

# Recollection of *Impatiens angustiflora* (Balsaminaceae) and notes on its lectotypification

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## इंपेशियंस अंगूस्टिफ्लोरा (बालसेमिनासी) का पुनर्संग्रहण एवं लेक्टोटाइपिफिकेशन

राजीब गोगोई, नोर्बू शेर्पा, बी. बी. टी थाम, छया देवरी एवं एस. आर. तालुकदार

### सारांश

इंपेशियंस अंगूस्टिफ्लोरा हुक. एफ (बालसेमिनासी) को लगभग 67 वर्षों के बाद इसके प्ररूप प्राप्ति क्षेत्र भारत के खासी हिल्स मेघालय से पुनर्संग्रहित किया गया। इस जाति के सही प्राप्ति क्षेत्र या वितरण क्षेत्र पर सही आंकड़ों के साथ प्रस्तुत शोध पत्र में उल्लेखित किया गया है, क्योंकि पूर्व में वितरण के ये आंकड़े भूलवश गलत थे। इस जाति के सही निर्धारण हेतु इसके जीवित पौधे से रंगीन सचित्रण, और संबद्ध जाति से इसका तुलनात्मक वर्णन प्रस्तुत किया गया है।

### ABSTRACT

*Impatiens angustiflora* Hook.f. (Balsaminaceae) re-collected from the type locality, Khasi Hills, Meghalaya, India after almost 67 years. The actual distributional range of the species has been discussed on actual data as there were erroneous reports of its occurrence. To facilitate its proper identity and easy identification, detailed description from live materials with coloured illustrations, comparison of characters with closely allied species are presented. The present status of the species in wild and measures of conservation are provided. A lectotype is designated here as no holotype was indicated in the protologue.

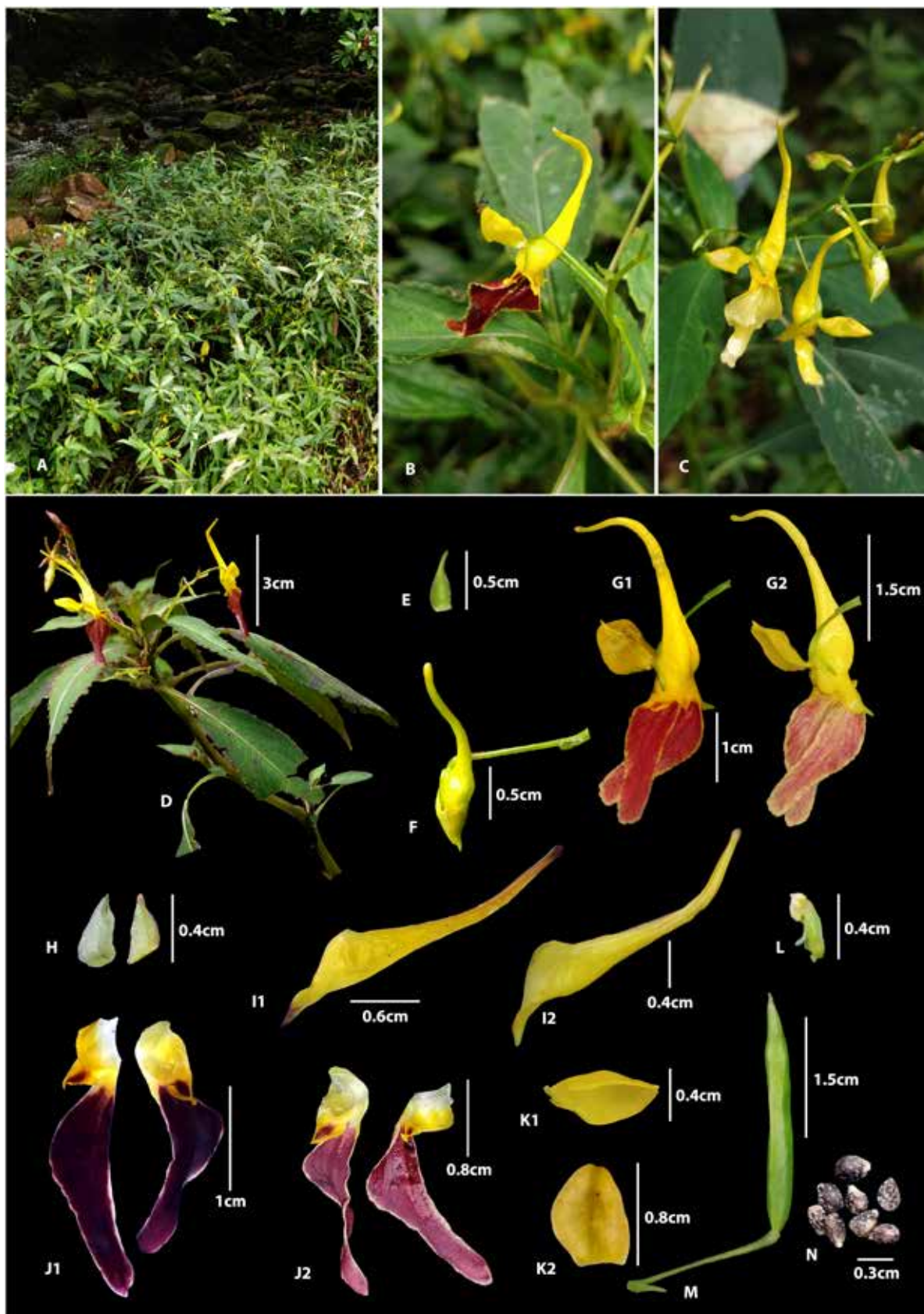
**Keywords:** Balsaminaceae, distribution, endemic, *I. angustiflora*, Khasi Hills, lectotype, Meghalaya.

## INTRODUCTION

The genus *Impatiens* Riv. ex L. is one of the largest genera with more than 1000 species mainly found in in the tropical and subtropical regions of the Old World as well as in the Northern temperate regions (Mabberley, 2008; Bhaskar, 2012; Yu, 2012; Gogoi & al., 2018, 2020). Most species of *Impatiens* cannot endure persistent drought or extended exposure to direct sunlight (Fischer, 2004), as a result *Impatiens* species are typically confined to stream margins, waterside boulders, and wet montane forests. During recent climatic changes many *Impatiens* forms were separated from closely related lineages, which resulted in an increase in the rate of species diversification leading to high endemism (Janssens & al., 2009).

In India, the genus is represented by 279 species, of which 196 species are endemic and are mainly distributed in the North-Eastern states, the Eastern Himalaya and the Western Ghats which constitute the major centres of diversity (Gogoi & al., 2020). The Western Himalaya is home to 30 species of which 14 species are endemic, the Peninsular India (including the Western Ghats) harbours 130 species, of which 124 species are endemic, the Eastern Himalaya has 92 species with 36 endemics and the North Eastern states of India harbours 82 species with 44 endemics of which Meghalaya is represented by 37 species with 8 endemics (Gogoi & al., 2020).

In a recent germplasm collection trip by one of the authors (BBTT) to David Scott trail of Mawphlang in East Khasi District of Meghalaya, an *Impatiens* species with yellow flowers and maroon lateral united petals



**Plate 1.** *Impatiens angustiflora* Hook.f., floral features. A. plants in habitat, B & C. inflorescence, D. flowering twig, E. bract, F. flower bud, G. flowers, H. lateral sepals, I. lower sepals, J. lateral united petals, K. dorsal petals, L. androecium, M. capsule, N. seeds.

was collected. BBT communicated for identification of the species to first author RG as he is revising the genus for Indian Himalayas. After critical examination of specimens and perusal of literature the species turned to be *I. angustiflora* Hook.f., a species that was in oblivion about its existence in wild. The same species was also encountered in West & South Khasi Hills by another co-author (CD) of which photos were communicated to RG for identification.

*I. angustiflora* Hook.f. was described by Sir J. D. Hooker in 1875 in “*Flora of British India*” (Hooker 1875) based on collection by T. Lobb and J. D. Hooker & T. Thomson’s collection from Khasi Hills of Meghalaya, India. Before erecting as an independent species J. D. Hooker & T. Thomson reported this species as *Impatiens leptoceras* DC. and its varieties (variety  $\eta$  &  $\theta$ ) (Hooker & Thomson 1860). In 1875, Hooker realised it to be a distinct species and described *I. angustiflora* Hook.f. with two varieties. The var. 1 included W. Griffith’s collection from Bhutan and the var. 2 was based on T. Lobb’s and Hooker & Thomson’s collections. Later, Hooker again realised the Bhutan plant (var. 1) to be not related with this species and excluded it from *I. angustiflora* Hook.f. (Hooker 1905).

Khasia collections made by J. D. Hooker & T. Thomson in 1850 are extant at CAL and K. One specimen by T. Lobb’s was found to be pasted on left side of the Hooker and Thomson’s sheet at K (K000694623). The second collection of the plant was made by C. B. Clarke on 15<sup>th</sup> Nov. 1872 from Dingling (Dienglieng in Khasi) (C. B. Clarke 17843, BM012558289 image!) and in 1952 the plant was again collected by W. N. Koelz (W. N. Koelz 31175, MICH1506325! wrongly identified as *I. stenantha* Hook.f.) from Mawphlang, Khasi Hills. Until the collection by BBT in 2019, for about last 67 years this species was almost not known.

Chen & al. (2008) in “*Flora of China*” treated *I. angustiflora* Hook.f. as conspecific to *I. stenantha* Hook.f.. Collections housed in different Chinese herbaria were studied and the authors found that *I. angustiflora* Hook.f. does not occur in China and the plants identified in China as *I. angustiflora* Hook.f. are non-other than *I. stenantha* Hook.f. In the revision of Balsaminaceae in “*Flora of India*” Vivekananthan & al. (1997) mentioned the occurrence of *I. angustiflora* Hook.f. in Arunachal Pradesh, Assam, Meghalaya, Sikkim and West Bengal. During this study, the actual distributional range of the species was examined carefully and no specimens of the species could be traced in any of the herbaria from Arunachal Pradesh, Assam, Sikkim and West Bengal. Even the online portal “Plants of the World Online” (POWO 2019) mentions the distribution range of *I. angustiflora* Hook.f. to be the whole Eastern Himalaya

(<http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:373956-1#bibliography>) as they have directly taken the information from Chakrabarty (2009). While preparing the checklist of the genus *Impatiens* of Sikkim, Chakrabarty (2009) adopted the distribution range of this species from Vivekananthan & al. (1997) also cited a specimen at CAL (Acc. no 71301). Hooker & Thomson (1860) mentioned *I. leptoceras* DC. var.  $\eta$  based on their specimens J.D. Hooker & T. Thomson 53 collected in Sikkim is present at CAL (Acc. no. 71301, CAL0000005177) and was also included in Hooker (1875) as *I. angustiflora* Hook.f. During this study the specimen (CAL0000005177) has been examined and has been found that it is not *I. angustiflora*, rather specimens of two different species, that are either *I. stenantha* Hook.f. or *I. longipes* Hook.f. & Thomson (on the left side) and *I. racemosa* DC. (on the bottom right side) both mounted on a single sheet.

It became evident during this study that *I. angustiflora* Hook.f. is an endemic species found only in the Khasi Hills region of present-day Meghalaya. It was also observed that the species is having some of the characters very similar to *I. stenantha* Hook.f., and that is the reason why many botanists have identified *I. stenantha* Hook.f. erroneously as *I. angustiflora* Hook.f. Here in this paper a comparison photo plate is presented for *I. angustiflora* Hook.f. and other two very closely allied species (*I. stenantha* Hook.f. and *I. albopetala* Gogoi & Borah) for easy identification of the species.

## TAXONOMY

***Impatiens angustiflora* Hook.f.**, Fl. Brit. India 1: 480. 1875; Hook.f., Rec. Bot. Surv. India 4: 35. 1905; Vivek. & al. in Hajra & al. (eds.) Fl. India 4: 119. 1997; *sensu* Chakrabarty, J. Econ. Taxon. Bot. 33(1): 206. 2009; *I. leptoceras* DC. var.  $\eta$  &  $\theta$ , *sensu* Hook.f. & Thomson, J. Proc. Linn. Soc. Bot. 4: 153. 1860. (Plate 1, 2 and 3 H–N)

**Types:** —INDIA. Khasya, s. d., T. Lobb s. n (lectotype designated here: K000694623 partly, one specimen on the left, image !); residual syntypes: Khasi Hills, Moflang (present day Mowphlang), 01.08.1850, J. D. Hooker & T. Thomson 55, CAL0000005176, image! (CAL) and K000694623 partly, two specimens on the right, image ! (K).

Perennial semi-succulent, sparsely branched herbs, up to 60 cm tall; stems glabrous, green, terete, slightly winged in upper parts. Leaves alternate; petiole subsessile, 1.0–1.5 cm long, extra floral nectaries absent; lamina lanceolate to elliptic lanceolate, 3.5–11.5 × 1.5–3.8 cm, glabrous, lateral veins 6–8 pairs, sub-opposite; base cuneate to attenuate; apex acuminate to slightly caudate; margins crenate, setose between teeth. Inflorescences axillary, 2–7 flowered, erect raceme; peduncles 4–5 cm long, glabrous; flower buds elongate-ovate, pale green.





**Plate 2.** Image of Lectotype of *Impatiens angustiflora* Hook.f. (T. Lobb s. n., K000694623 - left side specimen) K000694623 partly) <http://specimens.kew.org/herbarium/K000694623> © Board of Trustees of The Royal Botanic Gardens, Kew.

Flowers yellow; bracts persistent, lanceolate, 3–5 mm, with distinct awn at apex; pedicel 1–2 cm long, pale green, glabrous. Lateral sepals 2, ovate to deltoid, 3–4 mm long, apex acute, mid veins non prominent, margins entire, membranous. Lower sepals (lip) navicular, yellow, to 3–4 cm deep (whole), gradually constricting into straight or upcurved spur, mouth oblique, tip acute; spur tip unifid. Dorsal petals yellow, obovate to sub-orbicular, 0.8–1.0 cm long, 0.4–0.8 cm wide, apex acute, semi-cucullate; dorsal midrib prominent, not raised. Lateral united petals bilobed, unequal, 2.0–3.5 cm long (whole); basal lobes obovate, yellow, upper portion with maroon blotch, apex acute, to 0.5–1.0 cm long, to 0.3–0.8 cm wide, not clawed; distal lobe elongated dolabriform, to 1.5–2.5 cm long, maximum to 0.5 cm wide, usually maroon, rarely yellow, auricle inconspicuous. Stamens 5, united, enclosing ovary. Capsules linear, smooth, 2.5–3.0 cm long, 0.3 cm in diam.; seeds black, 1.5–2.0 mm across, surface warted.

**Phenology:** Flowering and fruiting in between July to November.

**Distribution:** Endemic to Khasi Hills, Meghalaya.

**Habitat:** The species grows in moist stream sides or moist shady forest margins in association with *Elatostema* spp., *Persicaria* spp., *Commelina* spp., *Viola* spp., *Centotheca* spp.

**Conservation:** The species is localized in areas of East and South-West Khasi Hills districts of Meghalaya. Live plants were collected by one of the authors (BBT) from David Scott's Trail, Mowphlang to be introduced in the Experimental Botanical Garden, at Borapani, Shillong as part of *ex situ* conservation programme of Botanical Survey of India. There are about five plants growing in the garden and bloomed in the month of October and November, this year.

**Specimens examined:** East Khasi Hills, Mawphlang, David Scott's Trail, 1650 m, 08.10.2020, *BBT Tham* 113469 (ASSAM!); East Khasi Hills, Mawphlang, David Scott's Trail, 1650 m, 18.10.2019, *BBT Tham* 113431 (ASSAM!); South West Khasi Hills, Mawhrywat, Mawlangwir community forest, 1505 m, 11.08.2018, *C. Deori & S. R. Talukdar* 138743 (ASSAM!); Khasi Hills, Dingling, 5000 ft., 15.11.1872, *C. B. Clarke* 17483, BM012558289 (BM!); East Khasi Hills, Mawphlang, 20.08.1952, *W. N. Koelz* 31175, MICH1506325 (MICH).

## LECTOTYPIFICATION

J. D. Hooker (1875) while describing *Impatiens angustiflora* Hook.f. mentioned T. Lobb's collection, the other specimens as “& C” which also includes their own collections *J. D. Hooker & T. Thomson: Impatiens* 55 from Moflang (present day Mowphlang), Khasi Hills

along with *J. D. Hooker & T. Thomson: Impatiens* 53 (*Impatiens leptoceras* DC. var. **η**) and *J. D. Hooker & T. Thomson: Impatiens* 58 (*Impatiens leptoceras* DC. var. **θ**) and Griffith's collection from Bhutan. Hooker (1905) later rectified the Griffith's collection from Bhutan not to be *I. angustiflora*. Among the original materials, T. Lobb's specimen was found mixed with the collection *J. D. Hooker & T. Thomson Impatiens* 55 from Khasi Hills at K (K000694623), duplicate of *J. D. Hooker & T. Thomson's* 55 from Moflang (present day Mowphlang) is also available at CAL (CAL0000005176). K000694623 partly (specimen of *T. Lobb s. n.*) designated here as lectotype as per Art. 9.3 of Shenzhen Code (Turland & al., 2018) for the name *Impatiens angustiflora* Hook.f., contain one flowering twigs (one on the left is T. Lobb's collection and other two on the right side are of Hooker & Thomson's), dissected flower parts pasted on a small piece of paper at top left, pencil illustrations and annotations by Hooker himself correspond well with the protologue.

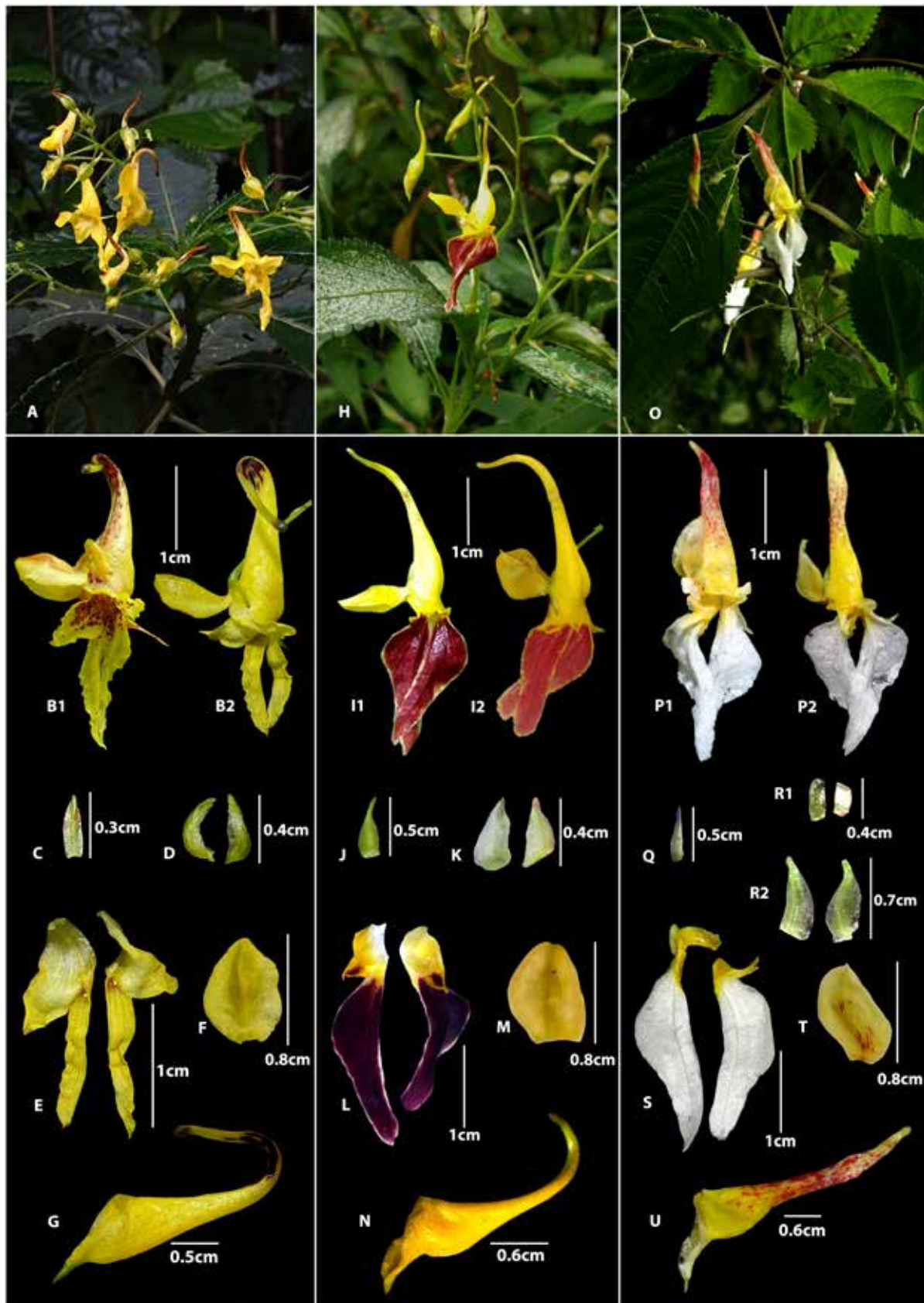
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## REFERENCES

- BHASKAR, V. 2012. *Taxonomic monograph on Impatiens L. (Balsaminaceae) of Western Ghats, South India: the key genus for endemism*. Centre for Plant Taxonomic Study, Bangalore, India. pp. 283.
- CHAKRABARTY, T. 2009. Checklist of the genus *Impatiens* L. (Balsaminaceae) for Sikkim State. *Journal of Economic and Taxonomic Botany* 33(1): 205–215.
- CHEN, Y.L., S. AKIYAMA AND H. OHBA. 2008. Balsaminaceae. In: Wu Z., Raven P. H., Hong D.Y. (Eds.) *Flora of China* Vol. 12. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, USA. pp. 43–113.
- FISCHER, E. 2004. Balsaminaceae. In: Kubitzki, K. (Ed.) *Families and Genera of Vascular Plants* Vol. 6. Springer-Verlag, Berlin, Heidelberg. pp. 20–25.
- GOGOI, R., A.K. UPADHYAY AND N.C. RATHAKRISHNAN. 2020. Balsaminaceae. In: *Flowering Plants of India* Vol. 1. Botanical Survey of India, Kolkata, India. pp. 193–211 (in press).
- GOGOI, R., S. BORAH, S.S. DASH AND P. SINGH. 2018. *Balsams of Eastern Himalaya – A regional revision*. Botanical Survey of India, Kolkata, India. pp. 1–216.





**Plate 3.** Comparison of floral parts. **H–N.** *Impatiens angustiflora* Hook.f., **A–G.** *I. stenantha* Hook.f. and **O–U.** *I. albopetala* Gogoi & Borah. **A, H & O.** plants in habitat, **B, I & P.** flowers, **C, J & Q.** bracts, **D, K & R.** lateral sepals, **E, L & S.** lateral united petals, **F, M & T.** dorsal petals, **G, N & U.** lower sepals.

- GOGOI, R., N. SHERPA AND G. CHHETRI. 2020. *Impatiens bakthangensis* sp. nov. (Balsaminaceae): a new species from Sikkim, India. *Nordic Journal of Botany* 38 (10). doi: [10.1111/njb.02872](https://doi.org/10.1111/njb.02872)
- GREY-WILSON, C. 1991. *Impatiens* L. In: Grierson A.J.C. & Long D.G. (Eds.) *Flora of Bhutan* Vol. 2, Part 1. Royal Botanic Garden Edinburgh, UK. pp. 82–102.
- HOOKE, J.D. 1875. *Impatiens* L. In: *Flora of British India* Vol. 1. L. Reeve & Co, London, UK. pp. 440–483.
- HOOKE, J.D. 1905. An epitome of the British Indian species of *Impatiens*. *Records of Botanical Survey of India* 4: 11–35.
- HOOKE, J.D. AND T. THOMSON. 1860. *Precursores ad Floram Indicum-Balsaminaceae*. *Journal of the proceedings of the Linnean Society. Botany* 4: 106–157. doi: [10.1111/j.1095-8339.1859.tb01160.x](https://doi.org/10.1111/j.1095-8339.1859.tb01160.x)
- JANSSENS, S.B., E.B. KNOX, S. HUYSMANS, E.F. SMETS AND V.F.S.T MERCKX. 2009. Rapid radiation of *Impatiens* (Balsaminaceae) during Pliocene and Pleistocene: result of a global climate change. *Molecular Phylogenetics and Evolution* 52: 806–824.
- MABBERLEY, D.J. 2008. *The Plant book – A Portable Dictionary of Plants*. Cambridge University Press, Cambridge, UK. pp. 1040.
- POWO. 2019. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.plantsoftheworldonline.org/> accessed on 29.10.2020.
- TURLAND, N.J., J.H. WIERSEMA, F.R. BARRIE, W. GREUTER, D.L. HAWKSWORTH, P.S. HERENDEEN, S. KNAPP, W.-H. KUSBER, D.-Z. LI, K. MARHOLD, T.W. MAY, J. MCNEILL, A.M. MONRO, J. PRADO, M.J. PRICE AND G.F. SMITH. 2018. *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books. doi: [10.12705/Code.2018](https://doi.org/10.12705/Code.2018)
- VIVEKANANTHAN, K., N.C. RATHAKRISHNAN, M.S. SWAMINATHAN AND L.K. GHARA. 1997. Balsaminaceae. In: Hajra P.K, Nair V.J., Daniel P (Eds.) *Flora of India* Vol. 4. Botanical Survey of India, Kolkata, India. pp. 95–229.
- YU, S.X. 2012. *Balsaminaceae of China*. Peking Univ. Press, Beijing, China. pp. 1-215.