
Impatiens cornutisepala (Balsaminaceae), a New Species from Guangxi, China

Sheng-xiang Yu,^{1,2} Xiu-ren Zhou,³ Yi-ling Chen,¹ and Hai-ning Qin^{1*}

¹State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, People's Republic of China. *Corresponding author: hainingqin@ibcas.ac.cn

²Graduate School of Chinese Academy of Sciences, Beijing, 100039, People's Republic of China

³Department of Life Science and Technology, Henan Institute of Science and Technology, Henan, 453002, People's Republic of China

ABSTRACT. A new species from Guangxi Province, *Impatiens cornutisepala* S. X. Yu, Y. L. Chen & H. N. Qin, is described for the Balsaminaceae in China. It is similar to *I. dicentra* Franchet ex Hooker f. in the 1-flowered peduncle and the lobes of the lateral united petals that are terminated by a long filamentous bristle. However, the new species differs from the latter in its narrowly elliptic to oblanceolate leaf blade, the smaller lateral sepals with entire margins and a prominent green cornute appendage dorsally, the spur of the lower sepal that is entire at the tip, and its differing leaf epidermis micromorphology. The micromorphology of seeds and pollen under SEM is presented.

Key words: Balsaminaceae, China, Guangxi, *Impatiens*, IUCN Red List.

The genus *Impatiens* L. belongs to the family Balsaminaceae, which contains two currently recognized genera, the small *Hydrocera* Blume and the prolific *Impatiens*. This genus contains about 850 species (Grey-Wilson, 1980; Fischer, 2004) distributed mainly in the Old World, throughout much of tropical Africa (including Madagascar), India, southwestern Asia, southern and central China, and Japan. There are also a few species that extend into the northern temperate zones of Europe and North America (Grey-Wilson, 1980).

In the last floristic treatment of *Impatiens* in China (Chen, 2001; Chen et al., 2008), 220 species were recognized, the majority from southwestern China in Yunnan, Sichuan, Guizhou, Xizang (Tibet), and Guangxi. Since 2001, several new species and varieties have been published from Yunnan, Guangxi, and Zhejiang (Jin & Ding, 2002; Huang et al., 2003; Yu et al., 2007). However, the high diversity and insufficient fieldwork on *Impatiens* suggest that additional new species await discovery.

The first author carried out numerous field explorations in southern China from 2004 to 2007.

The species described here was confirmed as new after detailed comparison with previously described species.

Impatiens cornutisepala S. X. Yu, Y. L. Chen & H. N. Qin, sp. nov. TYPE: China. Guangxi: Quanzhou Co., Jiaojiang, in valley near river, 25°30'49"N, 110°55'17"E, ca. 1000–1300 m, 6 Oct. 2006, S. X. Yu 4023 (holotype, PE; isotype, IBK, MO). Figure 1.

Species ob pedunculum uniflorum et lobulos petalorum lateralium connatorum apice in trichomata longa desinentes *Impatiens dicentrae* Franchet ex Hooker f. similis, sed ab ea foliis anguste ellipticis vel obovato-ellipticis, sepalis lateralibus parvis margine integris dorsaliter appendicibus corniformibus viridibus praeditis atque calcaris apice integro differt.

Annual herb, (30–)60–80 cm tall, glabrous; stems erect, branched, lower nodes swollen with numerous fibrous roots. Leaves submembranous, alternate, petiolate or uppermost sessile; petiole 0.5–2 cm; leaf blades narrowly elliptic to oblanceolate, 12–15 × 3–5 cm, apex acuminate to cuspidate, base orbicular to cordate, with many stipitate glands scattered at the base, margin crenate, teeth mucronate, lateral veins in 5 to 7 pairs, arcuate, midvein abaxially prominent. Inflorescence in upper leaf axils, solitary, 1-flowered, peduncles 2–3 cm, glabrous, bracteate above middle; bracts solitary, elliptic-ovate, 1–2 mm, entire, persistent. Flowers yellow, 4–5 cm; lateral sepals 2, ovate, 4–5 × 2–3 mm, apex acuminate, dorsally with a green spinelike appendage 2–3 mm, base with reddish patches; lower sepal infundibuliform, ca. 2 cm, mouth truncate, apex acute, reddish striate, base gradually narrowed into spur; spur 1–1.5 cm, incurved, apex not bilobed; dorsal petal reniform, 1.2–1.5 × 1.8–2 cm, base truncate, apex curved abaxially to a cusp, dorsally with a green mucro ca. 5 mm, abaxially with a green spinelike crest or appendage ca. 5 mm, base with reddish patches; lateral united petals not clawed,

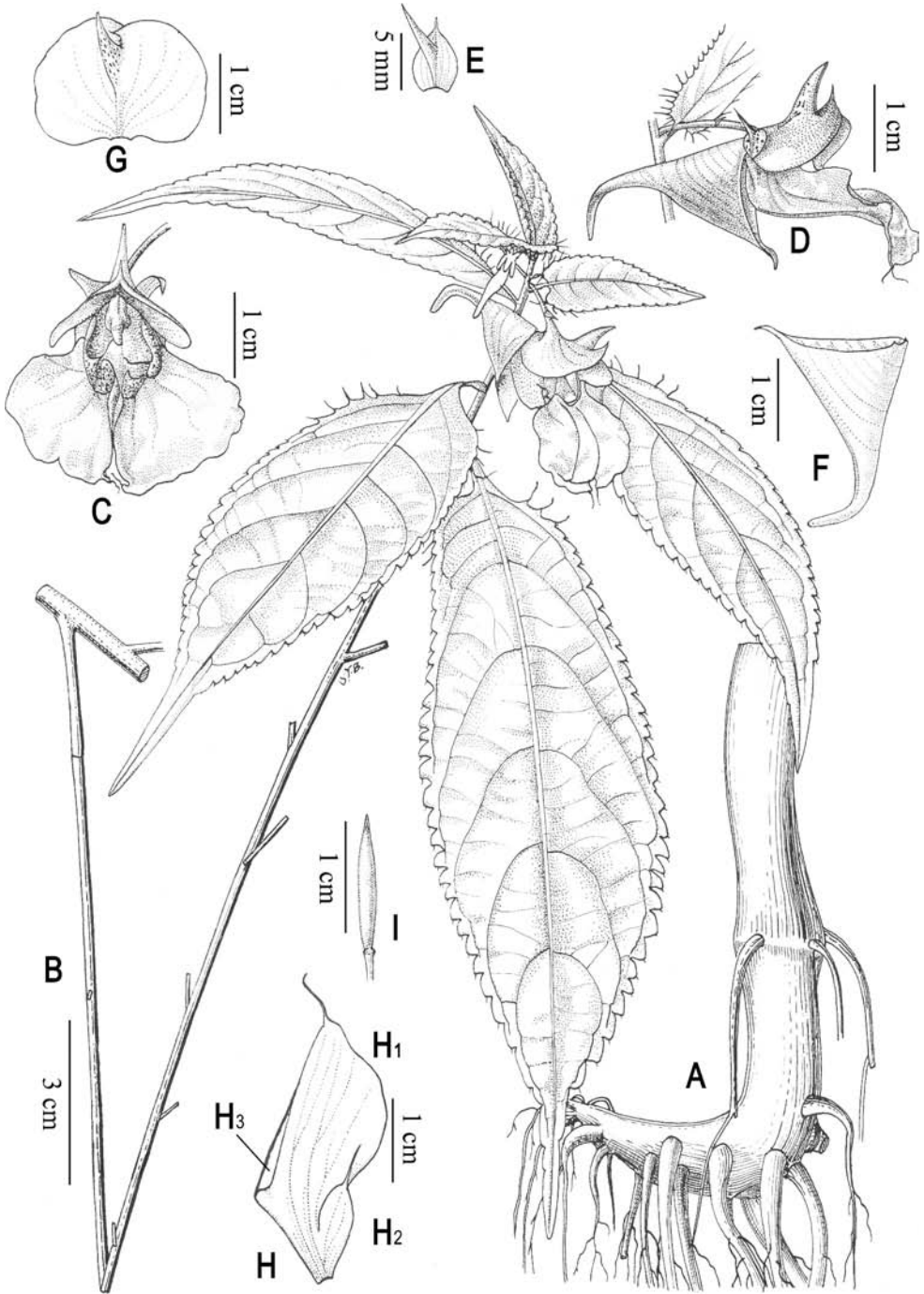


Figure 1. *Impatiens cornutisepala* S. X. Yu, Y. L. Chen & H. N. Qin. —A. Root. —B. Flowering branch. —C. Flower (front view). —D. Flower (lateral view). —E. Lateral sepal. —F. Lower sepal. —G. Dorsal petal. —H. Lateral united petals: H1, lower petal of lateral united petals; H2, upper petal of lateral united petals; H3, auricle. —I. Fruit. Drawn by Y. B. Sun from the holotype S. X. Yu 4023 (PE).

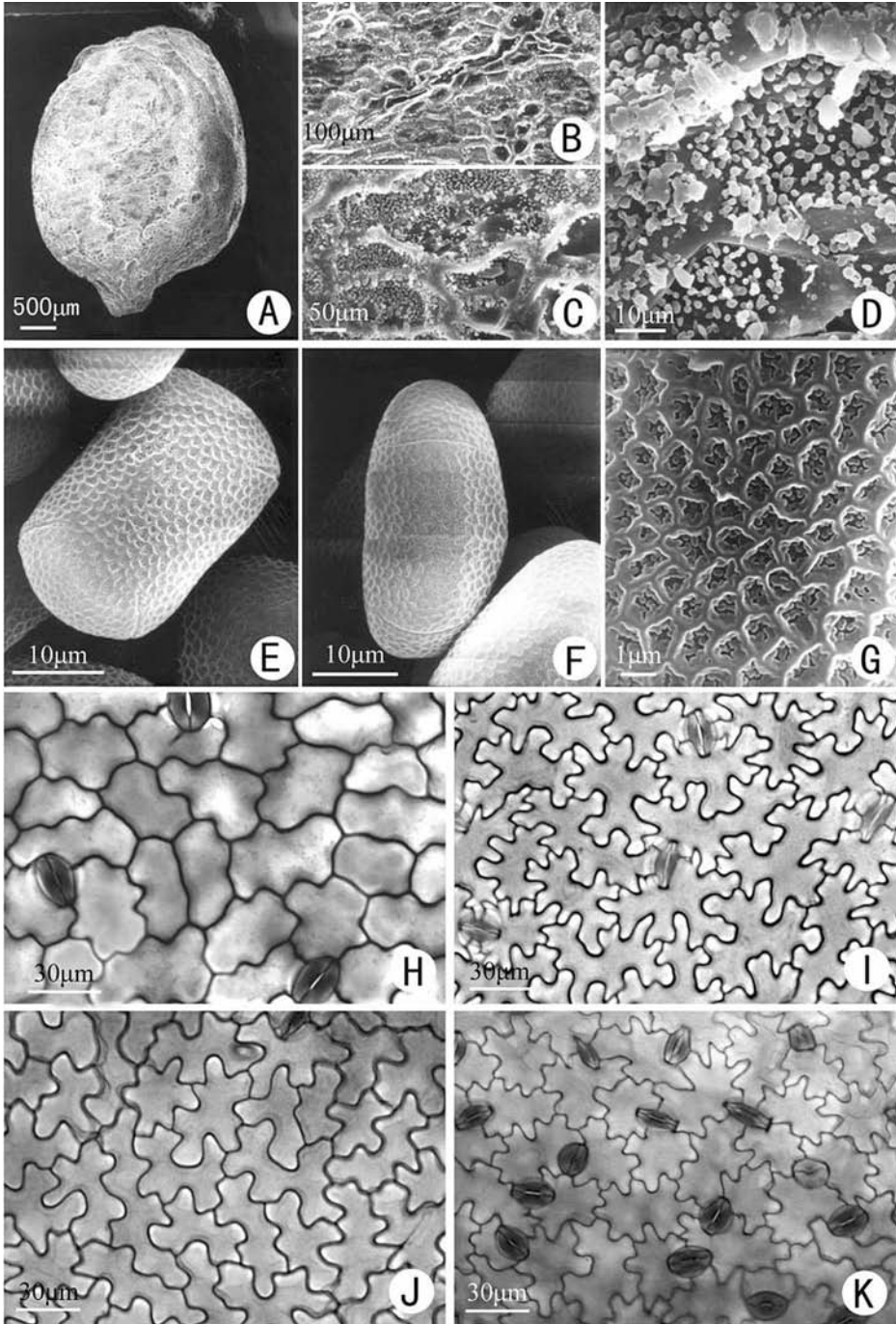


Figure 2. A–I. *Impatiens cornutisepala* S. X. Yu, Y. L. Chen & H. N. Qin. A–D. SEM images of seeds. —A. Entire view to show the shape of the seed. —B, C. Partial view to show the reticulate ornaments. —D. Partial view to show the ornaments in the lumina. E–G. SEM images of pollen grains. —E. Polar or short equatorial view to show the shape of the pollen grain and its four colpi. —F. Long equatorial view to show the shape of the pollen grain. —G. Partial view to show the reticulate ornaments. H, I. Light photomicrographs of epidermis cells. —H. Adaxial epidermis to show the cells and stomata. —I. Abaxial epidermis to show the cells and stomata. J, K. *Impatiens dicentra*, light photomicrographs of epidermis cells. —J. Adaxial epidermis to show the cells and stomata. —K. Abaxial epidermis to show the cells and stomata. A–I from S. X. Yu 4023 (PE); J, K from S. X. Yu 4093 (PE).

ca. 2 cm, 2-lobed; upper petal of the lateral united petals ovate-lanceolate, 5–7 mm, upper part with reddish patches, apex acuminate into long filamentous trichomes; lower petal dolabriform, 1.2–1.5 cm, incurved, inner margin curled, with small auricle, apex abruptly narrowed into long filamentous trichomes; stamen filaments, 2–3 mm linear; anthers small, ca. 5 mm, apex obtuse; ovary 4–5 mm, fusiform, erect, apex acuminate, glabrous. Capsule 2–2.5 cm, cylindrical, many-seeded, acuminate, glabrous; seeds ca. 3.33×2.83 mm, with a length:width ratio of 1.18, orbicular-ovoid, brown, obviously reticulate (Fig. 2A–D).

Pollen grains (P [polar length] \times E1 [long equatorial length] \times E2 [short equatorial length]) $14.3(13.8\text{--}14.6) \times 27.8(27.2\text{--}28.1) \times 16.7(16.3\text{--}17.5)$ μm , tetracolpate, colpi long, thin, exine with reticulate ornamentation, dense granules in lumina (Fig. 2E–G).

Distribution and ecology. *Impatiens cornutisepala* is endemic to northeastern Guangxi Province, China, recorded so far only from Quanzhou County. The plants were found in a moist valley in Jiaojiang village from 1000–1300 m elevation, in association with *Pilea* Lindley, *Elatostema* J. R. Forster & G. Forster, *Carex* L., an unidentified bamboo species, and other grasses.

IUCN Red List category. The population covers an area of about 1000 m² and includes approximately 500 to 600 individuals. According to IUCN Red List criteria (IUCN, 2001), *Impatiens cornutisepala* should be categorized as Critically Endangered (CR).

Phenology. The new species was observed in flower from July to October and in fruit from August to November.

Etymology. The specific epithet *cornutisepala* is from the Latin and refers to the lateral sepals with their green cornute appendages.

Leaf anatomy. The leaf epidermis of the two species, *Impatiens cornutisepala* (Fig. 2H, I) and *I. dicentra* Franchet ex Hooker f. (Fig. 2J, K), are both irregular, with stomata on both sides of the leaf. The stomata are anomocytic, and the guard cell outlines are suborbicular. However, the anticlinal walls of the adaxial epidermis differ: wavy or sinuous in *I. cornutisepala*, but with deeper crenulations in *I. dicentra*. In contrast, on the abaxial epidermis, the cell walls of the two species both seemed deeply crenulate, but the stomatal density (SD) and stomatal index (SI) (Dilcher, 1974) differ: *I. cornutisepala*: SI (adaxial epidermis) = 7.32%–9.46%, SI (abaxial epidermis) = 17.84%–22.4%; *I. dicentra*: SI (adaxial

epidermis) = 2.61%–4.27%, SI (abaxial epidermis) = 33.72%–38.41%.

Taxonomic relationships. *Impatiens cornutisepala* is morphologically similar to *I. dicentra* in its single-flowered peduncles and in the lobes of the lateral united petals that are tipped by long hairlike processes. However, the two species differ in the narrowly elliptic to oblanceolate leaves (vs. ovate to ovate-lanceolate in *I. dicentra*), smaller lateral sepals (4–5 \times 2–3 mm) with entire margins and conspicuous dorsal spinelike appendages (vs. larger sepals [7–9 \times 5–6 mm] with crenate margins and no dorsal spinelike appendages in *I. dicentra*), and the spur of the lower sepal that is entire at the tip (vs. bilobed in *I. dicentra*).

Three species, *Impatiens macrovexilla* Y. L. Chen, *I. siculifer* Hooker f., and *I. cyanantha* Hooker f., are sympatric in Guangxi Province with *I. cornutisepala*. These four species are readily distinguished by their reproductive and vegetative characters in the following key.

KEY TO FOUR SPECIES OF *IMPATIENS* IN GUANGXI PROVINCE, CHINA

- 1a. Inflorescences in upper leaf axils, 1- to 2-flowered, flowers red or yellow 2
- 1b. Inflorescences in upper leaf axils, racemes, 5- to 7-flowered, flowers yellow or purple 3
- 2a. Flowers yellow, apices of lateral united petals with trichomes *I. cornutisepala*
- 2b. Flowers yellow, apices of lateral united petals entire *I. macrovexilla*
- 3a. Flowers golden yellow, lower sepal narrowly funnelliform *I. siculifer*
- 3b. Flowers purple, lower sepal widely funnelliform *I. cyanantha*

Paratypes. CHINA. **Guangxi:** Quanzhou Co., Jiaojiang, in valley near river, ca. 1200 m, 18 Nov. 2007, W. B. Xu 200711183a (IBK, MO).

Acknowledgments. We express our thanks to Magnus Lidén for checking the English in an earlier version of the manuscript, Y. H. Xiao for assistance with SEM imaging, and Y. B. Sun for the illustration. This work was supported by the National Basic Research Program of China (973 Program; 2006CB403207-2b).

Literature Cited

Chen, Y. L. 2001. Balsaminaceae. Pp. 1–4, 36–39 in Y. L. Chen (editor), *Flora Reipublicae Popularis Sinicae*, Vol. 47(2). Science Press, Beijing.

———, S. Akiyama & H. Ohba. 2008. Balsaminaceae. Pp. 43–113 in Z. Y. Wu & P. H. Raven (editors), *Flora of China*, Vol. 12. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.

Dilcher, D. L. 1974. Approaches to the identification of angiosperm leaf remains. *Bot. Rev.* 40: 1–157.

-
- Fischer, E. 2004. Balsaminaceae. Pp. 20–25 in K. Kubitzki (editor), *The Families and Genera of Vascular Plants*, Vol. 6. Springer, Berlin.
- Grey-Wilson, C. 1980. *Impatiens* of Africa. A. A. Balkema, Rotterdam.
- Huang, S.-H., Y.-M. Shui & W.-H. Chen. 2003. New taxa of *Impatiens* L. from Yunnan. *Act. Bot. Yunnan.* 25: 261–280.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- Jin, X.-F. & B.-Y. Ding. 2002. A new species of *Impatiens* from eastern Zhejiang, China. *Acta Phytotax. Sin.* 40(2): 167–169.
- Yu, S.-X., Y.-L. Chen & H.-N. Qin. 2007. *Impatiens macrovexilla* var. *yaoshanensis* S. X. Yu, Y. L. Chen & H. N. Qin, a new variety of Balsaminaceae from Guangxi, China. *Acta Phytotax. Sin.* 45(5): 708–712.