

Studies of *Impatiens* (Balsaminaceae) of Nepal 2. *Impatiens jurpia*, *I. urticifolia*, and Allied Species

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Abstract *Impatiens jurpia* Buch.-Ham. ex Hook.f. & Thomson, *I. discolor* DC., *I. urticifolia* Wall., *I. gamblei* Hook.f., *I. hobsonii* Hook.f., and *I. wallichii* Hook.f. are taxonomically revised and new section names, sect. *Jurpia* S.Akiyama & H.Ohba (*I. jurpia* and *I. discolor*) and sect. *Urticifoliae* S.Akiyama & H.Ohba (*I. urticifolia*, *I. gamblei*, *I. hobsonii*, and *I. wallichii*) are proposed. *Impatiens kathmanduensis* Grey-Wilson reported from Nepal is conspecific with *I. discolor*.

Key words: Flora of Nepal, Himalaya, *Impatiens*, Nepal, new section.

Hooker (1874–75) placed *Impatiens jurpia* in Series BIII *Axilliflorae* based on the following characters: ‘Leaves all alternate. Flowers in axillary 2–4-flowered peduncles, not umbelled or racemed.’ Within this series he included *I. discolor*, *I. spirifer*, *I. porrecta*, *I. scabrida*, *I. tro-paeolifolia*, *I. laevigata*, *I. cathcartii*, *I. serrata*, *I. longipes*, *I. urticifolia*, and *I. cymbifera* together with *I. jurpia*. Later, Hooker (1905) modified the system and recognized assemblages ‘I § 6, 8, and 9’ in Series B for the species of Series BIII *Axilliflorae*. Assemblages ‘I § 6 and 8’ do not fit the characters of Series BIII *Axilliflorae*, but ‘I § 9’ fits. In ‘I § 6’ Hooker included *I. prainii*, *I. nummularifolia*, *I. scitula*, *I. gamblei*, *I. wallichii*, and *I. hobsonii* of the eastern Himalaya from the Kathmandu Valley to Upper Assam (Mishmi Hills) and the Chumbi Valley together with the several species cited above. Among them, *I. jurpia*, *I. cymbifera*, *I. discolor*, *I. urticifolia*, *I. gamblei*, *I. wallichii*, and *I. hobsonii* are reported to occur in Nepal (Hara, 1979). We treat these 6 species, except *I. cymbifera*, in this paper, because of differences in the inflorescence, as

mentioned below.

1) Diversity of inflorescence types and chromosome numbers in the assemblage

As pointed out by Hooker (1905), the inflorescence is diverse in Himalayan *Impatiens*, but Hooker’s descriptions of the inflorescences is ambiguous. We studied the inflorescences to clarify their architecture and, as a result, recognize 9 types, mainly based on differences in the position of the bracts, the length and direction of the peduncles, rachise, and pedicels, and the number of flowers (Akiyama and Ohba, 2000). The species of Hooker’s assemblage ‘I § 6’ in Series B in Nepal, except for *I. cymbifera*, have type 2 (a and b) inflorescences, as defined by Akiyama and Ohba (2000). In *Impatiens*, the phylogenetic tree supports the evolutionary trends in inflorescence morphology, as well as the basic chromosome number (Fujihashi *et al.*, 2002).

Impatiens discolor was grouped in subclade B3 of clade B by Fujihashi *et al.* (2002), and *I. urticifolia* and *I. wallichii* in subclade A1 of clade A with species of inflorescence types 1 (a

and b), 3, and 6. For the species of Hooker's assemblage 'I § 6' in Series B in Nepal, except for *I. cymbifera*, with inflorescence type 2, two groups are recognized. One group contains only *I. discolor* with $2n=20$ chromosomes: the other group contains *I. urticifolia* and *I. wallichii* with $2n=18$ chromosomes. *Impatiens cymbifera*, grouped in clade A and located between subclades A1 and A2, has type 1a inflorescence. *Impatiens urticifolia* and *I. wallichii*, both belonging to clade A1, have inflorescence type 2 (a and b). Inflorescence type 1a is easily distinguished from inflorescence type 2. In Nepal there are several species of inflorescence type 1a. We believe that *I. cymbifera* should be treated with other species of inflorescence type 1a in clade A.

2) Taxonomic status of *Impatiens kathmanduensis* Grey-Wilson

Impatiens kathmanduensis (Grey-Wilson, 1989) has inflorescence type 2b, a bucciniform lower sepal (Fig. 1), and a dorsal petal with a crest-like appendage. Grey-Wilson (1989) distinguished *I. kathmanduensis* from *I. jurpia* by the presence of superfluous bracts below the lowest flower of the inflorescence, a short peduncle and a short appendage on the dorsal petal, but he did not directly compare *I. kathmanduensis* with the most closely related species, *I. discolor*, owing to the color difference of their flowers. Grey-Wilson (1989) reported the flowers of *I. jurpia* and its allies to be basically pale yellow or white and those of *I. discolor* basically mauve or purple. In the protologue the flowers of *I. discolor* are described as yellow [flores flavi] (de Candolle, 1824). We also observed the flowers of *I. discolor* in Nepal to be nearly pure white, sometimes shaded pink, and the lower sepal white, pale yellow or pale pink (Akiyama *et al.*, 1991).

Impatiens discolor has the lower sepal with abrupt constriction and a conspicuously incurved spur (Akiyama *et al.*, 1991). We observed specimens with the spur intermediate between *I. discolor* (Fig. 2c) and *I. kathmanduensis* (Fig. 2b). *Impatiens discolor* also has superfluous bracts below the lowest flower of the inflorescence, a

short peduncle and a short appendage on the dorsal petal. The type specimen of *I. discolor* in G has the apex of the spur of the lower sepal conspicuously incurved (Fig. 3).

We treat *I. kathmanduensis* as conspecific with *I. discolor*. Hooker's sketch of the flower together with a photocopy of the type of *I. discolor* and the corresponding letters of Hooker and de Candolle are on a herbarium sheet in K. Hooker's sketch of the lower sepal of the flower (Fig. 4) is most valuable in defining *I. discolor*.

3) Resemblance among the species

Impatiens jurpia (Figs. 5, 6) and *I. discolor* (including *I. kathmanduensis*) are similar in having a racemose inflorescence and a crest-like appendage on the dorsal petal, but they are distinguished by the shape of the spur of the lower sepal. *Impatiens jurpia* has a slightly incurved spur (Fig. 2a); the spur of *I. discolor* is conspicuously incurved overall or at the apex (Figs. 2b & c, 4).

Although no molecular or chromosomal evidence is available for *I. gamblei* and *I. hobsonii*, those two species have a similar dorsal petal without a crest-like appendage, as in *I. urticifolia* and *I. wallichii*. Hooker (1905) distinguished these four species by the shape of the lower lobe of the lateral united petals, i.e. dolabriform (*I. wallichii* and *I. hobsonii*) or loriform (*I. urticifolia* and *I. gamblei*). *Impatiens hobsonii* (Fig. 7) and *I. gamblei* (Fig. 8) are extremely difficult to distinguish on herbarium specimens, because the shape and size of the lower lobe of the lateral united petals is almost impossible to determine owing to the poor condition of the specimens. Grey-Wilson (1991) treated those two species as synonyms of *I. kingii*, which is in Bhutan and Sikkim. The shape of the lower sepal with spur of *I. hobsonii* (Fig. 9b) is similar to that of *I. gamblei* (Fig. 9d). As pointed out by Hooker (1905), the shape of the lower lobe of the lateral united petals of *I. wallichii* is dolabriform (Fig. 10d) while that of *I. urticifolia* (Akiyama *et al.*, 1991) and *I. gamblei* is loriform (Fig. 10j, q). Although we have no material of *I. hobsonii* to



Fig. 1. Holotype of *Impatiens kathmanduensis* Grey-Wilson (Schilling 1971, K).



Fig. 2. Lower sepals of *Impatiens* (1). a: *I. jurpia* (Brühl in 1903, E). b: *I. discolor* (*I. kathmanduensis*) (Taylor 10 in Grey Wilson 4695, E). c: *I. discolor* (Ohba *et al.* 8520262) (Akiyama *et al.*, 1991). Bar indicates 10 mm.

examine the lateral united petals, at present we follow Hooker (1905) and treat *I. hobsonii* and *I. gamblei* as distinct species because of the differences in the shape of the lower lobe of the lateral united petals. To determine the stability and variation in floral features, further specimens of good quality collected at numerous localities are needed.

Impatiens wallichii is characterized by the S-shaped spur of the lower sepal and lack of an elongate tip at the oblique mouth (Figs. 9a, 10a–f, 11). *Impatiens urticifolia* is characterized by the lower sepal with an elongate tip at the vertical mouth and a forwardly incurved spur (Figs. 9c, 12).

4) Infrageneric treatment

We concluded that the Nepalese species in this assemblage (i.e. *I. jurpia*, *I. discolor*, *I. urticifolia*, *I. gamblei*, *I. wallichii*, and *I. hobsonii*), except *I. cymbifera*, constitute two natural groups distinguished from sect. *Axilliflorae*, which we name here sect. *Jurpia* (nov.), including *I. jurpia* and *I. discolor*, and sect. *Urticifoliae* (nov.), including *I. urticifolia*, *I. gamblei*, *I. wallichii*, and *I. hobsonii*. As pointed out in the introduc-

tion, Hooker's assemblages 'I § 6 and 8' do not fit the characters of Series BIII *Axilliflorae*.

[Systematic treatment]

Impatiens L. sect. *Jurpia* S.Akiyama & H. Ohba, sect. nov.

Type: *I. jurpia* Buch. Ham. ex Hook.f. & Thomson

Impatiens sect. *Brachycentron* Warb. subsect. *Epiphyticae* Warb. & Reiche in Engl. & Prantl, Pflanzenfam., 3, 5: 391 (1895), pro parte.

Impatiens sect. *Axilliflorae* (in Series B) Hook. f., Fl. Brit. Ind. 1: 471 (1874), pro parte.

Impatiens sect. *Scorpioid-cyma* S.X.Yu, Balsaminaceae China: 66 (2012), nom. nud., versim. pro parte.

Inflorescences pendulous, racemose, with few to many flowers [Type 2a and 2b (Akiyama and Ohba, 2000)]. Leaves alternate. Flowers yellow or whitish with reddish to yellowish spur; lower sepal bucciniform; dorsal petal with crest-like appendage.

Distr. E Himalaya.

Species: *I. discolor* DC. and *I. jurpia* Buch.-Ham. ex Hook.f. & Thomson (type).

Key to the species of sect. *Jurpia* in Nepal

- 1a. Spur of lower sepal slightly incurved overall; crest-like appendage of dorsal petal (4–)6–16 mm long..... 1. *I. jurpia*
- 1b. Spur of lower sepal conspicuously incurved at apex or overall; crest-like appendage of dorsal petal 3–6 mm long..... 2. *I. discolor*



Fig. 3. Holotype of *Impatiens discolor* DC. (Wallich s.n., G00218031).

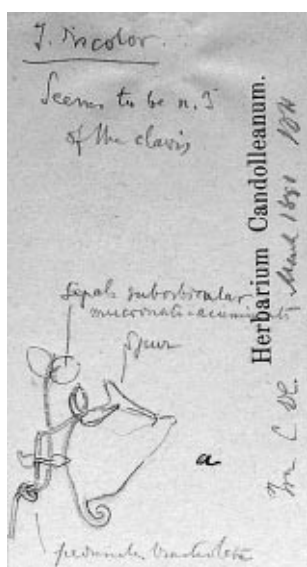


Fig. 4. Hooker's sketch of the lower sepal of the flower of the type of *Impatiens discolor* DC.

1. *Impatiens jurpia* Buch.-Ham. in Wall. [Cat. 168, n. 4761 (1831), nom. nud.] ex Hook.f. & Thomson in J. Linn. Soc. Bot. 4: 140 (1860). Type: Nepal. Morang Hills (Hamilton, 14 July 1810, in Wallich Herb. no. 4761[A], K-W[K001039839], lectotype selected by Grey-Wilson in 1989). [Figs. 2a, 5, 6]

Herbs, perennial, erect, more than 30 cm tall, pubescent, glabrescent. Leaves alternate, petiolate; petiole 0.5–4.5(–5.5) cm long; blade herbaceous, elliptic to elliptic-ovate, 7.5–19.2 cm × 3–6.2 cm, base attenuate, margins shallowly crenate, apex acuminate, both surfaces scabrid on veins or rarely nearly glabrous. Inflorescences racemose, 3.5–10.5 cm long, axillary, not aggregated on apical part of stem, with 2–7 flowers, sometimes with 1–4 bracts below lowest flower. Peduncle 2.5–6.5 cm long, pubescent. Pedicels 10–25 mm long, glabrous, with a bract at base. Flowers yellow, 2.8–3.5 cm long, 3.5–4.6 cm deep. Lateral sepals 2, ovate, ca. 5 mm long. Lower sepal bucciniform, 15–21 mm long, 13–18 mm deep (excluding spur), constricted into spur; spur slightly incurved, 8–15 mm long, apex sometimes slightly swollen and bifid. Dorsal petal ca. 12 mm long, ca. 13 mm wide when flat-

tened, apex slightly retuse, base rounded, slightly cucullate, with crest-like appendage (4–)6–16 mm long. Lateral united petals ca. 27 mm long; upper lobe widely oblong, ca. 18 mm long, ca. 11 mm wide, apex slightly retuse, midvein extending to apex; lower lobe oblique-ovate, ca. 18 mm long, ca. 8 mm wide, apex rounded, midvein extending to inner margin. Anthers with appendage or without(?).

Specimens examined: (Wallich 4761D, BM). Silhet? (Wallich 4761B, K-W, K001039841). **Nepal.** E Nepal. Sanguri Bhanjang–Dhara Pani (Hara *et al.* 6300490, TI). S Nepal. S of Hatora, c. 700 m (Grey-Wilson & Phillips 67A, K). **Sikkim.** (Thomson s.n. in 1857, E). Regio temp., 5–7000 ped. (Hooker s.n., A, BM). Balaum Valley, 6000 ft. (C.N. 653 in 26 Aug. 1874, E). Darjeeling (Griffith 1229, K). Darjeeling, 6000 ft. (Unknown coll. in 17 Dec. 1937, GH, NA, NY). Darjeeling, Batasi, 2100 m (Kanai, Ohba *et al.* 723209, A, TI). Batasi–Mani Bhanjyang, 2000 m (Kanai, Ohba *et al.* 721576, TI). Birch Hill (Hara 6306727, TI); (Hara & Togashi 2991, TI). East Birch Hill (Ohashi *et al.* 723207, TI). Darjeeling–Tista, 400–2300 m (Ohashi, Ohba *et al.* 723208, TI). Darjeeling, Takda, 1750 m (Ohashi, Ohba *et al.* 775739, TI). East of Kalimpong, 3000 ft. (Burkill 32264, K). Kursemg & neighborhood (Brühl in 1903, E). Mongpo, 5500 ft. (Clarke 36302A, BM; 36304, NA). Parhetung, 6000 ft. (Dr. Prain's Collector 86 7, BM). Rongli Valley, 3000 ft. (Ludlow & Sherriff 10001, E). Shinghik–Gangtok, 1500–1900 m (Hara *et al.* 69869, TI). **Assam.** (Griffith in 1850, NY). Khasi Hills (ex Herb. Sulp. Kurz, E). Mont. Khasia. Regio temp., 5–6000 ped. (Hooker & Thomson s.n., BM, E, NY). Shillong, 6000 ft. (Clarke 44593J, BM). **Bhutan.** Sarbhang–Chirang road, 19 km above Sarbhang 26°57' 90°14', ca. 1100 m (Grierson & Long 1551, E). Sinchu La, 6000 ft. (Cooper 4966, E). **E Himalaya.** (Griffith 1229, GH). 4000 ft. (Cave, 2 June 1919, A, E). Mun-song (Cave, 26 June 1919, A, E). Chungthang–Singhik, 5500 ft. (Biswas 6977, A).

Specimens collected in Darjeeling have a crest-like appendage 10–16 mm long, but in other



Fig. 5. Lectotype of *Impatiens jurpia* Buch.-Ham. ex Hook.f. (Hamilton, 14 July 1810, in Wallich Herb. no. 4761[A], K-W[K001039839]).

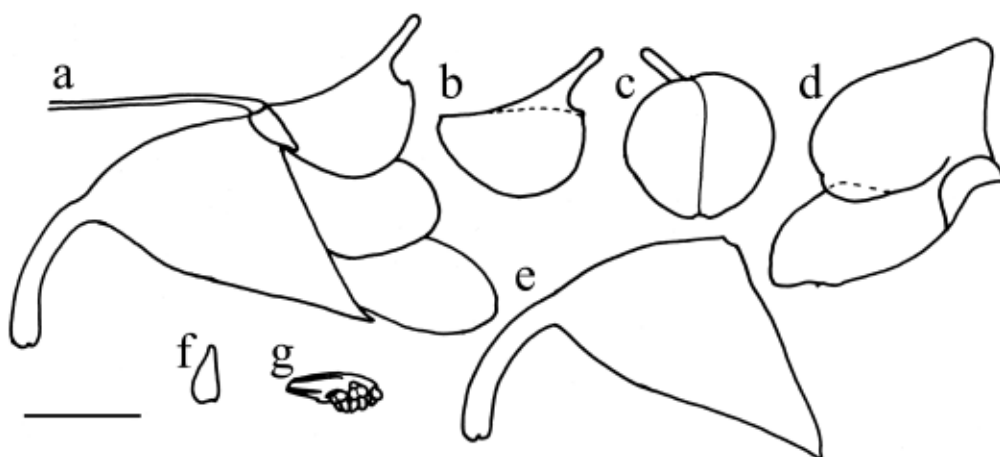


Fig. 6. *Impatiens jurpia* (Hara *et al.* 6300490). a: Flower. b & c: Dorsal petal. d: Lateral united petals. e: Lower sepal. f: Lateral sepal. g: Stamens. Bar indicates 10 mm.

regions it is only 4–9 mm long. Grey-Wilson (1989) distinguished *I. kathmanduensis* from *I. jurpia* by the presence of superfluous bracts below the flowers in the inflorescence, the short peduncle and the short appendage on the dorsal petal, but some specimens of *I. jurpia* also have superfluous bracts below the flowers and a short appendage on the dorsal petal (4–5 mm). He (Grey-Wilson, 1989) also mentioned the slightly bifid apex of the lower sepal in *I. kathmanduensis*, but *I. jurpia* sometimes also has such a lower sepal (Fig. 6e). The shape of the spur of the lower sepal is one of the significant characters to distinguish these two species.

Hooker (1905) reported *I. jurpia* to have muticose anthers (i.e. without appendages), but we observed anthers with appendages in the specimens Hara *et al.* 6300490 (TI) and Kanai *et al.* 721576 (TI) and in an illustration at Kew.

2. *Impatiens discolor* DC., Prodr. 1: 687 (1824). Akiyama *et al.*, Himalayan Pl. 2: 81 (1991). Type: Nepal [Nepaulia]. (Wallich s.n., G00218031, holotype).

[Figs. 2b, c, 3, 4]

I. kathmanduensis Grey-Wilson in Kew Bull. 44: 119 (1989), syn. nov. Type: Nepal. Phulchoke, S. of Kathmandu, alt. 8700 ft. (Schilling 1071, K, holotype) (Fig. 1).

I. spirifer auct. non Hook.f. & Thomson: Hara in Fl. E. Himalaya: 197 (1966).

Herbs perennial, erect, 15–35(–60) cm tall, pubescent, glabrescent. Leaves alternate, petiolate; petiole (3–)5–35 mm long; blade herbaceous, elliptic to elliptic-ovate, or ovate, 4–12 cm × 2–6.5 cm, base attenuate, margins shallowly crenate, apex acuminate, both surfaces scabrid on veins or nearly glabrous on lower surface. Inflorescences racemose, 1.5–5.8 cm long, axillary, not aggregated on apical part of stem, with (1 or) 2–5 flowers, sometimes with 1–4 bracts below the lowest flower. Peduncle 8–12 mm long, glabrous. Pedicels 10–19 mm long, glabrous with a bract at base. Flowers white or pink with reddish veins; 2.3–2.5 cm long, 3–4 cm deep. Lateral sepals 4, inner ones minute; or 2, widely ovate to ovate, 6–12 mm long. Lower sepal bucciniform, 15–20 mm long, 16–25 mm deep (excluding spur), abruptly constricted into spur; spur conspicuously incurved at apex or overall, 10–15 mm long in overall length, apex sometimes slightly swollen and bifid. Dorsal petal cucullate, 13–16 mm long, 14–18 mm wide when flattened, apex rounded, base rounded, with crest-like appendage 3–6 mm. Lateral united petals 28–34 mm long; upper lobe widely oblong, 14–17 mm long, 8–10 mm wide, apex emarginate; lower lobe oblique, narrowly



Fig. 7. *Impatiens hobsonii* Hook. f. (Stainton 828, BM, cited in Hara, 1979).



Fig. 8. Lectotype of *Impatiens gamblei* Hook.f. (Gamble 8423, K000694669).

obovate to oblanceolate with an appendage at inner basal part, 17–23 mm long, 8–15 mm wide, apex rounded (sometimes slightly emarginate). Anthers with appendage. Fruit clavate ca. 2 cm.

Additional specimens examined (addition to Akiyama *et al.*, 1991): **Nepal.** (Wallich s.n. BM); (Wallich 4766, BM, GH); (Wallich 4767, K-W, [K001039856]). Bagward (Malla 4959, NA). Botebus–Fururu, 1800–2050 m (Ohashi, Ohba *et al.* 773305, 774502, 771647, TI). Between Chauki and Tinjure, 27°10' 87°26', 2720 m (KEKE 1243, E). Between Dobato and Pativanjyang, c. 2400 m (Grey-Wilson & Phillips 214, K). Gangia La–Palchock Danda, 7000 ft. (Polunin 1950, BM). 2 miles E. of Gorepani, c. 2200 m (Grey-Wilson & Phillips 321, K, det. *I. kathmanduensis* by Grey-Wilson). E. of Gorepani (Grey-Wilson & Phillips 878, K, det. *I. kathmanduensis* by Grey-Wilson). N. (and S.) of Gulu-Bhanjyang, 27°55' 85°30', 2300–2500 m (de Haas 2840, BM). Gosainkund, Duche Gyang–Thodang Danda, 2450 m (Malla & Kanai 674619, TI). Kathmandu Valley, Phulchoke, 7250 ft. (Schilling 641, TI). Phulchoki, 2300–2700 m (Ohashi *et al.* 771446, TI). Phulchoki, Lay-Lay Cape, 6000 ft. (Unknown coll. 7154, BM). Kathmandu, Sheopuri (Chuma 7009224, TI); 6500 ft. (Stainton, Sykes & Williams 6936, BM). Mangalbare (Hara *et al.* 6300497, TI). Manglabare, 27°15' 87°29', 2650 m (Dobremez 1553, BM). Milke Danda, 9000 ft. (Beer 25740, BM). Khare, E. of Lumle, NW of Pokhara (Grey Wilson & Phillips 261, K, det. *I. kathmanduensis* by Grey-Wilson). Sati Khola, Peramchaw, 3500 ft. (Stainton *et al.* 6495, BM). Tinjure Danda,

27°10'N 87°29'E, 7500 ft. (Williams & Stainton 8379, BM). Kaski Distr., Banthathi, 2180 m (Mikage *et al.* 9485565, TI). Sankhuwasabha Distr., Arun Valley, ridge between Bhotebas and Chichila, 27°26'N, 87°12'E, 1930 m (Long *et al.* 91, E). Solukhumbu Distr., Namkhli–Gori–Gnaua, 2720 m (Miyamoto *et al.* 9584026, TI); 2755 m (Miyamoto *et al.* 9596067, TI). Terhathum Distr., ridge between Oyakjung and Sankranti, 2000 m (Taylor 10 in Grey Wilson 4695, E, K, det. *I. kathmanduensis* by Grey-Wilson). **Sikkim.** (Cave s.n., BM). Duncors (Pantling in 1902, K). Regio temp., 6–8000 ped. (Hooker s.n., K). Darjeeling (Cowan s.n., E); 9000 ft. (Clarke 27482A, 27482B, 27482E, K); Peshok, 4500 ft. (Orwasbri s.n., K). **Bhutan.** Kob' La, 7000 ft. (Cooper 4646, E).

***Impatiens* L. sect. *Urticifoliae* S. Akiyama & H. Ohba, sect. nov.**

Type: *I. urticifolia* Wall.

Impatiens sect. *Brachycentron* Warb. subsect. *Epiphyticae* Warb. & Reiche in Engl. & Prantl, Pflanzenfam., 3, 5: 391 (1895), pro parte.

Impatiens sect. *Axilliflorae* (in Series B) Hook. f., Fl. Brit. Ind. 1: 471 (1874), pro parte.

Inflorescences pendulous, racemose, with few to many flowers [Type 2a and 2b (Akiyama & Ohba, 2000)]. Leaves alternate. Flowers yellow or purple; lower sepal bucciniform; dorsal petal without crest-like appendage.

Distr. E Himalaya.

Species: *I. gamblei* Hook.f., *I. hobsonii* Hook.f., *I. urticifolia* Wall. (type), and *I. wallichii* Hook.f.

Key to the species of sect. *Urticifoliae* in Nepal

- 1a. Lower lobe of lateral united petals dolabriform.....2
- 1b. Lower lobe of lateral united petals loriform, tailed3
- 2a. Flowers pale yellow with orange spots; spur curved downward usually S-shaped 1. *I. wallichii*
- 2b. Flowers purple; spur incurved forward, not S-shaped 2. *I. hobsonii*
- 3a. Flowers yellow with reddish veins; lower sepal with elongate tip at vertical mouth, spur incurved forward 3. *I. urticifolia*
- 3b. Flowers purple; lower sepal without elongate tip at oblique mouth, spur curved downward or incurved forward 4. *I. gamblei*

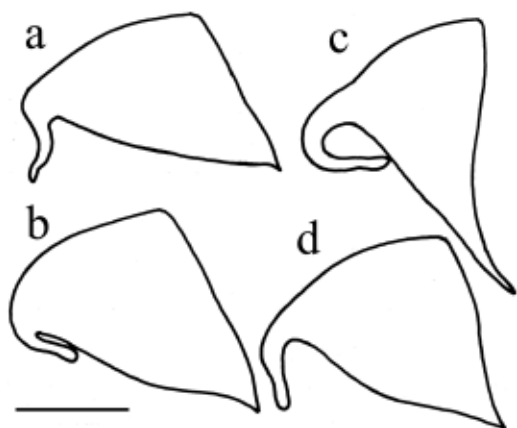


Fig. 9. Lower sepals of *Impatiens* (2). a: *I. wallichii* (Stainton *et al.* 1951, E). b: *I. hobsonii* (Stainton 828, BM). c: *I. urticifolia* (Ohba *et al.* 8530933, TI) (Akiyama *et al.*, 1991). d: *I. gamblei* (Gamble 8423, K00069466). Bar indicates 10 mm.

1. *Impatiens wallichii* Hook.f. in Rec. Bot. Surv. India 4: 15, 20 (1905). Type: Nepal. (Wallich 4767, K-W[K001039857], upper right and left branches, lectotype designated here).

[Figs. 9a, 10a–f, 11]

Herbs perennial(?), erect, 26–60 cm tall, almost glabrous. Leaves alternate, petiolate or sessile in upper part of stem; petiole 2–10 mm long; blade herbaceous, widely ovate (to elliptic), 5–10.3 cm × 2.3–5 cm, base cuneate to truncate or rounded, margins crenate with 17–26 notches on one side in larger leaves, apex acuminate, lower surfaces sometimes scabrid on veins. Inflorescences racemose, 2–6 cm long, axillary, not aggregated on apical part of stem, with (1 or) 2–4 flowers. Peduncle 2–5 cm long. Pedicels 10–20 mm long, with a bract at base or sometimes on pedicel. Flowers pale yellow with orange spots, 2.5–3.5 cm long, 2.5–3.5 cm deep. Lateral sepals 2, ovate, ca. 5 mm long, with a few glands on margins, apex gland-tipped. Lower sepal bucciniform, 15–20 mm long, 13–15 mm deep (excluding spur), constricted into spur; spur downwardly curved, usually slightly S-shaped, 7–8 mm long. Dorsal petal ca. 12 mm long, ca. 15 mm wide when flattened, base rounded, apex slightly retuse, slightly cucullate, without crest-

like appendage. Lateral united petals ca. 3 cm long; upper lobe widely ovate, ca. 14 mm long, ca. 10 mm wide, apex truncate; lower lobe elliptic, ca. 22 mm long, ca. 7 mm wide, apex rounded. Anthers without appendage.

Specimens examined: **Nepal.** Bhiroukunda, 4100 m (Maire s.n., BM). Kali Gandaki, Larjung, S. of Tukucha, 10000 ft. (Stainton *et al.* 1951, E). Kali Gandaki, Taglung (S. of Tukucha), 12000 ft. (Stainton *et al.* 1756, E). Lamjung Himal, 13500 ft. (Stainton *et al.* 6353, E). Lamjung Himal, Rambrong, 13500 ft. (Stainton *et al.* 6140, E). Above Lumsum, 10000 ft. (Stainton *et al.* 4339, E). Bagmati Zone, Rasuwa Distr., A Kharka–Pati Kharka, 28°15'N 85°10'E, 3900 m (Miyamoto, Akiyama *et al.* 9420163, TI); Chyauche Kharka–Lingju, 28°14'N 85°07'E, 3730 m (Miyamoto, Akiyama *et al.* 9420240, TI); Pabil Kharka–a Kharka (near Seto Kund), 28°15'N 85°07'E, 3550 m (Miyamoto, Akiyama *et al.* 9420193, TI); Seto Kund–Chyauche Kharka, 28°13'N 85°12'E, 4000 m (Miyamoto, Akiyama *et al.* 9420232, TI); Sunchet Kharka–Lipchet Kharka, 28°07'N 85°07'E, 3500 m (Miyamoto, Akiyama *et al.* 9420279, TI).

Impatiens wallichii is similar to *I. urticifolia*, but differs in the dolabriform (not loriform tailed) lower lobe of the lateral united petals, slightly S-shaped spur and widely ovate leaves. It grows at high elevations, 3000–4200 m, in Central Nepal. Hooker (1905) cited 'Central Nepal and Sikkim, alt. 10,000–11,000 ft.' in the protologue, but we have not seen material from Sikkim.

2. *Impatiens hobsonii* Hook.f. in Rec. Bot. Surv. India 4: 15, 20 (1905), '*hobsoni*.' Type: Sikkim, Yatung (not seen).

[Figs. 7, 9b]

Herbs erect, 40–50 cm tall, almost glabrous. Leaves alternate, petiolate or sessile in upper part of stem; petiole 1–2.8 cm long; blade elliptic to lanceolate, 5.8–13 cm × 2.8–4 cm, base attenuate, margins crenate, apex acuminate, lower surface nearly glabrous or with minute hairs on veins. Inflorescences racemose, axillary, with 3–6 flowers. Peduncle 4.5–7 cm long. Pedicels 10–16 mm

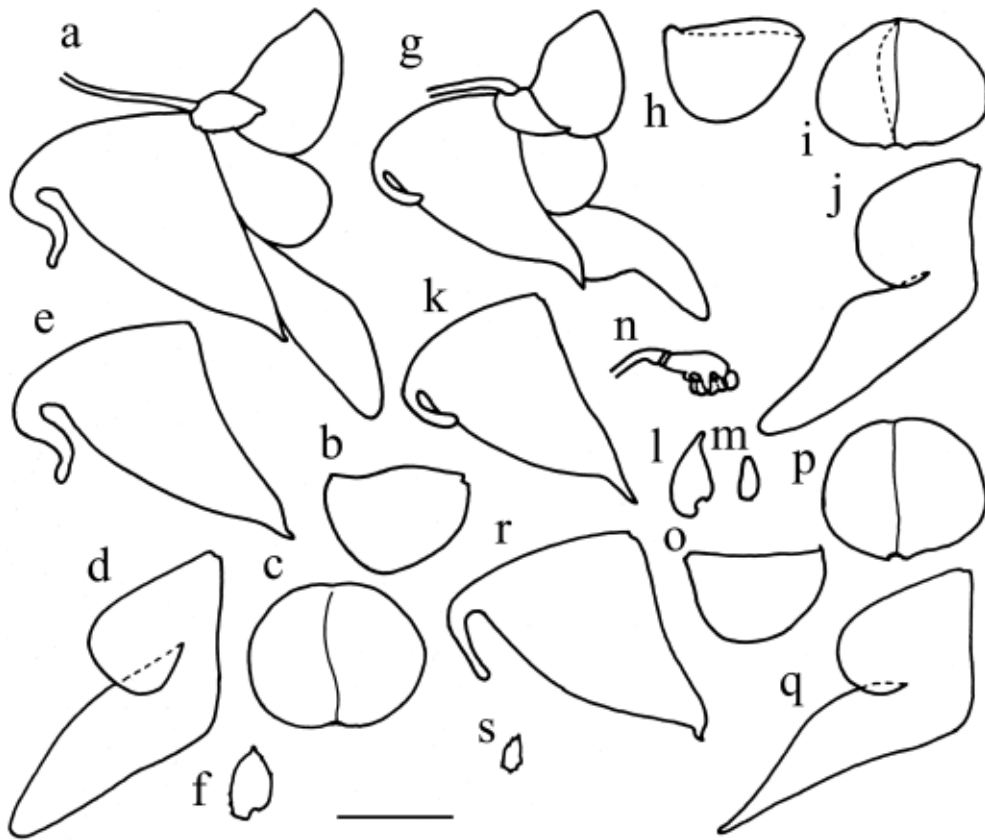


Fig. 10. *Impatiens wallichii* (a–f: Kanai & Shakya 672178, TI) and *I. gamblei* (g–n: Ohba, Akiyama *et al.* 9120291, TI. o–s: Hara *et al.* 69891, TI). a & g: Flower. b, c, h, i, o, & p: Dorsal petal. d, j, & q: Lateral united petals. e, k, & r: Lower sepal. f, l (outer), m (inner), & s: Lateral sepal. n: Stamens. Bar indicates 10 mm.

long, with a bract at base. Flowers purple, ca. 25 mm long, ca. 25 mm deep. Lower sepal bucciniform, ca. 20 mm long, ca. 15 mm deep (excluding spur), abruptly constricted into spur; spur forwardly curved, ca. 7 mm long.

Specimens examined: **Nepal**. Arun Valley, Maghang Khola, E. of Num, 11000 ft. (Stainton 828, BM). Milke Dande, 9000 ft. (Beer 10051, BM). Wabak Khola, 11500 ft. (Beer 9467, BM).

We have not seen sufficient material of *Impatiens hobsonii* to determine the shape of the flower, especially the lateral united petals.

3. *Impatiens urticifolia* Wall. in Roxb., Fl. Ind. 2: 457 (1824). Akiyama *et al.*, Himalayan Pl. 2: 83 (1991). Type: Nepal. Gosain-Than (Wallich 4768, K-W[K001039858], lectotype designated

here).

[Figs. 9c, 12]

Herbs, erect, 40–80 cm tall, almost glabrous or pubescent. Leaves alternate, petiolate or sessile in upper part of stem; petiole 5–25 mm long; blade elliptic to narrowly elliptic to lanceolate or broadly lanceolate, (5–)7–18 cm × 3–6.5 cm, base long attenuate to attenuate, margins crenate to crenulate, apex acuminate or acute, both surfaces nearly glabrous. Inflorescences racemose, axillary not aggregated on apical part of stem, 5–14 cm long, with 3–6 flowers. Peduncle (2–)5–13 cm long. Pedicels 15–28 mm long, with a bract at base. Bracts narrowly ovate, 3–7 mm long. Flowers yellow with red spots and stripes, 3–4.3(–5) cm long, 2.5–3.5 cm deep. Lateral sepals 4, inner ones 2–3 mm long; or sometimes 2, ovate to widely lanceolate, 5–6 mm long, with

a few glands on margins, apex gland-tipped. Lower sepal bucciniform, 20–26 mm long, 10–13 mm deep (excluding spur), with elongate tip and vertical mouth, constricted into spur, spur forwardly incurved, 13–16 mm long in overall length. Dorsal petal cucullate, 10–12 mm long, 14–16 mm wide when flattened, without crest-like appendage. Lateral united petals 26–40 mm long; upper lobe widely oblong to nearly square or widely elliptic, 11–12 mm long, 6–8 mm wide, apex rounded or truncate; lower lobe triangular-ovate to obovate, loriform tailed, 16–29 mm long, 6–7 mm wide. Anthers without appendage.

Additional specimens examined (addition to Akiyama *et al.*, 1991). **Nepal.** Arun Valley, Chooyang Khola, W. of Num, 10500 ft. (Stainton 752, A, E, TI). Kalingchok, Thala–Tale Bisauna, 2050–2750 m (Kanai *et al.*, 10 Sept. 1970, TI). Bajura Distr., Pategaon–Badigaon, 29°31'N 81°24'E, 3100 m (Suzuki *et al.* 9170640, TI). Dhankuta Distr., Tinjure Phedi–Tinjure, 2600 m (Kanai, Ohba *et al.* 721110, TI); Tinjure, 2900 m (Kanai, Ohba *et al.* 721130, 721131, TI); Chauke–Dor (Kanai, Ohba *et al.* 723228, TI); Chauke–Tute, 2600 m (Ohashi, Ohba *et al.* 771263, TI); Tute–Tinjure Phedi, 27°10' 87°25' (Ohba, Akiyama *et al.* 9120049, 9120051, TI). Kalikot Distr., Panipokhari–Chaukebada, 28°59' 81°38', 2690 m (Suzuki *et al.* 9170225, TI). Kaski Distr., Banthanti–Ghodepani Deurali (Ghorapani), 29°20' 83°40', 2660 m (Suzuki *et al.* 8860649, TI); 2700 m (Suzuki *et al.* 881280, 881283, TI); 2950 m (Suzuki *et al.* 881270, TI); Gorepani, 28°24' 83°41', 2530 m (Mikage *et al.* 9485563, TI). Panchthar Distr., Phalut, 3600 m (Kanai, Ohba *et al.* 723188, TI). Rasuwa Distr., Langtang forest area, c. 9500 ft. (Polunin 1654, E); Deolari–Sing Gompa, 28°06'N 85°20'E (Hoshino *et al.* 9536049, TI); Laurebinayak–Sing Gompa, 28°06'N 85°22'E, 3450–3950 m (Hoshino *et al.* 9539225, TI); Gopte–Thale Patil, 3200–3500 m (Hara *et al.* 723223, A, E, TI); Gosainkund–Gopte, 3400 m (Kanai, Ohba *et al.* 721952, TI); between Lama Hotel and Ghora Tabela, just southwest of Ghora Tabela, 3048 m (H. Van T. *et al.* N163, A); Lama Hotel–Shin-

gdum, 28°10'N 85°26'E (Noshiro 9154520, TI); Pabil Kharka–a Kharka, 28°15' 85°07', 3650 m (Miyamoto, Akiyama *et al.* 9420196, TI); Chyauche Kharka–Lingju, 28°14' 85°07', 3730 m (Miyamoto, Akiyama *et al.* 9420238, TI). Sankhuwa Sabha (Sankhuwasawa) Distr., Bhainsi Kharka–Khongma (Kauma), 27°35'N 87°15'E, 2900 m (Suzuki *et al.* 8850385, TI); Bhuje, 2700 m (Kanai, Ohba *et al.* 721075, TI); Gidde–Khokling, 27°25'N 87°28'E (Ohba, Akiyama *et al.* 9120113, TI); Khokling–Jaljala, 27°27' 87°27' (Ohba, Akiyama *et al.* 9120122, TI); Kongma–Tashi Gaun, 27°40'N 87°10'E, 2150–3510 m (Minaki *et al.* 9020912, TI); Mangal Bare–Gupha Pokhari, 27°15' 87°30' (Ohba, Akiyama *et al.* 9120065). Solukhumbu Distr., Dudh Kund–Thasing Dingma, 27°42'N 86°50'E, 3305 m (Miyamoto *et al.* 9596491, TI); Junbesi–Kensa, 27°35'N 86°32'E, 3100 m (Miyamoto *et al.* 9592558, TI); Junbesi–Sete, 27°34'N 86°32'E, 3250 m (Wakabayashi *et al.* 9715306, TI); Mosom Kharka–Tashing Dingma, 27°40'N 86°49'E, 3270 m (Wakabayashi *et al.* 9715240, TI); 3430 m (Wakabayashi *et al.* 9720285, TI). **Bhutan.** Nr Sheedrang, S of Sengor, 27°21' 91°01', c. 2800 m (Grierson & Long 1933, E).

Impatiens urticifolia is characterized and distinguished from the other three species of section *Urticifoliae* by the lower sepal with elongate tip and vertical mouth and the longer peduncle (to 13 cm).

4. *Impatiens gamblei* Hook.f. in Rec. Bot. Surv. India 4: 15, 20 (1905). Type: Sikkim, Darjeeling, Sandukpho, 11500 ft. (J. S. Gamble 8423, Sept. 1880, K000694669, lectotype designated here).

[Figs. 8, 9d, 10 g–s].

Herbs, perennial(?), erect, 30–60 cm tall, almost glabrous. Leaves alternate, petiolate or nearly sessile in upper part of stem; petiole 2–25 mm long; blade herbaceous, elliptic, 5–12.5 cm × 2–4 cm, base attenuate, margins crenate with 15–24 notches on one side, apex acuminate. Inflorescences racemose, axillary, 2.5–7.3 cm long, with (1 or) 2–4 flowers. Peduncle 2–6.5 cm long. Pedicels 10–20 mm long, with a



Fig. 12. Lectotype of *Impatiens urticifolia* Wall. (Wallich 4768, K-W[K001039858]).

bract at base or sometimes on pedicel. Bract narrowly ovate, 3–5 mm long. Flowers purple, 2.5–3.5 cm long, 3–3.3 cm deep. Lateral sepals 2 or 4, ovate, 3–6 mm long; inner ones sometimes minute. Lower sepal bucciniform, ca. 21 mm long, ca. 16 mm deep (excluding spur), without elongate tip at oblique mouth, abruptly constricted into spur; spur downwardly or forwardly curved, ca. 8 mm long overall. Dorsal petal, ca. 12 mm long, ca. 14 mm wide when flattened, apex rounded to slightly retuse, base rounded to truncate, without crest-like appendage. Lateral united petals 30–35 mm long; upper lobe widely oblong, ca. 14 mm long, ca. 7 mm wide, apex rounded, lower lobe triangular-ovate, loriform tailed, 22–27 mm long, 6–7 mm wide, apex acute to rounded. Anthers without appendage.

Specimens examined: **Nepal.** Tinjure Phedi–Tinjure, 2800 m (Kanai, Ohba *et al.* 721126, TI). Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Shuwan Kharka–Topke Gola, 3570–4360 m (Ohba, Akiyama *et al.* 9120291, TI). **Sikkim.** Darjeeling, Kalopokri–Sandakphu (Hara s.n. in 16 Sept. 1964, TI); Sandakphu, 3600 m (Kanai, Ohba *et al.* 723232, TI). Singalila, Mane(y) Bhanjan–Tonglu, 2200–3150 m (Hara *et al.* 69890, TI); Tonglu, 2800–3100 m (Hara *et al.* 69891, TI); Tonglu–Kalapokhari, 2800–3100 m (Hara *et al.* 69892, TI); Sandakphu–Tonglu, 2800–3970 m (Hara *et al.* 69893, TI).

Impatiens gamblei is similar to *I. urticifolia* Wall. but distinguished by the shape of the lower sepal without elongate tip at the oblique mouth. Hooker (1905) distinguished it from *I. urticifolia* by the size of leaves (1–3 inch long, mostly petiolate vs. 3–8 inch long, mostly sessile). From our observations the leaf blade is 5–12.5 cm long, while the leaf blade of *I. urticifolia* is (5–)7–18 cm long, making it impossible to distinguish these two species by leaf length. Grey-Wilson (1991) treated *I. gamblei* as a synonym of *I. kingii* and distinguished it from *I. urticifolia* by the 4 lateral sepals and lateral united petals (32–36 mm long; 37–42 mm long in *I. urticifolia*). But *I. gamblei* sometimes has 4 lateral sepals (the inner ones minute) or 2 lateral sepals and lateral

united petals 30–35 mm long. *Impatiens urticifolia* also has 2 or 4 lateral sepals and lateral united petals 26–40 mm long.

Impatiens gamblei has a bract at the base of the pedicel, or sometimes on the pedicel. Although the bract is sometimes on the pedicel, the inflorescence is considered to be a raceme, type 2b.

Impatiens gamblei was reported from Sikkim and Chumbi, alt. 8000–12000 ft. (Hooker, 1905). We examined the original material from Sikkim (Darjeeling, Sandukpho, 11500 ft., J. S. Gamble 8423, Sept. 1880, K000694669), but have not seen material from Chumbi.

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