



Impatiens agastyamalayensis stat. nov. (Balsaminaceae)—A reassessment of *Impatiens rufescens* var. *agastyamalayensis* and rediscovery of the plant from the Western Ghats, India

ALFRED JOE^{1,2}, V. BHASKAR³ & MAMIYIL SABU^{2*}

¹Department of Botany, St. Thomas' College, Thrissur, Kerala-680 001, India

²Department of Botany, University of Calicut, Malappuram, Kerala-673 635, India

³Botanical Garden & Herbarium, University of Agricultural Sciences, Bangalore-560 065, India

*Email: msabu9@gmail.com, vbhaskar49@gmail.com

Abstract

Impatiens rufescens var. *agastyamalayensis* was described based on a herbarium specimen of C.A. Barber collected in 1901 from Agastyamala. It has now been rediscovered from the same locality after more than a century. Present studies on fresh specimens revealed that the characters are strong enough to elevate the variety to species level, *I. agastyamalayensis* stat. nov. A detailed description and color photographs are given for easy identification of the species. Detailed notes on seed hair and pollen morphology of *I. agastyamalayensis* are also provided.

Key words: *Impatiens tomentosa*, *Impatiens rufescens*, *Impatiens gardneriana*, Agastyamala

Introduction

The family Balsaminaceae consists of two genera, the monotypic *Hydrocera* Blume (1825: 241) and *Impatiens* Linnaeus (1753: 937) with over 1000 species worldwide, with most species concentrated in south and southeast Asia and southwestern China, eastern to central Himalayas, southwestern India, tropical Africa, and Madagascar (Grey-Wilson, 1980). In India, *Impatiens* is represented by more than 210 species and infraspecific taxa, mainly distributed in the eastern Himalayas, the neighbouring northeastern states and the Western Ghats, in southwestern India, which are the major centres of diversity and occurrence (Hooker, 1908; Gamble, 1915; Vivekananthan *et al.*, 1997; Augustine *et al.*, 1999; Bhaskar, 2012). J.D. Hooker (1874, 1904a, b, 1905, 1906, 1908, 1910, 1911) contributed to a great extent on the taxonomy of *Impatiens* of India, in particular. After Gamble (1915), Fischer (1930-1938) and Barnes (1938, 1939), several authors have reported new species of *Impatiens* from the Western Ghats (Chandrabose, 1979; Bhaskar, 1981, 2006, 2012; Bhaskar & Razi, 1982; Bhaskar *et al.*, 1975; Chandrabose *et al.*, 1984; Dessai & Janarthnam, 2011; Narayanan *et al.*, 2011, 2012a,b,2013; Hareesh *et al.*, 2015; Prabhukumar *et al.*, 2015a,b, 2016, 2017; Ramasubbu *et al.*, 2015a,b, 2017; Manudev *et al.* 2017 etc.).

The balsams of the Western Ghats in particular are annuals or perennial herbs or shrubs with a wide range of form and flower morphology. Based on their distinct form and morphology, Hooker and Thomson (1859) grouped Indian species of *Impatiens* into several sections (*Scapigeriae*, *Oppositifoliae*, *Sub-verticillatae*, *Uniflorae*, *Lateriflorae*, *Umbellatae*, *Capitatae* and *Racemosae*), while Gamble (1915) grouped *Impatiens* species of then Madras Presidency into seven sections (*viz.* *Scapigeriae*, *Epiphyticae*, *Annuae*, *Microsepalae*, *Tomentosae*, *Sub-umbellatae* and *Racemosae*). In Gamble's treatment, the species grouped under *Annuae* are annual herbs with opposite leaves, flowers solitary or fascicled in the axils of leaves without peduncles, sepals elongate-linear, rarely ovate or lanceolate (as in *I. gardneriana* Wight (1846: 1050) *ex* Hooker (1874: 450) and *I. concinna* Hooker (1874: 449) and seeds usually globose, black and polished (except *I. gardneriana*). This grouping by Hooker and Thomson (*l.c.*) and Gamble (*l.c.*) is almost natural with species showing more or less uniform characters such as linear and elongate sepals, opposite leaves and black globular shiny seeds. However, in Gamble's (*l.c.*) treatment, *I. concinna* and *I. gardneriana* were the only exceptions that have ovate-lanceolate lateral sepals, but later Bhaskar (2012) added *I. rufescens* var. *agastyamalayensis* Bhaskar (2012: 171)

which was described by him as a new variety. *I. gardneriana* is the only exception in this section bearing a verticillate leaf arrangement and brown hairy seeds. Hence, Bhaskar (2012) divided Section *Annuae* into two sub-sections viz. 'Verticillatae' consisting of *I. gardneriana* and 'Oppositifoliae' with the rest of the species having opposite leaves. Bhaskar (*l.c.*), while studying *Impatiens* of the Western Ghats, came across two herbarium specimens in the Madras Herbarium (*s.n.* 7488 and Barber 2923 - MH) collected from the Agastyamala hills exhibiting a rufous-tomentose nature as in *I. tomentosa* B. Heyne (1831: 4751) *ex* Wight & Arnott (1834: 139) and *I. rufescens* Benth. *ex* Wight & Arnott (1834: 138), but differing distinctly in having ovate-lanceolate lateral sepals, saccate and hairy lip with straight short spur. As live plants were not collected and flower colour, fruit and seed characters were not known, Bhaskar (*l.c.*) erected this as only a new variety 'agastyamalayensis' named after the place from where it was collected. Further, he went on to suggest that the plant looks so different that after collecting fresh specimens from the type locality it may deserve to be elevated to a distinct species. Recently, during a field exploration of the Agastyamala, Thiruvananthapuram District, Kerala, the first author collected this interesting balsam which happened to be the same plant as described by Bhaskar (*l.c.*) as *I. rufescens* var. *agastyamalayensis*. This plant has shown further interesting characters such as having 1–3 large seeds that are brown with testa indumentum, in addition to having ovate-lanceolate lateral sepals and standing very distinct from the rest of the members under the Section *Annuae* and subsection *Oppositifoliae*. Hence the status of *I. rufescens* var. *agastyamalayensis* is herein elevated to the species level.

Taxonomy

Impatiens agastyamalayensis (Bhaskar) A. Joe, V. Bhaskar & M. Sabu *stat. nov.*

Impatiens rufescens var. *agastyamalayensis* Bhaskar, Taxonomic Monograph on *Impatiens* of Western Ghats 171, 2012.

Type:—*Exsiccatum*, *sin. num.* Agastyamalai (Acc. No. 7488 MH!), Aghasteer Mallay, Tinneveli, (erstwhile Madras state, presently in Trivandrum district, Kerala) May 1901, *C.A. Barber 2923* (MH!) (FIGURES 1, 2)

Branched, erect perennial herbs up to 30 cm tall; stem 4-angled, glabrous except at upper reddish nodes, green or green with purple tinge; internodes 1.5–8 cm long. Leaves opposite, decussate, crowded at apex, 2.7–3.5 × 1.1–1.3 cm, oblong, acute at apex, base rounded, margin serrate, spinose, upper surface green, puberulous, lower surface pale greenish or whitish, veins 3 on each side, hairy at midrib and veins; petiole 1–2 mm long, glabrous, pale green or whitish. Flowers solitary on leaf axils, 16–18 × 12–15 mm, purple or pale purple with 2 red spots at the throat and whitish towards base; pedicel 18–22 mm long, whitish or pale purple, densely villous, hairs white. Lateral sepals ovate-lanceolate, 8–9 × 2–3 mm, villous, pale green with purple apex. Lower sepals 7–8 × 4–5 mm, saccate, villous, white with few reddish honey guides towards margin, spur ca. 2 mm long, cylindrical, stout, straight, villous, purple. Dorsal petal 7–8 × 4–5 mm, broadly ovate, white, glabrous except hairy keel, keel green, apex mucronate. Lateral united petals 2-lobed; distal lobe 9–11 × 5–6 mm, ovate with obtuse apex, purple; basal lobe ca. 6 × 2 mm, pale purple or whitish, orbicular or obovate, apex acute or rounded; dorsal auricle 2–3 × 2 mm, cream with reddish honey guides. Stamens 5–6 × 2 mm; filaments 3–4 mm long, glabrous, white, anthers 2–3 × 2–3 mm, glabrous, white, pollen white. Pistil 3–4 × 1 mm; ovary oblong-obovate, green, glabrous. Capsule 12–14 mm long, ellipsoid or oblong, glabrous, ridged, stalk 2–3 cm long, purple; seeds 1–3 per capsule, 6–7 × 3–4 mm, oblong, almond-shaped, brown, villous.

Micro-morphological characters:—

Pollen morphology:—4-colpate, rectangular, bilateral, pollen greatly vary in size, ranging from 32 × 19 μm to 43 × 25 μm, exine finely reticulate, reticulations small; lumen ca. 2–3 × 2–3 μm, muri thin, ca. 0.5 μm, duplibaculate, apo- and meso-colpium slightly differentiated.

Seed trichome morphology:—Trichomes bi-morphic, trichomes near hilum in a white sticky bunch, long and slender, with double helical banding pattern, trichomes away from hilum stiff with reticulate banding pattern. Trichomes with reticulate banding arise from a dark brown base and the apices without reticulate banding. There are also dwarf trichomes all over the seed in between long stiff trichomes and they are also reticulately banded and bands brownish.

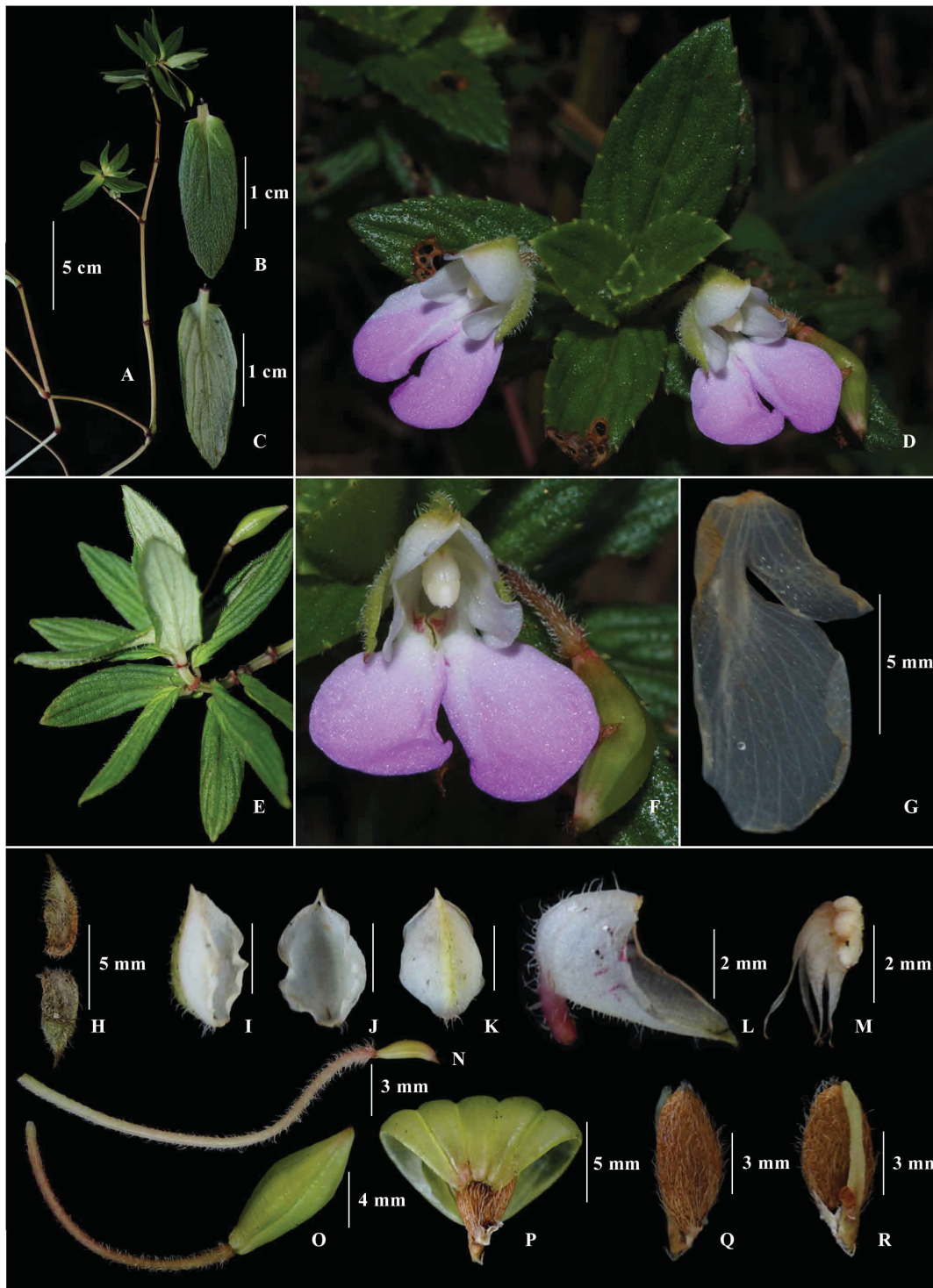


FIGURE 1. *Impatiens agastyamalayensis*. A. Twig showing branching pattern; B-C. Leaf-adaxial and abaxial surfaces; D. Flowering twig; E. Portion of plant showing red ring and long hairs at nodal region; F. Flower-front view; G. Lateral united petal; H. Lateral sepals; I-K. Dorsal petal; I. Side view; J. Abaxial view; K. Adaxial view; L. Lower sepal; M. Stamen; N. Ovary with pedicel; O. Mature fruit with pedicel; P. Dehisced fruit; Q. Seed; R. Seed attached to the placenta with aborted ovule. (Photos by Alfred Joe).

Phenology:—This plant was collected with both flowers and fruits during February by Udayan and during March by the first author, while the specimen collected by C.A. Barber during May 1901 bears only flowers. From its occurrence during summer months like February and March (the northeast monsoon often extends up to these months in this part of the Western Ghats) it appears that this species is perennial in nature and its life cycle is adopted to both southwest and northeast monsoon seasons.



FIGURE 2. Seed trichomes and pollen morphology of *Impatiens agastyamalayensis*. A–D. Hilum part of seed showing whitish bunch of trichomes which have double helical banding pattern; E–I. Seed trichomes away from hilum showing reticulate banding pattern; E–F. Dark brown base of the trichomes and dwarf trichomes with reticulate banding pattern ad-pressed to testa; J. Brownish bands in dwarf trichomes; K–O. Pollen morphology showing 4-colpate nature, variation in pollen size, finely reticulate exine, intraluminal bacules and colpus. (Micro-photographs by V. Bhaskar).

TABLE 1. Comparison of *Impatiens agastyamalayensis* and allied species.

Characters	<i>I. tomentosa</i>	<i>I. rufescens</i>	<i>I. agastyamalayensis</i>	<i>I. gardneriana</i>
Leaf arrangement	Opposite-decussate	Opposite-decussate	Opposite-decussate	Verticillate
Lateral sepals	Linear	Linear	Ovate-lanceolate	Ovate-lanceolate
Lower sepals	With a short spur, incurved like a hook	Without a spur	With a short straight spur	With an elongated incurved spur
Ovules	Many	Many	One to three	Many
Seeds	Many, round, black and shining, size 1.2-2 mm	Many, round, black and shining, size 1.2-2 mm	One to three, oblong, almond-shaped, brown and villous, size 6–7 × 3–4 mm	Many, oblong, oblong- shaped, brown and villous, size ca. 3 mm
Seed trichome morphology	No trichomes	No trichomes	Bimorphic, hairs at hilum with double helical banding, hairs away from hilum with reticulate banding pattern	Bimorphic, hairs at hilum with double helical banding, hairs away from hilum with reticulate banding pattern
Pollen morphology	4-colpate, bilateral, rectangular	4-colpate, bilateral, rectangular	4-colpate, bilateral, rectangular, finely reticulate exine, with prominent intra- luminal bacules	3-colpate, radial, reticulate, intra-luminal bacules present

Distribution:—This species is narrowly endemic and so far known only from Pongalapara of Agastyamala, Western Ghats of Kerala.

Conservation Status:—Ever since the type specimen was collected by C.A. Barber in 1901, there have been no collections of this balsam from either the type locality or from any other part of the Western Ghats. Its first collection was by Udayan and others during 2009 from the same locality (CMPR!) and the present one by the first author during 2016 (CALI!). Further, it is known to exist only in a single location, i.e., Pongalapara of Agastyamala and the geographic range or area of occupancy is estimated to be less than 10 km². Therefore, this species is classified as Critically Endangered [CR B1ab(ii, iii)+B2ab(i,ii)] (IUCN 2012).

Note:—*Impatiens agastyamalayensis* is a very interesting species as it resembles *I. tomentosa* and *I. rufescens* on one hand with its tomentose nature of leaves and floral parts and bearing opposite-decussate leaves, but differs from them in having glabrous stems except at nodes, ovate-lanceolate lateral sepals, straight short spur 2 mm long, and capsule enclosing 1–3 large brown seeds which are oblong and hairy. On the other hand, this species resembles *I. gardneriana* in having ovate-lanceolate lateral sepals, brown seeds and bimorphic hairs on seeds but differs from it in not having a verticillate leaf arrangement, long slender spur and 3-colpate pollen grains. Further, the seed size (6–7 × 3–4 mm) is unusually big and not encountered in any brown-seeded species of *Impatiens* known so far in the Western Ghats. Bhaskar (2012) had formed two new subsections under section ‘*Annuae*’, viz. ‘*Verticillatae*’ placing *I. gardneriana* under it, while the rest of the species were under ‘*Oppositifoliae*’. Incidentally, *I. gardneriana* was the only species exhibiting brown hairy seeds and 3-colpate pollen grains and the grouping hitherto looked natural, but now with the discovery of *I. agastyamalayensis* having similar seed (except the size) and seed hair characters but with opposite leaf arrangement and 4-colpate pollen morphology and also being the only perennial balsam in the whole of Section ‘*Annuae*’, it has become difficult to place it either under subsection ‘*Verticillatae*’ or under subsection ‘*Oppositifoliae*’ although it has opposite-decussate leaf arrangement and 4-colpate pollen. This is additional evidence that active speciation is under progress among the species of *Impatiens* in the Western Ghats. Thus, presently it is assumed that it forms an intermediate position between these two subsections and further DNA studies of these related species would resolve its exact taxonomic position and relationships.

Additional Specimens examined:—INDIA. Kerala: Thiruvanthapuram District, Agastyamala, near Pongalapara, 15 March 2016, *A. Joe 148725* (CALI!); Pongalapara, 13 February 2009, *Udayan P.S. et al. 05632* (CMPR!).

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References

- Augustine, J., Sasidharan, N. & Sivadasan, M. (1999) Balsams of Periyar Tiger Reserve, southern Western Ghats, Kerala. In: Sivadasan, M. & Mathew, P. (Eds.) Biodiversity, Taxonomy and Conservation of Flowering plants. Mentor Books, Calicut, pp. 275–292.
- Barnes, E. (1938) New or little known plants from South India. *Bulletin of Miscellaneous Information, Kew* 1938: 32–34.
<https://doi.org/10.2307/4115467>
- Barnes, E. (1939) The species of Geraniaceae occurring on the Travancore High Range, including the description of a new balsam. *Journal of Indian Botanical Society* 18 (3): 95–105.
- Bhaskar, V. (1981) The genus *Impatiens* in South India: Endemism and affinities. *Indian Forester* 107: 368–376.
- Bhaskar, V. (2006) *Impatiens clavata* Bhaskar sp. nov. – a new scapigerous balsam (Balsaminaceae) from Bisle Ghat, Western Ghats, South India. *Current Science* 91 (9): 1138–1140.
- Bhaskar, V. (2012) *Taxonomic monograph on Impatiens L. (Balsaminaceae) of Western Ghats – The key genus for endemism*. Centre for Plant Taxonomic Studies, Bangalore, pp. 1–283.
- Bhaskar, V. & Razi, B.A. (1981) Peninsular Indian *Impatiens* L. (Balsaminaceae). *Bulletin of Botanical Survey of India* 23 (3–4): 191–196.
- Bhaskar, V. & Razi, B.A. (1982) Two more new species of *Impatiens* L. from South India. *Journal of Bombay National History Society* 79: 382–384.
- Bhaskar, V. & Razi, B.A. & Yoganarasimhan, S.N. (1975) A ‘pollen variety’ of *Impatiens acaulis* Arn. (Balsaminaceae). *Current Science*

44 (7): 622–623.

- Blume, C.L. (1825) Hydrocera. In: *Bijdragen tot de Flora van Nederlandsch Indie*, vol. 5. Ter Lands Drukkerij, Batavia, 241 pp.
- Chandrabose, M. (1979) A new species of *Impatiens* L. (Balsaminaceae) from South India. *Journal of Bombay National History Society* 75: 901–902.
- Chandrabose, M., Chandrasekaran, V. & Nair, N.C. (1984) A new species of *Impatiens* L. (Balsaminaceae) from South India. *Journal of Bombay National History Society* 81: 676–677.
- Dessai, J.R.N. & Janarthanam, M.K. (2011) The genus *Impatiens* (Balsaminaceae) in the northern and parts of central Western Ghats. *Rheedea* 21: 23–80
- Fischer, C.E.C. (1930–1938) New or little known plants from South India. *Bulletin of Miscellaneous Information, Kew* 1930: 150, 330; 1931: 41; 1934: 389–394; 1935: 92–97 & 157–160; 1938: 32–37.
- Gamble, J.S. (1915) *Impatiens*. In: *Flora of the Presidency of Madras*, vol. 1. West Newman & Co, Adlard & Son, Calcutta, pp. 134–145.
<https://doi.org/10.5962/bhl.title.21628>
- Gamble, J.S. & Fischer, C.E.C. (1956) *Impatiens*. In: *Addenda to the Flora of the Presidency of Madras*, vol. 3. Botanical Survey of India, Calcutta, pp. 1293–1295.
- Grey-Wilson, C. (1980) *Impatiens of Africa*. A. A. Balkema, Rotterdam, Netherlands.
- Hareesh, V.S., Sreekumar, V.B., Dantas, K.J. & Sujanapal, P. (2015) *Impatiens sahyadrica* sp. nov. (Balsaminaceae) – a new species from southern Western Ghats, India. *Phytotaxa* 207 (3): 291–296.
<https://doi.org/10.11646/phytotaxa.207.3.8>
- Heyne, B. (1831) *Impatiens tomentosa*. In: Wallich, N. (Eds.) *A Numerical List of dried specimens of plants in the East India Company's Museum: collected under the superintendence of Dr. Wallich of the Company's botanic garden at Calcutta*. London. n. 4751.
- Hooker, J.D. & Thomson, T. (1859) Praecursores ad Floram Indicam: Balsaminaceae. *Proceedings of Linnaean Society London (Botany)* 4: 106–157.
<https://doi.org/10.1111/j.1095-8339.1859.tb01160.x>
- Hooker, J.D. (1874) *Impatiens*. In: *The Flora of British India*, vol. 1. L. Reeve & Co., London, pp. 440–464.
- Hooker, J.D. (1904a) On the species of *Impatiens* in Wallichian Herbarium of the Linnaean Society. *Journal of Linnaean Society of Botany* 37: 22–32.
<https://doi.org/10.1111/j.1095-8339.1904.tb00821.x>
- Hooker, J.D. (1904b, 1905, 1906) An epitome of the British Indian species of *Impatiens*. *Records of the Botanical Survey of India* 4 (1): 1–10; 4 (2): 11–35; 4 (3): 37–58.
- Hooker, J.D. (1908) *Impatiens*. In: *Icones Plantarum, 4th series 9*. Dulau & Co, London, pp. 2851–2875.
- Hooker, J.D. (1910) Indian species of *Impatiens*: generis *Impatiens* species Indicae novae et minus rite cognitae a cl. A. Meebold. *Bulletin of Miscellaneous Information, Kew* 1910: 291–300
<https://doi.org/10.2307/4111723>
- Hooker, J.D. (1911) Indian species of *Impatiens*. On some western peninsular Indian Balsaminaceae collected by Mr. A. Meebold. *Bulletin of Miscellaneous Information, Kew* 1911: 353–356.
<https://doi.org/10.2307/4113270>
- IUCN (2012) *IUCN Red List Categories and Criteria: Version 3.1. Second Edition*. International Union for Conservation of Nature and Natural Resources. Gland, Switzerland and Cambridge, UK, pp. 1–32.
- Linnaeus, C. (1753) *Impatiens*. In: *Species Plantarum*, vol. 2. L. Salvius, Stolkholm, 937 pp.
- Narayanan, M.K.R., Sujana, K.A., Balakrishnan, V., Meera Raj, R. & Anil Kumar, N. (2012b) *Impatiens mohana* (Balsaminaceae), a new scapigerous balsam from Wayanad, Western Ghats, India. *Edinburgh Journal of Botany* 69 (2): 281–285.
<https://doi.org/10.1017/S096042861200008X>
- Narayanan, M.K.R., Anil Kumar, N., Jayesh, P.J., Sunil, C.N. & Shaju, T. (2012a) *Impatiens johnsiana* (Balsaminaceae), A new scapigerous balsam from Western Ghats, India. *Journal of Botanical Research Institute of Texas* 6 (1): 113–118.
- Narayanan, M.K.R., Anil Kumar, N., Meera Raj, R., Sivadasan, M. & Alfarhan, A.H. (2011) A new scapigerous species of *Impatiens* (Balsaminaceae) from India. *Bangladesh Journal of Plant Taxonomy* 18: 141–148.
<https://doi.org/10.3329/bjpt.v18i2.9299>
- Narayanan, M.K.R., Jayesh P. Joseph, Anil Kumar, N., Sivadasan, M. & Alfarhan, A.H. (2013) *Impatiens theuerkaufiana* (Balsaminaceae), a new scapigerous species from the Western Ghats, India. *Phytotaxa* 83 (1): 54–60.
<https://doi.org/10.11646/phytotaxa.83.1.3>
- Prabhukumar, K.M., Hareesh, V.S., Bhaskar, V., Sreekumar, V.B., Nirmesh, T.K. & Indira Balachandran (2016) *Impatiens glabrata* (Balsaminaceae) – A new species from southern Western Ghats, India. *Phytotaxa* 266 (1): 33–39.
<https://doi.org/10.11646/phytotaxa.266.1.5>

- Prabhukumar, K.M., Hareesh, V.S., Sreekumar, V.B., Nirmesh, T.K. & Indira Balachandran (2015a) *Impatiens neo-modesta* (Balsaminaceae)- A new species from Western Ghats, India. *Webbia* 70 (2): 231–235.
<https://doi.org/10.1080/00837792.2015.1074792>
- Prabhukumar, K.M., Jagdeesan, R., Prasad, G., Nagaraj, B.N., Naveen Kumar, V.N., Bhaskar, V., & Indira Balachandran (2017) Two new taxa of *Impatiens* (Balsaminaceae) from southern parts of Western Ghats, India. *Phytotaxa* 296 (3): 281–286.
<https://doi.org/10.11646/phytotaxa.296.3.7>
- Prabhukumar, K.M., Omalsree, M., Hareesh, V.S., Bhaskar, V., Nirmesh, T.K., Sreekumar, V.B. & Indira Balachandran (2015b) Two new taxa of *Impatiens* L. (Balsaminaceae) from Western Ghats of India. *Phytotaxa* 238 (3): 255–264.
<https://doi.org/10.11646/phytotaxa.296.3.7>
- Ramasubbu, R., Divya, C., Sasikala, N., Surendran, A. & Sreekala, A.K. (2017) *Impatiens megamalayana*, a new species of *Impatiens* from the Western Ghats, Tamil Nadu, India. *Phytotaxa* 300 (2): 193–197.
<https://doi.org/10.11646/phytotaxa.302.2.10>
- Ramasubbu, R., Felix Irudhyaraj, D., Mohanraj, A. & Pandurangan, A.G. (2015b) *Impatiens matthewiana*, A new scapigerous balsam from Western Ghats, India. *Phytotaxa* 227 (3): 268–274.
<http://doi.org/10.11646/phytotaxa.227.3.6>
- Ramasubbu, R., Manikandan, G., Mehalingam, P. & Pandurangan, A.G. (2015a) *Impatiens courtallensis* (Balsaminaceae), A new species of *Impatiens* from Western Ghats, Tamil Nadu, India. *Phytotaxa* 203 (2): 199–204.
<http://doi.org/10.11646/phytotaxa.203.2.10>
- Vivekananthan, K., Rathakrishnan, N.C., Swaminathan, M.S. & Ghara, L.K. (1997) Balsaminaceae. In: Hajra, P.K., Nair, V.J. & Daniel, P. (Eds.) *Flora of India*, vol. 4. Botanical Survey of India, Calcutta, pp. 95–229.
- Wight, R. & Arnott, G.A.W. (1834) *Prodromus Florae Peninsulae Indiae Orientalis*, vol. 1. Parbury Allen & Co., London.
- Wight, R. (1846) *Impatiens gardneriana*. In: *Icones Plantarum Indiae Orientalis*, Vol. 3. Messrs, Frank & Co., Madras. T. 1050.