

Impatiens lobulifera (Balsaminaceae), a new species from limestone areas in Guangxi, China

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ABSTRACT. *Impatiens lobulifera* (Balsaminaceae), a new species from limestone areas in southwestern Guangxi Zhuangzu Autonomous Region, China, is described and illustrated. The characters of its seed micro-morphology and pollen morphology under SEM are given. It is similar to *I. verrucifera* in having succulent stems, peduncles 4-5 mm long, tufted pedicels and connate distal lobes of lateral united petals, but differs in having ovate or ovate-orbicular leaf blades, 4-5-flowered peduncle, yellow-green flowers, outer lateral sepals ovate-orbicular, inner lateral sepals ovate-lanceolate and topped with four finger-like lobes.

Key words: Balsaminaceae; China; Guangxi; *Impatiens lobulifera*; *Impatiens morsei*; *Impatiens musyana*; *Impatiens verrucifera*; Limestone areas; New species; Pollen morphology; Rare species; Seed morphology.

INTRODUCTION

The genus *Impatiens* L., belonging to Balsaminaceae, contains about 900 species (Grey-Wilson, 1980), and has about 240 species in China (Chen, 2001; Chen et al., 2008). It is mainly distributed in the Old World, ranging from tropical Africa, India, south-western Asia, southern China to Japan, with a few species spreading into Europe, Siberia, northern China, and North America (Grey-Wilson, 1980). A molecular study suggests that extant *Impatiens* species originate from the Southeast Asia, and then disperse to boreal Eurasia and North America, to central Asia and Eastern Europe via the Himalayas, and to India and Africa (Chen, 2001; Yuan et al., 2004). From 2004 to 2006, the first author, S. X. Yu, had conducted extensive field investigations on the genus in Guangxi, southern China. A new species is ascertained after a careful comparison with its closely related species in southern China and Vietnam. Seed coat micro-morphology and pollen morphology generate useful taxonomic characters to the genus. Four types were recognized in seed coat micro-morphology (Song et al., 2005; Janssens et al., 2005). Micro-morphological characters of seed and pollen using SEM (scanning electron microscopy) were presented for detailed comparison in addition to morphology. The new species is described here.

NEW SPECIES

Impatiens lobulifera S. X. Yu, Y. L. Chen & H. N. Qin, sp. nov. — TYPE: China. Guangxi Zhuangzu Autonomous Region, Baise Shi, Napo Xian, Pingmeng Xiang, Nianjing Cun, 23°00'29.6" N, 105°52'24.9"E, alt. ca. 800 m, shady places in limestone areas, 30 Aug 2004, S. X. Yu 3220 (holotype: PE, here designated; isotype: IBK). 裂萼鳳仙花 Figures 1 & 2

Affinis I. verruciferae Hook. f., sed foliorum lamina ovatis vel ovato-orbiculatis, pedunculis 4-5 mm longis, 4-vel 5-floris, floribus flavo-virentibus, sepalis lateralibus exterioribus ovato-orbiculatis, conchatis, interioribus ovato-lanceolatis, apice 4-lobatis digitiformibus differt.

Herbs perennial, 50-70 cm tall. Stems succulent, glabrous, erect, often branched in the upper part. Leaves alternate, aggregated towards the end of stems. Petioles 2-3 cm long, bearing two big glands close to the base of the blades. Blades 8-11 cm long, 5-7 cm wide, ovate or ovate-orbicular; lateral veins 7-9 pairs; crenate-serrate, with simple narrow teeth; apex acute, base cuneate. Inflorescences in upper axils, 4- or 5-flowered; peduncles ca. 4-5 mm long. Bracts ca. 2 mm long, ovate-lanceolate, inconspicuous. Pedicels 2-2.5 cm long, slender, glabrous. Flowers yellow-green. Lateral sepals 4, the outer pair 1.8-2 cm long, 1.5-1.7 cm wide, ovate-orbicular, conchate, 9-veined, apex mucronate; inner lateral sepals 2-3 mm long, ovate-lanceolate, topped with four finger-like lobes. Lower sepal ca. 2.5 cm long, 1 cm deep excluding spur,

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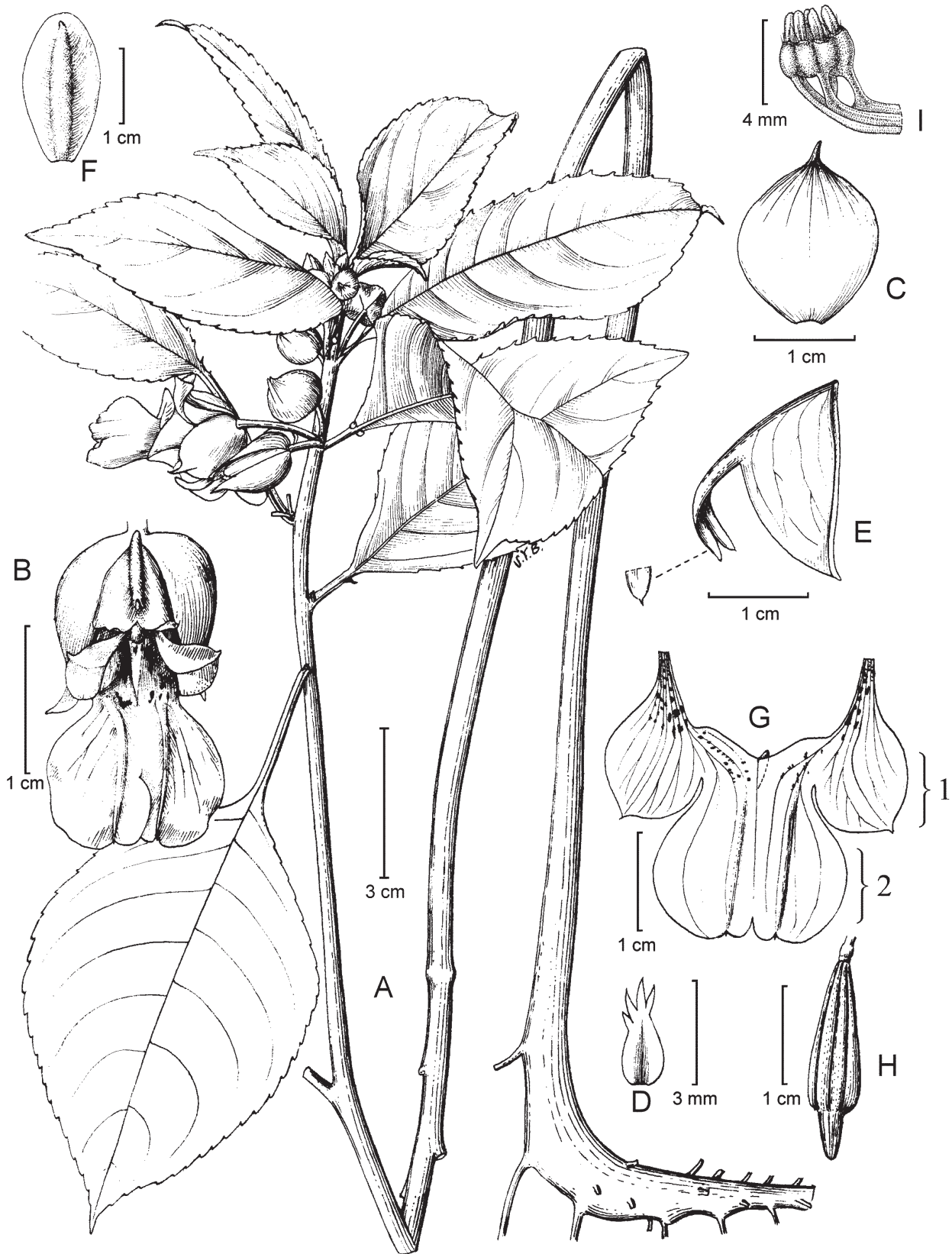


Figure 1. *Impatiens lobulifera* S. X. Yu, Y. L. Chen & H. N. Qin. A, Habit; B, Flower (face view); C, Outer lateral sepal; D, Inner lateral sepal; E, Lower sepal; F, Dorsal petal; G, Lateral united petal, 1: basal lobe, 2: distal lobe; H, Fruit; I, Androecium. Drawn by Y. B. Sun from S. X. Yu 3220 (holotype, PE).

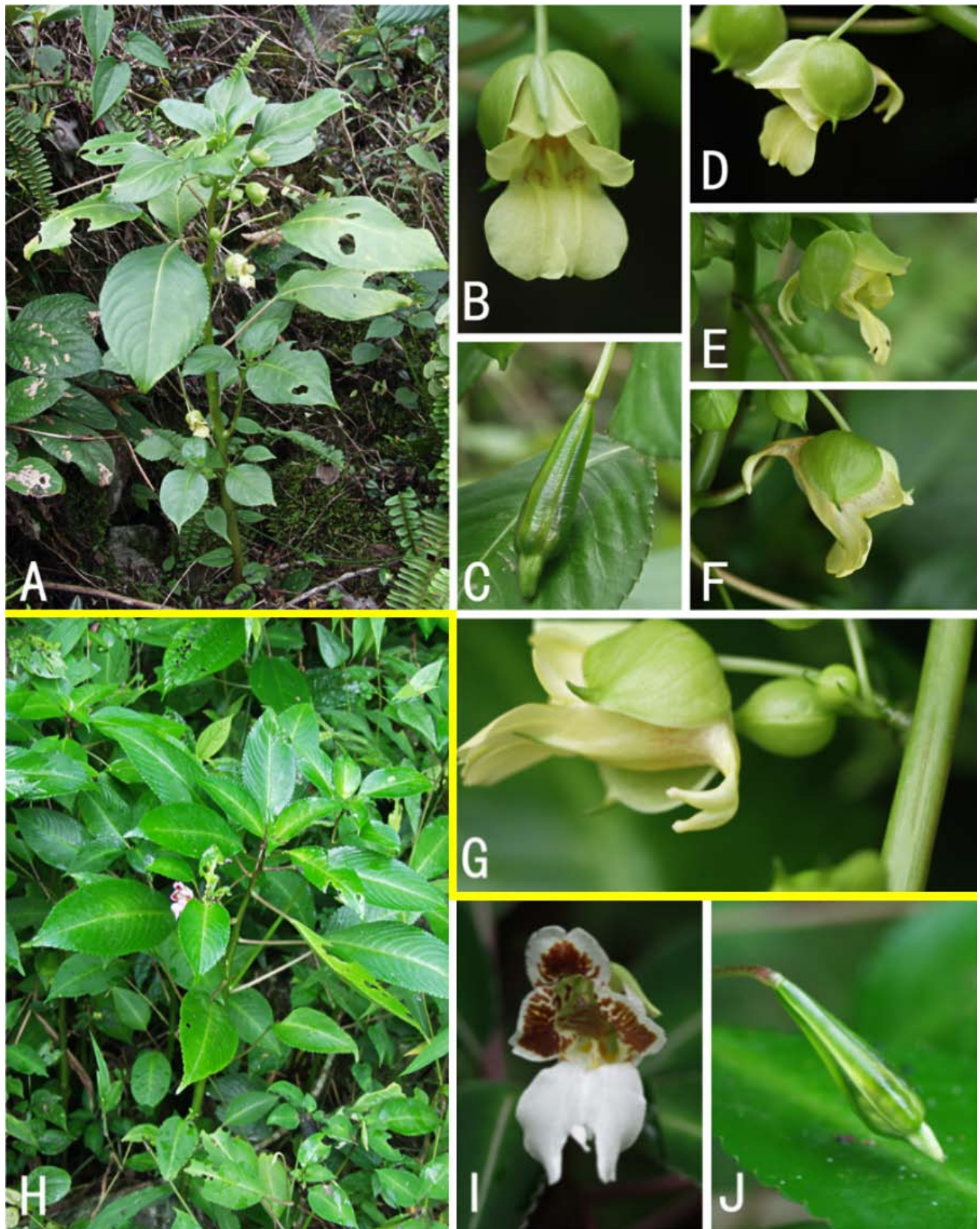


Figure 2. *Impatiens lobulifera* (A-G) and *I. morsei* (H-J). A, Habit; B, Flower, face view; C, Fruit; D-G, Flower, different views; H, Habit; I, Flower; J, Fruit.

infundibuliform, base abruptly constricted into a spur, spur 1.3-1.5 mm long, incurved, bilobed to the middle, mucronate. The dorsal petal ca. 1.6-1.8 cm long, 0.8-1 cm wide, elliptic or ovate-elliptic, apex mucronate, with a narrow crest abaxially. Lateral united petals 2.5-3 cm long, 2-lobed, basal lobe 2-2.2 cm long, 1.2-1.3 cm wide, shortly stalked, ovate-orbicular, with a mid-vein ending in a conspicuous mucro; distal lobe dolabriform, ca. 1.8 cm long, ca. 8 mm wide, obovate-oblong, with a mid-vein ending in a mucro, connected with each other in a piece of lamella. Stamens 5; filaments 5-6 mm long, flat; anthers obtuse. Ovary fusiform, glabrous. Capsule clavate, glabrous, ca. 2 cm long, apex abruptly pointed. Seeds quadrate-elliptic, ca. $2.64 (2.49-2.76) \times 2.08 (1.93-2.20)$ mm, densely covered with spiral vessel-shaped hairs and obvious longitudinal grooves along the raphes, hilum prominent (Figure 3A, B & C). Ratio of L/W (length/width) ca. 1.28. Pollen grains oblong in polar view, ca. $22.12 (21.63-23.70) \times 45.82 (43.98-46.17) \times 18.33 (17.56-19.64)$ μm , covered with reticulate sculpture (Figure 4A, B & C).

Additional specimens examined. CHINA. Guangxi Zhuangzu Autonomous Region, Baise Shi, Napo Xian, Pingmeng Xiang, Nianjing Cun, 2 Oct 2000, Y. F. Deng 15487 (PE).

Ecology. *Impatiens lobulifera* grows sparsely at ca. 800

m altitude in small populations, and is confined to shady places in limestone slopes under broadleaved forests near villages.

Distribution. Southwestern Guangxi, China (Figure 5).

Phenology. Flowering March to April; fruiting April to May.

Notes. *Impatiens lobulifera* is very special for its ovate-lanceolate inner lateral sepals that are topped with 4 finger-shaped lobes. This new species is similar to *I. verrucifera* in having succulent stems, connate distal lobes of lateral united petals and 4-carpellate ovary. It differs from *I. verrucifera* in having yellow green flowers (vs. pink flowers), with inner lateral sepals (vs. without inner lateral sepals), 4-5-flowered inflorescences (vs. 1- or 2-flowered inflorescences). *Impatiens musyana* and *I. morsei*, confined to limestone habitat in Vietnam and South China respectively, also resemble *I. lobulifera* in morphology (Hooker, 1908; Tardieu, 1944). Reproductive and vegetative characters of *Impatiens lobulifera*, *I. morsei*, *I. musyana* and *I. verrucifera* are compared in Table 1.

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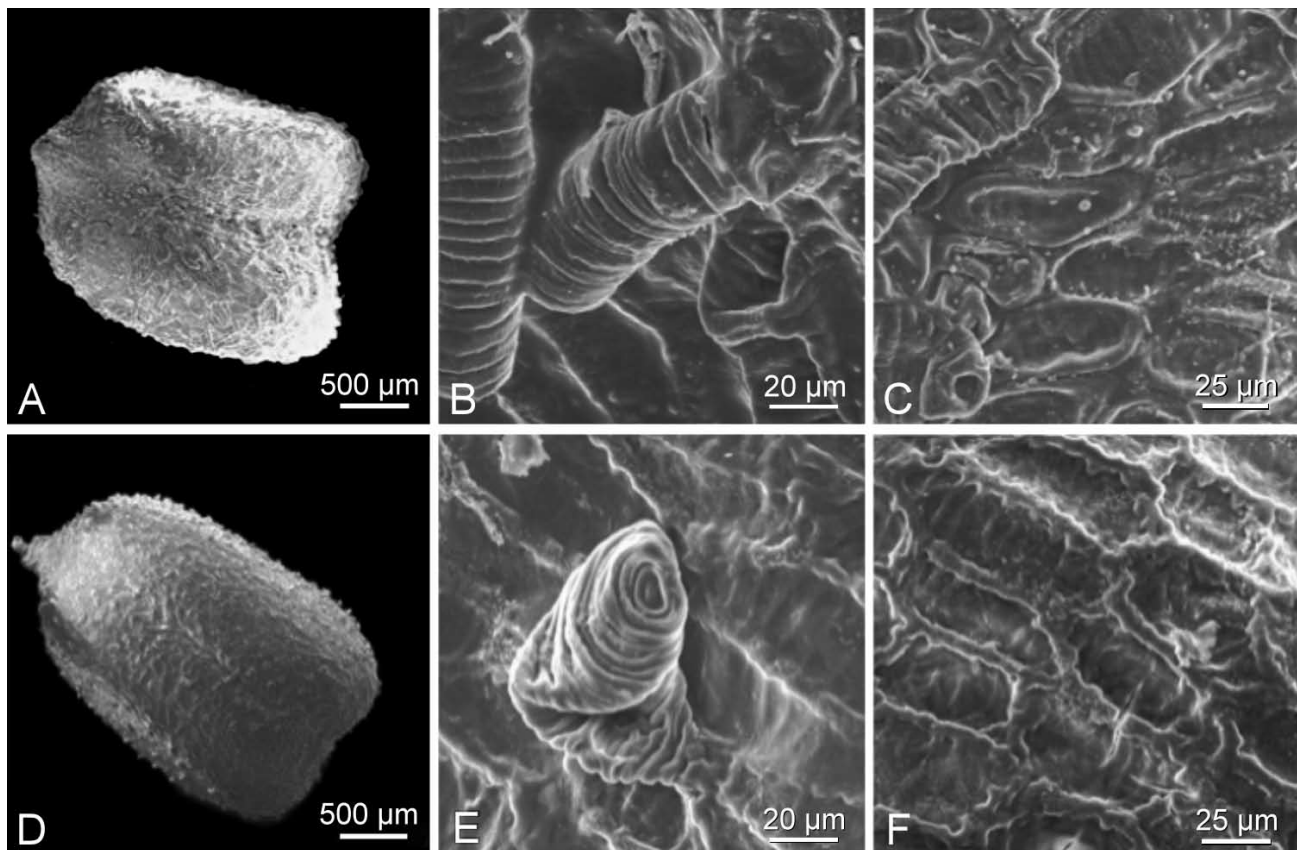


Figure 3. Seed SEM microphotographs of *Impatiens lobulifera* (A-C) and *I. morsei* (D-F). A, D, General view; B, C, E, F, Partial view. Voucher specimens: *I. lobulifera*, S. X. Yu 3220 (PE); *I. morsei*, S. X. Yu 3087 (PE).

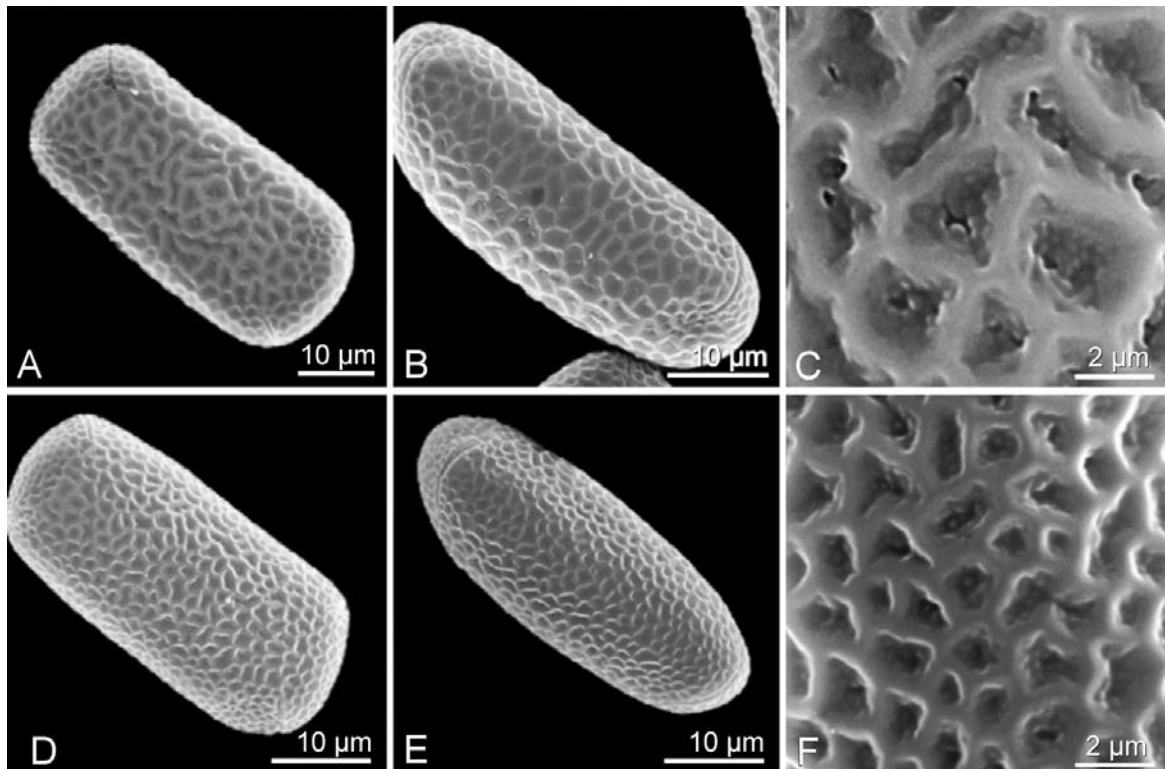


Figure 4. Pollen grain SEM microphotographs of *Impatiens lobulifera* (A-C) and *I. morsei* (D-F). A, D, Polar view; B, E, Long equatorial view; C, F, Exine sculpture. Voucher specimens: *I. lobulifera*, S. X. Yu 3220 (PE); *I. morsei*, S. X. Yu 3087 (PE).

Table 1. Comparison among *Impatiens lobulifera*, *I. morsei*, *I. musyana* and *I. verrucifera*.

Characters	<i>I. lobulifera</i>	<i>I. morsei</i>	<i>I. musyana</i>	<i>I. verrucifera</i>
Leaf shape	Ovate or ovate-orbicular	Elliptic or oblong-elliptic	Ovate- or oblong-lanceolate	Oblong-elliptic
Inflorescence	4 - or 5-flowered	1- or 2-flowered	1- or 2-flowered	1- or 2-flowered
Floral color	Yellow-green	Purple, white or yellow	Reddish-purple	Pink
Outer lateral sepals	Ovate-orbicular, conchate, apex mucronate	Oblique orbicular, apex acute	Ovate to ovate-orbicular, apex acute	Orbicular, apex apiculate
Inner lateral sepals	Ovate-lanceolate, apex with 4 finger-shaped lobes	Absent	Oblong, apex entire	Absent
Spur shape	Bifid	Shallowly bilobed	Bifid	Bifid
Seed shape	Quadrato-elliptic (Figure 3A)	Oblong-elliptic (Figure 3D)	Oblong	Oblong-globose
Seed size (L × W)	2.64 (2.49-2.76) × 2.08 (1.93-2.20) mm	2.89 (2.63-2.94) × 1.93 (1.78-2.14) mm	2 mm long	4 mm long
Seed surface	Dense spiral-vessel shaped hairs (Figure 3B)	Dense spiral-vessel shaped hairs (Figure 3E)	Laevigate	Dense hairs
Pollen size (P × E1 × E2)	22.12 (21.63-23.70) × 45.82 (43.98-46.17) × 18.33 (17.56-19.64) μm	18.96 (18.23-19.37) × 41.10 (38.92-42.39) × 15.8 (15.20-16.41) μm	Data not available	Data not available
Pollen sculpture	Reticulate, lumens bigger (Figure 4C)	Reticulate, lumens smaller (Figure 4F)	Data not available	Data not available



Figure 5. Distribution of *Impatiens lobulifera* (★) in China.

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中國廣西石灰岩地區鳳仙花屬一新種：裂萼鳳仙花

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本文報導了中國廣西壯族自治區西南部石灰岩地區的鳳仙花屬 (*Impatiens*) 一個新種：裂萼鳳仙花 (*I. lobulatifera*)；提供了線繪圖與彩色照片以資辨識；並報導其種皮和花粉微形態資料。該種在莖肉質、總花序柄 4-5 mm 長、花近簇生以及翼瓣的上部裂片相互聯合等特徵與具疣鳳仙花 (*I. verrucifera*) 略似；但裂萼鳳仙花葉卵形或卵圓形、總花柄具 4-5 花、花黃綠色、外面的側生萼片卵圓形、裏面的側生萼片卵狀披針形以及頂端具 4 個指狀的裂片可與之區別。

關鍵詞： 鳳仙花科；中國；裂萼鳳仙花；龍州鳳仙花；越南鳳仙花；具疣鳳仙花；石灰岩地區；新種；花粉形態；稀有植物；種皮微形態。