0189503!; isotype: HIB 0189504!, 0189505!, 0189506!).

3. Discussion and Conclusions

Impatiens longiaristata is morphologically and phylogenetically allied to *I. longiloba* and *I. siculifer*. The information available about the distribution of the latter two species suggests that *I. longiloba* is endemic to the type locality in Thailand and that *I. siculifer* is distributed in southwest China [9][10] and Vietnam [31]. Morphologically, all three have a similar type of inflorescences (racemose), the color of flowers (yellow with red spots), and the shape of lower sepals (funnelform). However, *I. longiaristata* can be easily distinguished from these two allied species by its long arista of the lower sepal, the shape of the spurs, and the lateral united petals (**Figure 1**). The lower sepal has an arista ca. 1 cm long at the apex of the mouth in *I. longiaristata*, while it is shortly rostellate or aristate (no more than 5 mm) in *I. siculifer* and apiculate in *I. longiloba*. The spur is curved downward or circinate in *I. longiaristata*, while it is curved upward in *I. siculifer* and slightly curved at the tip in *I. longiloba*. The lateral united petals of *I. longiaristata* are ca. 3 cm long, the upper petal is triangular and semi-circular, and the lower petal is oblong-elliptic, tip rounded, ca. 1.8 cm long, and two times longer than the upper petal, whereas in *I. siculifer* the lateral united petals are ca. 1.8 cm long, the upper petal is subtriangular, and the lower petal is lorate with an acuminate tip, and in *I. longiloba* the lateral united petals are ca. 2.5 cm long and the lower petal is lorate, elongate, and four times longer than the upper petal. The lateral veins of leaves are 5–7 pairs in *I. longiaristata*, but they are 10–12 pairs in *I. longiloba* and 5–11 pairs in *I. siculifer*. The lateral sepals are two pairs in *I. longiaristata* and *I. longiloba*, but just a pair in *I. siculifer*. The detailed morphological comparisons between new species and allied species are shown in **Table 1**. The results of the BI and ML analyses showed that these three species were in a well-supported clade (PP = 0.99 and BP = 85), in which *I. longiaristata* and *I. longiloba* formed a highly supported clade (PP = 1.00 and BP = 100) with *I. siculifer* forming a sister clade. It was also noted that *I. longiaristata* was morphologically closer to *I. longiloba* than to *I. siculifer* (**Table 1**).

Table 1. Morphological comparisons of *Impatiens longiaristata*, *I. longiloba*, and *I. siculifer*.

Characters	*I. longiaristata*	*I. longiloba*	*I. siculifer*
Lamina shape	obovate, elliptic, or elliptic-lanceolate	oblong-elliptic	ovate-lanceolate or elliptic-lanceolate
Lamina size	8–13 × 3–6.5 cm	3–11 × 1.2–5 cm	5–13 × 2.5–5 cm
Lateral veins	5–7 pairs	10–12 pairs	5–11 pairs
Length of peduncle	6.2–8.3 cm	3–5 cm	5.5–7 cm
Number of flowers	3–5	2–4	5–8
Bracts	caducous	caducous	persistent
Number of lateral sepals	4 (2 pairs)	4 (2 pairs)	2 (1 pair)

Characters	*I. longiaristata*	*I. longiloba*	*I. siculifer*
Arista of lower sepal	aristate at apex of mouth, arista ca. 1 cm long in bud and mature flower	shortly apiculate	shortly rostellate or aristate at apex of mouth
Shape of spur	curved downward or circinate	slightly curved at tip	curved upward
Length of lateral united petals	ca. 3 cm long	ca. 2.5 cm long	ca. 1.8 cm long
Shape of lower petal	oblong-elliptic, tip rounded, 2 times longer than the upper petal	lorate, 4 times longer than the upper petal	lorate, tip acuminate

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