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The genus *Impatiens* (Balsaminaceae) in the northern and parts of central Western Ghats

Jyosna R.N. Dessai and M.K. Janarthanam*
Department of Botany, Goa University, Goa – 403 206, India.
*E-mail: mkjana@yahoo.com

Abstract

The genus *Impatiens* L. comprises over 1,000 species worldwide. It is represented by *c.* 210 species in India and most of them are either endemic to the Himalaya or Western Ghats. We have studied the genus in the Northern and parts of Central Western Ghats. We report here 26 species and 2 varieties including a new species with detailed descriptions, illustrations, distribution, critical note, updated nomenclature and IUCN threat status.

Keywords: Endemic, *Impatiens*, New Species, Taxonomy, Western Ghats

Introduction

The richness of flowering plants makes India one of the megadiversity countries in the world with four biodiversity hotspots and three megacentres of endemism. The flora of India shows high diversity in terms of families, genera and species of angiosperms. Many genera and families are known to be represented by a large number of endemic species; one amongst them is the genus, *Impatiens* L. of the family Balsaminaceae.

The family Balsaminaceae comprises annual as well as perennial herbs that show conspicuous and striking floral morphology. It comprises two widespread genera, viz., *Hydrocera* Wight & Arn., a monotypic genus and *Impatiens* L., a genus with a large number of species. *Hydrocera* can be distinguished by its five free petals and capsular berry while *Impatiens* has four petals that are fused to form two lateral petals and a 5-valved capsule. *Hydrocera triflora* (L.) Wight & Arn. is a semi-aquatic herb distributed in the Indomalesian region.

Impatiens with more than 1,000 species (Janssens *et al*., 2006, 2009a, b; Morgan, 2007) is distributed in the tropical and subtropical regions of the Old World as well as in the northern temperate regions (Grey-Wilson, 1980; Mabberly, 2008). The genus is known to have 5 distinct diversity hotspots, viz., tropical Africa, Madagascar, Southern India and Sri Lanka, the Eastern Himalaya and Southeast Asia (Yuan *et al*., 2004). Many species are cultivated as ornamental and some are used in medicine and cosmetics. Species belonging to this genus are commonly referred to as 'balsams' or 'jewel weeds'.

The genus is represented by *c*. 210 species in India with two centres of diversity – the Eastern Himalaya and the Western Ghats. Both regions show a high degree of endemism and hence recognised as two amongst the 34 biodiversity hotspot regions in the world (Mittermeier *et al*., 2004). Species occurring in India can be recognised under two groups: the first group with short, swollen spindle-shaped pods occurring in the peninsular region and the second group with long and narrow pods distributed in the Himalayan region (Hooker, 1874).

Historical Review

Indian species of *Impatiens* first appeared in print in *Hortus Malabaricus* (Rheede, 1689). This monumental pre-Linnaean work of Rheede includes six plates of balsams with a brief description in Latin, which are recognised as five distinct species (Nicolson *et al*., 1988).

Linnaeus (1753) described seven species of *Impatiens* including the present day *Hydrocera triflora* (= *I. triflora* L.) in the genus. It was later regarded as a monotypic genus. Of the six species of *Impatiens* described by Linnaeus (1753), three species occur in India that include 'Valli onapu' (*I. latifolia*) and 'Kondam pallu' (*I. oppositifolia*) of Rheede.

Major contributions on Peninsular Indian (basically the Western Ghats) *Impatiens* came from de Candolle (1824), Wight & Arnott (1834), Arnott (1835), Wight (1837, 1844, 1845, 1846) and Beddome (1859, 1868 – 1874). Hooker (1904, 1905, 1906, 1911) worked extensively on the Indian *Impatiens.* The present day understanding of Indian *Impatiens* can be attributed to Hooker.

Hooker & Thomson (1859) divided the genus into two broad groups, viz., Scapigerae and Caulescentes. Hooker (1874) refined the classification provided by Hooker & Thomson (1859). Warburg & Reiche (1895) were the pioneers to classify *Impatiens* at global level. However, their classification was considered artificial by Grey-Wilson (1980).

Regional floristic studies and inventories published in the early and mid 20th century by Cooke (1901), Gamble (1915), Fischer (1930, 1931, 1934, 1935, 1936, 1938), Fyson (1932), Blatter (1933), Barnes (1939) and Santapau (1967) have also contributed significantly. Bhaskar (1975) worked extensively on the genus *Impatiens* in Southern India. His studies included taxonomy, cytology, palynology, anatomy and reproductive biology and were published in a series of papers.

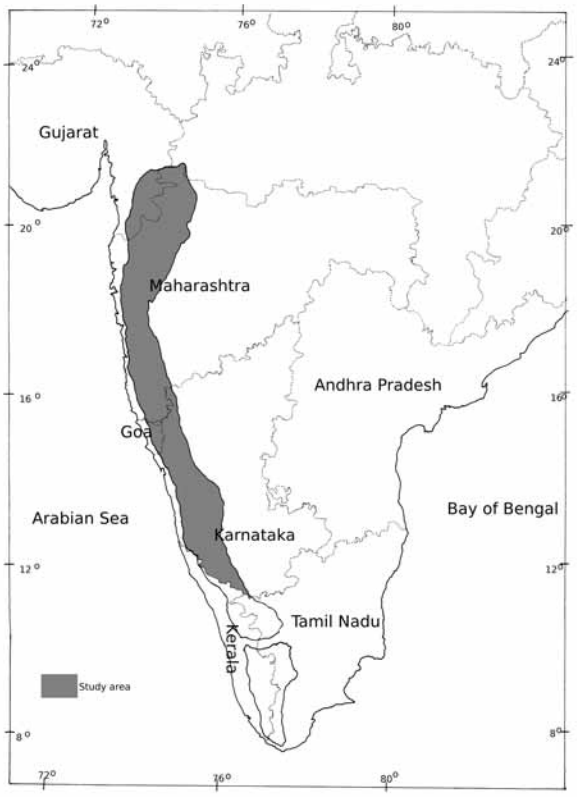
Several district floras and floristic works were published during the past four decades by various authors including: Ramamoorthy (1978), Shah (1978), Rao & Razi (1981), Yoganarasimhan *et al*. (1982), Vajravelu (1983, 1990), Sharma *et al*. (1984), Rao (1985), Manilal (1988), Ramachandran & Nair (1988), Almeida (1990), Murthy & Yoganarasimhan (1990), Lakshminarasimhan & Sharma (1991), Deshpande *et al*. (1993), Kothari & Moorthy (1993), Mohanan & Henry (1994), Saldanha (1996), Augustine *et al*. (1999), Ramaswamy *et al*. (2001), Yadav & Sardesai (2002), Bhat (2003), Sasidharan (2004), Rathakrishnan *et al*. (2005) and Nayar *et al*. (2006). All these taxonomic endeavours of these authors resulted in deposition of large number of collections in various Indian herbaria.

The only major study of the entire genus for the country is by Vivekananthan *et al*. (1997) which is primarily based on literature and herbarium specimens and includes 204 species for India. Critical taxonomic account, nomenclature, relationship among species and infrageneric classification are not dealt within this treatment.

Several new species and extended distributional reports from various parts of the Western Ghats have been published from time to time (Chandrabose, 1979; Chandrabose *et al*., 1984; Bhaskar & Razi, 1982; Pandurangan & Nair, 1995, 1996; Kumar & Sequiera, 1996, 2001; Ravikumar *et al*., 2000; Viswanathan & Manikandan, 2003; Bhaskar, 2006). These publications imply that knowledge on *Impatiens* is incomplete and there are species to be discovered and described as well as rediscovered. Hence, the present study on the genus in the Northern and parts of Central Western Ghats was taken up.

Study Area

Western Ghats is a chain of mountains running parallel to the West Coast of Peninsular India. The hill ranges are about 1,600 km long and cover an area of about 1,60,000 km^2 (Nayar, 1996). The study area covers the whole of Northern Western Ghats (from river Tapti in Gujarat to river Kali in Karnataka) and the Karnataka part of Central Western Ghats. The remaining parts of Central Western Ghats from Kerala and Tamil Nadu and the Biligirirangan Hills linking Western Ghats to the Eastern Ghats are not covered in the study (Map 1). The vegetation types include scrubs, sholas, montane grasslands, tropical moist deciduous forests, tropical dry deciduous forests, peat bogs,



Map 1. Northern and parts of central Western Ghats.

tropical evergreen forests, semi-evergreen forests and lateritic rocky plateaus. Many *Impatiens* species are found growing in all these diverse habitats.

Materials and Methods

Specimens collected from various parts of the study area were processed for herbarium using standard herbarium techniques proposed by Fosberg & Sachet (1965) and flowers preserved using the method described by Hooker (1904) and Grey-Wilson (1980). The processed and identified sheets were deposited in the Herbarium of Botany Department, Goa University (GUH), Goa. Entities found as novelties were recognised as new species. Species that were not found distributed in the study area and not represented by any collection from the study area in any of the herbaria have been excluded. Herbarium specimens from BLAT, BSI, CAL, FRLH, JCB, MH, MGM, SPU and SUK were studied. Photographs of herbarium sheets (types and authentic specimens) were obtained (or downloaded) from E, G, K, LINN, NY and W. Provisions of the International Code of Botanical Nomenclature (McNeill *et al*., 2006) have been applied for resolving various nomenclatural issues and typification problems. All the species have been evaluated for their threat status using IUCN Red List Categories and Criteria: Version 3.1 (IUCN, 2001).

Impatiens L., Sp. Pl. 2: 937. 1753; de Candolle, Prodr. 1: 687. 1824; Roxburgh, Fl. Ind. 2: 452. 1824; Wight & Arnott, Prodr. Fl. Ind. Orient.: 135. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 118. 1859; Dalzell & Gibson, Bombay Fl.: 42. 1861; Bentham & Hooker, Gen. Pl. 1: 277. 1862; Hooker, Fl. Brit. India 1: 440. 1874; Cooke, Fl. Bombay 1: 168. 1901; Gamble, Fl. Madras 1: 134. 1915; Grey-Wilson in Dassanayake, Rev. Handb. Fl. Ceylon 5: 80. 1985; Saldanha, Fl. Karnataka 2: 247. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 99. 1997.

Type: *I. noli-tangere* L. (Lectotype).

Annual or perennial, caulescent or acaulescent herbs, rarely shrubs, terrestrial or epiphytic, sometimes with tuberous or rhizomatous rootstocks. Stem quadrangular to terete, flaccid, succulent, rarely woody at base, glabrous to tomentose, often rooting at lower nodes. Leaves simple, rarely palmately lobed, alternate to opposite, alternate and opposite, whorled, or all radical, exstipulate, petiolate to sessile, attenuate to cordate at base, apiculate-crenate to serrate at margins; acute or acute-apiculate to emarginate at apex, glabrous or hairy, pinnately nerved; petioles short or long, glabrous to hairy, with glandular base or on petiole. Flowers in axillary racemes, fascicles, umbels or solitary, sometimes scapose, bisexual, zygomorphic, resupinate through 180º. Bracts entire. Pedicels glabrous or with 1 or 2 rows of hairs or hairy throughout. Sepals 3, rarely 5, free, entire at margins; lateral sepals linear to ovate, small; lip (posterior sepal) navicular, funnel-shaped or saccate; spur long or short, rarely absent, straight, bent, incurved or coiled, clavate, cylindric or inflated, bulged, forked, acuminate at apex, rarely 2-lobed or digitately lobed, coloured. Petals 3 or 5; standard (anterior) small or large, petaloid, flat or concave, crested or keeled dorsally; lower 4 petals (wing petals) free or fused, 1 or 2-lobed or 3-lobed, sometimes with a short or long and slender dorsal auricle near base. Stamens 5, cohering above pistil; filaments 5, narrow and free at base, broad and fused at apex. Ovary superior, 5-loculed; ovules 2 – many in each locule, on axile placenta; style 1, absent or rudimentary; stigma 5-toothed. Fruit a loculicidal capsule, explosive; valves open and coil elastically expelling the seeds out; seeds non endospermous; testa smooth, warted or hairy.

About 1,000 species distributed mainly in the tropical and subtropical regions of Asia and Africa with a few in the temperate regions of Asia, Europe and North America with five centres of diversity, viz., Africa, Madagascar, Western Ghats, Eastern Himalaya and Southeast Asia.

The genus is represented by *c.* 210 species in India of which *c.* 90 species occur in the Western Ghats region.

Key to the species

1. Plants caulescent, without tubers; leaves cauline; flowers axillary ….....……... 8
1. Plants acaulescent, with tubers; leaves radical; flowers in scapes ..... (Sect. **Scapigerae**)..... 2

2. Wing petals 2-lobed ..... **I. acaulis**
2. Wing petals 3-lobed 3

3. Wing petals without a tuft of hairs at base; spur cylindric, 3 – 5 cm long ..... **I. scapiflora**
3. Wing petals with a tuft of hairs at base; spur flat or absent, less than 2 cm long 4

4. Flowers white; seeds comose with tuft of hairs at ends 5
4. Flowers pink to lilac; seeds hairy throughout ... 6

5. Spur clavate; dorsal auricle present .... **I. dendricola**
5. Spur saccate or absent; dorsal auricle absent .... **I. stocksii**

6. Dorsal auricle rounded, less than 2 mm .... **I. bhaskarii**
6. Dorsal auricle spiniform, 5 – 10 mm long 7

7. Spur clavate; standard petal orbicular ..... **I. clavata**
7. Spur oblong; standard petal ovate ..... **I. barberi**

8. Leaves all opposite; seeds glabrous .... (sect. **Oppositifoliae**) 9
8. Leaves alternate or ternate; seeds hairy or with appendages .. (sect. **Uniflorae/Microsepalae**) .. 19

9. Plants tomentose ..... **I. tomentosa**
9. Plants glabrous …….....…….... 10

10. Wing petals 2-lobed 12
10. Wing petals not lobed 11

11. Lamina glandular at base; pedicel glabrous .... **I. minor**
11. Lamina eglandular at base; pedicels with two rows of hair ..... **I. kleiniformis**

12. Spur hooked, less than 0.8 cm long 13
12. Spur straight or curved, more than 1 cm long 16

13. Dorsal auricle present 14
13. Dorsal auricle absent ..... **I. dalzellii**

14. Flowers orange ..... **I. raziana**
14. Flowers pink 15

15. Leaves linear to linear-lanceolate; serrations acute; spur curved, straight or hooked .... **I. oppositifolia**
15. Leaves ovate; serrations cuspidate; spur bent, parallel to the lip ..... **I. lawii**

16. Spur distinctly curved, flat, broad in middle, thick ..... **I. chinensis**
16. Spur not curved, cylindric, thin 17

17. Distal lobe of wing petals stipitate; basal lobe triangular with acute apex ..... **I. diversifolia**
17. Distal lobe of wing petals sessile; basal lobe ovate with obtuse apex 18

18. Flowers more than 2 cm across; spur as long as pedicel ..... **I. vivekananthanii**
18. Flowers less than 1 cm across; spur shorter than pedicel ..... **I. tenella**

19. Leaves all alternate 21
19. Leaves at least a few opposite 20

20. Plants herbs; flowers pink ..... **I. gardneriana**
20. Plants undershrubs or shrubs; flowers white ..... **I. latifolia**
21. Plants glabrous; leaves broadly elliptic to ovate-lanceolate; lobes of wing petals subequal 22

21. Plants pubescent; leaves linear-elliptic to linear-lanceolate; lobes of wing petals unequal 24

22. Capsules tomentose ..... **I. talbotii**
22. Capsules glabrous 23

23. Stems quadrangular; seeds hairy .... **I. dasysperma**
23. Stems circular; seeds glabrous .... **I. pulcherrima**

24. Spur present 25
24. Spur absent ..... **I. scabriuscula**

25. Spur up to 1 cm long ..... **I. rosea**
25. Spur 1.5 – 2 cm long ..... **I. balsamina**

Section: Scapigerae Hook.f. & Thomson

Rootstocks tuberous. Leaves all radical. Inflorescence racemose. Seeds very minute, clothed with spiral hairs (Hooker, 1906).

Impatiens acaulis Arn., Companion Bot. Mag. 1: 325. 1835; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 119. 1859; Dalzell & Gibson, Bombay Fl.: 42. 1861; Hooker, Fl. Brit. India 1: 443. 1874 & Rec. Bot. Surv. India 4: 44. 1906; Cooke, Fl. Bombay 1: 170. 1901; Gamble, Fl. Madras 1: 138. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 309, t. 1. 1933; Santapau, Fl. Khandala: 30. 1967; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 52. 1983; Sharma *et al*., Fl. Karnataka: 36. 1984; Grey-Wilson in Dassanayake, Rev. Handb. Fl. Ceylon 5: 82, f. 2A – E. 1985; Rao, Fl. Goa 1: 56. 1985; Kulkarni, Fl. Sindhudurg District: 58. 1988; Almeida, Fl. Savantwadi 1: 76. 1990; Lakshminarasimhan & Sharma, Fl. Nasik District: 113. 1991; Deshpande *et al*., Fl. Mahabaleshwar 1: 113. 1993; Kothari & Moorthy, Fl. Raigad District: 46. 1993; Almeida, Fl. Maharashtra: 188. 1996; Saldanha, Fl. Karnataka 2: 257. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 111. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 445. 2000; Yadav & Sardesai, Fl. Kolhapur District: 93, t. 3, f. 19. 2002; Bhat, Fl. Udupi District: 87, t. 21. 2003; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 530. 2005. **Fig. 1; 7a**

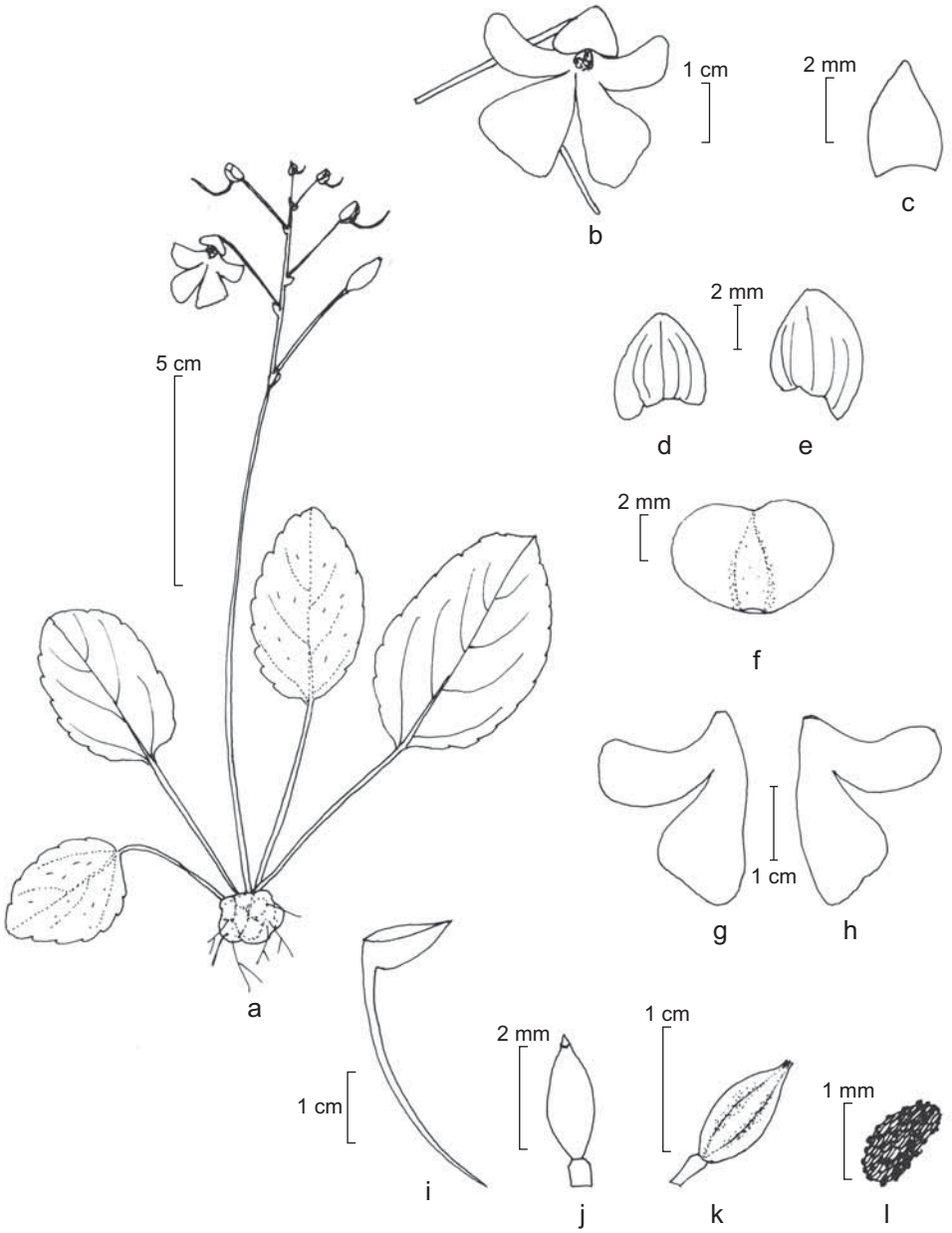


Fig. 1. *Impatiens acaulis* Arn. var. *acaulis*: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Type: CEYLON, *Walker s.n.* (K, photo!)

I. gracilis Bedd., Madras J. Lit. Sci. 2, 10: 69, t. 13. 1859.

I. scapiflora sensu Hook.f., Bot. Mag: t. 3587. 1837, non B. Heyne ex Roxb. 1824.

Terrestrial or epiphytic, scapigerous, tuberous or rhizomatous herb, 8 – 27 cm high; tubers oblongoid, 0.5 – 0.8 × 0.5 – 1.5 cm. Leaves radical, 3 – 6 per tuber, ovate, oblong to orbicular, (1.1 –) 2.5 – 16 × (0.8 –) 2 – 9 cm, obtuse, cordate to truncate at base, distantly apiculate-crenate at margins, acute to acute-apiculate at apex, hairy mainly on nerves above, glabrous below; petioles 2.5–9 cm long, glabrous. Inflorescence a racemose scape, 7 – 27 cm long, 4 – 10-flowered. Flowers 1.5 – 5 cm across, pink to lilac with white throat; bracts ovate, 2 – 3.5 × 1 – 3 mm, green; pedicels 0.7 – 3 cm long, glabrous, deflexed in fruits. Lateral sepals asymmetrically ovate, 2 – 5 × 1.5 – 4 mm, acute at apex, glabrous, pale green. Standard petal broadly obovate, 0.5 – 1 × 0.6 – 1.6 cm, concave, humped at base, forming a hood above column,

obcordate to emarginate, glabrous, pink outside, white inside; wing petals 1.6 – 3.2 × 1 – 2.5 cm, unequally 2-lobed; basal lobe oblong, 0.9 – 2.5 × 0.3 – 0.8 cm, rounded to obtuse at apex; distal lobe asymmetrically obovate, 1.1 – 2.6 × 0.6 – 1.5 cm; lip boat-shaped, 6 – 12 × 4 – 6 mm, 0.2 – 6 mm deep, acute at apex, glabrous, pinkish white; spur basal, tubular, 3 – 5.8 cm long, rounded at apex, glabrous, pink to white. Column 3 – 6 × 1 – 3 mm, curved; anthers *c.* 1 × 1 mm, white; filaments 3 – 5 × 0.5 – 1 mm, pink. Pistil 2.5 – 5 × 1 – 3 mm; ovary ellipsoid to broadly lanceoloid, glabrous. Capsules asymmetrically ellipsoid to lanceoloid, 1 – 1.3 × 0.4 – 0.7 cm, glabrous; pedicels 1 – 3.5 cm long; seeds oblongoid to lanceoloid, *c.* 1 × 0.5 mm, brown, hairy; hairs coiled forming a cone-like structure.

Note: *Impatiens acaulis* has closest ally in *I. scapiflora*. However, *I. acaulis* differs from *I. scapiflora* in the presence of 2-lobed wing petals and not 3-lobed wing petals. In the herbarium, *I. acaulis* cannot be differentiated from *I. scapiflora* unless the flowers are properly spread. *Impatiens acaulis* has the widest latitudinal distribution from Maharashtra to Tamil Nadu in the Western Ghats and Sri Lanka with major concentration in the Western Ghats of Maharashtra.

Two varieties have been recognized under this species that differ only in pollen characters.

Key to the varieties

1. Pollens 4-colpate; exine reticulate ..... var. **acaulis**

1. Pollens 3-colpate; exine granulate …..... ..... var. **granulata**

var. **acaulis**: Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 111, t. 34. 1997.

Flowering & Fruiting: June – December (April).

Habitat: Damp rocks, between rock crevices, vertical black boulders, amidst grasses in loose soil; spray zones of waterfalls and cemented walls and also tree trunks.

Distribution: India (Western Ghats) and Sri Lanka.

Specimens examined: INDIA, **Goa,** North Goa district, Chorla ghat, 27.8.2005, *Jyosna R.N. Dessai* 69 (GUH); South Goa district, Dudhsagar, 17.9.1970, *M.Y. Ansari* 124017; Mollem-Belgaum road, 17.9.1970, *N.P. Singh* 124261 (BSI); Savar falls, Tudav, Netravali, 26.4.2006, *Ashish Prabhugaonkar* 102 (GUH). **Kerala**, Idukki district, way to Kattuppana, 5.10.1983, *A.G. Pandurangan* 79262 (MH). **Maharashtra**, Kolhapur district, Ambha, 17.9.1996, *Milind Sardesai* MMS227 (SUK); Raigad district, Waterpipe, Junnapatti (Matheran), 26.8.1959, *N.A. Irani* NI4425, NI4426 (BLAT); Ratnagiri district, Amba ghat, 17.9.1961, *C.J. Saldanha* CS7195 (JCB); Satara district, Khandala, 9.6.1941, *H. Santapau* HS715; Fitzgerald ghat, Mahabaleshwar, 9.6.1954, *P.V. Bole* BOLE1150; Fitzgerald ghat, Mahabaleshwar, 22.12.1954, *P.V. Bole* BOLE1270; Fitzgerald ghat, Mahabaleshwar, 22.10.1957, *P.V. Bole* BOLE1452; Fitzgerald ghat, Mahabaleshwar, 31.8.1958, *B. Balaman* BB349; Fitzgerald ghat, Mahabaleshwar, 16.9.1958, *H. Santapau* HS22827; Fitzgerald ghat, Mahabaleshwar, 30.10.1958, *H. Santapau* HS22905, HS22907 (BLAT); Sindhudurg district, Phonda ghat, 18.8.1965, *B.G. Kulkarni* 105574 (BSI); Amboli ghat, 17.7.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 4; Amboli ghat, 9.8.2005, *Jyosna R.N. Dessai* 41; Amboli ghat, 12.8.2006, *Jyosna R.N. Dessai* 107; On the way to Chaukul, Amboli, 12.8.2006, *Jyosna R.N. Dessai* 112; Phonda ghat, 30.9.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 167 (GUH). SRI LANKA**,** Madulkelle, *s. die, s. leg., s.n.* (MH).

Chromosome No.: 2n = 20 (Bhaskar, 1976, 1980).

IUCN Threat Status: LC.

var. **granulata** Bhaskar *et al.*, Curr. Sci. 44: 622, t. 2. 1975; Yoganarasimhan *et al*., Fl. Chikmagalur District: 60, f. 1. 1982; Sharma *et al*., Fl. Karnataka: 36. 1984; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 113. 1997.

Holotype: INDIA, **Karnataka,** Chikmagalur district, Charmadi ghat, 29.8.1972, *V. Bhaskar* 312 (MGM!).

Flowering & Fruiting: August – September.

Habitat: Damp rocks, between rock crevices, vertical black boulders, amidst grasses in loose soil; spray zones of waterfalls and cemented walls and also tree trunks.

Distribution: Endemic to the Western Ghats of Karnataka.

Specimens examined: INDIA, **Karnataka**, North Kanara district, Karwar, *s. die, W.A. Talbot s.n*. (BSI); Chikmagalur district, Charmadi ghat, 15.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 59, 63; Shimoga district, Agumbe ghat, 4.9.2005, *Jyosna R.N. Dessai* 72; Agumbe ghat, 27.8.2006, *M.K. Janarthanam* 161 (GUH).

Chromosome No.: 2n = 16, 18 (Bhaskar, 1980); 2n = 18, 20 (Bhaskar & Razi, 1972 – 1973).

IUCN Threat Status: EN [B2ac(iii)].

Impatiens barberi Hook.f., Rec. Bot. Surv. India 4: 39, 45. 1906; Gamble, Fl. Madras 1: 139. 1915; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 400, f. 78A. 1978; Sharma *et al*., Fl.

Karnataka: 37. 1984; Saldanha, Fl. Karnataka 2: 250, f. 100A. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 124. 1997. **Fig. 2, 8b – d**

Type: INDIA, **Karnataka**, Mysore State, Cadamany, 8.9.1903, *C.A. Barber* 6082 (K, photo!). Lectotype selected here.

I. agumbeana Bhaskar & Razi, Curr. Sci. 79: 382. 1982; Saldanha, Fl. Karnataka 2: 249. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 124. 1997; Ramaswamy *et al*., Fl. Shimoga District: 107. 2001, **syn. nov**.

Holotype: INDIA, **Karnataka**, Shimoga district, Agumbe, 29.9.1973, *V. Bhaskar* 386 (MGM!)

Epiphytic, scapigerous, tuberous herb, 7 – 15 cm high; tubers oblongoid to globose, 4 – 7 mm across, creamish brown. Leaves radical, 3 or 4 per tuber, elliptic to ovate, 1.1 – 3.7 × 1 – 1.8 cm, attenuate at base, apiculate-crenate at margins, retuse to apiculate at apex, hairy only on nerves above, glabrous below; nerves 3 – 5 pairs; petioles 1 – 3 cm long, glabrous, light green with reddish tinge. Inflorescence a racemose scape, 6 – 9 cm long, 3 – 7-flowered. Flowers 1.2 – 2.4 cm across, lilac to pink; bracts ovate, 1.5 – 2.5 × 1 – 1.5 mm, concave, entire at margins, acute at apex, glabrous; pedicels 1.3 – 1.8 cm long, deflexed in fruits. Lateral sepals asymmetrically ovate, *c.* 2 × 1 mm, entire at margins,

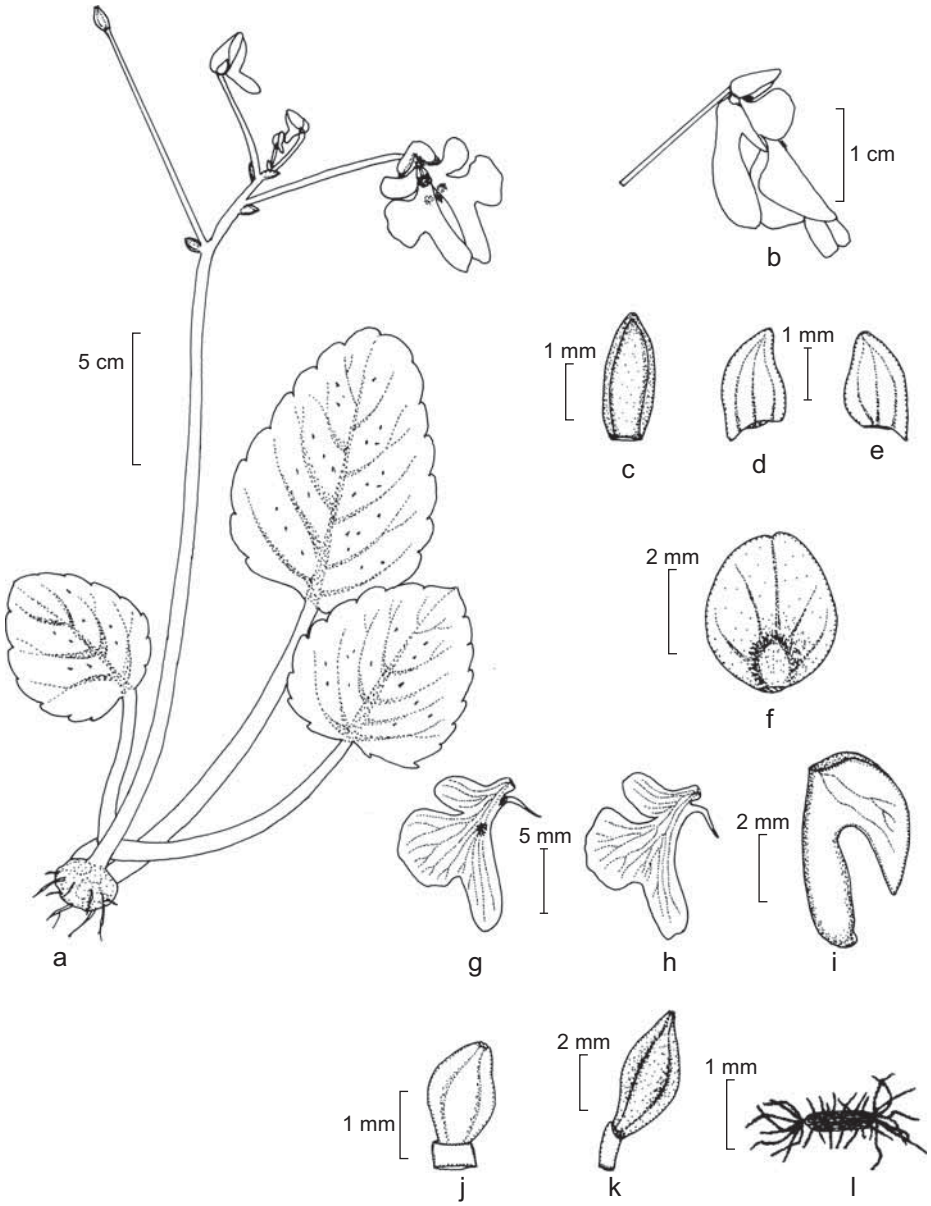


Fig. 2. *Impatiens barberi* Hook.f.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petal dorsal and ventral views; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

acute to obtuse at apex, glabrous. Standard petal ovate, 2.5 – 4 × 2 – 3 mm, concave, cordate, forming a pouch-like structure at base, glabrous, 3-nerved; wing petals 1 – 1.5 × 0.6 – 0.8 cm, auricled near base, unequally 3-lobed; basal lobe oblong, 2 – 4 × 1 – 2 mm, rounded at apex; mid-lobe larger than other 2, ovate, 5 – 7 × 4 – 6 mm, obtuse at apex; distal lobe oblong, 4 – 6 × 1.5 – 2.5 mm, rounded at apex; dorsal auricle slightly above base of wing petal, modified into a tapering needle-like structure, 5 – 7 mm long, yellow at base and apex; lip boat-shaped, 3 – 6 mm long, 1 – 2 mm deep, acute at apex, glabrous; spur basal, 3 – 6 mm long, laterally flattened, broad at base, notched at apex, glabrous. Column *c.* 2.5 mm long, bent forward; filaments *c.* 2 × 0.5 mm; anthers *c.* 0.5 × 0.5 mm. Pistil *c.* 1.5 × 1 mm; ovary ellipsoid to oblanceoloid, glabrous. Capsules asymmetrically ellipsoid, 6 – 8 × 3 – 4 mm, glabrous; pedicels 1.7 – 2 cm long; seeds oblongoid, *c.* 1 × 0.25 mm, with reticulate testa, hairy throughout; hairs long and dense at ends, lateral ones short and uniformly distributed, spirally coiled.

Flowering & Fruiting: July – October.

Habitat: Wet moss-covered tree trunks and rocky localities.

Distribution: Endemic to the Western Ghats of Karnataka.

Specimens examined: INDIA, **Karnataka**, Hassan district, Kenchankumri State Forest, 15.8.1971, *T.P. Ramamoorthy* 2042 (JCB); North Kanara district, Jog falls, 6.8.2005, *Jyosna R.N. Dessai* 39 (GUH); Shimoga district, Gubbiaga, 22.8.1963, *R. Sundara Raghavan* 90159 (BSI, CAL); Hulical, 25.8.1963, *R. Sundara Raghavan* 90206 (CAL); Agumbe ghat, 30.8.1963, *R. Sundara Raghavan* 90304 (BSI, CAL); Hulical ghat, 5.8.1979, *C.J. Saldanha, S.R. Ramesh & K.P. Sreenath* KFP8933 (JCB); Agumbe ghat, 4.9.2005, *Jyosna R.N. Dessai* 74, 75; Agumbe ghat, 27.8.2006, *M.K. Janarthanam* 162 (GUH); Malabar, Concan, *Stocks & Law s.n*. (MH).

Note: *Impatiens barberi* was described by Hooker based on C.A. Barber's material. During the present work two relevant materials of Barber (*Barber* 6082) have been traced; one at K and the other at MH. In this context the material at K is designated here as a lectotype of *I. barberi* as the sheet of this material bears dissected floral parts. When Hooker (1906) described *I. barberi* he did not provide any illustration or a detailed description. The characters provided in the key and the type specimen formed the basis for identifying this species.

Bhaskar & Razi (1982) who described *I. agumbeana* as a new species compared it with *I. lawsonii* and *I. stocksii* and distinguished it based on a distinct cylindrical spur which is up to 4 mm long enclosing a dorsal auricle that is 3 – 4 mm long, a slightly lobed distal lobe of wing petal with open dichotomous venation.

The type of *I. agumbeana* (*Bhaskar* 386) at MGM is very inadequate and has neither well preserved flowers nor any dissected floral parts. Details are not clear in the two specimens on the sheet as the flowers are not properly preserved. However, the authors have provided illustrations of floral parts that throw light on morphology. Interestingly there are no specimens of *I. barberi* at MGM, though it is one of the common species in the locality of *I. agumbeana*. The specimens determined as *I. barberi* by Bhaskar (1975) were later described by him as a new species, *I. clavata* (Bhaskar, 2006). Further, a thorough search in the type locality of *I. agumbeana* did not result in collecting any specimen despite *I. barberi* was abundant on tree trunks.

Critical observations of the type specimens of *I. agumbeana* and *I. barberi* including the illustrations therein revealed that both the species are morphologically similar with minor variations such as height of the plant, length of spur and dorsal auricle. Our other collections show that all these characters are continuous variations. Hence, we have synonymised *I. agumbeana* under *I. barberi*. *Impatiens barberi* is similar to *I. clavata* but differs in having oblong spur rather than clavate spur.

This species also grows along with *Utricularia striatula* Sm. Plants grow on tree trunks from base to heights of more than 20 m. Individuals growing in shade are with dark pink flowers having deep yellow-coloured tuft of hairs while those exposed to light have lilac-coloured flowers with light yellow-coloured tuft of hairs. Plants growing amidst mosses are more luxuriant than the ones which grow in other habitats.

IUCN Threat Status: EN [B2ab(iii)].

Impatiens bhaskarii J. Dessai *et al.*, Taiwania 54(2): 149. 2009. **Fig. 3, 8e, f**

Type: INDIA, **Karnataka**, Chikmagalur district, Charmadi ghat, 15.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 62 (Holotype, CAL; Isotypes, BSI, MH).

Epiphytic, scapigerous, tuberous herb, 10 – 15 cm high; tubers globose to oblongoid, 5 – 8 mm across, creamish brown. Leaves radical, 3 – 7 per tuber, broadly ovate to orbicular, 0.6 – 4 × 0.5 – 3.6 cm,

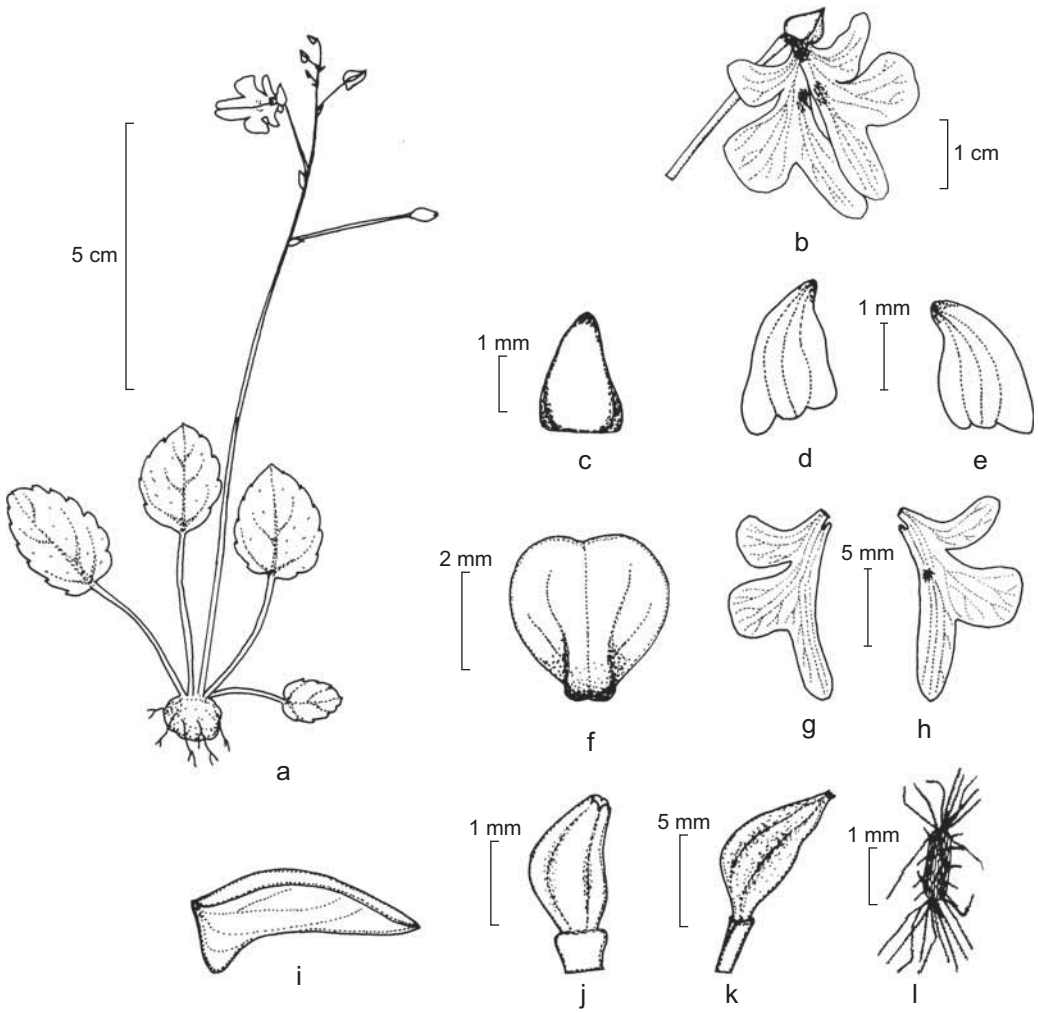


Fig. 3. *Impatiens bhaskarii* J. Dessai, L. Joseph & Janarth.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petal ventral and dorsal views; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

obtuse to truncate at base, apiculate-crenate at margins, acute, retuse to apiculate at apex, hairy above, glabrous below; petioles 1.5 – 4 cm long, glabrous. Inflorescence a racemose scape, 1 – 4 per tuber, slender, 5 – 14 cm long, glabrous, 6 – 10-flowered. Flowers 0.8 – 2 cm across, lilac to pink with a tuft of yellow hairs at base of mid-lobe; bracts ovate, 1.5 – 2 × 1 – 1.3 mm, acute at apex; pedicels slender, 0.6 – 2 cm long, glabrous, deflexed in fruits. Lateral sepals asymmetrically ovate, 1.5 – 2 × 0.5 – 1 mm, slightly concave, acute at apex, glabrous, distinctly 3-nerved, light green. Standard petal petal orbicular to obovate, 2.5 – 4 × 3 – 4.5 mm, concave, dorsally humped at base, obcordate at apex, glabrous, white outside, lilac to pink inside; wing petals 0.8 – 1.5 × 0.6 – 1 cm, 3-lobed, auricled near base; dorsal auricle up to 2 mm long, yellow, unequally lobed; basal lobe asymmetrically ovate, smaller than distal and mid-lobe, 3 – 5 × 1.5 – 3 mm, obtuse to rounded at apex; mid-lobe broadly ovate, 2.5 – 5 × 2 – 5 mm, obtuse at apex; distal lobe oblong, 2.5 – 6 × 1 – 3 mm, rounded; lip ovate, 4 – 5 × 2 – 3 mm, 1.5 – 3 mm deep, acute at apex; spur saccate. Column *c.* 2 mm long, curved; filaments *c.* 1.5 mm long, light pink to white; anthers *c.* 1 × 0.5 mm, white. Pistil *c.* 1.5 × 0.5 mm; ovary lanceoloid to ellipsoid, glabrous. Capsule asymmetrically ellipsoid, 0.6 – 1 × 0.2 – 0.4 cm, glabrous; pedicel 1.5 – 2.2 cm long; seeds numerous, oblongoid, *c.* 1 × 0.5 mm; testa reticulate, brown, hairy; hairs sparse throughout but long and tufted at ends, spirally coiled.

Flowering & Fruiting: August.

Habitat: Moss-covered tree trunks.

Distribution: Endemic to the Western Ghats of Karnataka; known only from type locality.

Specimen examined: INDIA, **Karnataka**, Chikmagalur district, Charmadi ghat, 26.8.1972, *V. Bhaskar* 315 (MGM).

Note: *Impatiens bhaskarii* is allied to *I. stocksii* Hook.f. & Thomson and *I. dendricola* C.E.C. Fisch. but differs from the former in possessing lilac to pink flowers, short dorsal auricle, and seeds hairy all over, and from the latter in the presence of lilac to pink flowers, saccate spur and seeds hairy all over.

Bhaskar (1975) had determined material of this species as *I. lawsonii* and voucher material (*Bhaskar* 315) is available at MGM. He considered the auricle as spiniform as described by Hooker (1906) in the protologue, neglecting the fact that the species is placed under the short-spurred group. However, *I. bhaskarii* can be distinguished from *I. lawsonii* based on its saccate spur and rounded dorsal auricle rather than short spur (*c.* 5 mm long) and short spiniform dorsal auricle. A material of *I. lawsonii* collected by Barnes housed at K matches with the key characters provided by Hooker thus indicating that *I. lawsonii* as determined by Bhaskar is actually an undescribed species.

Chromosome No.: 2n = 20 [as *I. lawsonii* Hook.f. (Bhaskar, 1976, 1980)].

IUCN Threat Status: CR [B2ab(iii)].

Impatiens clavata Bhaskar, Curr. Sci. 91(9): 1139, f. 2. 2006. **Fig. 4, 8g, h**

Holotype: INDIA, **Karnataka**, Hassan district, Pushpagiri, Bisle ghat, 24.9.1972, *V. Bhaskar* 328 (MGM!).

Epiphytic, scapigerous, tuberous herb, 8 – 10 cm high; tubers globose, 5 – 7 mm, whitish brown. Leaves radical, 1 – 3 per tuber, asymmetrically ovate, orbicular to obovate, 0.8 – 3.6 × 0.7 – 2.5 cm, attenuate at base, apiculate-crenate at margins, apiculate at apex, hairy above

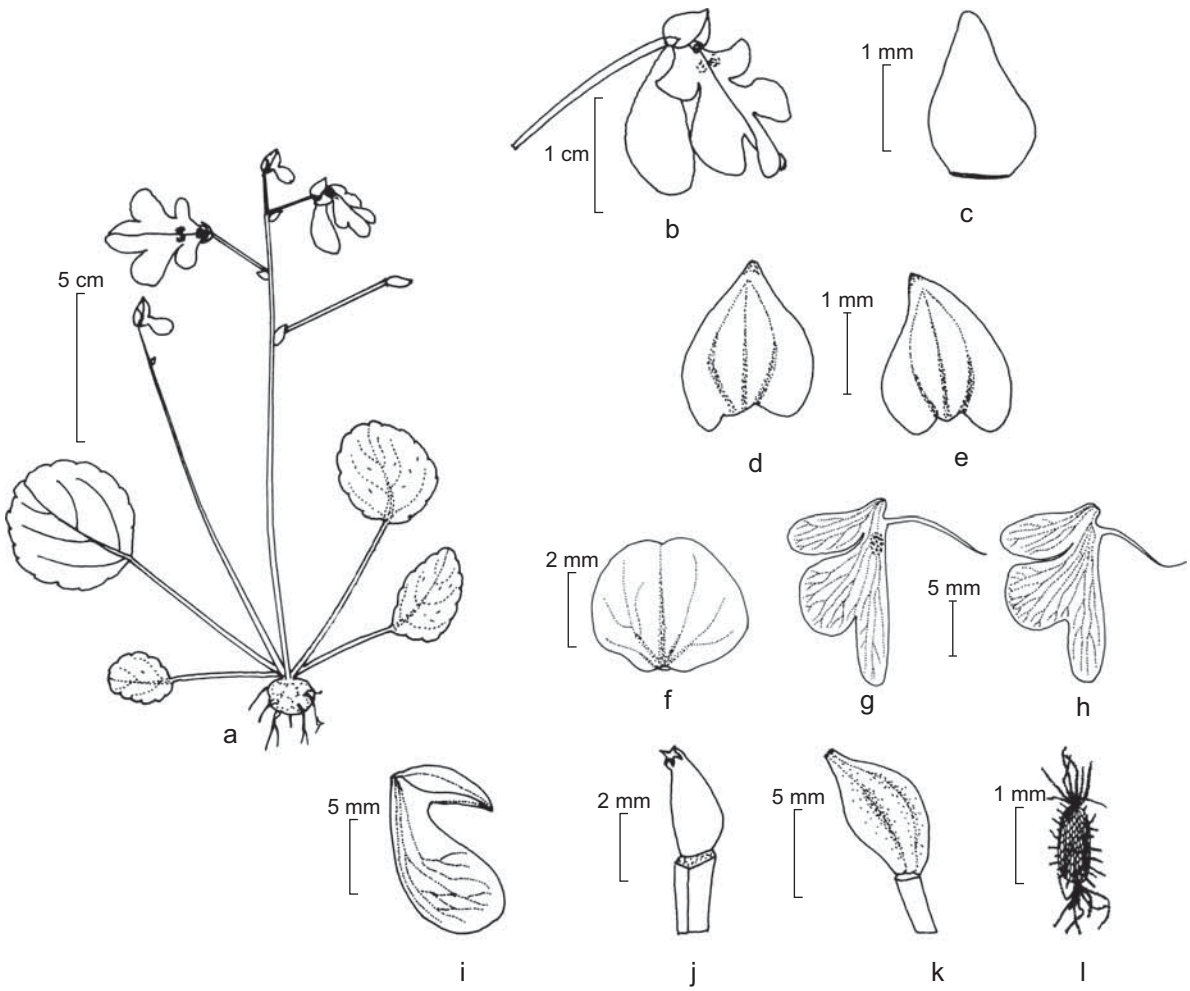


Fig. 4. *Impatiens clavata* Bhaskar: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petal dorsal and ventral views; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

(mostly on nerves), glabrous below; nerves 2 or 3 pairs; petioles 1.3 – 2.5 cm long, glabrous. Inflorescence a racemose scape, slender, 4.5 – 9 cm long, glabrous, pale green to white with reddish tinge, 2 – 4-flowered. Flowers 1 – 2.2 cm across, pink to lilac-pink; bracts ovate, *c.* 1.5 × 1 mm, concave, acute to rounded, thick at apex, fleshy, glabrous, green; pedicels slender, 7 – 12 mm long, glabrous, pale green, deflexed in fruits. Lateral sepals asymmetrically broadly ovate, *c.* 1.5 × 1 mm, acute at apex, thick, fleshy, glabrous, distinctly 3-nerved, pale green with reddish tinge. Standard petal petal broadly ovate, 4 – 6 × 2 – 4 mm, concave, forming a hood above column, obcordate at apex, glabrous, light pink; wing petals 1.5 – 1.9 × 0.6 – 1 cm, auricled near base, unequally 3-lobed; base of mid-lobe and dorsal auricle with tuft of yellow hairs; basal lobe asymmetrically ovate to oblong, 4 – 7 × 2 – 4 mm, rounded to obtuse at apex; mid-lobe broadly ovate to oblong, 3 – 7 × 4 – 8 mm, rounded at apex; distal lobe oblong, 3 – 6 × 2 – 3 mm, rounded at apex; auricle spiniform, 8 – 10 mm long, produced in spur, yellow at base, rounded at apex with yellow tinge; lip ovate, 5 – 7 × 5 – 6 mm, 2 – 5 mm deep, acute at apex, pinkish white; spur clavate, 0.7 – 1.3 × 0.3 – 0.7 mm. Column *c.* 3.5 × 1.5 mm, curved; filaments *c.* 2 mm long, light pink to white; anthers *c.* 1 × 1 mm, white. Pistil *c.* 2.5 × 1 mm; ovary ellipsoid to oblongoid, glabrous. Capsules asymmetrically ovoid to ellipsoid, 5 – 7 × 2.5 – 4 mm, glabrous; pedicels 1.3 – 1.5 cm long; seeds numerous, oblongoid, *c.* 1 × 0.5 mm, brown, hairy; hairs long and dense at ends, short and uniformly distributed in middle, spirally coiled.

Flowering & Fruiting: September.

Habitat: Moss-covered wet tree trunks.

Distribution: Endemic to the Western Ghats of Karnataka; not known from elsewhere other than the type locality.

Specimen examined: INDIA, **Karnataka**, Hassan district, Panoroma point, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 138 (GUH).

Note: *Impatiens clavata* is similar to *I. barberi* Hook.f. in flower colour, presence of tuft of hairs near the base of the wing petal and the long tapering spiniform dorsal auricle. However, it differs from *I. barberi* in the presence of a long, broadly clavate and inflated spur rather than slightly club-shaped and somewhat cylindrical spur. Since this is the only difference between the two species and both the species show morphological variations with regard to their spur shape and size. Study of more populations along with molecular data will be of great significance in throwing light on their individual status. However, we could not find even another population in spite of our repeated attempts.

IUCN Threat Status: CR [B2ab(iii)].

Chromosome No.: 2n = 16 [as *I. barberi* Hook.f. (Bhaskar, 1976, 1980)].

Impatiens dendricola C.E.C. Fisch., Bull. Misc. Inform. 1935: 157. 1935 & Fl. Madras 3: 1870. 1936; Henry *et al*., J. Bombay Nat. Hist. Soc. 75: 686. 1979; Sharma *et al*., Fl. Karnataka: 37. 1984; Murthy & Yoganarasimhan, Fl. Coorg: 86. 1990; Saldanha, Fl. Karnataka 2: 251. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 139. 1997; Ravikumar *et al*., J. Econ. Taxon. Bot. 24: 335. 2000. **Fig. 5, 8i, l**

Type: INDIA, **Karnataka**, Coorg district, on tree trunks in shola at foot of Thadiandamol, 17.9.1934, *E. Barnes* 887 (K, photo!).

Epiphytic, scapigerous, tuberous herb, 10 – 20 cm high; tubers oblongoid to globose, 1 – 1.5 × 0.5 – 1 cm, brownish white. Leaves radical, 4 or 5 per tuber, ovate, elliptic or lanceolate to oblong-lanceolate, 1.2 – 6 × 1 – 4 cm, cuneate or oblique to obtuse at base, apiculate-crenate at margins, obtuse or apiculate to retuse at apex, hairy above, glabrous below; midrib distinct with obscure secondary nerves; petioles 1.5 – 7 cm long, glabrous. Inflorescence a racemose scape, 5 – 18 cm long, 2 – 10-flowered. Flowers 1.3 – 1.8 cm across, white; bracts ovate, 3 – 5 × 1.5 – 3 mm, concave, acute to obtuse at apex, flaccid, green; pedicels filiform, 1 – 2 cm long, glabrous, deflexed in fruits. Lateral sepals asymmetrically ovate, acute to obtuse at apex, glabrous, 3 – 5-nerved. Standard petal petal orbicular to reniform, 4 – 5 × 7 – 9 mm, concave, bulged at base, retuse at apex, glabrous; wing petals 1.6 – 2 × 0.8 – 1 cm, auricled at base, unequally 3-lobed; basal lobe linear-oblanceolate, 6 – 7 × 1.5 – 2.5 mm; mid-lobe suborbicular, 5 – 6 mm across, with a tuft of hairs at base; hairs *c.* 1.5 mm long, bulged at apex, yellow, yellowish brown to orange (only at apices); distal lobe linear-oblong, 9 – 11 × 3 – 5 mm, rounded at apex; auricle *c.* 1 × 1 mm, yellow; lip broadly ovate, 7 – 8 × 4 – 6 mm, 3 – 4 mm deep, acute to acuminate at apex; spur basal, clavate, 1.3 – 1.8 × 0.4 – 0.7 cm, rounded at apex, flat, glabrous, white. Column *c.* 4 × 2 mm, bent forward; filaments *c.* 3 × 1 mm, white; anthers *c.* 0.5 × 0.5 mm, white. Pistil *c.* 3 × 1.5 mm; ovary lanceoloid or ellipsoid to elliptic-lanceoloid, glabrous. Capsules ellipsoid or oblanceoloid to lanceoloid, 6 – 8 × 3 – 5 mm, glabrous; pedicels 1.9 – 2.5 cm long; seeds oblongoid, *c.* 1 × 0.5 mm,

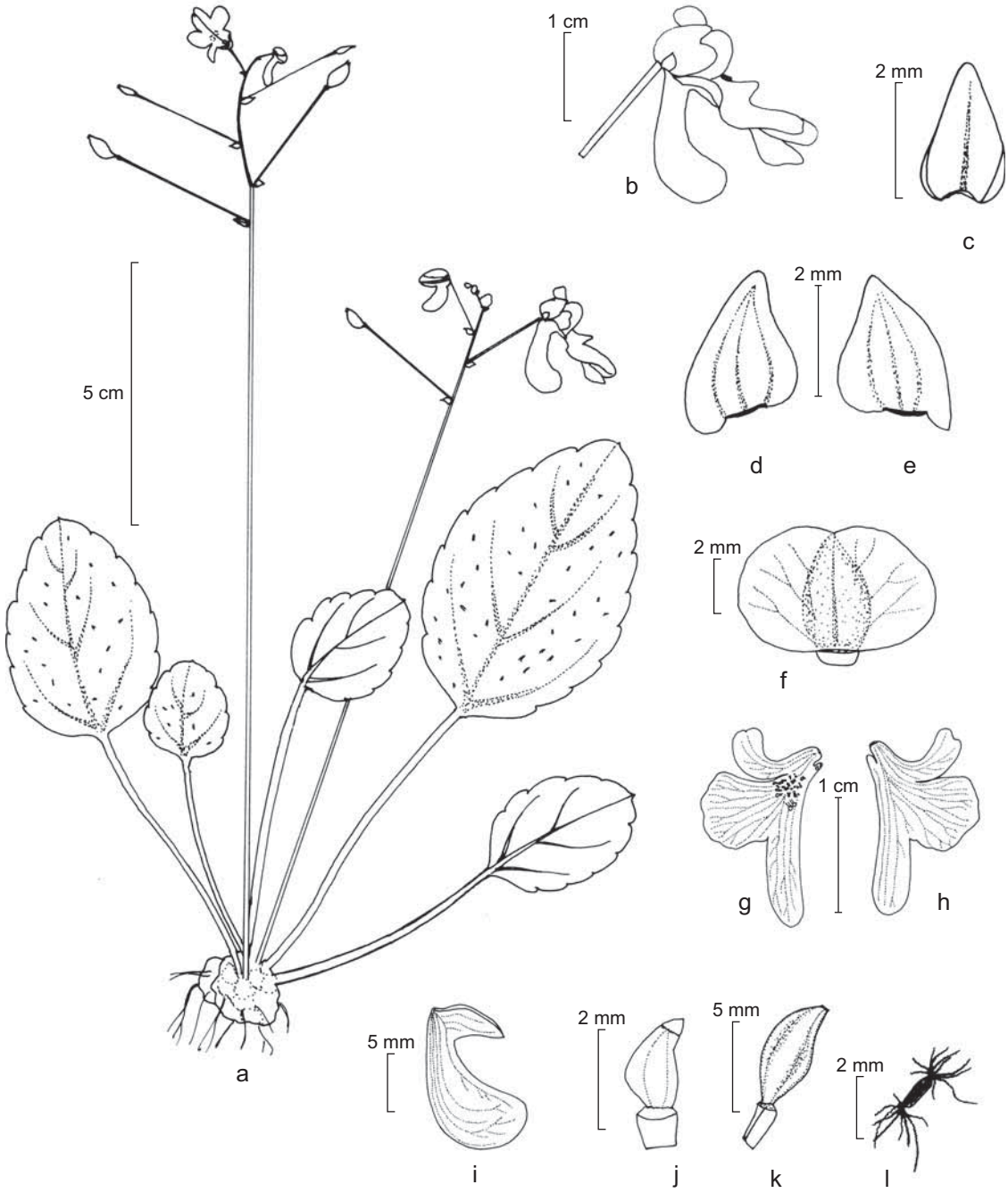


Fig. 5. *Impatiens dendricola* C.E.C. Fisch.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petal dorsal and ventral views; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

reticulately veined, comose with tuft of hairs at ends; hairs spirally coiled.

Flowering & Fruiting: August – September.

Habitat: Moss-covered tree trunks.

Distribution: Endemic to the Western Ghats of Kodagu district, Karnataka; known so far only from two localities, viz., Talacauvery and Thadiandamol.

Specimens examined: INDIA, **Karnataka**, Kodagu district, Thadiandamol, 17.9.1934, *E. Barnes* 886 (K, photo!); Thadiandamol, 25.8.1975, *V. Bhaskar* 473 (MGM); Talacauvery, 10.8.1998, *K. Ravikumar, P.S. Udayan, S.P. Subramani & Mohan Karnat* 06418 (FRLH); Foot of Thadiandamol peak, 18.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 153; Foot of Thadiandamol peak, 18.8.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 166 (GUH).

Note: Fischer (1935) described this species based on two specimens collected by Barnes (*Barnes* 886, 887, K) at Thadiandamol. Nair (1991) stated that the species is known only from type collection. Bhaskar collected specimens of the species from the type locality in 1975 after a lapse of 40 years (*Bhaskar* 473, MGM). Saldanha (1996) cited only the Barnes collections housed at Kew. Murthy & Yoganarasimhan (1990) included the species in their flora based on the authority of Fischer (1936). As there were no other collections, Nayar (1996) included the species under endangered category. Vivekananthan *et al*. (1997), however, overlooked Bhaskar's collection and stated that specimens of this species were not collected after type. Ravikumar *et al*. (2000) reported the species from Talacauvery which is about 10 km south of the type locality thus indicating its extended distribution.

Impatiens dendricola is similar to *I. stocksii* Hook.f. & Thomson in the presence of white flowers, but differs from it by presence of dorsal auricle and clavate spur. This species grows on trunks and lateral branches of huge trees on the periphery of coffee and cardamom plantations adjoining evergreen forest at about 1250 m. Plants usually occur 1 m above the ground level up to a height of 20 m. The peak flowering period is mid-August. The habitat being along cardamom and coffee plantations may be a major threat to the species in the near future since the trees are likely to be cut.

Chromosome No.: 2n = 14 (Bhaskar, 1976, 1980).

IUCN Threat Status: CR [B1ab(iii)].

Impatiens scapiflora B. Heyne ex Roxb., Fl. Ind. 2: 464. 1824; Wight & Arnott, Prodr. Fl. Ind. Orient.: 137. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 118. 1859; Hooker, Fl. Brit. India 1: 443. 1874 & Rec. Bot. Surv. India 4: 44. 1906; Gamble, Fl. Madras 1: 138. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 310. 1933; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 403. 1978; Yoganarasimhan *et al*., Fl. Chikmagalur District: 60. 1982; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 56. 1983; Sharma *et al*., Fl. Karnataka: 39. 1984; Almeida, Fl. Savantwadi: 78. 1990; Murthy & Yoganarasimhan, Fl. Coorg: 87. 1990; Almeida, Fl. Maharashtra 1: 196. 1996; Saldanha, Fl. Karnataka 2: 257. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 208. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 461. 2000; Ramaswamy *et al*., Fl. Shimoga District: 109. 2001; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 557. 2005. **Fig. 6, 8j, m**

Type: Not traceable.

I. rivalis Wight, Madras J. Lit. Sci. 1, 5: 13, t. 8. 1837 & Icon. Pl. Ind. Orient. 3(1): 2, t. 751. 1844; Dalzell & Gibson, Bombay Fl.: 42. 1861; Hooker, Fl. Brit. India 1: 444. 1874, excl. syn. *I. verrucosa* Bedd.; Cooke, Fl. Bombay 1: 170. 1901.

Type: Courtallum, August 1835, *R. Wight* 174A (E, photo!). Lectotype selected here.

Terrestrial or epiphytic, scapigerous, tuberous or rhizomatous herb, 9 – 45 cm high; tubers oblongoid, 1 – 1.5 cm across. Leaves radical, 2 – 5 per tuber, reniform, ovate to obovate, 2.5 – 20 × 2 – 15 cm, cordate to rounded at base, crenate to distantly serrate at margins, acute to acuminate at apex, pubescent above, glabrous below; petioles 2.5 – 12 cm long, glabrous. Inflorescence a raceme, 8 – 45 cm long, 4 – 16-flowered. Flowers 2.5 – 5 cm across, pink; bracts ovate, 2 – 8 × 1 – 5, acute to rounded at apex, slightly concave, thick, fleshy, glabrous, pink to green; pedicels 1.8 – 5 cm long, glabrous, deflexed in fruits. Lateral sepals asymmetrically ovate, 3 – 5 × 1 – 3 mm, acute at apex, glabrous, pale green, 5 – 7-nerved. Standard petal petal broadly reniform, 0.6 – 1 × 1 – 1.5 cm, forming a hood above column, humped at base dorsally, emarginate to obcordate at apex, glabrous pink outside, white inside; wing petals 2.3 – 3.5 × 1.7 – 2.6 cm, 3-lobed; basal lobe oblong, 1.6 – 2.4 × 0.5 – 0.8 cm, rounded at apex; mid-lobe ovate to oblong, 1 – 2 × 0.6 – 1.2 cm, obtuse at apex; distal lobe oblong, 1.1 – 1.8 × 0.3 – 0.6 cm, rounded at apex; dorsal auricle absent; lip saccate, 8 – 12 × 0.4 – 0.7 cm, 5 – 9 mm deep, acute at apex, glabrous; spur tubular, 4 – 8.5 cm long, rounded at apex, curved, straight or coiled, glabrous. Column *c.* 5 × 3 mm, bent forward; filaments *c.* 5 × 1 mm; anthers *c.* 2 × 1 mm. Pistil *c*. 5 × 2 mm; ovary lanceoloid to ovate-lanceoloid, glabrous. Capsules lanceoloid, 1 – 1.5 × 0.5 – 0.8 cm, glabrous; pedicels 4 – 6 cm long; seeds oblongoid to ovoid-oblongoid, *c.* 1.5 × 0.5 mm, reticulately nerved, hairy all over; hairs spirally coiled, forming a cone-like structure.

Flowering & Fruiting: June – November.

Habitat: Tree trunks or terrestrial amidst grasses and mosses and also in moist rocky localities.

Distribution: Endemic to the Western Ghats of Karnataka, Kerala and Tamil Nadu.

Specimens examined: INDIA, **Karnataka,** Chikmagalur district, Bababudan, Peetha, 23.7.1973, *V. Bhaskar* 360; Bababudan, on the way to Abbe falls, 26.7.1973, *V. Bhaskar* 368 (MGM); Bababudan hills, 27.7.1979, *C.J. Saldanha & K.P. Sreenath* KFP8521;

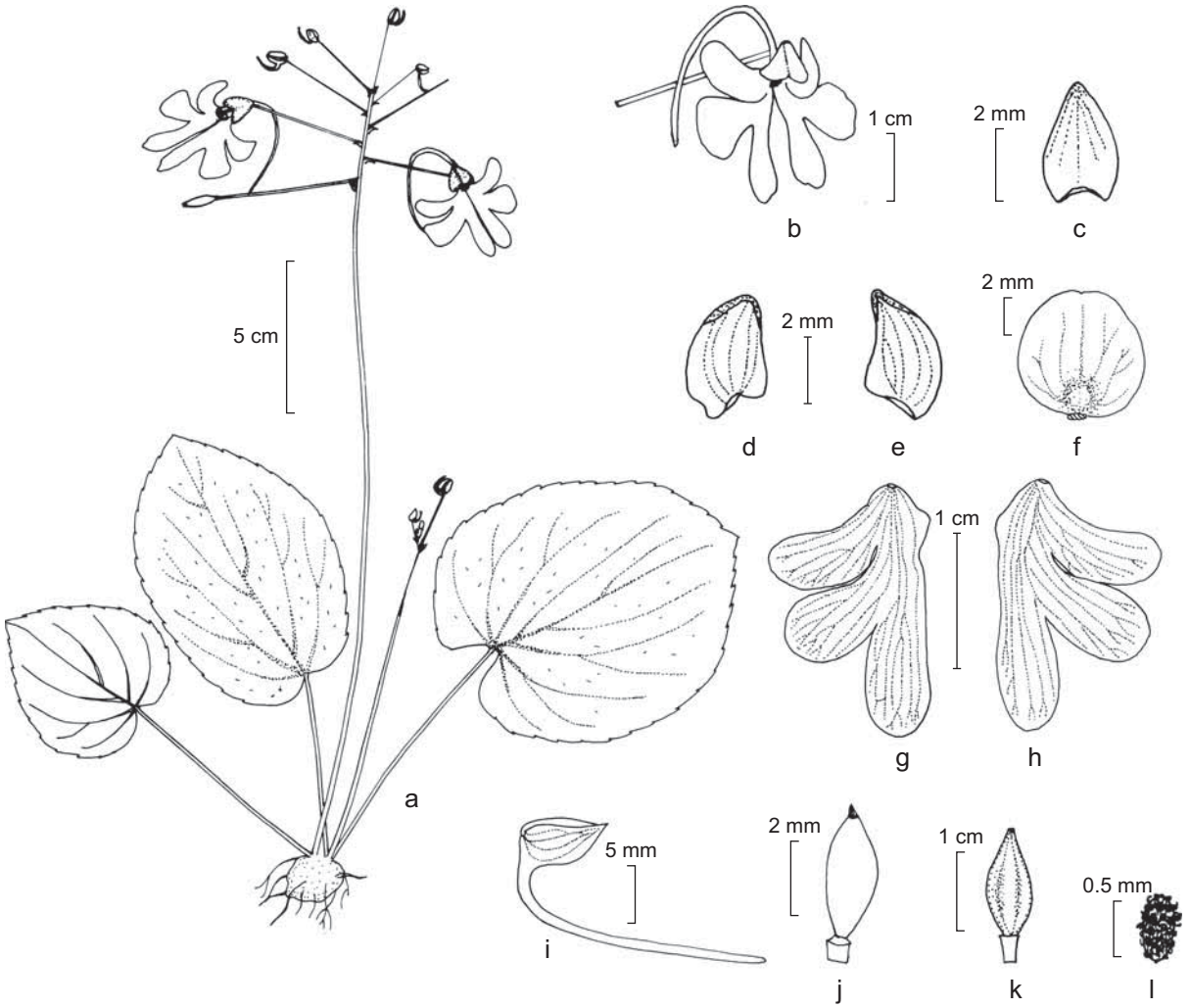


Fig. 6. *Impatiens scapiflora* B. Heyne ex Roxb.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

Kemmangundi, Bababudan hills, 5.9.1980, *C.J. Saldanha* KFP12189 (JCB); Kemmangundi, on the way to Z-point, 17.11.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 25; Kemmangundi, 5.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 78 (GUH); Hassan district, Bisle ghat, 16.7.1967, *C.J. Saldanha* 10745; Bisle ghat, 14.8.1967, *C.J. Saldanha* 10927; Vanagur, 8.7.1970, *T.P. Ramamoorthy* HFP292; Peak above Vanagur, 10.9.1970, *F.M. Jarrett & C.J. Saldanha s.n.*; Bisle ghat, 7.7.1971, *T.P. Ramamoorthy* HFP1885; Peak overlooking Vanagur, 14.8.1971, *T.P. Ramamoorthy* HFP1992 (JCB); Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai* 136 (GUH); Kodagu district, Sampaji ghat, 6.8.1973, *V. Bhaskar* 374; Jodpala, 4.8.1974, *V. Bhaskar* 411 (MGM); Talacauvery, 914 m, 24.6.1977, *T.A. Rao & B.C. Banerjee* 18227; 10 kms from Mercara, Mercara to Mangalore road, 20.7.1978, *S.R. Ramesh* KFP1851 (CAL); Jodpala, on the way to Madikeri from Mangalore, 13.8.2005, *Jyosna R.N. Dessai* 46; 2 km from Bagmandala, on the way to Talacauvery, 13.8.2005, *Jyosna R.N. Dessai* 50; Talacauvery, 17.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 149; Foot of Thadiandamol peak, 18.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 151, 152; Foot of Thadiandamol peak, 18.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 165 (GUH); North Kanara district, Karwar, 28.8.1883, *W.A. Talbot* 599; Gersoppa falls, October 1908, *A. Meebold* 10721 (CAL); Jog falls, 6.8.2005, *Jyosna R.N. Dessai* 38 (GUH); Shimoga district, Hulical ghat, 8.11.1972, *V. Bhaskar* 345 (MGM); South Kanara district, Shiradi, 15.8.1967, *s. leg*. 10957; Shiradi ghat, 7.8.1969, *C.J. Saldanha* 14427 (JCB). **Kerala**, Idukki district, Murinnavizha, 17.6.1972, *V. Bhaskar* 288; Peermade, 18.6.1972, *V. Bhaskar* 291 (MGM); Idukki to Kattappana, 900 m, 26.9.1981, *C.N. Mohanan & B. Ramarajan* 72018

(CAL); Kottayam district, Devicolam, 31.10.1973, *V. Bhaskar* 401 (MGM); Palakkad district, Silent Valley, 10.10.1965, *E. Vajravelu* 26068 (MH); Palghat, 10.8.1972, *V. Bhaskar* 308 (MGM). **Tamil Nadu**, Coimbatore district, way to Ayyappan temple, 2.9.1977, *N.C. Nair* 50787; Anamalai hills, Konalar, 1950 m, 18.11.1980, *M. Chandrabose* 69004; Akkamalai R.F., 1650 m, 19.11.1980, *M. Chandrabose* 69033 (CAL); Tirunelveli district, Courtallum, August 1835, *R. Wight* 174B, C (E, photo!); Kallar river forest, 16.10.1989, *R. Gopalan* 90691 (MH).

Note: *Impatiens scapiflora* is similar to *I. acaulis* in its general habit and spur characteristics but differs from it in having 3-lobed wing petals. Though both the species are closely allied, it was observed that *I. acaulis* and *I. scapiflora* are mutually exclusive in the study area.

Roxburgh (1824) described *I. scapiflora* based on Heyne's material. However, he provided neither a detailed description of the flower especially the wing petal nor any illustration of the flowers or its dissected parts. But in the description he mentioned that the spur is several inches long which provides the only clue. The absence of a description perhaps made Wight (1837) to describe a new species, *I. rivalis*, which is actually *I. scapiflora*. Wight (1844) illustrated both *I. scapiflora* (t. 967) and *I. rivalis* (t. 751). Accordingly *I. rivalis* has a long tubular spur whereas *I. scapiflora* has a short clavate spur which actually makes it *I. clavicornu* (= *I. beddomei*) described by Hooker (1874). Hooker & Thomson (1859) and Hooker (1874) overlooking the fact dealt with both the species independently, though Hooker later considered *I. rivalis* a synonym of *I. scapiflora*.

Impatiens rivalis was described by Wight based on the material collected from Courtallum. There are three relevant materials of Wight (*Wight* 174A, B, C) at E. Since Wight (1837) did not designate any type for this taxon, a lectotype has been selected here.

Specimens growing at an altitude of above 1250 m around sholas have white flowers. Based on earlier collections in herbaria and present collections it is concluded that the species is well distributed and occurs in large population in the Western Ghats of Karnataka.

When Blatter (1933) revised Balsaminaceae for the flora of Bombay Presidency, North Kanara was also a part thereof. It is likely that following Blatter (1933), Almeida (1990, 1996) and Mudaliar & Prasad (2000) must have included the species for Maharashtra. There are no specimens from Maharashtra in any of the herbaria to prove its distribution in the state.

Chromosome No.: 2n = 20 (Krishnaswamy *et al.*, 1969); 2n = 12 (Bhaskar, 1976); 2n = 14, 16, 20 (Bhaskar, 1980).

IUCN Threat Status: LC.

Impatiens stocksii Hook.f. & Thomson, J. Proc. Linn. Soc. Bot. 4: 119. 1859; Dalzell & Gibson, Bombay Fl.: 42. 1861; Hooker, Fl. Brit. India 1: 442. 1874 & Rec. Bot. Surv. India 4: 45. 1906; Cooke, Fl. Bombay 1: 170. 1901; Blatter, J. Bombay Nat. Hist. Soc. 33: 310. 1933; Fischer, Fl. Madras 3: 1870. 1936; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 404, f. 78B. 1978; Henry *et al.*, J. Bombay Nat. Hist. Soc. 75: 686. 1979; Yoganarasimhan *et al.*, Fl. Chikmagalur District: 59. 1982; Sharma *et al.*, Fl. Karnataka: 39. 1984; Murthy & Yoganarasimhan, Fl. Coorg: 88. 1990; Saldanha, Fl. Karnataka 2: 257, t. 100B. 1996. **Fig. 7, 8k, n**

Type: INDIA, **Karnataka**, Malabar, Concan and regio trop., *s. die*, *Stocks & Law s.n.* (E, photo!). Lectotype selected here.

Epiphytic, scapigerous, tuberous herb, 5 – 10 cm high; tubers globose, *c.* 6 mm, creamish brown. Leaves radical, 2 – 5 per tuber, broadly ovate or elliptic to orbicular, 1 – 5 × 0.8 – 2.5 cm, obtuse to truncate at base, distantly apiculate-crenate at margins, notched to emarginate at apex, membranous, pubescent above (more so on nerves), glabrous below; petioles slender, 1 – 4.5 cm long, glabrous. Inflorescence a racemose scape, 3 – 8.5 cm long, slender, glabrous, 2 – 7-flowered. Flowers 1 – 1.5 cm across, white; bracts ovate, *c.* 2.5 × 1 mm, glabrous, light green; pedicels 0.9 – 1.3 cm long, glabrous, deflexed in fruits. Lateral sepals ovate, *c.* 2.5 × 1.5 mm, acute at apex, glabrous, light green. Standard petal petal suborbicular, *c.* 3.5 × 4 mm, forming a small sac-like structure at base, glabrous, white; wing petals 1.3 – 1.6 × 0.5 – 0.8 cm, white with a tuft of yellow hairs at base of mid-lobe, 3-lobed; mid-lobe broader than distal and basal lobes; basal lobe oblong, *c.* 5 × 3 mm, acute to obtuse at apex; mid-lobe *c.* 5 × 4 mm, obtuse at apex; distal lobe oblong – oblanceolate, *c.* 7 × 3 mm, rounded to obtuse at apex; lip saccate, *c.* 6 × 3 mm, *c.* 3 mm deep, acute at apex, white with a yellow spot; spur absent. Column *c.* 2 mm long, curved; filaments *c.* 1.5 × 0.5 mm, translucent; anthers *c.* 0.5 × 0.25 mm, white. Pistil *c.* 1 × 0.75 mm; ovary broadly lanceoloid to ellipsoid, glabrous. Capsules broadly asymmetrically ellipsoid, 5 – 7 × 2 – 4 mm, glabrous; pedicels 1 – 1.6 cm long; seeds oblongoid, *c.* 1 × 0.25 mm, comose with spirally coiled hairs.

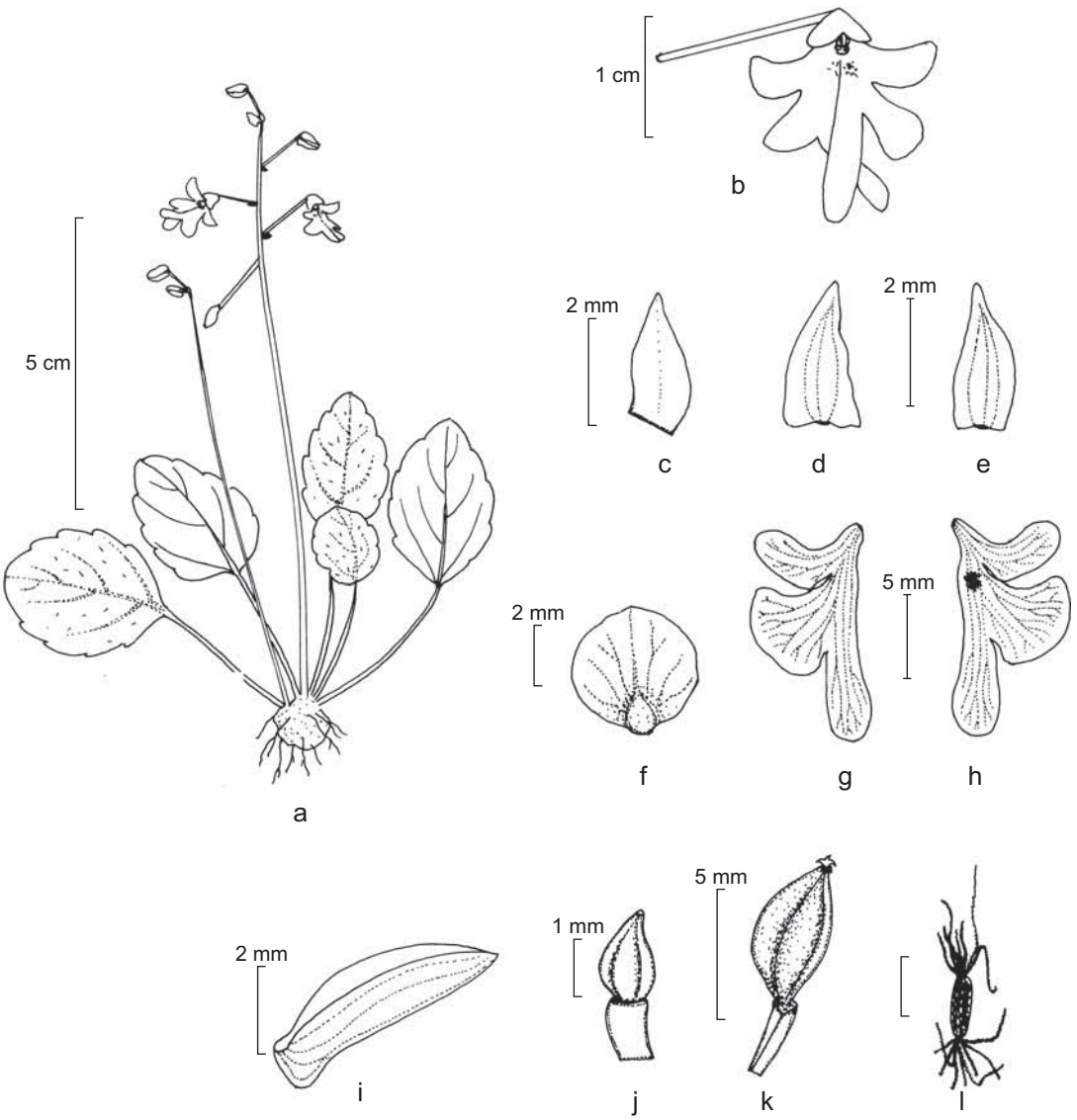


Fig. 7. *Impatiens stocksii* Hook.f. & Thomson: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petal ventral and dorsal views; i. Lip; j. Pistil; k. Capsule; l. Seed.

Flowering & Fruiting: July – September.

Habitat: Moss-covered tree trunks in evergreen forests, 700 – 1600 m.

Distribution: Endemic to the Western Ghats of Karnataka.

Specimens examined: INDIA, **Karnataka**, Chikmagalur district, Peetha, Bababudan, 24.7.1973, *V. Bhaskar* 363 (MGM); Kemmanagundi, 5.9.2005, *Jyosna R.N. Dessai* 82 (GUH); Hassan district, near Vanagur, 14.8.1967, *C.J. Saldanha* 10876; Bisle ghat, 21.8.1969, *C.J. Saldanha* 14595; Vanagur, 4.9.1969, *C.J. Saldanha* 17815; Mankanahalli, 19.9.1969, *C.J. Saldanha* 15075; Peak above Vanagur, 14.8.1971, *T.P. Ramamoorthy* HFP2003 (JCB); Bisle ghat, 14.8.2005, *Jyosna R.N. Dessai* 56; Mankanahalli, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 142; Kodagu district, Indu Poovaia Estate (Madhe), 13.8.2005, *Jyosna R.N. Dessai* 49; Talacauvery, 13.8.2005, *Jyosna R.N. Dessai* 51 (GUH); South Kanara district, Shiradi ghat, 700 m, 3.8.1979, *Saldanha, Ramesh & Sreenath* KFP8801 (CAL, JCB); Shiradi ghat, 22.8.1980, *C.J. Saldanha* KFP12080 (MGM).

Note: This species is distinguished from others in section Scapigerae based on its white flowers wherein the lip is saccate. It is similar to *I. dendricola* in the presence of white flowers but differs in lacking distinct clavate spur and dorsal auricle. Bhaskar & Razi (1978a) discussed taxonomy of *I. crenata* and *I. stocksii* and accept *I. crenata* as the correct name.

Fig. 8. a. *Impatiens acaulis* Arn.; b – d. *I. barberi* Hook.f.; e, f. *I. bhaskarii* J. Dessai *et al*.; g, h. *I. clavata* Bhaskar; i, l. *I. dendricola* C.E.C. Fisch.; j, m. *I. scapiflora* B. Heyne ex Roxb.; k, n. *I. stocksii* Hook.f. & Thomson.

Ramachandran & Nair (1988), Mudaliar & Prasad (2000), Sasidharan (2004) and Nayar *et al*. (2006) also considered *I. stocksii* as a synonym of *I. crenata*. However, *I. stocksii* differs from *I. crenata* in the presence of entire standard petal, tuft of hairs on wing petals and saccate lip. Hence, *I. stocksii* is treated as a distinct species in this work.

Fischer (1936) described the wing petals as 2-lobed and the lobes as filamentous thus introducing an element of doubt about material. However, Hooker & Thomson (1859) in the protologue described the wing petals as 3-lobed. The present collections from the Western Ghats of Karnataka have 3-lobed wing petals.

Dalzell & Gibson (1861) cited that the species occurs in the southern ghats. Blatter (1933) followed Dalzell & Gibson (1861) whereas Cooke (1901) cited collections by Stocks, Law and Woodrow from Konkan and Kanara without any details. In the present study material was collected only from Karnataka. Hence, its distribution in the localities referred by Cooke (1901) is doubtful.

The species was considered endemic to Karnataka until Pandurangan & Nair (1996) reported it from Meenmutty, Idukki district, Kerala. In the description provided, the authors stated that the lip is saccate with 3 – 4 mm long curved spur. The specimen cited by them is deposited at MH. The specimen has a short spur of *c*. 3 mm long in buds whereas in *I. stocksii* the spur is completely absent. Hence its distribution in Kerala is doubtful. However, the correct identity of the specimen at MH could not be ascertained as other floral parts overlay on each other and are not clearly visible.

Impatiens stocksii was described by Hooker & Thomson based on Stocks & Law's material. During the present work four relevant materials of *I. stocksii* have been traced; two at CAL, one at E and the remaining at NYBG. In this context the material at E is designated here as a lectotype of *I. stocksii*.

IUCN Threat Status: VU [D1].

Chromosome No.: 2n = 20 (Bhaskar & Razi, 1972 – 73); 2n = 14 (Bhaskar, 1976, 1980).

Section: Oppositifoliae Hook.f. & Thomson

Annual. Leaves opposite. Flowers pedicelled, solitary, binate or fascicled, axillary, ebracteate or minutely bracteate at base. Sepals elongated, linear, rarely ovate or lanceolate. Seeds usually globose, polished, glabrous, black (Hooker, 1906).

Impatiens chinensis L., Sp. Pl.: 937. 1753; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 119. 1859, excl. syn. *I. fasciculata* Lam. (1785), *I. setacea* Colebr. (1824), *Balsamina fasciculata* (Lam.) DC., Prodr. (1824), *Impatiens fasciculata* sensu Hook. (1852); Hooker, Fl. Brit. India 1: 444. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 171. 1901; Gamble, Fl. Madras 1: 141. 1915; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 402. 1978; Sharma *et al*., Fl. Karnataka: 37. 1984; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 131. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 449. 2000. **Fig. 9, 21a**

Type: CHINA, Linn. Herb. No. 1053.1 (LINN, photo!).

Balsamina chinensis (L.) DC., Prodr. 1: 686. 1824.

Impatiens heterophylla Wall. in Roxburgh, Fl. Ind. 2: 458. 1824.

Type: Wall. Numer. List No. 4748 (CAL!)

I. cosmia Hook.f., Hooker's Icon. Pl.: t. 2915. 1913.

Type: CHINA, Jungkun (Tungkun), *s. die*, *E. Faber s.n*. (W0016508, photo!). Lectotype selected here.

I. chinensis var. *brevicornis* E. Barnes, J. Indian Bot. Soc. 18: 99. 1939; Yoganarasimhan *et al*., Fl. Chikmagalur District: 62. 1982; Sharma *et al*., Fl. Karnataka: 37. 1984; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 131. 1997; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 534. 2005, **syn. nov.**

Type: INDIA, **Kerala**, Idukki district, Travancore, Munnar, 20.10.1932, *E. Barnes* 558 (K, photo!). Lectotype selected here.

Herb, 15 – 40 cm high. Stem quadrangular, rooting at lower nodes, glabrous, pinkish red; branches alternate. Leaves opposite, linear-lanceolate to linear-oblong, sessile to shortly petiolate, 3 – 8.5 × 0.8 – 1.5 cm, truncate to cuneate at base, serrate at margins, acuminate at apex, hairy above, glabrous below; midrib distinct; lateral nerves obscure; petioles *c.* 5 mm long, decurrent on stem and terminates in glands (sometimes glands absent). Flowers 2 – 4 per axil, 2 – 2.5 cm across, dark pink with a violet throat; bracts linear, *c.* 3 × 1 mm, acuminate to aristate at apex, minutely hairy on costa dorsally, pink; pedicels 3 – 3.8 cm long, dialated, glabrous to pubescent with 2 (rarely 1) rows of hairs, deflexed in fruits, pinkish red. Lateral sepals linear-lanceolate to oblanceolate, 7 – 10 × 1 – 1.5 mm, acuminate at apex, minutely hairy on keel dorsally. Standard petal petal orbicular to reniform, 8.8 – 1 × 0.6 – 0.8 cm,

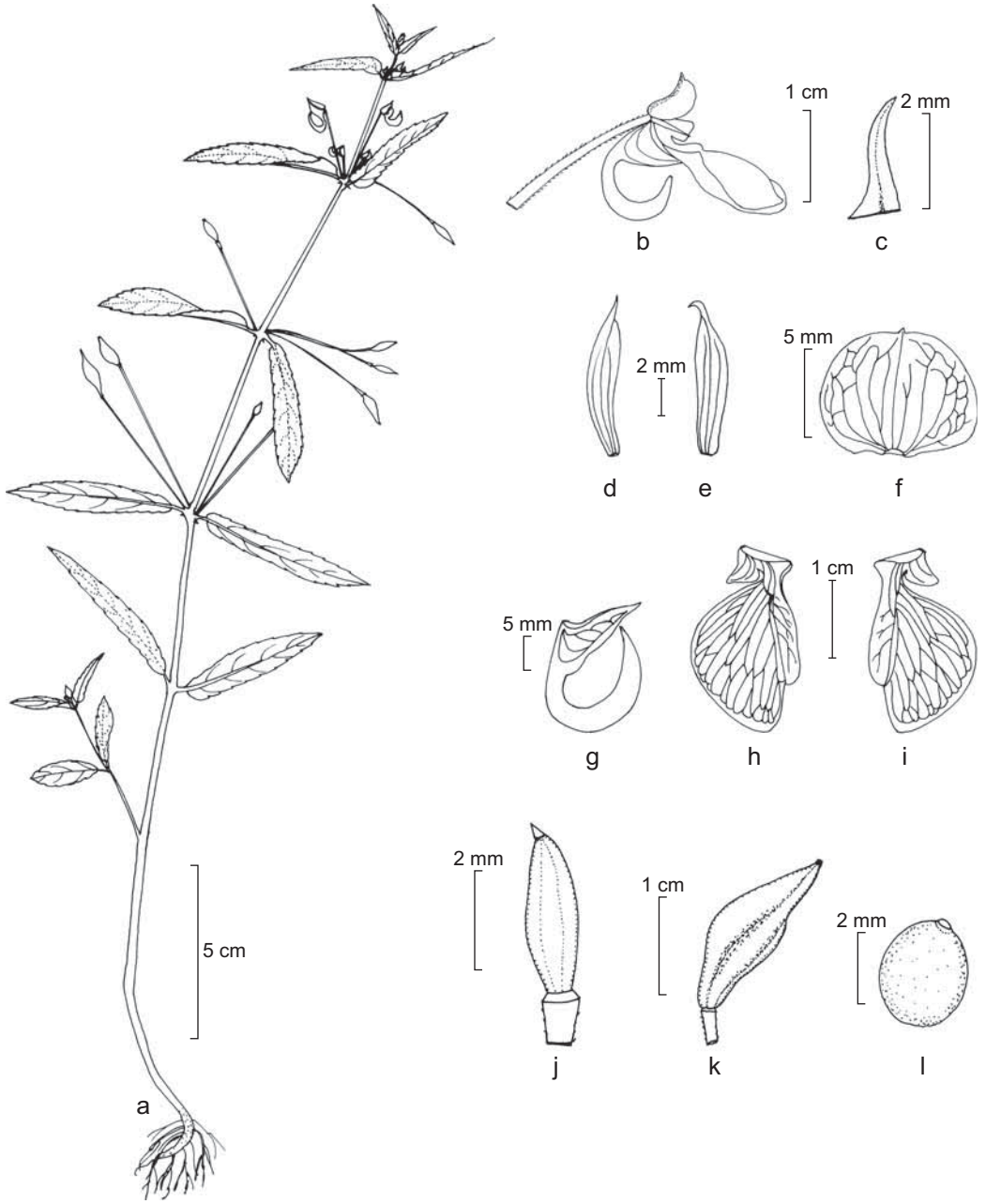


Fig. 9. *Impatiens chinensis* L.: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g. Lip; h, i. Wing petals; j. Pistil; k. Capsule; l. Seed.

semi-obcordate at apex, glabrous, dorsally keeled; keel mucronate; mucro *c.* 1 mm long; wing petals 1.8 – 2.4 × 1 – 1.4 cm, auricled at base, 2-lobed; basal lobe ovate, 5 – 7 × 4 – 5 mm, acute at apex; distal lobe asymmetrically obovate, 1.3 – 1.6 × 1 – 1.4 cm, elevated at base, obtuse at apex; lip conical, 9 – 12 × 0.4 – 0.6 cm, 6 – 7 mm deep, acuminate at apex, glabrous to minutely hairy especially on nerves; spur 1.8 – 2.5 cm long, inflated, broad in middle, acute to notched at apex, distinctly curved, thick, glabrous to minutely hairy. Column *c.* 5 × 3 mm, curved; filaments *c.* 3.5 × 1 mm; anthers *c.* 1 × 1 mm, pink. Pistil *c.* 3 × 1.5 mm; ovary oblong-lanceoloid, glabrous. Capsules asymmetrically ellipsoid to lanceoloid, 1.5 – 2 × 0.5 – 0.7 cm, glabrous; stigma persistent; pedicels 3.3 – 3.8 cm long; seeds globose, *c.* 3 mm, shining, glabrous, black; funicle prominent.

Flowering & Fruiting: August – November.

Habitat: Roadsides in evergreen forests, open plains, foothills and on rock faces along with grasses.

Distribution: India to Southeast Asia through China; widely distributed in the Western Ghats from Karnataka to Tamil Nadu.

Specimens examined: INDIA, **Karnataka**, Chikmagalur district, Charmadi ghat, 13.8.1981, *C.J. Saldanha* KFP13459 (JCB); Kudremukh, 18.11.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 27; Charmadi ghat, 15.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 61 (GUH); Hassan district, Maranahalli, Bisle ghat, 22.8.1969, *C.J. Saldanha* 14611; Maranahalli, Bisle ghat, 3.9.1969, *C.J. Saldanha* 14725; Vanagur, Bisle ghat, 14.8.1971, *T.P. Ramamoorthy* HFP2054 (JCB); Bisle ghat, from Subramanya to Vanagur, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 137, 139; Mankanhalli, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 140; Kodagu district, Talacauvery, 17.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 148 (GUH). **Kerala**, Idukki district, Travancore, Munnar, 20.10.1932, *E. Barnes* 556, 557; Travancore, Kanan Devan hills, Munnar, September 1933, *E. Barnes* 553; Travancore, Munnar, September 1933, *E. Barnes* 554, 606; Below Kandalur, Travancore High Range, September 1937, *E. Barnes* 1729 (K, photo!).

Note: *Impatiens chinensis* is similar to *I. diversifolia* B. Heyne [Wall. Numer. List No. 4749, nom. nud.] ex Wight & Arn. but differs in having distinctly curved and thick spur that is broad in the middle which is the key character for identifying this species in section Oppositifoliae.

Plants growing in open plains are short with small leaves and white to pale pink flowers. This species is widely distributed and shows a high degree of variation in shape of leaves, presence or absence of stipular glands, hairy nature of pedicel either with 1 or 2 rows of hairs or glabrous. Hence, several species that have been described are referrable to this single variable entity.

Two distinct entities that were described as varieties of *I. chinensis* by Saldanha (1996) were collected. No other variety has been recognised under this species outside the study area, though *I. cosmia* Hook.f., *I. crassicornu* Hook.f., *I. ecalcarata* Collett & Hemsl., *I. fasciculata* Lam., *I. heterophylla* Wall. ex Roxb. and *I. setacea* Colebr. are treated as synonyms of *I. chinensis.* Hence, to properly understand the taxonomy and correct application of names, protologues of *I. chinensis* and all its considered synonyms including those at varietal level were critically examined along with their types.

The type of *I. chinensis* L. came from China. Linnaeus (1753) described its spur as, "*nectarium valde arcuatum crassum*". Though the type of *I. chinensis* has not been mentioned in the Linnaean Typification Project report, a specimen (Herb. LINN 1053.1) labelled as *I. chinensis* (http://www.linnaean-online.org/11124) at LINN clearly depicts the spur character described by Linnaeus (1753). Lamarck (1785) published *I. fasciculata* and the illustration (Vol. 9: t. 47) in Hortus Malabaricus (Rheede, 1689) that formed the basis for *I. fasciculata* shows that spur is filiform and neither arcuate nor thick as described by Linnaeus for *I. chinensis*. Further observations show that the wing petal of the latter is with a distinct basal lobe that is absent in Rheede's illustration. As *I. fasciculata* Lam. is found as a distinct species and is considered as a good species following Wight & Arnott (1834).

Wight & Arnott (1834) treated *I. fasciculata* Lam. as distinct species, but described the wing petal as 2-lobed. Again this character was well depicted by Wight (1844: t. 748). Hooker (1852) too illustrated *I. fasciculata* Lam. in colour from the plants grown from seeds obtained from Thwaites from Ceylon. He observed that the name "*fasciculata*" is not appropriate as the flower is solitary in axils. He also noticed in Wight's illustration a conspicuous 'spur' at the base of the decurrent leaf on the stem that he called stipule. These characters are conspicuously absent in Rheede's illustration thus showing that what had been considered by these authors as *I. fasciculata* was distinct from that of Lamarck's thus paving the way for confusion.

Balsamina setacea (= *Impatiens setacea*) was described by Hooker (1824) in his Exotic Flora with an excellent coloured illustration. The spur of the lip is long and thin and projecting backwards in all the three flowers and also in the dissected flower as well as in the line drawing of a dissected flower. This character is entirely different from that of *I. chinensis* and *I. fasciculata*. The distal lobe of the wing petal is also without a notch at the apex. Hence, *I. setacea* is considered here as a distinct species.

Since *I. fasciculata,* as illustrated by Wight (1844) and Hooker (1852), was synomised under *I. chinensis* by Hooker & Thomson (1859), later authors mistook *I. fasciculata* for true *I. chinensis.* This is evident as subsequent material of actual *I. chinensis* with thick and distinctly curved spur led Barnes (1939) to describe a new variety. The description of *I. chinensis* var. *brevicornis* E. Barnes exactly matches with *I. chinensis* especially in its spur character and paradoxically the spur character formed the basis for this new variety. Hence, *I. chinensis* var. *brevicornis* is merged with *I. chinensis*.

Since Barnes did not designate any type for this taxon, a lectotype has been selected here.

Hooker (1852) also cited *I. heterophylla* Wall. ex Roxb. as a synonym of *I. fasciculata* (a wrong identification, which is published here as a new species). Examination of the type of *I. heterophylla* [Wall. Numer. List No. 4748 (CAL!)] shows that it is conspecific with *I. chinensis* as treated by Hooker (1874).

Hooker (1913b, c) described two more species of *Impatiens*: *I. cosmia* and *I. crassicornu* from China. Both these species are considered as conspecific with *I. chinensis* (Yi-ling *et al*., 2007).

Impatiens cosmia was described based on material collected in Jungkun, China by Fr. Faber and from Chekiang by Capt. Jacobs. Original materials are found at K and W. Photographs of original materials have been studied. As there is more than one original specimen, selection of lectotype becomes necessary. Since the protologue is based on the material at W it is designated here as lectotype of *I. cosmia* (excluding the detached flower).

Impatiens crassicornu is characterised by its spur that is forked a little below the apex. This is very well depicted in one of the dissected flowers, in the bud present on the plant material as well as the illustration made by Hooker on the sheet. However, the spur in other dissected flower is without a fork. Apart from the above character the species bears ovate-lanceolate lateral sepals, dorsally crested standard petal and oblong basal lobe thus distinguishing it from *I. chinensis*. These characters show that *I. crassicornu* is a distinct species and hence treated so.

Hooker (1906) reduced *I. ecalcarata* Collett & Hemsl. to a variety under *I. chinensis*. However, this is distinct from the latter for the absense of spur that was critically illustrated in the protologue by Collett & Hemsley (1890). Further they also stated that they had observed copious healthy specimens all exhibiting invariably the same character. Hence, it is treated as a distinct species here.

The four names, viz., *I. crassicornu* Hook.f., *I. heterophylla* Lam., *I. setacea* Colebr. and *I. ecalcarata* Collett & Hemsl. which were treated conspecific with *I. chinensis* are found to be distinct species and hence not considered under *I. chinensis*.

Chromosome No.: n = 8 (Song *et al*., 2003).

IUCN Threat Status: LC.

Impatiens dalzellii Hook.f. & Thomson, J. Proc. Linn. Soc. Bot. 4: 123. 1859; Dalzell & Gibson, Bombay Fl.: 43. 1861; Hooker, Fl. Brit. India 1: 449. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 173. 1901; Blatter, J. Bombay Nat. Hist. Soc. 33: 312. 1933; Lakshminarasimhan & Sharma, Fl. Nasik District: 114. 1991; Deshpande *et al*., Fl. Mahabaleshwar 1: 114. 1993; Almeida, Fl. Maharashtra: 191. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 138. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 443. 2000. **Fig. 10, 21b**

Type: (Mont. Tropicis Concan, *Dalzell*, Hb, Stocks) Not known.

Herb, 30 – 50 cm high. Stem terete, swollen at nodes, glabrous, light green; branches opposite. Leaves opposite, broadly lanceolate to oblong-lanceolate, 5 – 8 × 2 – 3 cm, truncate at base, serrate at margins, acute at apex, membranous, glabrous; lateral nerves 4 – 6 pairs; petioles *c.* 3 mm long, glabrous, light green. Flowers 3 – 6 in axillary fascicle, 8 – 10 mm across, yellow; bracts lanceolate, *c.* 1.8 × 0.8 mm, acuminate at apex, light green; pedicels terete, slender, 2 – 2.5 cm long, glabrous, deflexed in fruits. Lateral sepals oblanceolate, 4 – 6 × 1 – 1.5 mm, acute to acuminate at apex, glabrous, 3-nerved, greenish yellow. Standard petal petal broadly suborbicular, 5 – 7 × 6 – 8 mm, concave, obcordate, dorsally keeled (keeled surface green and with teeth-like outgrowth), glabrous, yellow; wing petals 1.1 – 1.4 × 0.5 – 0.6 cm, yellow with orange to brown streaks at base, subequally 2-lobed; basal lobe broadly ovate, 5 – 6 × 4 – 5 mm, rounded at apex; distal lobe ovate, 6 – 8 × 4 – 5 mm, acute at apex, slightly notched in upper half towards inner side; lip boat-shaped, 7 – 9 × 3 – 4 mm, 3 – 4 mm deep, glabrous, yellow with reddish brown streaks inside; spur tubular, *c.* 2 mm long, rounded at apex, glabrous, yellow. Column *c.* 4.5 × 2 mm, slightly curved; filaments 3 – 4 × *c.* 1 mm, yellow; anthers *c.* 1 × 1 mm, yellow. Pistil *c.* 3.5 × 1 mm; ovary ellipsoid or lanceoloid to oblongoid, glabrous. Capsules ellipsoid, 1 – 2 × 0.4 – 0.5 cm, with distinct ridges and furrows, glabrous, dark green; pedicels 3.5 – 4 cm long; seeds oblongoid, *c.* 4 × 2 mm, laterally compressed, smooth, shining, black.

Flowering & Fruiting: July – October.

Habitat: Open areas, on grassy hill slopes, along the periphery of semi-evergreen forests and lateritic plateaus.

Distribution: Endemic to the Western Ghats of Maharashtra.

Specimens examined: INDIA, **Maharashtra,** Concan, *Stocks s.n*. (MH); Pune district, Purandhar fort, 22.9.1902, *R.K. Bhide* 1025; Purandhar hill fort,

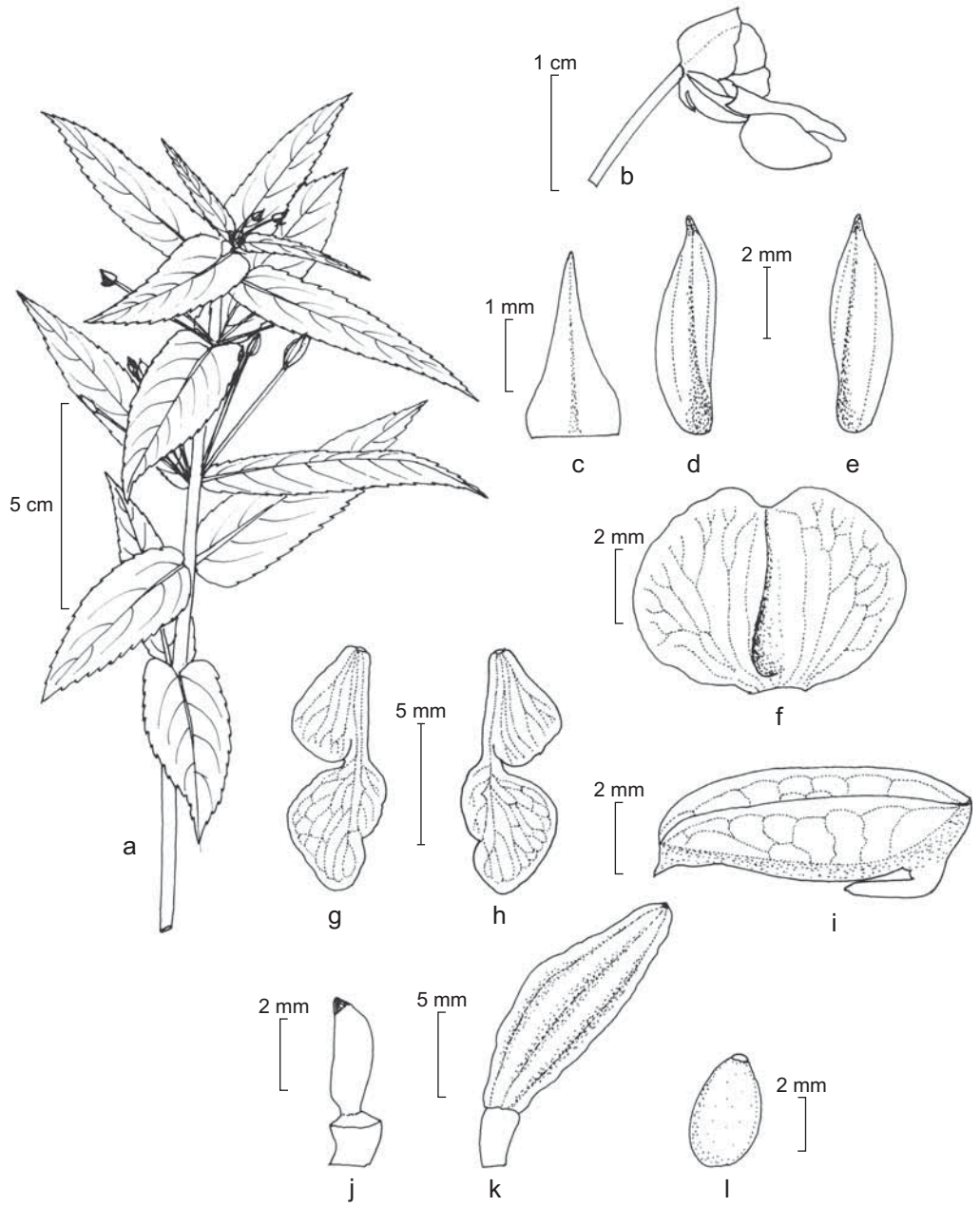


Fig. 10. *Impatiens dalzellii* Hook.f. & Thomson: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

25.10.1944, *H. Santapau* 5304; Purandhar, July end 1945, *Lesze* 7277; Purandhar hill, behind RC church, 29.8.1945, *H. Santapau* 7084; Purandhar, level path above camp, 31.8.1945, *H. Santapau* 7144, 7145, 7146, 7147, 7148; Purandhar camp, 10.7.1950, *H. Santapau* 11332; Purandhar, 12.8.1955, *N.A. Irani* NI1052 (BLAT); Sinhagad, 25.8.1956, *V.D. Vartak* 5592; Sinhagad, 3.7.1961, *U.R. Puram s.n.* (MGM); Satara district, Mahabaleshwar, Lodwick point, 17.8.1951, *H. Santapau* 13111, 13112; Mahabaleshwar, Lingmala, 18.8.1951, *H. Santapau* 13182, 13183; Mahabaleshwar, 9.7.1954, *P.V. Bole* BOLE1168 (BLAT); Mahabaleshwar, 10.9.1956, *S.D. Mahajan* 6847; Mahabaleshwar, Wilson point road, 12.10.1957, *S.D. Mahajan* 27172 (CAL); Mahabaleshwar, Hotel Lake, 14.9.1958, *H. Santapau* 22706; Mahabaleshwar, 13.9.1959, *H. Santapau* 23263; Mahabaleshwar, 13.9.1959, *Y.A. Merchant* 1273; Mahabaleshwar (along Petit road), 13.9.1959, *Y.A. Merchant* 1280; (BLAT); Kas, October 1993, *M.P. Bachulkar-Cholekar* 5419 (SUK); Mahabaleshwar, Wilson point, *s. die*, *B. Balamani* BB305 (BLAT); Mahabaleshwar, Ambenini ghat, 17.9.2005, *Jyosna R.N. Dessai* 95; Mahabaleshwar, Lingmala fall, 17.9.2005,

Jyosna R.N. Dessai 97; 1 km before Kas plateau from Satara, 18.8.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 114; Panchgani, 19.8.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 121 (GUH).

Note: Rao (1985) recorded this species for Goa from Amdiga near Bhutpal in Canacona taluk. Neither it is collected from Goa during our studies, nor specimens from Goa are located in any major Indian herbaria.

Yellow flowers distinguish this species from others in the section Oppositifoliae. It is similar to *I. oppositifolia* L. but differs in having broadly lanceolate to oblanceolate leaves, yellow flowers with glabrous pedicels and oblongoid and black seeds. *I. oppositifolia* is characterized by linear-lanceolate leaves, pink flowers with glabrous to pubescent pedicel and brown globular seeds.

Chromosome No.: n = 8 (Zinov'eva-Stahevitch & Grant, 1982, 1984).

IUCN Threat Status: EN [B1ab(iii)].

Impatiens diversifolia B. Heyne [Wall. Numer. List No. 4749, nom. nud.] ex Wight & Arn., Prodr. Fl. Ind. Orient.: 139. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 121. 1859; Hooker, Fl. Brit. India 1: 446. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Gamble, Fl. Madras 1: 140. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 310. 1933; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 402. 1978; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 53. 1983; Sharma *et al*., Fl. Karnataka: 37. 1984; Alemida, Fl. Maharashtra 1: 192. 1996; Saldanha, Fl. Karnataka 2: 252, t. 33. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 141. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 463. 2000; Bhat, Fl. Udupi District: 88, t. 22. 2003; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 539. 2005. **Fig. 11, 21c**

Type: Wall. Numer. List No. 4749 (CAL!).

Herb, 20 – 40 cm high, rooting at lower nodes. Stem quadrangular, glabrous, red. Leaves opposite-decussate, linear-lanceolate, 3 – 4.5 × 1 – 1.5 cm, rounded to truncate at base, distantly crenate at margins, acute to acuminate at apex, pubescent above, glabrous below; midrib distinct; lateral nerves obscure; petioles *c.* 2 mm long, decurrent on stem and terminating in glands, glabrous. Flowers 3 in each axil, *c.* 2.1 cm across, pink; bracts *c.* 1.5 × 0.5 mm, acute at apex, glabrous; pedicels 2.5 – 3 cm long, with 2 rows of hairs, deflexed in fruits. Lateral sepals 2, linear to linear-oblanceolate, *c.* 6 × 1 mm, acuminate at apex, glabrous, 3-nerved. Standard petal petal suborbicular, *c.* 6.5 × 5 mm, deeply concave, mucronate at apex, glabrous; wing petals 1.2 – 1.5 × 0.7 – 1 cm, 2-lobed; basal lobe linear to lanceolate, much smaller than distal lobe, *c.* 3 × 1 mm, acute to mucronate at apex; distal lobe broadly obovate, *c.* 1.2 × 1 cm, elevated at base, shortly stipitate, obtuse at apex; dorsal auricle *c.* 1 mm, rounded; lip saccate, 9 – 13 × 3 – 4 mm, 3 – 4 mm deep, acuminate at apex, glabrous; spur tubular, 1.5 – 2.2 cm long, tapering from base to apex, coiled into a semicircular ring, straight or curved upwards, notched or rounded at apex. Column *c.* 4 × 2 mm, slightly curved; filaments 5, *c.* 3 × 1 mm, light pink; anthers *c.* 1 × 1 mm. Pistil *c.* 3.5 mm long; ovary ellipsoid, *c.* 3 × 1 mm, glabrous. Capsules asymmetrically ellipsoid, 1 – 1.3 × 0.4 – 0.6 cm, glabrous; pedicels 3 – 3.4 cm long; seeds ovoid *c.* 1.5 × 1 mm, shining, glabrous, black to brown.

Flowering & Fruiting: July – October.

Habitat: Field bunds, grasslands and near streams, up to 850 m.

Distribution: Endemic to the Western Ghats of Karnataka, Kerala and Tamil Nadu.

Specimens examined: INDIA, **Karnataka**, Shimoga district, Hulical, 25.8.1965, *R. Sundara Raghavan* 90212 (CAL); Vanagur, 23.9.1971, *C.J. Saldanha & K.N. Gandhi* HFP2132, 2164 (JCB); South Kanara district, Sullia, 25.10.1900, *C.A. Barber s.n*. (MH); Yernal, 29.7.1978, *C.J. Saldanha, Ramesh & Ravindra* KFP2022 (CAL); Udupi district, Mavinmanay, Baindur-Kollur road, 4.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 71 (GUH). **Kerala**, Wayanad district, Tirunelli, 850 m, 18.8.1980, *V.S. Ramachandran s.n*. (CAL).

IUCN Threat Status: EN [B1ab(iii)].

Impatiens kleiniformis Sedgw., Rec. Bot. Surv. India 6: 351. 1919; Blatter, J. Bombay Nat. Hist. Soc. 33: 311. 1933; Sharma *et al*., Fl. Karnataka: 38. 1984; Rao, Fl. Goa 1: 59. 1985; Kulkarni, Fl. Sindhudurg: 60. 1988; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 164. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 455. 2000; Yadav & Sardesai, Fl. Kolhapur District: 95. 2002. **Fig. 12, 21d**

Type: INDIA, North Kanara district, Western Ghats, Castle Rock, August 1917. Not traceable.

Herb, 15 – 40 cm high. Stem branched or not, semiterete, glabrous, green. Leaves opposite-decussate, sessile to shortly petiolate, lanceolate, linear-lanceolate or oblong to elliptic, 5 – 14 × 2 – 3.8 cm, obtuse at base, apiculate-crenate to serrate at margins, acuminate at apex, hairy above, glabrous below; nerves 5 – 7 pairs; petioles up to 6 mm long, glabrous. Flowers 2 or 3 per axil, 0.8

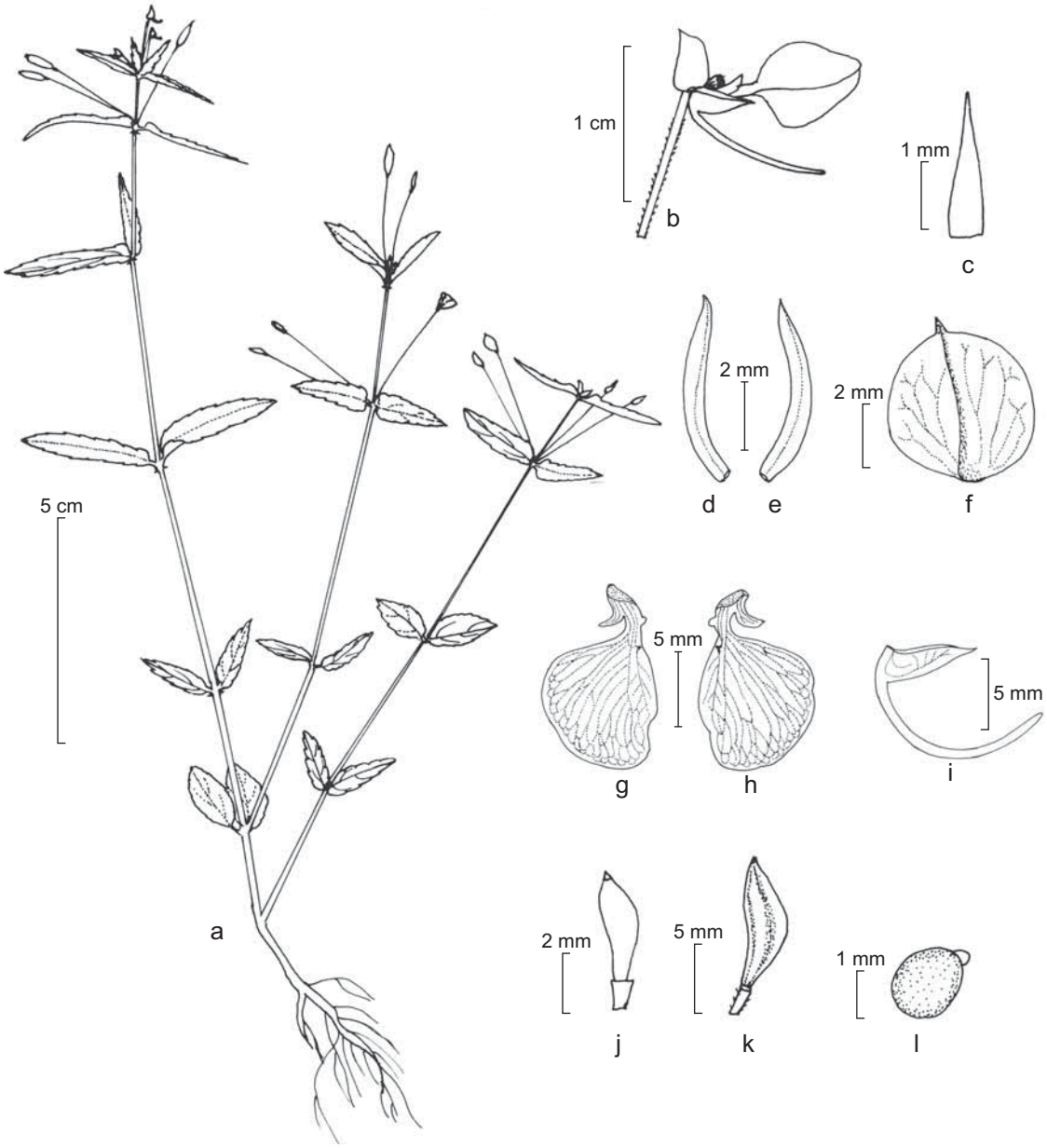


Fig. 11. *Impatiens diversifolia* B. Heyne ex Wight & Arn.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

– 1.2 cm across, pink with violet throat; bracts triangular to ovate, *c.* 1 × 0.75 mm, acute to acuminate at apex, glabrous; pedicels 2.5 – 3 cm long, pubescent with 2 rows of hairs, deflexed in fruits. Lateral sepals 2, linear-lanceolate, *c.* 5 × 1 mm, acuminate at apex, hairy on costa dorsally and side facing downwards, pale green. Standard petal ovate, *c.* 4 × 3 mm, acute at apex, pinkish white, dorsally keeled; keel hairy, green; wing petals 8 – 10 × 5 – 6 mm; basal lobe rudimentary or absent, *c.* 0.5 × 0.5 mm, asymmetrically ovate, acute to obtuse at apex; distal lobe asymmetrically ovate, *c.* 7 × 6 mm, clawed; claw *c.* 2.5 × 0.5 mm; lip saccate to conical, *c.* 6 × 3 mm, *c.* 2 mm deep, acuminate at apex, glabrous; spur 1 – 1.3 cm long, compressed, straight or curved, broad in middle, notched to rounded at apex, glabrous, pale green. Column *c.* 3 × 1 mm, curved; filaments *c.* 2.5 × 0.5 mm; anthers *c.* 0.5 × 0.5 mm, pink. Pistil *c.* 2.5 × 0.5 mm; ovary lanceoloid, *c.* 2 × 0.5 mm, glabrous. Capsules ellipsoid to fusiform, 1.2 – 1.7 × 0.3 – 0.4 mm, glabrous; pedicels 3 – 3.5 cm long; seeds globose, *c.* 1.5 mm, glabrous, shining, black to brown; funicle present.

Flowering & Fruiting: June – October.

Habitat: Roadsides, rock crevices and occasionally on tree trunks.

Distribution: Endemic to the Western Ghats of Goa, Karnataka and Maharashtra.

Specimens examined: INDIA, **Goa**, North Goa district, Surla, 1.8.2004, *M.K. Janarthanam* 14; Chorla ghat, 27.8.2005, *Jyosna R.N. Dessai* 67, 68; South Goa district, Anmod ghat, 25.7.2004, *M.K. Janarthanam* 08 (GUH). **Karnataka**, Belgaum district, Castle rock, August 1919, *L.J. Sedgwick* 2841 (CAL); North Kanara district, Karwar, October 1919, *Hall & McCann* 34258 (BLAT); Guddshali, Karwar, *s. die*, *L.J. Sedgwick* 6629 (CAL). **Maharashtra**, Sindhudurg district, Amboli, near water fall, 17.7.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 3; Amboli ghat, 16.7.2005, *Jyosna R.N. Dessai* 31; Amboli ghat, 9.8.2005, *Jyosna R.N. Des-*

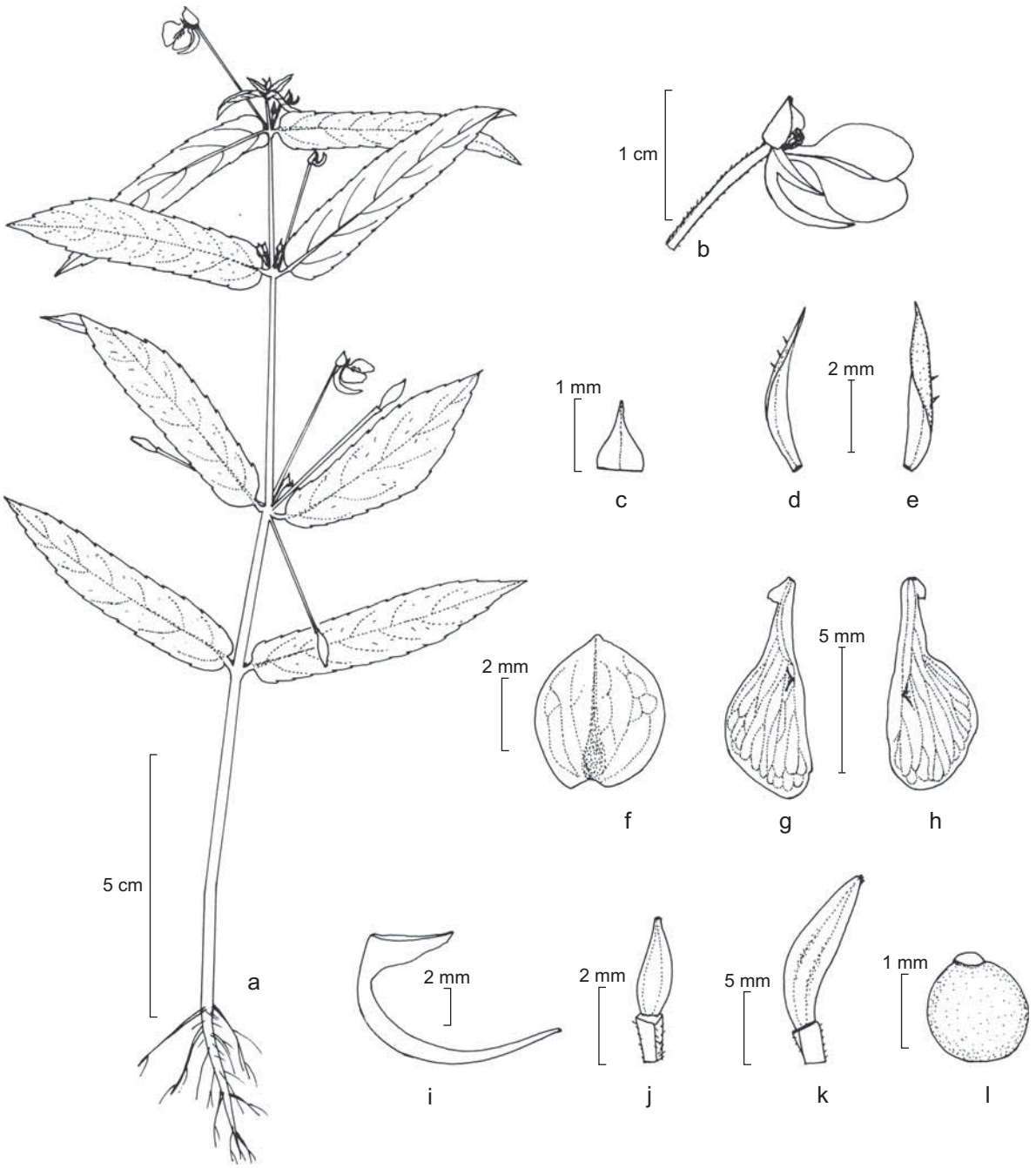


Fig. 12. *Impatiens kleiniformis* Sedgw.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

sai 42; Amboli ghat, 6.10.2007, *Jyosna R.N. Dessai* 171 (GUH).

Note: *Impatiens kleiniformis* is similar to *I. minor* but differs in the absence of glands at the base of lamina and pedicels with 2 rows of hairs.

IUCN Threat Status: EN [B1ab(iii)].

Impatiens lawii Hook.f. & Thomson, J. Proc. Linn. Soc. Bot. 4: 122. 1859; Dalzell & Gibson, Bombay Fl.: 43. 1861; Hooker, Fl. Brit. India 1: 448. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 172. 1901; Gamble, Fl. Madras 1: 141. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 312. 1933; Vartak, Enum. Plant. Gomantak: 32. 1966; Kulkarni, Fl. Sindhudurg: 60. 1988; Almeida, Fl. Savantwadi 1: 77. 1990; Deshpande *et al*., Fl. Mahabaleshwar 1: 116. 1993; Almeida, Fl. Maharashtra: 193. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 169. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 457. 2000; Yadav & Sardesai, Fl. Kolhapur District: 95. 2002. **Fig. 13, 21f**

Type: INDIA, Karnataka, Bababudan hills, *s. die*, *Stocks & Law s.n*. (K, photo!).

Herb, 20 – 30 cm high. Stem semi-quadrangular, diffusely branched, grooved on 2 sides, glabrous, reddish pink; branches alternate. Leaves opposite-decussate, subsessile, ovate, 1 – 2 × 1 – 1.5 cm,

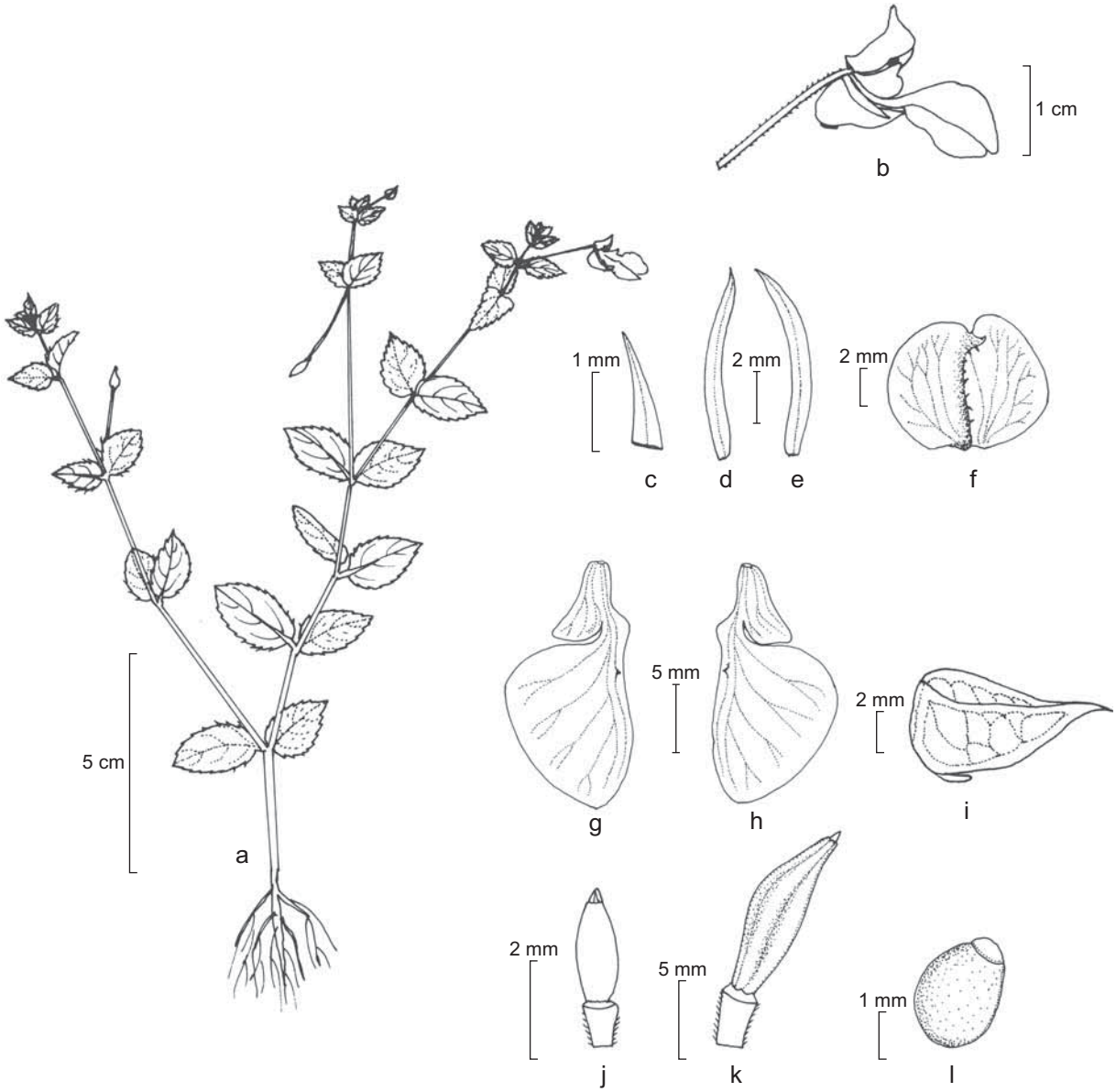


Fig. 13. *Impatiens lawii* Hook.f. & Thomson: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

truncate at base, serrately toothed at margins, acuminate at apex, hairy above in upper half, glabrous below; midrib distinct; lateral nerves 3 or 4 pairs; petioles decurrent on stem, glabrous. Flowers solitary, axillary, 1.7 – 2.2 cm across, pink to purple with violet throat; bracts linear, *c.* 1.5 × 0.5 mm, acuminate at apex, dorsally glabrous to sparsely hairy, light green; pedicels pubescent with 1 row of hairs, 1.5 – 2 cm long, deflexed in fruits, pinkish red. Lateral sepals linear, 8 – 10 × *c.* 1 mm, acuminate at apex, slightly keeled on midrib dorsally, glabrous, pink. Standard petal suborbicular, 8 – 11 mm, slightly concave, hairy in middle on dorsal surface, pink, dorsally keeled; keel lacerate, mucronate at apex; wing petals 1.7 – 2.2 cm long, 2-lobed, auricled near base; auricle rounded, *c.* 1 mm; basal lobe triangular or ovate to fin-shaped, much smaller than distal lobe, 4 – 6 × 2 – 2.5 mm, acute at apex; distal lobe asymmetrically obovate, 1 – 1.5 × 0.8 – 1 cm, shortly stipitate, elevated at base, obtuse at apex; lip saccate, 1 – 1.2 × 0.4 – 0.5 cm, 4 – 5 mm deep, glabrous, purple with violet nerves; spur *c.* 1.5 mm long, straight, bent inwards, very close and parallel to lip surface, appearing spurless when viewed from sides, notched at apex, greenish yellow. Column *c.* 5 × 3 mm, incurved; filaments *c.* 4.5 × 1 mm, pink; anthers *c.* 0.5 × 0.5 mm, yellow. Pistil *c.* 2.5 × 1 mm; ovary ellipsoid or oblongoid to oblong-lanceoloid, glabrous. Capsules asymmetrically ellipsoid to elliptic-lanceoloid, glabrous; pedicels 2 – 2.5 cm long; seeds spherical to oblongoid, *c.* 2.5 × 1.5 mm, glabrous, shining, brown to brownish black; funicle prominent.

Flowering & Fruiting: August – October.

Habitat: Open lateritic plateaus with high wind velocity and mist; usually in association with *I. tomentosa* and *I. oppositifolia* as well as species of *Strobilanthes* and *Utricularia*.

Distribution: Endemic to the Western Ghats of Karnataka and Maharashtra.

Specimens examined: INDIA, **Karnataka**, Malabar, Concan, *s. die*, *Stocks & Law s.n.* (CAL); Malabar, Concan, *Stocks & Law s.n.* (MH); Belgaum district, Sada, near Goa-Karnataka border, 24.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 158 (GUH). **Maharashtra**, Satara district, Mahabaleshwar, 19.9.1958, *V.D. Vartak* 13907 (MGM); Kas, September 1992, *M.P. Bachulkar-Cholekar* 5337 (SUK); Kas plateau, 18.9.2005, *Jyosna R.N. Dessai* 98; Kas plateau, 18.8.2006, *Jyosna R.N. Dessai* 115 (GUH).

Note: *Impatiens lawii* is similar to *I. oppositifolia* but differs in the presence of ovate leaves which are crowded at apex, short lip with short and straight spur that is very close to lip. *Impatiens oppositifolia* on the contrary posseses linear-lanceolate leaves and lip with a short, hooked spur.

Hooker & Thomson (1859) compared *I. lawii* with *I. inconspicua* Benth. ex Wight & Arn. and *I. diversifolia* B. Heyne ex Wight & Arn. and differentiated it from the latter two based on its stature, branched nature, smaller leaves at the apex and size of the flower. Gamble (1915) in the key mentioned that the flowers are yellow but in the text describes them as purple or rose. Blatter (1933) also mentioned that the flowers are yellow. Saldanha (1996) stated that the type at K collected by Law from Bababudan resembles *I. scabriuscula* B. Heyne ex Roxb. except for the linear lateral sepals. However, the latter species has alternate leaves and the specimen at K has opposite leaves.

IUCN Threat Status: EN [B1ab(iii)].

Impatiens minor (DC.) Bennet, Indian J. Forest. 2: 283. 1979; Almeida, Fl. Savantwadi 1: 78. 1990; Lakshminarasimhan & Sharma, Fl. Nasik District: 144. 1991; Deshpande *et al*., Fl. Mahabaleshwar 1: 116. 1993; Almeida, Fl. Maharashtra: 194. 1996; Saldanha, Fl. Karnataka 2: 255, t. 36. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 181. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 457. 2000; Yadav & Sardesai, Fl. Kolhapur: 95. 2002; Bhat, Fl. Udupi District: 88. 2003; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 550. 2005. **Fig. 14, 21g**

Type: Same as *Balsamina minor* DC.

Balsamina minor DC., Prodr. 1: 686. 1824.

Type: Rheede, Hort. Malab. 9: 95, t. 50. 1689.

Impatiens kleinii Wight & Arn., Prodr. Fl. Ind. Orient.: 140. 1834; Wight, Icon. Pl. Ind. Orient. 3(2): 7, t. 884. 1844 – 1845; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 122. 1859; Dalzell & Gibson, Bombay Fl.: 43. 1861; Hooker, Fl. Brit. India 1: 445. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 171. 1901; Gamble, Fl. Madras 1: 140. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 311. 1933; Vartak, Enum. Plant. Gomantak: 31. 1966; Santapau, Fl. Khandala: 30. 1967; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 403. 1978; Shah, Fl. Gujarat 1: 143. 1978; Yoganarasimhan *et al*., Fl. Chikmagalur District: 62. 1982; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 54. 1983; Sharma *et al*., Fl. Karnataka: 38. 1984; Rao, Fl. Goa 1: 60. 1985; Kulkarni, Fl. Sindhudurg: 59. 1988; Murthy & Yoganarasimhan, Fl. Coorg: 87. 1990; Kothari & Moorthy, Fl. Raigad

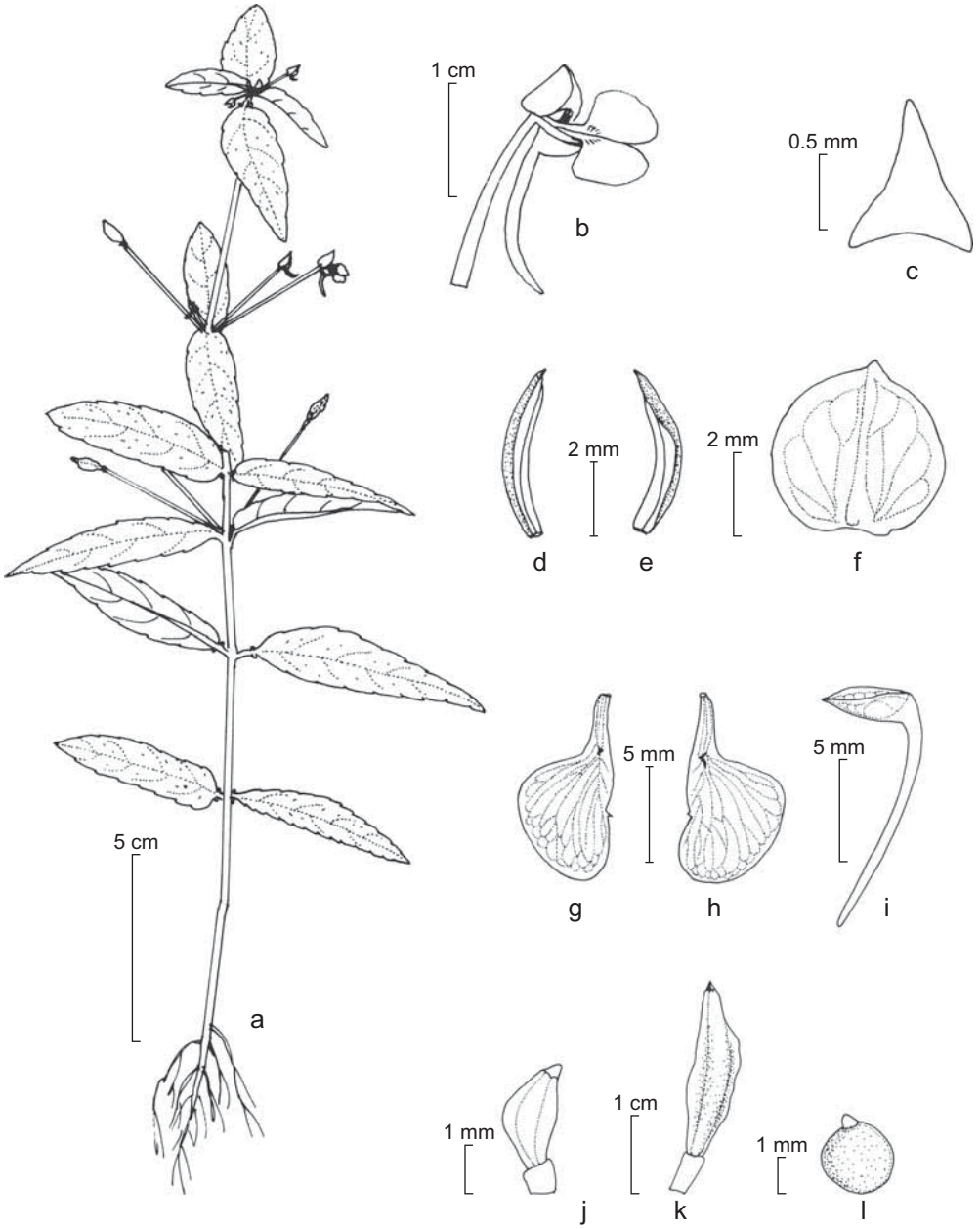


Fig. 14. *Impatiens minor* (DC.) Bennet: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

District: 46. 1993; Ramaswamy *et al*., Fl. Shimoga District: 109. 2001.

Type: INDIA, **Kerala**, Cannanore, *R. Wight* 442 (K, photo!)

Herb, 8 – 50 cm high. Stem semiterete, branched or not, glabrous, green. Leaves opposite-decussate, sessile to shortly petiolate, lanceolate, linear-lanceolate, oblong or ovate to elliptic, 3 – 14 × 1 – 3.8 cm, obtuse to semicordate at base, apiculate-crenate to serrate at margins, acute to acuminate at apex, glandular at base, hairy above, glabrous below; nerves 3 – 7 pairs; petioles up to 4 mm long, glabrous. Flowers 1 – 3 per axil, 0.8 – 1.5 cm across, pink with violet throat; bracts triangular to ovate, *c.* 0.5 × 0.3 mm, acute at apex, glabrous; pedicels 1 – 2.5 cm long, glabrous, deflexed in fruits. Lateral sepals linear-lanceolate, 3 – 6 × 0.7 – 1 mm, acute at apex, hairy on costa dorsally, 3-nerved, pale green. Standard petal ovate to orbicular, 3 – 4 × 3 – 5 mm, acute at apex, pinkish white, dorsally keeled; keel glabrous to hairy, green; wing petals 0.8 – 1 × 0.5 – 0.7 cm, entire at margins; lobe asymmetrically obovate, 4 – 7 × 5 – 7 mm, obtuse at apex; stipe 2

– 3 × *c.* 0.5 mm; lip boat-shaped, 3 – 6 × *c.* 2 mm, 1 – 2 mm deep, acute at apex, glabrous; spur tubular to compressed, 1 – 1.3 cm long, rounded at apex, straight or curved, glabrous, pale green. Column *c.* 2 × 1 mm, curved; filaments *c.* 1.5 × 0.5 mm, pink; anthers *c.* 0.25 × 0.25 mm. Pistil *c.* 1.5 × 0.5 mm; ovary lanceoloid, glabrous. Capsules ellipsoid to fusiform, 1 – 1.5 × 2 – 4 mm, glabrous; pedicels 1.8 – 2.3 cm long; seeds globose, *c.* 0.5 mm, glabrous, shining, black to brown; funicle present.

Flowering & Fruiting: June – December (May).

Habitat: Moist places, open plains amidst grasses, rock crevices, on roofs or walls, in shade and also on tree trunks.

Distribution: Endemic to Peninsular India; widely distributed in the Western Ghats.

Specimens examined: INDIA, **Andhra Pradesh**, East Godavari district, Maredumilli, 18.8.1995, *M. Mohanan* 105044 (MH). **Goa**, North Goa district, Anmod ghat, 18.7.2004, *Jyosna R.N. Dessai* 6; Goa University campus, Taleigao plateau, 21.7.2005, *Jyosna R.N. Dessai* 33; Bondir, Sattari, 27.7.2006, *Jyosna R.N. Dessai* 103 (GUH). **Gujarat**, Valsad district, Pangarbari, Dharampur, 22.8.1984, *A. Sundara Reddy* ASR2751 (SPU). **Karnataka**, Chikmagalur district, Baserukatte, 28.7.1972, *V. Bhaskar* 300; Charmadi ghat, 26.8.1972, *V. Bhaskar* 317; Bababudan, Abbe, 26.7.1973, *V. Bhaskar* 368; Sukalahatti, 28.7.1973, *V. Bhaskar* 369 (MGM); Hassan district, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 134; Kodagu district, Managunddi, on the way to Madikeri from Mangalore, 13.8.2005, *Jyosna R.N. Dessai* 45; Madyanadu, Jodpalla, 14 km before Madikeri from Mangalore, 13.8.2005, *Jyosna R.N. Dessai* 48 (GUH); North Kanara district, Karwar, July 1882, *W.A. Talbot* 28 (CAL); Karwar, 1.10.1919, *Hall & McCann* 34254 (BLAT); Jog falls, 5.11.1972, *V. Bhaskar* 341 (MGM); Jog falls, 6.8.2005, *Jyosna R.N. Dessai* 36 (GUH); Shimoga district, Heggargudda, Tirthahalli, 30.8.1963, *S. Sundara Raghavan* 90097 (CAL); Balehonnur, Coffee Research Station Estate, 19.10.1971, *V. Bhaskar* (MGM); South Kanara district, Shiradi, 15.12.1918, *s. leg., s.n.* (MH); Subramanya, 5.8.1973, *V. Bhaskar* 373 (MGM). **Kerala**, Idukki district, Marinjapuzha, 17.6.1972, *V. Bhaskar* 293, 294 (MGM); Kottayam district, Pulluparai, 24.9.1964, *K. Vivekananthan* 21342; Palakkad district, Karivara, 20.9.1977, *J. Joseph* 51401; Thrissur district, Vazhani, 5.9.1976, *K. Ramamurthy* 47637 (MH); Wayanad district, near Kalpetta, 4.7.1972, *V. Bhaskar* 293; Tambracheri ghat, 5.8.1972, *V. Bhaskar* 303 (MGM). **Maharashtra**, Nasik district, Tambakeshwar – Bhramagiri hill, 25.7.1984, *G. Chandramohan* GCM83 (SPU); Pune district, Lonavala, 1.9.1949, *H. Santapau* 18684; Lonavala, 18.7.1951, *B.A. Razi* RAZI5229; Raigad district, Matheran waterpipe, 17.9.1960, *N.A. Irani* NI5410; Sindhudurg district, Mazgaon, Savantwadi, 13.9.1980, *S.M. Almeida* SMA2950 (BLAT); Chaukul road, Amboli, 7.10.2007, *Jyosna R.N. Dessai* 174 (GUH); Satara district, Khandala, 9.6.1941, *H. Santapau* 714; Khandala, 24.7.1943, *H. Santapau* 2232; Khandala, Monkey hill, 13.7.1946, *H. Santapau* 9242; Khandala, Bhoma hills, 23.7.1949, *H. Santapau* 10135; Khandala, Battery hill plateau, 21.7.1950, *H. Santapau* 6794; Mahabaleshwar, Fitzgerald ghat, 20.8.1957, *H. Santapau* 13230; Mahabaleshwar, Dhobi's waterfall, 26.12.1957, *B.B. Bole* 281 (BLAT).

Note: *Impatiens minor* (DC.) Bennet is similar to *I. kleiniformis* Sedgw. but differs in characters as shown in notes under *I. kleiniformis*. However, in certain cases the leaves may lack glands hence this character is not reliable for segregating this species from *I. kleiniformis*.

Chromosome No.: n = 8 (Zinovéva-Stahevitch & Grant, 1982, 1984, as *I. kleinii* Wight & Arn.).

IUCN Threat Status: LC.

Impatiens oppositifolia L., Sp. Pl.: 937. 1753; Lamarck, Encycl. 1: 363. 1785; Wight & Arnott, Prodr. Fl. Ind. Orient. 1: 139. 1834; Wight, Icon. Pl. Ind. Orient. 3(2): 7, t. 883. 1844 – 1845; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 120. 1859; Dalzell & Gibson, Bombay Fl.: 43. 1861; Hooker, Fl. Brit. India 1: 448. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 172. 1901; Gamble, Fl. Madras 1: 141. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 312. 1933; Vartak, Enum. Plant. Gomantak: 32. 1966; Santapau, Fl. Khandala: 30. 1967; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 403. 1978; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 55. 1983; Sharma *et al*., Fl. Karnataka: 38. 1984; Grey-Wilson in Dassanayake, Rev. Handb. Fl. Ceylon 5: 110, f. 2X – Z. 1985; Rao, Fl. Goa 1: 60. 1985; Kulkarni, Fl. Sindhudurg: 60. 1988; Almeida, Fl. Savantwadi 1: 78. 1990; Deshpande *et al*., Fl. Mahabaleshwar 1: 117. 1993; Kothari & Moorthy, Fl. Raigad District: 47. 1993; Saldanha, Fl. Karnataka 2: 256. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 187. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 459. 2000; Ramaswamy *et al*., Fl. Shimoga District: 109. 2001; Yadav & Sardesai, Fl. Kolhapur District: 95. 2002; Bhat, Fl. Udupi District: 88. 2003; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 552. 2005. **Fig. 15, 21e**

Type: CEYLON, Hermann Herb. 314 (BM, photo!).

I. rosmarinifolia Retz., Observ. Bot. 5: 29. 1788; Arnott, Companion Bot. Mag. 1: 325. 1835; Wight, Icon. Pl. Ind. Orient. 3(1): 2, t. 750. 1844; Almeida, Fl. Maharashtra 1: 195. 1996.

Type: E. Zeylona mifit Cel. König (C, photo!).

Balsamina oppositifolia (L.) DC., Prodr. 1: 686. 1824.

Type: Same as *Impatiens oppositifolia*

Balsamina rosmarinifolia (Retz.) DC., Prodr. 1: 686. 1824.

Type: Same as *Impatiens rosmarinifolia*

I. rupicola Hook.f., Bull. Misc. Inform. 1910: 292. 1910; Gamble, Fl. Madras 1: 140. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 312. 1933; Sharma *et al*., Fl. Karnataka: 39. 1984; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 206. 1997; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 556. 2005.

Type: Castle Rock, October 1908, *A. Meebold* 10719 (K, photo!). Lectotype selected here.

I. nataliae Hook.f., Bull. Misc. Inform. 1910: 294. 1910; Gamble, Fl. Madras 1: 141. 1915; Sharma *et al*., Fl. Karnataka: 39. 1984; Saldanha, Fl. Karnataka 2: 225. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 184. 1997; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 552. 2005, **syn. nov.**

Type: INDIA, **Karnataka**, Shimoga district, Kumsi, October 1908, *A. Meebold* 10718 (K, photo!)

I. chinensis L. var. *rupicola* (Hook.f.) Bhaskar, Indian J. Forest. 1: 172. 1978.

Herb, 15 – 50 cm high. Stem often branched, semi-circular at base, quadrangular above, glabrous,

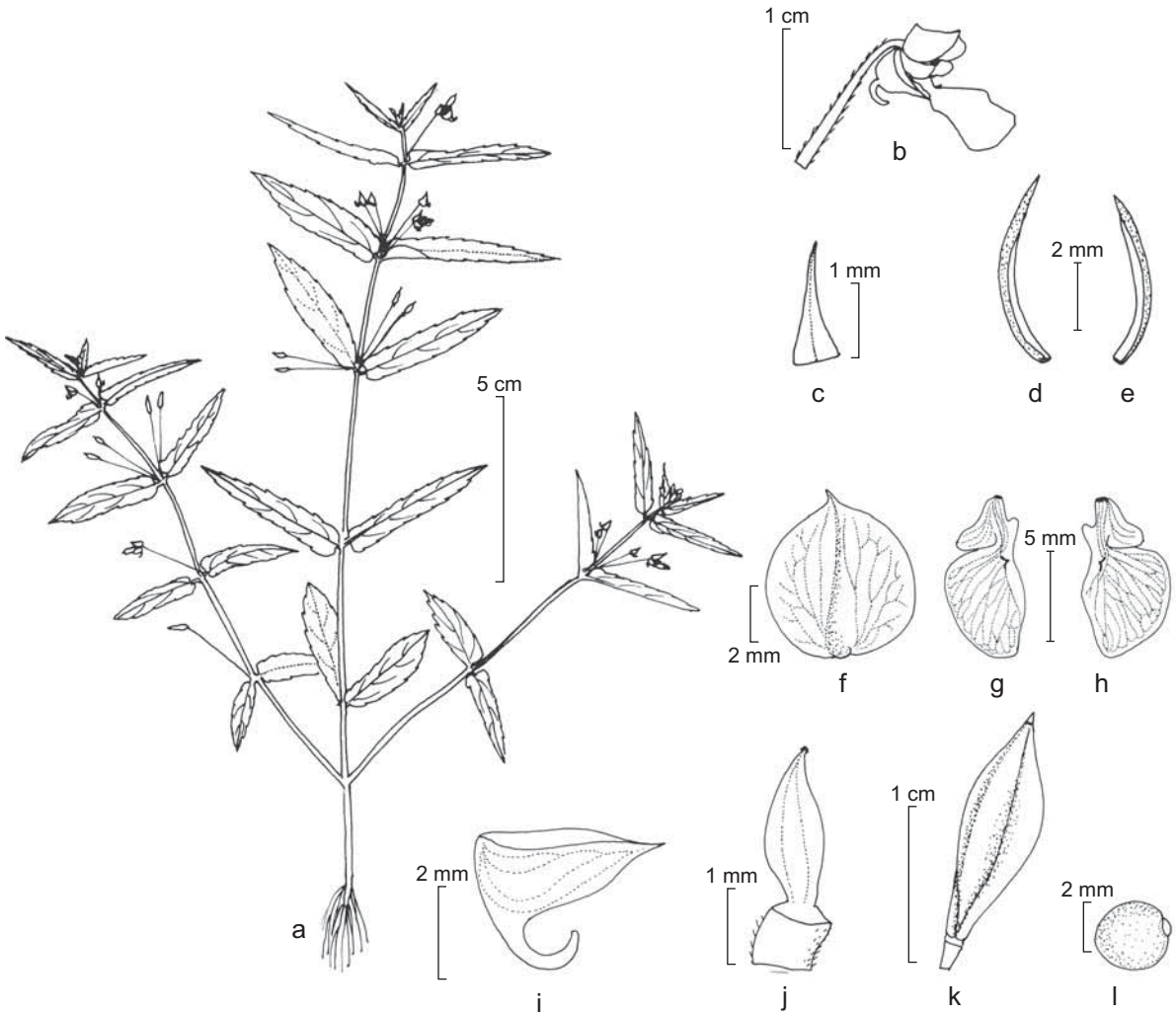


Fig. 15. *Impatiens oppositifolia* L.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

red, rarely green above. Leaves opposite-decussate, sessile to shortly petiolate, elliptic-lanceolate, linear-lanceolate, linear-oblanceolate or oblong to spathulate, 3.5 – 7 × 0.8 – 1.9 cm, cuneate or truncate to subcordate at base, apiculate-crenate at margins, acute to acute-apiculate at apex, hairy mostly on nerves above, glabrous below; nerves 4 or 5 pairs; petioles decurrent on stem and terminating in glands, up to 4 mm long, glabrous. Flowers 2 or 3 per axil, 1 – 1.6 cm across, lilac to pink with violet throat; bracts linear, *c.* 1.5 × 0.5 mm, acuminate at apex, glabrous; pedicels 1 – 2.6 cm long, with 2 rows of hairs, rarely glabrous, deflexed in fruits. Lateral sepals linear, 4 – 5 × *c.* 1 mm, acute at apex, translucent, glabrous. Standard petal broadly ovate, 3 – 6 × 4 – 6 mm, concave, emarginate to obcordate at apex, pink, dorsally keeled; keel mucronate; mucro *c.* 0.5 mm long; wing petals 0.9 – 1.3 × 0.4 – 0.7 cm, 2-lobed; basal lobe ovate, 3 – 5 × 2 – 3 mm; distal lobe 7 – 9 × 4 – 6 mm, asymmetrically obovate, elevated at base, obtuse at apex; lip conical to saccate, 5 – 6 × *c.* 3 mm, 1 – 3 mm deep, acuminate at apex, glabrous; spur straight or hooked, 2 – 4 mm long, rounded, notched to bulged at apex, glabrous, pink. Column *c.* 3 × 1.5 mm, curved; filaments *c.* 2.5 × 0.5 mm, pink; anthers *c.* 0.5 × 0.5 mm, white to pink. Pistil *c.* 2 × 0.5 mm; ovary oblong-lanceoloid, curved at apex, glabrous. Capsules asymmetrically ellipsoid or lanceoloid to oblanceoloid, 0.8 – 1.5 × 0.4 – 0.5 cm, glabrous; pedicels 2 – 3 cm long; seeds globose, *c.* 0.5 mm, glabrous, shining, black to brown; funicle present.

Flowering & Fruiting: July – October.

Habitat: Grassy places; often forming large scattered colonies.

Distribution: India (Western Ghats), Myanmar and Sri Lanka.

Specimens examined: INDIA, **Goa**, North Goa district, Nagzar, Pernem, 17.7.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 5; Surla, 1.8.2004, *M.K. Janarthanam* 12; Goa-Karnataka border, 27.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 70; Bondir, Sattari, 27.7.2006, *Jyosna R.N. Dessai* 104; Surla, 24.8.2006, *Jyosna R.N. Dessai* 125; South Goa district, Cotigao WLS, 22.8.2004, *Jyosna R.N. Dessai* 20; Cotigao, 5.8.2006, *Jyosna R.N. Dessai* 105, 106 (GUH). **Karnataka**, Belgaum district, Castle rock, October 1908, *A. Meebold* 10719 (K, photo!); Sada, 24.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 155, 156 (GUH); North Kanara district, 15.9.1891, *W.A. Talbot* 2514 (K, photo!); Nagavelly, on the way to Bhatkal from Jog falls, 6.8.2005, *Jyosna R.N. Dessai* 40; Shimoga district, Talaguppa, 6.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 91 (GUH). **Maharashtra**, Kolhapur district, Gaganbawda, 18.9.2004, *M.K. Janarthanam* 21 (GUH); Satara district, Khandala, September 1907, *A. Meebold* 8813 (K, photo!); Barrington point, Mahabaleshwar, 17.9.2005, *Jyosna R.N. Dessai* 94; Needle point, Mahabaleshwar, 17.9.2005, *Jyosna R.N. Dessai* 96; Kas plateau, 18.9.2005, *Jyosna R.N. Dessai* 99; Panchgani, 19.8.2006, *Jyosna R.N. Dessai* 120; Sindhudurg district, Tilari ghat, *s. die, M.K. Janarthanam* 17; Amboli, beyond ghats, 17.7.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 1; Amboli ghat, 12.8.2006, *Jyosna R.N. Dessai* 108; Chaukul road, Amboli, 12.8.2006, *Jyosna R.N. Dessai* 110; Tilari, 3.9.2006, *M.K. Janarthanam* 126; Amboli ghat, 9.9.2006, *Harshala Gad* 131, 133; Phonda ghat, 30.9.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 170; Chaukul, Amboli, 7.10.2007, *Jyosna R.N. Dessai* 173 (GUH).

Note: *Impatiens oppositifolia* L. is allied to *I. tomentosa* B. Heyne ex Wight & Arn. but differs in stem, lateral sepals, lip and spur being glabrous. It is also similar to *I. raziana* Bhaskar & Razi but differs in the presence of lilac to pink-coloured flowers.

Impatiens oppositifolia is a very variable species with regard to leaf shape and hairy nature of the pedicel (glabrous or with 1 or 2 rows of hairs). Plants exposed to sunlight and growing in humus rich soil are tall, have semicircular stem with broad leaves whereas those growing in shade are stunted with quadrangular stem, linear and smaller leaves. There are variations in the spur as well. The spur in material collected in Amboli region is straight, hooked or straight and curved inwards at apex. Grey-Wilson (1985) who stated that the Ceylon specimens exhibit variation in leaf shape and size, however, did not mention any variation in flower.

Impatiens oppositifolia was described by Linnaeus (1753) based on the Hermann's material from Ceylon (Sri Lanka). The description provided by Linnaeus runs thus: "*pedunculis unifloris aggregatis, foliis oppofitis linearibus*". Hooker (1910) who described *I. rupicola* compared the species with *I. chinensis* and differentiated the species from the latter by its entire leaves, much smaller flowers and capsules and a small and distinct spur. He also stated that *I. rupicola* may prove to be a small-flowered and fruited; almost spurless state of *I. chinensis* occuring in the Western Ghats from the latitude of Goa up to Pune.

Santapau (1967) studied the material of *I. rupicola* and *I. oppositifolia* at Kew and treated *I. rupicola* a synonym of *I. oppositifolia*. He also stated that

none of the specimens were with entire leaves as cited by Hooker (1910). Gamble (1915), Blatter (1933), Sharma *et al*. (1984) and Vivekananthan *et al*. (1997) treated them as distinct species. However, Saldanha (1996) treated *I. rupicola* conspecific with *I. oppositifolia*. Bhaskar (1978a) considered it as a variety of *I. chinensis*: *I. chinensis* var. *rupicola* (Hook.f.) Bhaskar.

A detailed study of the specimens collected from the study area and some of the specimens of *I. rupicola* at Kew cited by Hooker (1910) are morphologically similar to *I. oppositifolia* with a great range of continuous variation. Therefore, *I. rupicola* is considered a synonym under *I. oppositifolia* here. Since there is more than one original material, a lectotype is being selected here.

Hooker (1910) described *I. nataliae* along with *I. rupicola*. The type material revealed that *I. nataliae* is a morphological variation of *I. oppositifolia* and hence synonymised under the latter.

IUCN Threat Status: LC.

Impatiens raziana Bhaskar & Razi, J. Bombay Nat. Hist. Soc. 79: 383. 1982; Sharma *et al*., Fl. Karnataka: 39. 1984; Saldanha, Fl. Karnataka 2: 257, t. 38. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 204. 1997; Dessai & Janarthanam, Indian J. Forest. 32: 313. 2009. **Fig. 16, 21h**

Holotype: INDIA, **Karnataka**, Chikmagalur district, Charmadi ghat, 26.8.1972, *V. Bhaskar* 311 (MGM!).

Herb, 10 – 40 cm high. Stem erect or prostrate to procumbent, quadrangular, branches at basal nodes, glabrous, red. Leaves opposite-decussate, subsessile at apex, oblong, elliptic or oblanceolate to obovate-spathulate, 2 – 6.5 × 1 – 1.8 cm, cuneate to truncate at base, apiculate-crenate at margins, acute at apex, membranous, hairy above, glabrous and distinctly nerved below; petioles decurrent on stem and terminating in glands, up to 4 mm long, glabrous. Flowers 1 – 4 in each axil, 1.4 – 2 cm across, bright saffron; bracts linear-lanceolate,

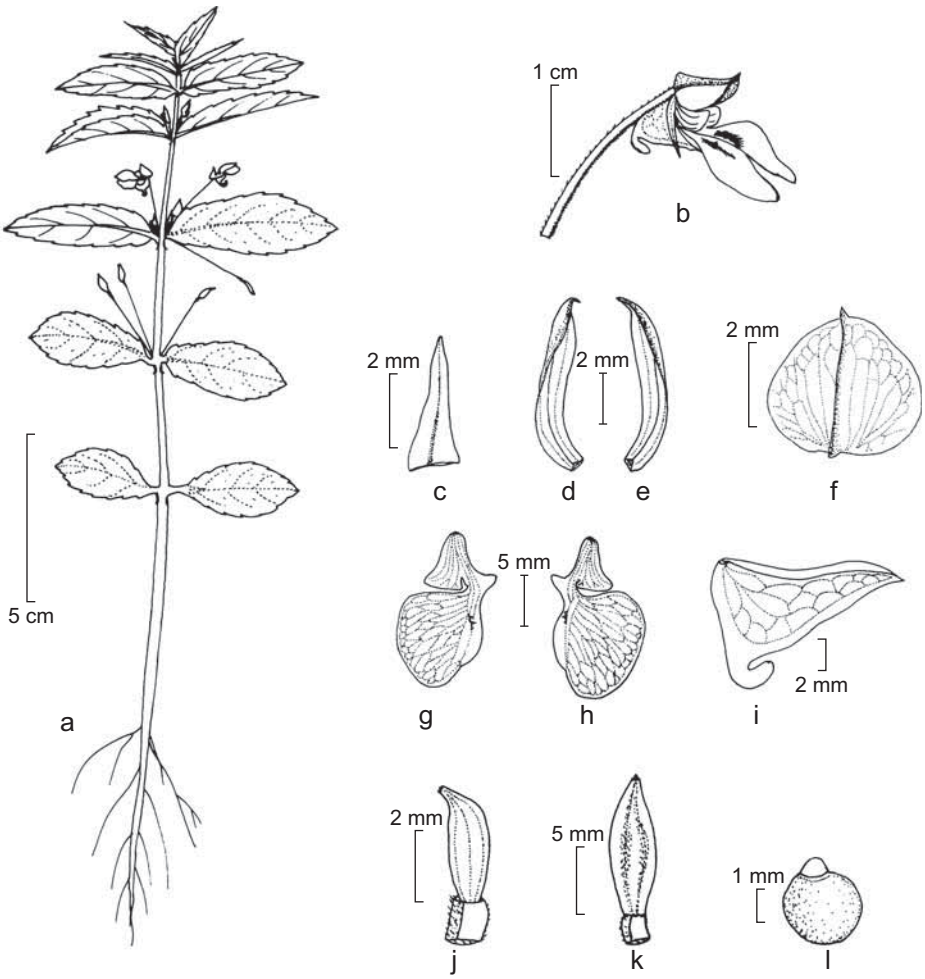


Fig. 16. *Impatiens raziana* Bhaskar & Razi: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i) Lip; j. Pistil; k. Capsule; l. Seed.

c. 1.5 × 0.75 mm, acute at apex, glabrous; pedicels 2 – 3 cm long, pubescent with 2 rows of hairs, deflexed in fruits. Lateral sepals linear to linear-lanceolate, 8 – 10 × 1 – 1.5 mm, acute to acuminate at apex, glabrous, light orange, 3-nerved; midrib distinct, dorsally keeled, others obscure. Standard petal orbicular to broadly ovate, 5 – 7.5 × 7 – 9 mm, concave, rounded to subcordate at apex, dorsally keeled, orange; costa mucronate, glabrous to hairy dorsally; wing petals 1 7 – 2 × 0.8 – 1.1 cm, auricled at base, unequally 2-lobed; basal lobe triangular, *c.* 5 × 4 mm; distal lobe obliquely ovate, 1 – 1.3 × 0.8 – 1.1 cm, elevated in basal region, shortly stipitate; stipe bears 4 or 5 dark orange spots; lip funnel-shaped, 10 – 12 × 5 – 6 mm, 6 – 8 mm deep, acuminate at apex, light orange with darker nerves; spur 3 – 5 mm long, curved, rounded to notched at apex, glabrous to hairy, yellow to green. Column *c.* 5 mm long, curved; filaments *c.* 3 × 1 mm, yellowish orange; anthers *c.* 1 × 1 mm. Pistil *c.* 4 × 2 mm; ovary linear-oblongoid, curved at apex, glabrous. Capsules ellipsoid or oblongoid to oblanceoloid, 1 – 1.2 × 0.4 – 0.5 cm, glabrous; pedicels 3.5 – 4 cm long; seeds subglobose, *c.* 2.5 × 2 mm, laterally compressed, glabrous, shining, dark brown to black; funicle prominent.

Flowering & Fruiting: July – November.

Habitat: Grows on the periphery of the moist deciduous forest in shade of *Terminalia bellirica* (Gaertn.) Roxb. and *T. paniculata* Roth amidst grasses and on field bunds at Tinaighat in Belgaum district at about 650 m and in cultivated areas with sandy soil in plantation of *Acacia auriculiformis* Benth. at Bidargad in Shimoga district, reaching up to 800 m.

Distribution: Endemic to the Western Ghats of Karnataka.

Specimens examined: INDIA, **Karnataka**, Belgaum district, Tinaighat, Rajval, 15° 26′ 13.8″ N and 74° 26′ 19.2″ E, 646 m, 1.8.2004, *M.K. Janarthanam* 11; Tinaighat, Rajval, 21.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 64 (GUH); Chikmagalur district, Kotigehar, 850 m, 25.9.1979, *C.J. Saldanha* KFP9756; Chikmagalur, 800 m, 3.11.1981, *C.J. Saldanha* KFP13494 (JCB); Shimoga district, Bidargad, Agumbe-Sringeri road, 4.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 76 (GUH).

Note: *Impatiens raziana* is the only species with bright saffron-coloured flowers in the section Oppositifoliae. Though similar to *I. oppositifolia* L. in most characters, it can be easily distinguished in the field by flower colour.

Impatiens raziana appears a narrow endemic known by the collections from the type locality except for the collections of Dessai & Janarthanam (2009) who reported it from Belgaum and Shimoga districts.

Chromosome No.: 2n = 16 (Bhaskar, 1975).

IUCN Threat Status: CR [B1ab(iii)].

Impatiens tenella B. Heyne [Wall. Numer. List No. 4746, nom. nud.] ex Wight & Arn., Prodr. Fl. Ind. Orient.: 140. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 123. 1859; Hooker, Fl. Brit. India 1: 447. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Gamble, Fl. Madras 1: 141. 1915; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 56. 1983; Sharma *et al.*, Fl. Karnataka: 39. 1984; Vivekananthan *et al.* in Hajra *et al.*, Fl. India 4: 215. 1997. **Fig. 17, 21i**

Type: INDIA, Wall. Numer. List No. 4746A (CAL!).

Herb, 20 – 60 cm high. Stem semiterete, swollen at nodes; branches opposite, glabrous, reddish pink. Leaves opposite, lanceolate, 4 – 5.5 × 1.5 – 2 cm, cuneate at base, apiculate-serrate at margins, acute to acuminate at apex, pubescent above, glabrous below, shortly petiolate or sessile; nerves obscure above, prominent below; petioles decurrent on stem and terminating in glands, *c.* 2 mm long. Flowers binate, axillary, *c.* 1 cm across, dark pink, lilac to white; bracts linear, *c.* 2 × 0.5 mm, acute to acuminate at apex, glabrous; pedicels slender, 2.3 – 2.7 cm long, pubescent with 2 rows of hairs, deflexed in fruits. Lateral sepals linear-lanceolate to oblanceolate, *c.* 5 × 0.75 mm, acute to acuminate at apex, glabrous, distinctly 1-nerved. Standard petal broadly ovate, *c.* 4 × 3.5 mm, concave, mucronate at apex, white to pink; wing petals *c.* 1 × 0.4 cm, auricled near base, 2-lobed; basal lobe ovate to subulate, *c.* 3 × 1 mm, obtuse at apex; distal lobe asymmetrically obovate, *c.* 6 × 4 mm, rounded to obtuse at apex; auricle *c.* 1 mm long, rounded at apex; lip saccate, *c.* 8 × 3 mm, *c.* 3 mm deep, acute at apex; spur basal, tubular, *c.* 7 mm long, rounded at apex, slightly curved, glabrous. Column *c.* 3 × 1.5 mm, curved; filaments *c.* 2 × 0.5 mm, pink; anthers *c.* 0.75 × 0.5 mm. Pistil *c.* 2 × 0.5 mm; ovary linear-oblongoid, curved at apex, glabrous. Capsules ellipsoid or oblongoid to oblanceoloid, *c.* 1.2 × 0.5 cm, glabrous; pedicels 3 – 4 cm long; seeds subglobose, *c.* 2.5 × 2 mm, laterally compressed, glabrous, shining, dark brown to black; funicle prominent.

Flowering & Fruiting: September – November.

Habitat: Vertical cut surfaces on roadsides and in open plains amidst grasses.

Distribution: Endemic to Western Ghats of Karnataka and Tamil Nadu.

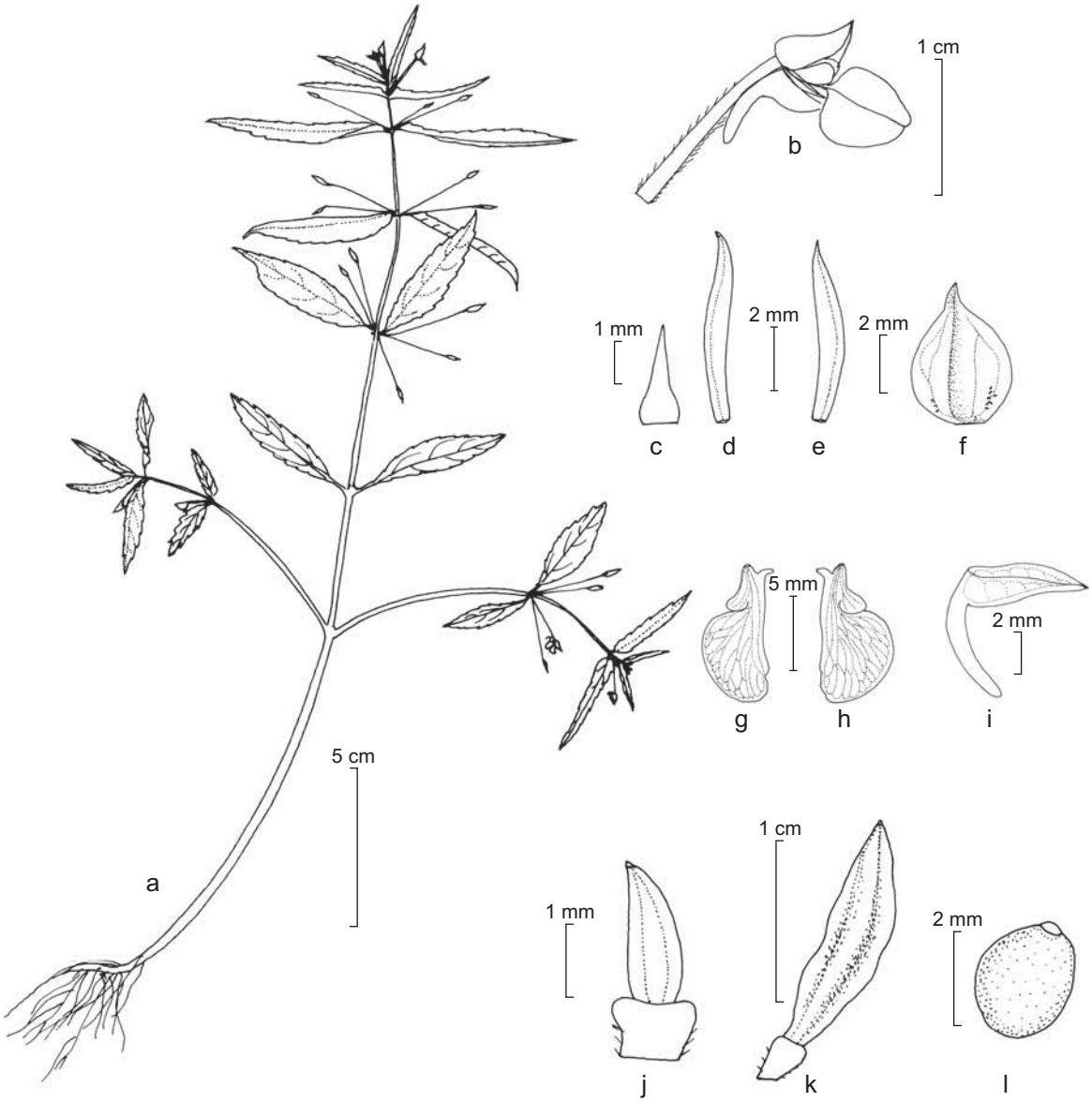


Fig. 17. *Impatiens tenella* B. Heyne ex Wight & Arn.: a. Habit; b. Flower; c. Bract, d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Specimens examined: INDIA, **Karnataka**, Chikmagalur district, Bababudan, 1400 m, 6.11.1979, *C.J. Saldanha* KFP9644 (CAL); Kavikal Gandhi forest check post, Kemmangundi, 5.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 77, 89 (GUH). **Tamil Nadu**, Nilgiri district, Nilgiri, 26.11.1971, *N.C. Rathakrishnan* 39017 (MH); Pykara range, 7.10.1972, *V. Bhaskar* 331; Naduvattam, Nilgiris, 16.9.1973, *V. Bhaskar* 384 (MGM).

Note: *Impatiens tenella* is closely related to *I. diversifolia* but differs in the presence of broadly ovate standard, ovate basal lobe of the wing petal, rounded dorsal auricle and 5 – 7 mm long spur. In *I. diversifolia* the standard petal is orbicular, basal lobe of the wing petal is triangular, dorsal auricle is ovate and spur is 15 – 20 mm long.

Chromosome No.: n = 7 (Rao *et al*., 1986); n = 8 (Bhaskar & Razi, 1972 – 1973).

IUCN Threat Status: EN [B1ab(iii)].

Impatiens tomentosa B. Heyne [Wall. Numer. List No. 4751, nom. nud.] ex Wight & Arn., Prodr. Fl. Ind. Orient. 2: 139. 1834; Wight, Icon. Pl. Ind. Orient. 3(1): 2, t. 749. 1844; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 121. 1859; Dalzell & Gibson, Bombay Fl.: 43. 1861; Hooker, Fl. Brit. India 1: 449.

1874, excl. var. *rufescens* & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 173. 1901; Gamble, Fl. Madras 1: 141. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 312. 1933; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 56. 1983; Kulkarni, Fl. Sindhudurg: 61. 1988; Deshpande *et al*., Fl. Mahabaleshwar 1: 119. 1993; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 217. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 443. 2000; Yadav & Sardesai, Fl. Kolhapur District: 95. 2002; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 559. 2005. **Fig. 18, 21j**

Type: Wall. Numer. List No. 4751.

Herb, 25 – 30 cm high. Stem branched; branches semi-quadrangular, densely hairy above, glabrous below, pinkish red. Leaves opposite-decussate, shortly petiolate at base, subsessile at apex, oblong to oblanceolate, 3–4.5 × 1.5–2 cm, truncate to obcordate at base, serrate at margins, acute to acuminate at apex, pubescent above, hairy on nerves below; petioles decurrent and terminating in glands, *c.* 2 mm long. Flowers 4 or 5 per axil, *c.* 1.5 cm across, dark pink with purple throat; bracts linear, *c.* 2 mm long, dorsally hairy on nerve in middle; pedicels

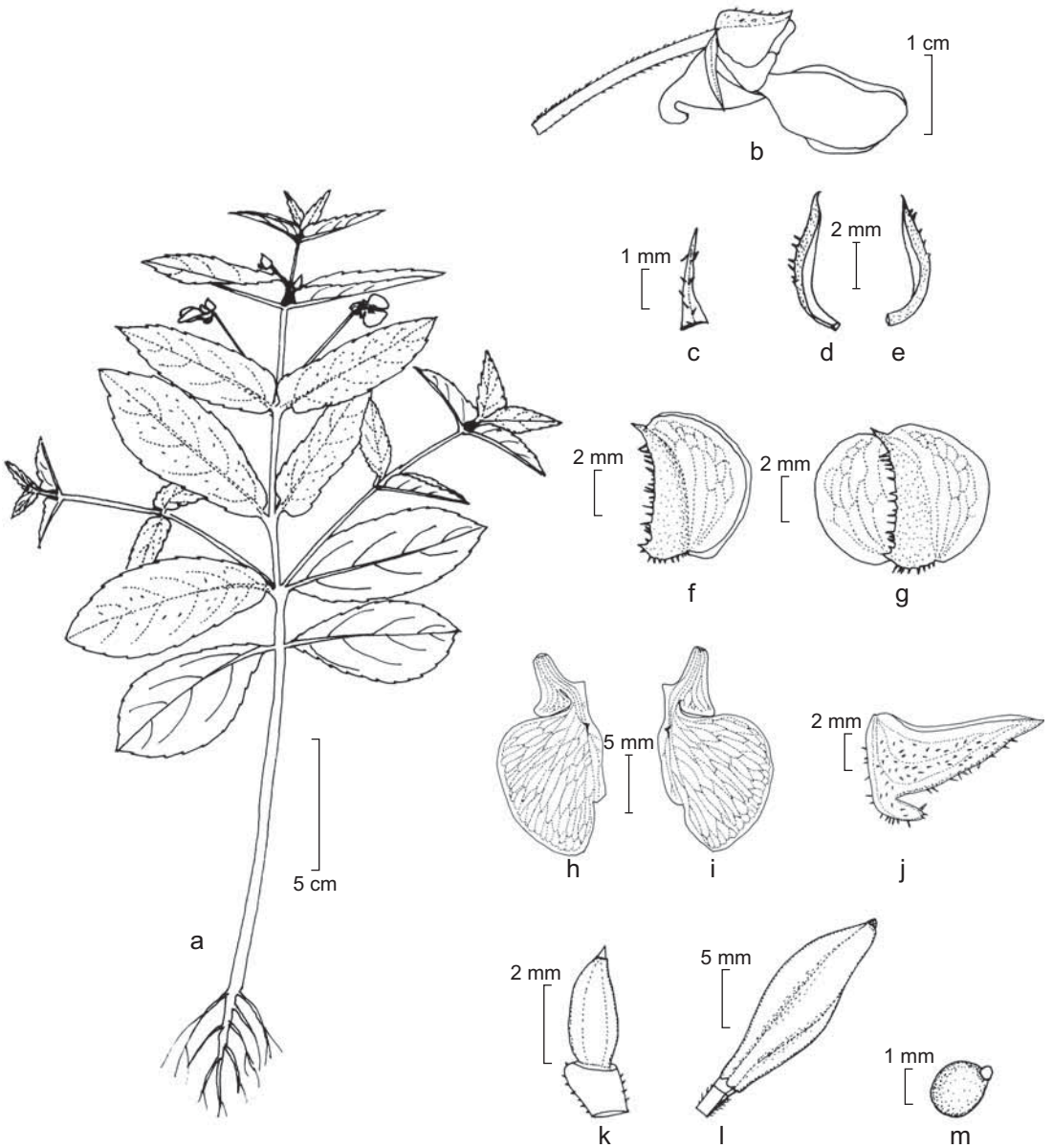


Fig. 18. *Impatiens tomentosa* B. Heyne ex Wight & Arn.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f, g.** Standard petal side and dorsal views; **h, i.** Wing petals; **j.** Lip; **k.** Pistil; **l.** Capsule; **m.** Seed.

2 – 3 cm long, hairy with 2 rows of hairs. Lateral sepals 2, linear, *c.* 9 × 1 mm, acute to acuminate at apex, dorsally slightly keeled, hairy on keel and side facing downwards, pink. Standard petal suborbicular, *c.* 9 × 8 mm, pink, dorsally keeled; keel mucronate at apex, hairy, green; wing petals *c.* 2.2 × 0.8 cm, auricled at base, 2-lobed; basal lobe triangular, *c.* 6 × 4 mm, acute to obtuse at apex; distal lobe asymmetrically obovate, *c.* 1.3 × 0.8 cm, elevated at base towards inner side, obtuse at apex; lip conical, *c.* 11 × 4 mm, *c.* 6 mm deep, acuminate at apex, hairy, pink; spur cylindric, *c.* 3 mm long, hooked, notched at apex, hairy, green. Column *c.* 5 × 3 mm, bent on one side; filaments *c.* 4.5 × 1 mm, pink; anthers *c.* 0.5 × 1 mm, pink. Pistil *c.* 3.5 × 1 mm; ovary oblong-lanceoloid, glabrous. Capsules asymmetrically ellipsoid to elliptic-lanceoloid, glabrous; pedicels 2 – 3.5 cm long; seeds oblongoid, *c.* 2.5 × 1.5 mm, glabrous, shining, brown to brownish black; funicle prominent.

Flowering & Fruiting: (May) July – October.

Habitat: Open table lands; in association with *I. lawii* Hook.f. & Thomson and *I. oppositifolia* L. and with grasses.

Distribution: Endemic to the Western Ghats of Kerala, Maharashtra and Tamil Nadu.

Specimens examined: INDIA, **Maharashtra**, Satara district, Kas plateau, 18.9.2005, *Jyosna R.N. Dessai* 101; Kas plateau, 18.8.2006, *Jyosna R.N. Dessai* 116 (GUH). **Tamil Nadu**, Dindigul district, Pulney hills, 1804, *R.H. Beddome s.n.*; Pambar river, Kodaikanal, 12.9.1905, *C.A. Barber* 7265; Nilgiri district, Pykara river, 15.7.1970, *J.L. Ellis s.n.*; Nilgiris, Kollimund, 12.10.1972, *K. Vivekananthan* 43034; Mudimund, in swamps, 22.6.1986, *M.K. Janarthanam* 83000 (MH); Tirunelveli district, Agasthiyamalai, 22.5.1901, *s. leg*. 2923 (CAL); Agastyamalai, 1.7.1964, *A.N. Henry & M. Chandrabose* 19182 (MH).

Note: *Impatiens tomentosa* is similar to *I. rufescens* Benth. ex Wight & Arn. but differs in having soft hairs only in the upper half of the stem and lip is with distinct spur. In *I. rufescens* the plant is with stiff hairs throughout and lip is devoid of spur.

Due to the morphological similarities between *I. tomentosa* and *I. rufescens*, Hooker (1874), reduced the latter to a variety of the former. However, both the species can be distinguished based on the presence and absence of a spur. Hence they are treated as distinct species in the present study.

Chromosome No.: n = 8 (Rao *et al*., 1986).

IUCN Threat Status: EN [B1ab(iii)].

Impatiens vivekananthanii J. Dessai & Janarth., **sp. nov.** **Fig. 19, 21k**

Impatienti chinensi similis, calcare gracili curvato e basi ad apice angustato (versus crasso valde incurvato compresso in medio latissimo), foliis scabridis (versus sparse pubescentibus) differt.

Typus: INDIA, **Karnataka**, Kodagu district, Talacauvery, 17 September 2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 146 (Holotypus, CAL; Isotypii, BSI, MH).

Herb, 60 – 70 cm high. Stem erect, quadrangular, succulent, subsucculent at base, slightly swollen at nodes, glabrous, pale green; internodes short at base, long at apex. Leaves opposite-decussate, sessile or subsessile, linear-oblanceolate to spathulate, 3.5 – 7 × 0.5 – 1.2 cm, truncate at base, distantly serrate at margins, acute to apiculate at apex, coriaceous, scabrid above, glabrous below, obscurely nerved; petioles decurrent on stem and terminating in glands. Flowers 2 or 3 (4) per axil, 2 – 3 cm across, pink with maroon throat; bracts triangular, *c.* 1.5 × 1 mm; pedicels subterete, 3 – 4.5 cm long, glabrous to hairy with a row of hairs. Lateral sepals linear to linear-oblanceolate, 0.7 – 1.2 × 0.1 – 0.2 cm, acuminate at apex, pinkish white, 3-nerved; nerves minutely hairy, pinkish red. Standard petal reniform, 0.7 – 0.8 × 0.9 – 1.3 cm, concave, glabrous, pink to pinkish white, dorsally keeled; keel mucronate at apex; mucro *c.* 1 mm long; wing petals 1.7 – 2.5 × 1 – 1.7 cm, 2-lobed; basal lobe ovate, 4 – 7 × 2 – 3 mm, acute to rounded at apex; distal lobe much larger than basal lobe, 1.1 – 1.9 × 0.9 – 1.8 cm, obtuse at apex, notched towards inner side much below apex; lip conical, 9 – 14 × 5 – 6 mm, 5 – 7 mm deep, glabrous to sparsely minutely hairy, dark pink-nerved, pink; spur tubular, 2 – 4 cm long, notched at apex, glabrous to sparsely minutely hairy, thick, pinkish white. Column 5 – 6 × 2 – 3 mm; filaments 4 – 5 × 1 – 1.5 mm, pink to white; anthers *c.* 1 × 0.75 mm, yellow. Pistil *c.* 5 mm long; ovary asymmetrically oblongoid, *c.* 4.5 × 1 mm, glabrous.

Fl.: July – November.

Habitat: Grassy slopes and vertical cut surfaces on roadsides.

Distribution: India (Western Ghats of Karnataka and Tamil Nadu) and Sri Lanka.

Specimens examined: INDIA, **Tamil Nadu**, Nilgiri district, Nilgiri, *s. die*, *R. Wight* 35 (G, photo!); Chinchona plantation, Naduvattam, 11.11.1959, *N.P.*

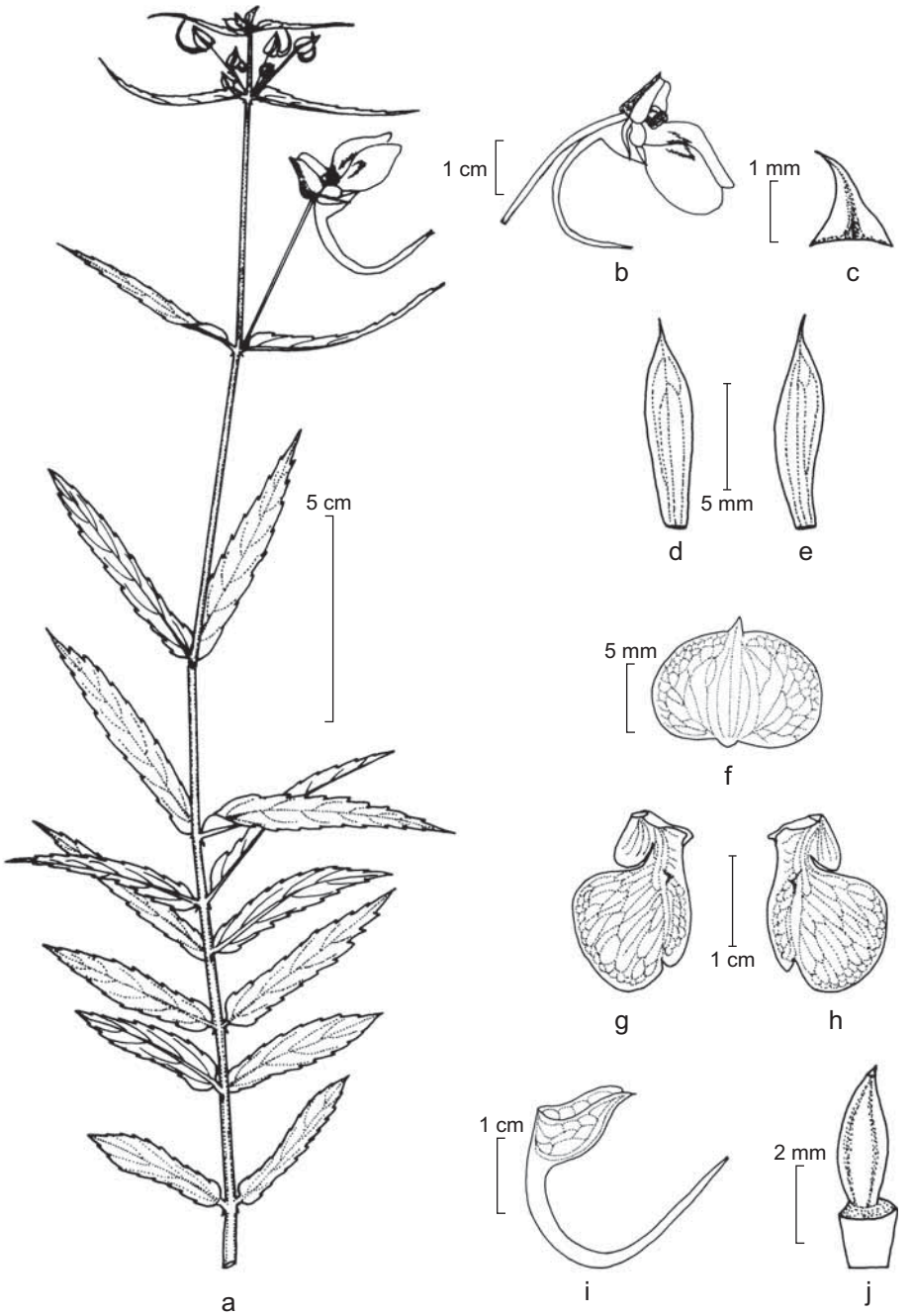


Fig. 19. *Impatiens vivekananthanii* J. Dessai & Janarth.: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil.

Balakrishnan 9693; Benne forest, Nilgiri, 19.7.1960, *K. Subramanyam* 10477; Mukruti, Nilgiri, 14.7.1970, *J.L. Ellis* 34668; Thalakunda, 27.8.1970, *B.D. Sharma* 35835; Pykara, 30.8.1970, *B.D. Sharma* 35951; Avalanche, 14.10.1972, *K. Vivekananthan* 42964 (MH).

Note: *Impatiens vivekananthanii* sp. nov. is similar to *I. chinensis* L. but differs in its scabrid leaves and slender, curved spur that tapers from the base to the apex against the sparsely hairy leaves and the thick, distinctly incurved, compressed spur that is broad in the centre in *I. chinensis*.

IUCN Threat Status: LC.

Etymology: This species is named in honour of Mr. K. Vivekananthan, who contributed extensively to the understanding of the flora of the Western Ghats and also co-authored the family Balsaminaceae for the Flora of India and that of Kerala.

Section: Uniflorae (Microsepalae) Hook.f. & Thomson

Shrubs and herbs. Leaves opposite or alternate, rarely whorled. Flowers pedicelled, solitary, binate or fascicled, axillary. Sepals small or minute. Seeds smooth, rugose or papillose (Hooker, 1906).

Impatiens balsamina L., Sp. Pl.: 938. 1753; Wight & Arnott, Prodr. Fl. Ind. Orient.: 135. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 130. 1859; Hooker, Fl. Brit. India 1: 453. 1874 & Rec. Bot. Surv. India 4: 47. 1906; Cooke, Fl. Bombay 1: 174. 1901; Gamble, Fl. Madras 1: 142. 1915; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 400. 1978; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 52. 1983; Almeida, Fl. Savantwadi 1: 77. 1990; Murthy & Yoganarasimhan, Fl. Coorg: 86. 1990; Almeida, Fl. Maharashtra 1: 189. 1996; Saldanha, Fl. Karnataka 2: 249. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 123. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 445. 2000; Bhat, Fl. Udupi District: 87. 2003; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 532. 2005.

Type: INDIA, Linnaean Herb. No. 1053.3 (LINN, photo!).

I. cornuta L., Sp. Pl.: 937. 1753.

Type: CEYLON, Linnaean Herb. 316 (LINN, photo!).

I. coccinea Sims, Bot. Mag.: t. 1250. 1810.

Type: Sims, Bot. Mag.: t. 1250. 1810.

Herb, up to 1.5 m high. Stem erect, much branched or not, terete, swollen at nodes, pubescent, pinkish red. Leaves alternate, linear-lanceolate, oblanceolate, linear-oblong or elliptic to linear-oblanceolate, 2.5 – 15 × 0.5 – 2 cm, cuneate to attenuate at base, crenate to serrate at margins, acuminate at apex, sparsely hairy above, hairy only on nerves below; nerves 6 – 12 pairs; petioles 1 – 1.5 cm long, hairy; glands 1 – 5 pairs. Flowers 1 – 4 per axil, 2 – 2.5 cm across, pink; bracts linear-lanceolate, 1 – 3 × 0.5 – 1 mm, acute to acuminate at apex, dorsally hairy, dark pink; pedicels 1 – 1.5 cm long, hairy, deflexed in fruits. Lateral sepals ovate or lanceolate, *c.* 2.5 × 1.5 mm, concave, acute to acuminate at apex, dorsally hairy. Standard petal broadly ovate to orbicular, *c.* 8 × 7 mm, concave, dorsally keeled; keel hairy, mucronate with *c.* 2 mm long mucro; wing petals 1.5 – 2 × 1 – 1.6 cm, 2-lobed, auricled near base; auricle curved outwards; basal lobe oblong-ovate, 5 – 6 × 3 – 5 mm, obtuse to apiculate at apex; distal lobe asymmetrically obovate, 1.2 – 1.6 × 1 – 1.5 cm, deeply notched at apex; lip conical, 8 – 13 × *c.* 6 mm, 5 – 8 mm deep, acuminate to cuspidate at apex, hairy; spur basal, tubular, 3 – 3.5 cm long, rounded to bulged at apex, sparsely hairy. Column 4 – 6 × 1 – 3 mm, curved; filaments 3 – 5 × *c.* 1 mm; anthers *c.* 1 × 1 mm. Pistil 3 – 5 × 1 – 2 mm; ovary ellipsoid to lanceoloid, villous. Capsules broadly ellipsoid, 1 – 1.5 × 0.6 – 0.9 cm, wooly; pedicels *c.* 2 cm long; seeds globose, *c.* 2.5 mm, granulate, dark brown.

Hooker (1906) listed 10 varieties under this species for Peninsular India of which the following two are found in the study area.

Key to the varieties

1. Flowers 2 per axil; lateral sepals ovate .... var. **balsamina**

1. Flowers 3 – 4 per axil; lateral sepals lanceolate .... var. **micrantha**

var. **balsamina** **Fig. 20, 21l – n**

Flowering & Fruiting: August – November.

Habitat: Open areas and roadsides.

Distribution: China, India, Malesia and Sri Lanka.

Specimens examined: **Gujarat**, Bulsar district, Bulsar, 25.8.1968, *R.M. Patel* RMP353; Narmada district, Dediapada, 22.9.1968, *V.K. Singh* VKS2158 (SPU). **Karnataka**, Chikmagalur district, Shivlinga estates, Kemmangundi, 17.11.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 30; Kemmangundi, 5.9.2005, *Jyosna R.N. Dessai* 81; North Kanara district, Jog falls, 6.9.2005, *Jyosna R.N. Dessai* 92; Shimoga district, Near Kuvempu University, 5.9.2005, *Jyosna R.N. Dessai* 88 (GUH). **Madhya Pradesh**, Bastar district, Jeeram hills, 27.8.1959, *K. Subramanyam* 8669 (MH). **Tamil Nadu**, Dindigul district, Thandikudi hills, 5.12.1989, *K. Ravikumar* 92361 (MH).

Note: It is widely cultivated in gardens as an ornamental; grows gregariously under all climatic conditions.

Uses: The plant possesses medicinal properties. Seeds of *I. balsamina* contain cysteine-rich peptides with marked antimicrobial activity. These proteins inhibit the growth of fungi and bacteria without harming human cells (Tailor *et al.*, 1997). A red-coloured dye obtained from the flowers and leaves is used for colouring nails (Polunin & Stainton, 1984; Yi-ling *et al.*, 2007).

IUCN Threat Status: LC.

var. **micrantha** Hook.f., Fl. Brit. India 1: 454. 1874 & Rec. Bot. Surv. India 4: 50. 1906. **Fig. 22, 30a**

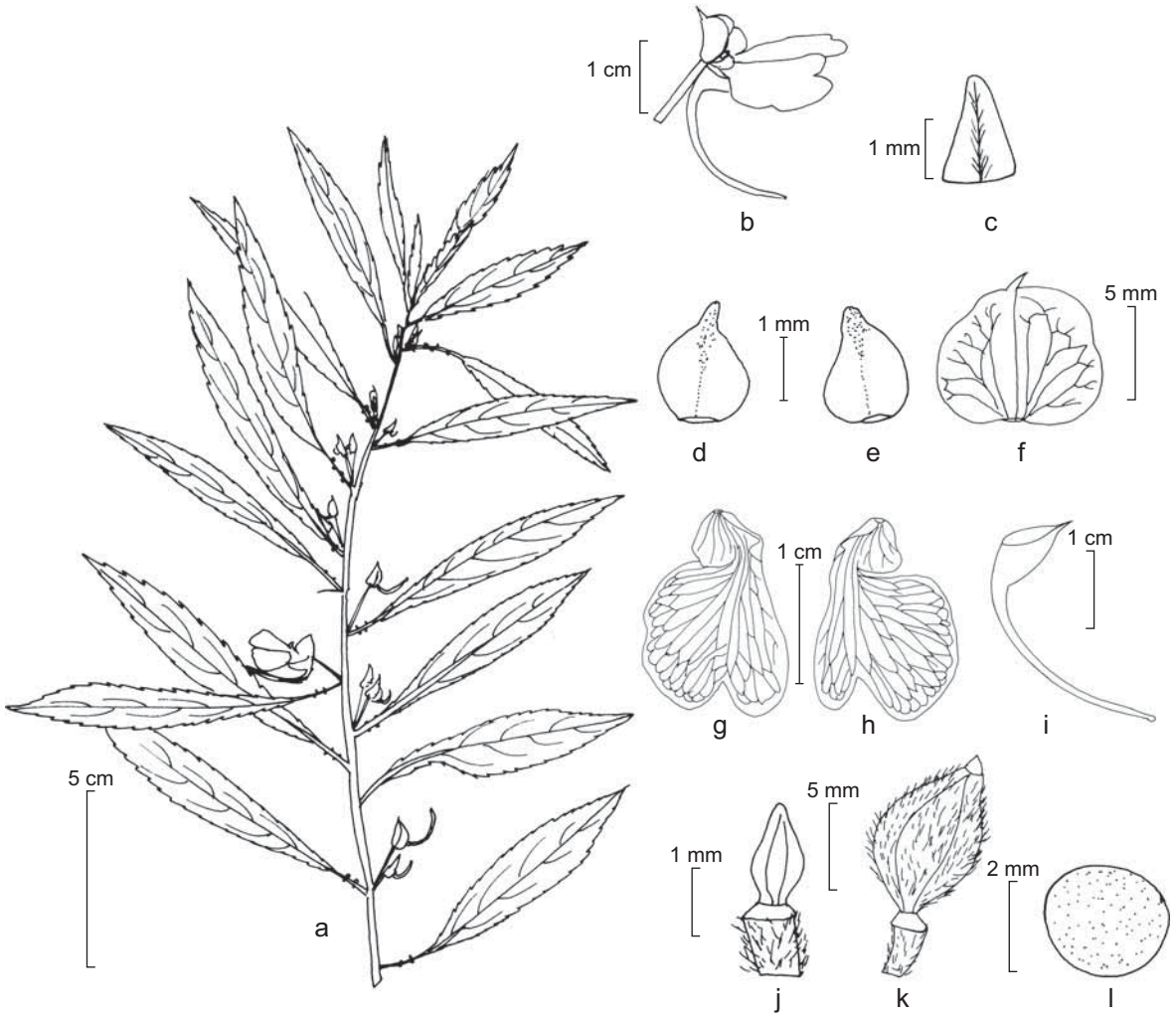


Fig. 20. *Impatiens balsamina* L. var. *balsamina*: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Fl.: September – December.

Habitat: Grassy slopes, margins of evergreen forests and cut hills.

Distribution: Karnataka at ± 1480 m.

Specimens examined: INDIA, **Karnataka**, Hassan district, Mankanahalli, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 144; Kodagu district, Talacauvery, 13.8.2005, *Jyosna R.N. Dessai* 52; Talacauvery, 17.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 147 (GUH).

IUCN Threat Status: EN [B2ab(iii)].

Impatiens dasysperma Wight, Madras J. Lit. Sci. 5: 7, t. 2. 1837; Wight, Icon. Pl. Ind. Orient. 3(1): 1, t. 742. 1844; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 134. 1859; Hooker, Fl. Brit. India 1: 457. 1874 & Rec. Bot. Surv. India 4: 47. 1906; Gamble, Fl. Madras 1: 148. 1915; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 53. 1983; Sharma *et al*., Fl. Karnataka: 37. 1984; Saldanha, Fl. Karnataka 2: 251. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 139. 1997; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 538. 2005. **Fig. 23, 30b**

Type: INDIA, Courtallum, 1835, *R. Wight* 166A (E, photo!). Lectotype selected here.

I. lucida B. Heyne [Wall. Numer. List No. 4738] ex Hook.f., Fl. Brit. India 1: 451. 1874; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 549. 2005, **syn. nov.**

Type: Wall. Numer. List No. 4738 (CAL!)

Herb, 15 – 50 cm high. Stem quadrangular, glabrous to hairy at base, glabrous above, light green. Leaves simple, alternate, broadly lanceolate to ovate-lanceolate, 1.8 – 6.5 × 1.1 – 3.5 cm, attenuate at base, apiculate-crenate at margins, acute to

Fig. 21. a. *Impatiens chinensis* L.; b. *I. dalzellii* Hook.f. & Thomson; c. *I. diversifolia* B. Heyne ex Wight & Arn.; d. *I. kleiniformis* Sedgw.; e. *I. oppositifolia* L.; f. *I. lawii* Hook.f. & Thomson; g. *I. minor* (DC.) Bennet; h. *I. raziana* Bhaskar & Razi; i. *I. tomentosa* B. Heyne ex Wight & Arn.; j. *I. tenella* B. Heyne ex Wight & Arn.; k. *I. vivekananthanii* J. Dessai & Janarth., sp. nov.; l – n. *I. balsamina* L. var. *balsamina*.

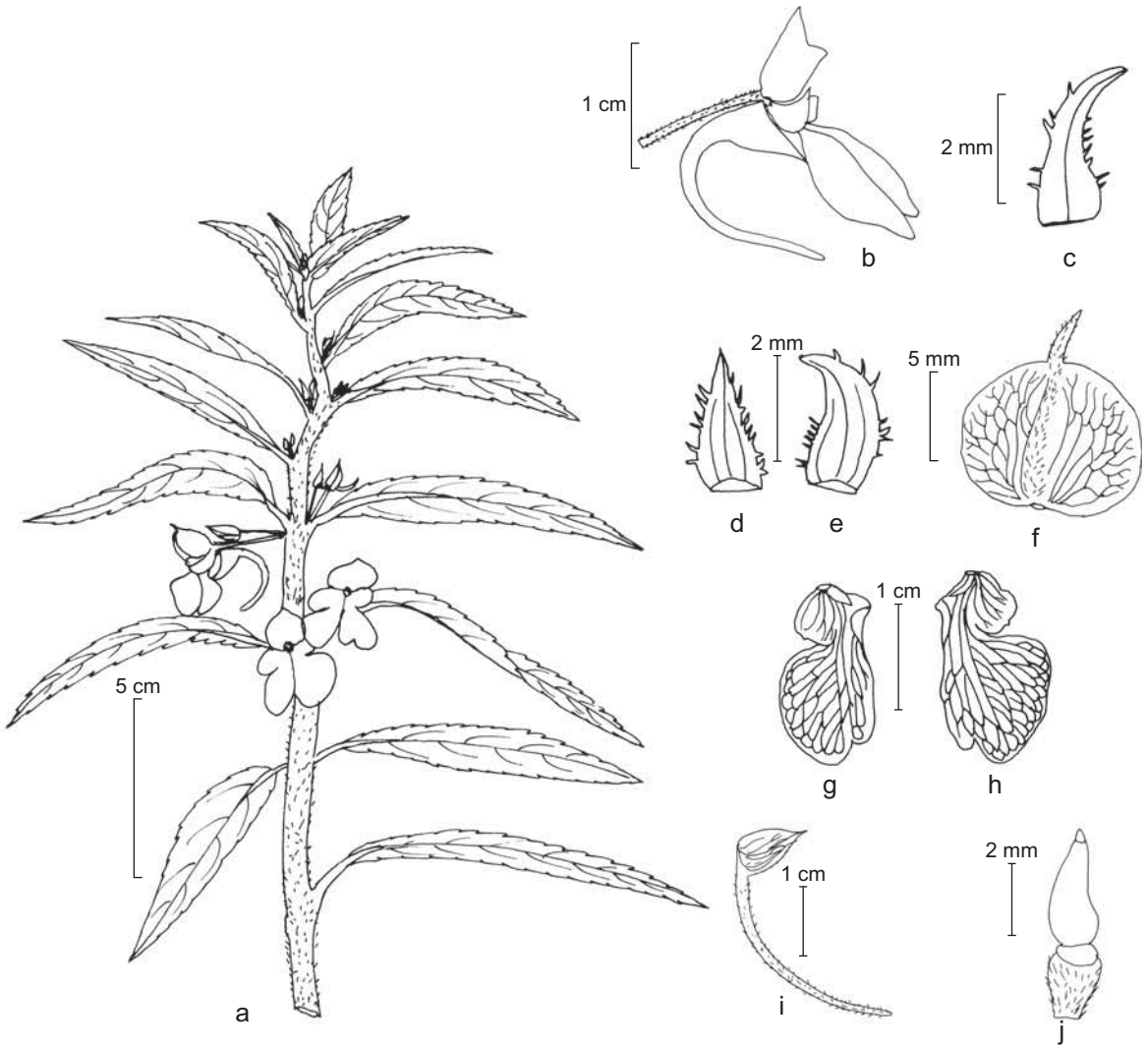


Fig. 22. *Impatiens balsamina* L. var. *micrantha* Hook.f.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil.

apiculate at apex, dark green and hairy above, pale green and hairy only on nerves below; petioles with 2 pairs of glands (rarely absent), 2 – 3.5 cm long, glabrous. Flowers 2 in each axil, 1.5 – 2 cm across, pink; bracts linear, *c.* 1.5 mm long, concave, acute at apex; pedicels 2.5 – 4 cm long, glabrous, light green, deflexed in fruits. Lateral sepals ovate, *c.* 2.5 × 1.5 mm, acute at apex, glabrous, light green, 3-nerved (2 distinct, 1 obscure). Standard petal cordate, 8 – 10 × 6 – 8 mm, obcordate at apex, dorsally hairy, pink; costa mucronate; mucro *c.* 1 mm long; wing petals 1 – 1.5 × 0.8 – 1 cm, unequally 2-lobed; basal lobe obovate, 6 – 8 × 4 – 6 mm, 2-lobulate; distal lobe broadly oblanceolate, 8 – 10 × 4 – 6 mm, rounded at apex; dorsal auricle absent; wing petals slightly protruding into a spur at base thus appearing as an auricle; lip conical, *c.* 7 × 5 mm, *c.* 4 mm deep, acuminate at apex, sparsely hairy, light pink; spur tubular, 2 – 2.5 cm long, rounded at apex, glabrous to sparsely hairy. Column *c.* 4 × 1.5 mm; filaments *c.* 2.5 × 1 mm; anthers *c.* 1 × 1 mm. Ovary ellipsoid, glabrous. Capsules asymmetrically ellipsoid, 1 – 1.3 × 0.3 – 0.6 cm, glabrous; pedicels 2 – 4.3 cm long; seeds ovoid to globose, *c.* 1.5 mm across, compressed, papillate-hairy, dark brown.

Flowering & Fruiting: August – October.

Habitat: Forest edges, in and around coffee plantations and on black boulders along with *I. gardneriana* in evergreen forests, 650 – 1650 m.

Distribution: Endemic to the Western Ghats of Karnataka, Kerala and Tamil Nadu.

Specimens examined: INDIA, **Karnataka,** Chikmagalur district, Bababudan hills, 4000 ft, 7.9.1893, *W.A. Talbot* 3099; Santaveri, Bababudan, 4000 ft, October 1908, *A. Meebold* 10701 (K, photo!); Near

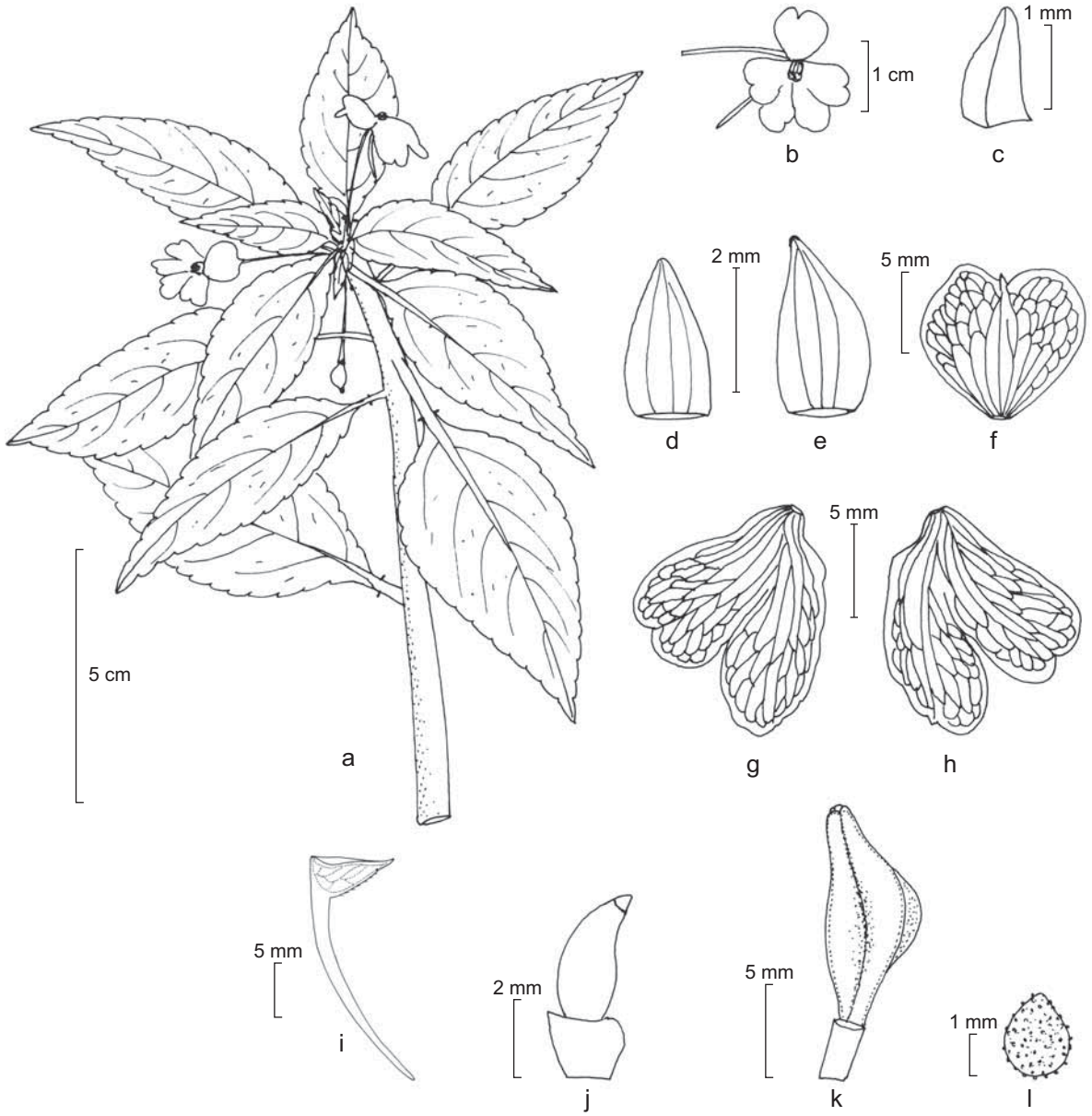


Fig. 23. *Impatiens dasysperma* Wight: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Gaurishankar estates, Kemmangundi, 5.9.2005, *Jyosna R.N. Dessai* 83; Kalhati coffee estates, Kemmangundi, 5.9.2005, *Jyosna R.N. Dessai* 87; Hassan district, Vanagunda, Bisle ghat, 14.8.2005, *Jyosna R.N. Dessai* 54; Mankanahalli, Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 141; Kodagu district, Thadiandamol, 18.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 150; Palace estate, Thadiandamol, 18.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 154; Thadiandamol, 18.8.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 164 (GUH); Shimoga district, Agumbe, 2.10.1960, *R. Sundara Raghavan* 69064 (BSI); Agumbe, 4.9.2005, *Jyosna R.N. Dessai* 73; Talaguppa, Shimoga – Sagar road, 6.9.2005, *Jyosna R.N. Dessai* 90 (GUH). **Kerala**, Travancore, Makora, 5.9.1913, *M. Rama Rao* 1591 (CAL). **Tamil Nadu**, Tirunelveli district, Courtallum, 1835, *R. Wight* 163, 164, 166B, C (E, photo!); Courtallum, August 1835, *R. Wight* 334 (CAL).

Note: *Impatiens dasysperma* is similar to *I. talbotii* Hook.f. but differs in the presence of quadrangular stem, obovate standard petals and glabrous capsules as compared to circular stem, orbicular standard petals and tomentose capsules of the latter. The presence of hair on spur is a variable character as Wight (1837) illustrated spur with and without

hair in protologue. None of the specimens studied by us have shown hair on spur.

During the present work five relevant materials of Wight (*Wight* 163, 164, 166A, B, C) have been traced at E. In this context the material (*Wight* 166A) is designated here as a lectotype of *I. dasysperma* as the sheet of this material bears illustration of floral parts.

Specimens of *I. dasysperma* in Indian herbaria have been determined as *I. flaccida* which is confined to Sri Lanka.

IUCN Threat Status: VU [B1ab(iii)].

Impatiens gardneriana Wight, Icon. Pl. Ind. Orient. 3(4): 1, t. 1050. 1846; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 121. 1859; Hooker, Fl. Brit. India 1: 445. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Gamble, Fl. Madras 1: 141. 1915; Ramamoorthy in Saldanha & Nicolson, Fl. Hassan District: 402, f. 78C. 1978; Yoganarasimhan *et al*., Fl. Chikmagalur District: 61. 1982; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 53. 1983; Sharma *et al*., Fl. Karnataka: 38. 1984; Murthy & Yoganarasimhan, Fl. Coorg: 87. 1990; Saldanha, Fl. Karnataka 2: 257. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 150. 1997; Ramaswamy *et al*., Fl. Shimoga District: 107. 2001; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 541. 2005. **Fig. 24, 30c**

Type: INDIA, 5 miles below Sisparah, *R. Wight* (K, photo!)

I. setosa Hook.f. & Thomson, J. Proc. Linn. Soc. Bot. 4: 123. 1859; Hooker, Fl. Brit. India 1: 445. 1874.

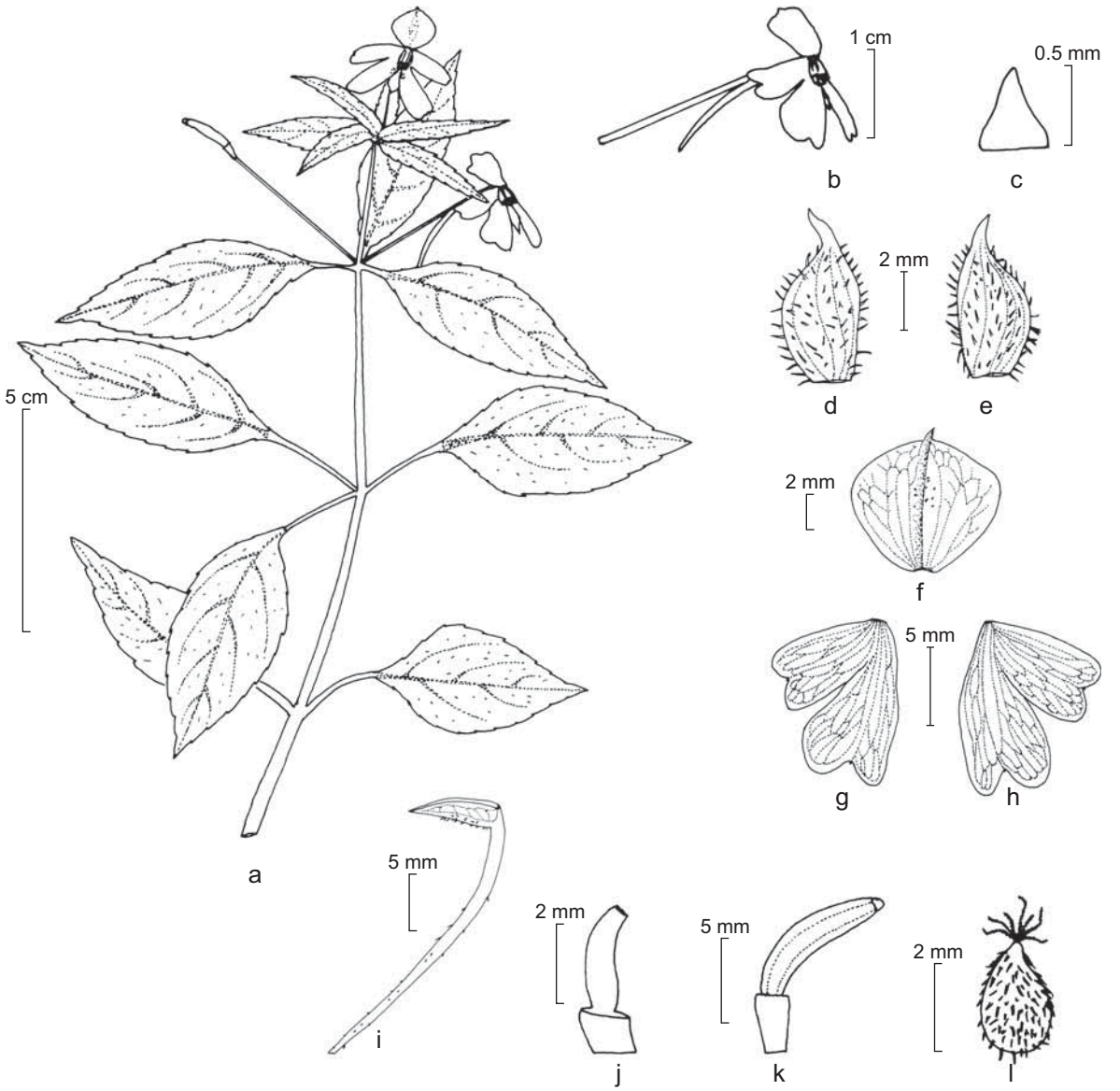


Fig. 24. *Impatiens gardneriana* Wight: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Type: Not known.

Herb, 25 – 60 cm high. Stem quadrangular, glabrous. Leaves opposite at base, ternate at apex, ovate, elliptic to lanceolate, 3 – 8 × 2 – 4 cm, cuneate to attenuate at base, apiculate-serrate at margins, acuminate at apex, hairy above, and only on nerves below; basal leaves petiolate; petioles 1 – 3 cm long, glabrous; upper leaves subsessile; petioles up to 3 mm long, hairy. Flowers solitary or binate, axillary, *c.* 2 cm across, dark pink; bracts triangular, *c.* 0.5 mm, acuminate at apex, scaly; pedicels 2.5 – 4 cm long, hairy. Lateral sepals ovate, *c.* 6 × 2 mm, concave, caudate at apex, hairy dorsally, 5-nerved, pale green. Standard petal broadly obovate, *c.* 8 × 8 mm, apiculate at apex, dorsally keeled and hairy, pink; wing petals *c.* 1.2 × 1 cm, 2-lobed; basal lobe oblong-lanceolate to obovate, *c.* 8 × 4.5 mm, obcordate at apex; distal lobe oblong-oblanceolate to oblanceolate, *c.* 8 × 5 mm, obcordate at apex; lip boat-shaped, *c.* 8 × 4 mm, *c.* 2.5 mm deep, caudate at apex, hairy only in middle; spur 2 – 3 cm long, notched to rounded at apex, sparsely hairy. Column *c.* 3 × 2 mm; filaments *c.* 3 × 0.75 mm, pink; anthers *c.* 0.75 × 0.5 mm, pink. Pistil *c.* 2.5 × 0.75 mm; ovary oblong-lanceoloid, glabrous. Capsules oblongoid, *c.* 1.3 × 0.3 cm, curved, glabrous; pedicels 3 – 4.5 cm long; seeds ovoid, *c.* 2.5 × 1.5 mm, densely hairy; apical hairs spirally coiled and without thickening; basal ones not coiled but with reticulate thickenings.

Flowering & Fruiting: July – November.

Habitat: Usually under the canopy of huge trees but also occurs in open plains; often grows in association with *I. dasysperma*, 500 – 1000 m.

Distribution: Endemic to the Western Ghats of Karnataka, Kerala and Tamil Nadu.

Specimens examined: INDIA, **Karnataka**, Chikmagalur district, Charmadi, 24.11.1927, *S.R. Raju* 18192 (MH); Charmadi ghat, 25.8.1972, *V. Bhaskar* 318; Yelneerukad, 21.11.1972, *V. Bhaskar* 351 (MGM); Kudremukh, 18.11.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 28; Charmadi ghat, 15.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 60 (GUH); Hassan district, Pushpagiri, Bisle ghat, 24.9.1972, *V. Bhaskar* 329 (MGM); Vanagur, Bisle ghat, 14.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 55; Bisle ghat, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 135; Bisle ghat, Vanagur, 16.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 143 (GUH); Shimoga district, Hulical ghat, 16.10.1964, *R. Sundara Raghavan* 90449 (BSI); Hulical ghat, 7.11.1972, *V. Bhaskar* 344 (MGM); South Kanara district, Maranahally, Shiradi ghat, 15.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 57 (GUH). **Kerala**, Idukki district, Kariapalakad, 21.8.1977, *K. Vivekananthan* 50458; Way to Pooyamkutty, 7.10.1983, *A.G. Pandurangan* 79280; Palakkad district, Dhoni Reserve Forest, 18.7.1963, *J. Joseph* 17196 (MH); Dhoni hills, 4.8.1972, *V. Bhaskar* 305; Dhoni hills, 9.8.1972, *V. Bhaskar* 310 (MGM); Karivara, 20.9.1977, *J. Joseph* 51403; Mukkali slopes, 15.10.1979, *N.C. Nair* 64658 (CAL); Wayanad district, Tambrachari ghat, 23.7.1905, *s. leg*., *s.n*. (MH); Near Kalpetta, 3.7.1972, *V. Bhaskar* 296 (MGM).

Note: Phyllotaxy in *I. gardneriana* is distinct among the species in the study area as both ternate (at apex) and opposite (at base) leaves are seen. Another characteristic feature is that the lateral sepals are dorsally hairy. It is closely allied to *I. dasysperma* in its floral structure but differs principally in the presence of leaves which are ternate at apex and opposite at base, lanceolate lateral sepals, oblongoid capsules and two types of hairs on the seeds. In *I. dasysperma* all the leaves are alternate, lateral sepals are ovate, capsules are lanceoloid and the seeds are with same type of hairs.

Hooker & Thomson (1859) placed *I. gardneriana* in section Oppositifoliae in spite of its ternate leaves and hairy seeds rather than opposite leaves and glabrous seeds that are characteristics of this section. In the present study this species is placed in section Uniflorae due to the hairy nature of the seeds and subequal lobes of the wing petals.

Impatiens setosa Hook.f. & Thomson has been synonymised by Gamble (1915) under *I. gardneriana* recorded from Kerala and Tamil Nadu (Nilgiris). Neither the type nor its any other material is available to ascertain its identity.

Chromosome No.: 2n = 16 (Bhaskar & Razi, 1972 – 1973; Zinovéva-Stahevitch & Grant, 1982, 1984).

IUCN Threat Status: EN [B1ab(iii)].

Impatiens latifolia L., Sp. Pl.: 937. 1753; Wight & Arnott, Prodr. Fl. Ind. Orient.: 138. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 124. 1859; Dalzell & Gibson, Bombay Fl.: 44. 1861; Hooker, Fl. Brit. India 1: 450. 1874, excl. syn. *I. cuspidata* Arn. 1835 & Rec. Bot. Surv. India 4: 47. 1906; Cooke, Fl. Bombay 1: 174. 1901; Gamble, Fl. Madras 1: 141. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 313. 1933; Sharma *et al*., Fl. Karnataka: 38. 1984; Almeida, Fl. Maharashtra 1: 193. 1996; Saldanha, Fl. Karnataka 2: 254. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 169. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 455.

2000; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 546. 2005. **Fig. 25**

Type: Rheede, Hort. Malab. 9: 91, t. 48. 1689.

I. bababudanensis Hook.f., Bull. Misc. Inform. 1910: 295. 1910.

Type: INDIA, **Karnataka**, Kulhutty, Bababudan, October 1908, *A. Meebold* 10706 (K, photo!).

Undershrub or shrub, up to 1.5 m high. Stem branched, woody at base, glabrous. Leaves alternate, subopposite or whorled, ovften crowded at apex, ovate to ovate-lanceolate, 5 – 11 × 2 – 3.5 cm, crenate-serrate at margins, glandular at lower margins, acuminate at apex, membranous; nerves 7 – 10 pairs; petioles 1 – 5 cm long. Flowers solitary, 2-nate or in fascicles, pink to violet, purple or white; pedicels 2 – 6 cm long, deflexed in fruits. Lateral sepals ovate, 4 – 5 mm long, cuspidate at apex. Standard petal petal orbicular, 2-lobed at apex, dorsally keeled; wing petals 1.5 – 2 cm long, unequally 2-lobed; basal lobe smaller than distal lobe, subrounded; distal lobe ovate or dolabiform; dorsal auricle rounded; lip cymbiform, acuminate at apex; spur incurved or straight, 1.2 – 2 cm long, white or greenish. Capsules ellipsoid, 1 – 2.4 cm long, glabrous; seeds few, subglobose or obovoid, sub-compressed, *c*. 4 mm across, rugose or papillose.

Flowering & Fruiting: September – October.

Habitat: Shady places in mountain ranges.

Distribution: Endemic to Western Ghats.

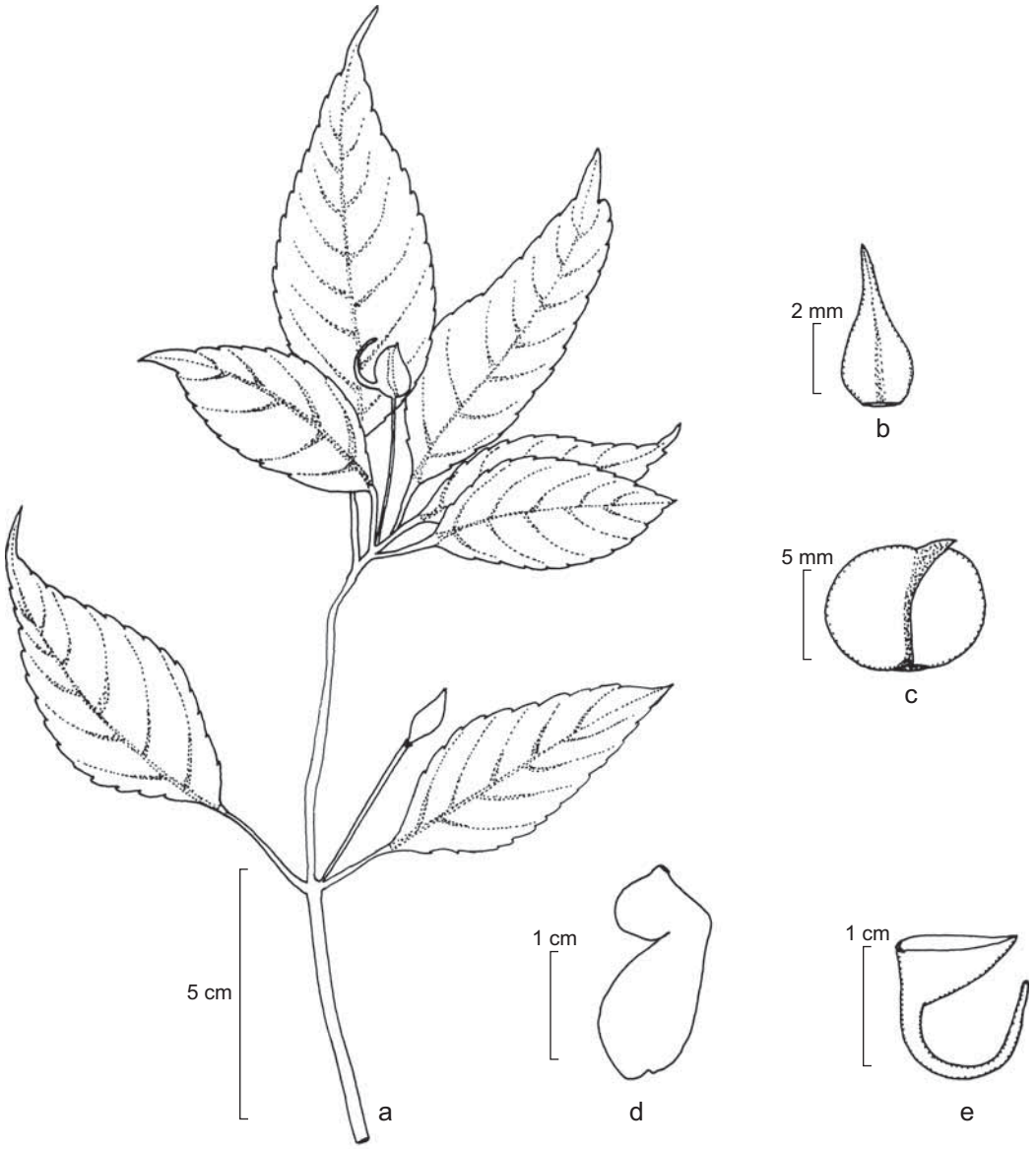


Fig. 25. *Impatiens latifolia* L.: a. Habit; b. Lateral sepal c. Standard petal; d. Wing petal; e. Lip.

Specimen examined: INDIA, **Karnataka**, Santaveri, 7.9.1893, *W.A. Talbot* 3045 (K, photo!).

Note: Dalzell & Gibson (1861) reported this species in their flora on Bombay with a note 'Concan common'. Subsequently, Cooke (1901) included it in his Flora of Presidency of Bombay and in addition cited collections of Stocks as well as Law from Konkan. However, their collections were could not be traced in any of the herbaria during the study. Almeida (1996) included this species based on Dalzell & Gibson. Whereas, Mudaliar & Prasad (2000) included it based on Cooke and also mentioned its occurrence in Kolhapur and Satara. Though Deshpande *et al*. (1993) have included it for Mahabaleshwar (in Satara district) and cite the locality as Khambil – Chorghe ghat; no specimens are available at BSI and in any of the Indian herbaria as well. Yadav & Sardesai (2002) have not included this species in Flora of Kolhapur. In the absence of any collections its distribution in Maharashtra could not be ascertained. During the present study we also could not collect any specimen from Karnataka. Hence, the taxonomic treatment and description of the species are based on protologues and type material (photograph) and other relevant literature as well. As it is well distributed in southern Western Ghats, further study spanning its entire distributional range is required.

IUCN Threat Status: Not assessed.

Impatiens pulcherrima Dalzell, J. Bot. Kew Gard. Misc. 2: 37. 1850; Hooker, Bot. Mag. 7: t. 4615. 1851; Hooker & Thomson, Proc. J. Linn. Soc. Bot. 4: 134. 1859; Dalzell & Gibson, Bombay Fl.: 44. 1861; Hooker, Fl. Brit. India 1: 458. 1874 & Rec. Bot. Surv. India 4: 47. 1906; Cooke, Fl. Bombay 1: 175. 1901; Gamble, Fl. Madras 1: 143. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 314, t. 2. 1933; Vartak, Enum. Plant. Gomantak: 32. 1966; Sharma *et al*., Fl. Karnataka: 39. 1984; Rao, Fl. Goa 1: 60. 1985; Kulkarni, Fl. Sindhudurg: 60. 1988; Almeida, Fl. Savantwadi 1: 78. 1990; Deshpande *et al*., Fl. Mahabaleshwar 1: 117, t. 6. 1993; Kothari & Moorthy, Fl. Raigad District: 48. 1993; Almeida, Fl. Maharashtra 1: 194. 1996; Saldanha, Fl. Karnataka 2: 256, t. 37. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 198. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 459. 2000; Yadav & Sardesai, Fl. Kolhapur District: 95, t. 11. 2002. **Fig. 26, 30d, e**

Type: INDIA, Bombay, Dalzell (K, photo!).

Herb, up to 1.5 m high. Stem swollen at nodes, branched or not, quadrangular, with 2 flat and 2 curved sides. Leaves alternate, ovate or elliptic to lanceolate, 4 – 12 × 1.8 – 6 cm, obtuse to attenuate at base, apiculate-crenate, ciliate at margins, acute at apex, hairy above, glabrous below; petioles with 3 – 5 pairs of glands, 1 – 4 cm long, glabrous. Flowers binate, axillary, 2.5 – 5 cm across, pink with violet to red in middle below column; bracts ovate, *c*. 0.5 mm long, acute at apex, scaly, glabrous; pedicels terete, 3 – 5 cm long, glabrous, green. Lateral sepals asymmetrically ovate, *c*. 4 × 1 mm, acute at apex, glabrous, green. Standard petal orbicular to reniform, 1.5 – 2 × 1.9 – 2.2 cm, emarginate at apex, glabrous, pink, dorsally keeled; keel mucronate at apex; mucro 5 – 7 mm long, green; wing petals 3 – 3.6 × 2 – 2.5 cm, unequally 2-lobed; basal lobe broadly ovate, 1 – 1.4 × 1.2 – 1.6 cm, obcordate at apex; distal lobe ovate, 2 – 2.5 × 1.6 – 2 cm, obcordate much below apex; dorsal auricle absent; wing petals slightly protruding into a spur at base thus appearing as an auricle; lip conical, 10 – 15 × 6 – 9 mm, 0.7 – 1 cm deep, mucronate at apex, glabrous, pink; spur cylindric, 3.5 – 4.5 cm long, rounded at apex, glabrous, light pink. Column *c*. 8 × 5 mm; filaments *c*. 7 × 1.5 mm, pink; anthers *c*. 1 × 2 mm. Pistil *c*. 5 × 2 mm; ovary oblong-lanceoloid, glabrous. Capsules asymmetrically ellipsoid, 1.2 – 2 × 0.5 – 1 cm, curved at apex, glabrous to minutely hairy; pedicels 5 – 7 cm long; seeds globose to ovoid, *c*. 4 × 3.5 mm, compressed, rugose, brown.

Flowering & Fruiting: July – December.

Habitat: Grassy slopes and vertically cut surfaces on roadsides.

Distribution: Endemic to Western Ghats of Goa, Karnataka and Maharashtra.

Specimens examined: INDIA, **Goa**, North Goa district, Keri, 27.8.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 65; Khorjuvem, 24.8.2006, *Emilia Mascarenhas* 124; South Goa district, Kumbhari, Sanguem, 2.8.2005, *Jyosna R.N. Dessai* 32 (GUH). **Karnataka**, Belgaum district, Londa, 1.8.1928, *R.D. Auckland* ACK128 (BLAT); North Kanara district, on the way to Dandheli, 4.11.1969, *H.S. Shantha Kumari* 11 (MGM). **Maharashtra**, Ratnagiri district, Amba ghat, *s.die*, *C.J. Saldanha* CS7197 (JCB); Satara district, Mahabaleshwar, Fitzgerald ghat, 1.10.1924, *R.D. Auckland* ACK134; Fitzgerald ghat, 24.9.1930, *McCann* 3319 (BLAT); Fitzgerald ghat, 29.12.1950, *P.V. Bole* PVB178 (CAL); Fitzgerald ghat, 20.8.1951, *H. Santapau* 13231, 13232, 13233, 13234; Fitzgerald ghat, 22.10.1951, *P.V. Bole* BOLE444, BOLE445; Fitzgerald ghat, 9.6.1954, *P.V. Bole* BOLE1147; Fitzgerald ghat, 16.9.1958, *H. Santapau* 22815,

Fig. 26. *Impatiens pulcherrima* Dalzell: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

22816; Fitzgerald ghat, 30.10.1958, *H. Santapau* 22904, 22908, 22909; Fitzgerald ghat, 31.8.1959, *P.V. Bole* 2079 (BLAT); Vasota, September 1992, *M.P. Bachulkar-Cholekar* 5999 (SUK); Sindhudurg district, Malgaon, Savantwadi, 4.9.1977, *S.M. Almeida* SMA764 (BLAT); Amboli ghat, 17.7.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 2; Amboli, 12.8.2006, *Jyosna R.N. Dessai* 111; Amboli ghat, 9.9.2006, *Harshala Gad & Emilia Mascarenhas* 132; Phonda ghat, 30.9.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 168; Amboli, 6.10.2007, *Jyosna R.N. Dessai* 172 (GUH).

Note: *Impatiens pulcherrima* is allied to *I. flaccida* in its overall morphology. However, the former differs from the latter in the presence of annual habit, orbicular standard petal which is obcordate at apex and the unequal lobes of the wing petals as against perennial habit, obovate standard petal which is emarginate at apex and the nearly equal lobes of the wing petals

Impatiens pulcherrima is also allied to *I. talbotii* Hook.f. The former also differs from the latter in its standard and wing petals, capsules and seeds.

This species prefers shade and grows under tree canopy with adequate light penetration. However, plants growing in complete shade bear white flowers with red markings in the centre. This species often makes patches of large population. The species is considered valuable for its large showy flowers.

Chromosome No.: 2n = 12 (Zinov'eva-Stahevitch & Grant, 1982, 1984, 1985).

IUCN Threat Status: VU [B1ab(iii)].

Impatiens rosea Lindl., Edwards's Bot. Reg. 27(Misc.): 6, t. 27. 1841. **Fig. 27, 30f**

Type: Lindl., Edwards's Bot. Reg. 27(Misc.): 6, t. 27.

I. trichocarpa Hook.f., Hooker's Icon. Pl. 30: t. 2914. 1910; Gamble, Fl. Madras 1: 142. 1915; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 218. 1997; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 560. 2005, **syn. nov.**

Type: INDIA, Nilgiri hills, *s. die*, *Perrottet* 176 (Herb. Mus. Palat. Vindobon). Not traceable.

I. balsamina L. var. *rosea* (Lindl.) Hook.f., Fl. Brit. India 1: 454. 1874 & Rec. Bot. Surv. India 4: 49. 1906; Blatter, J. Bombay Nat. Hist. Soc. 33: 314. 1933; Santapau, Fl. Khandala: 30. 1967; Shah, Fl. Gujarat 1: 143. 1978; Rao, Fl. Goa 1: 59. 1985; Lakshminarasimhan & Sharma, Fl. Nasik District: 113. 1991; Deshpande *et al*., Fl. Mahabaleshwar 1: 114, t. 5. 1993; Kothari & Moorthy, Fl. Raigad District: 47. 1993; Almeida, Fl. Maharashtra 1: 189. 1996; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 449. 2000.

I. balsamina L. var. *brevicalcarata* Cooke, Fl. Bombay 1: 185. 1901.

Type: Not designated.

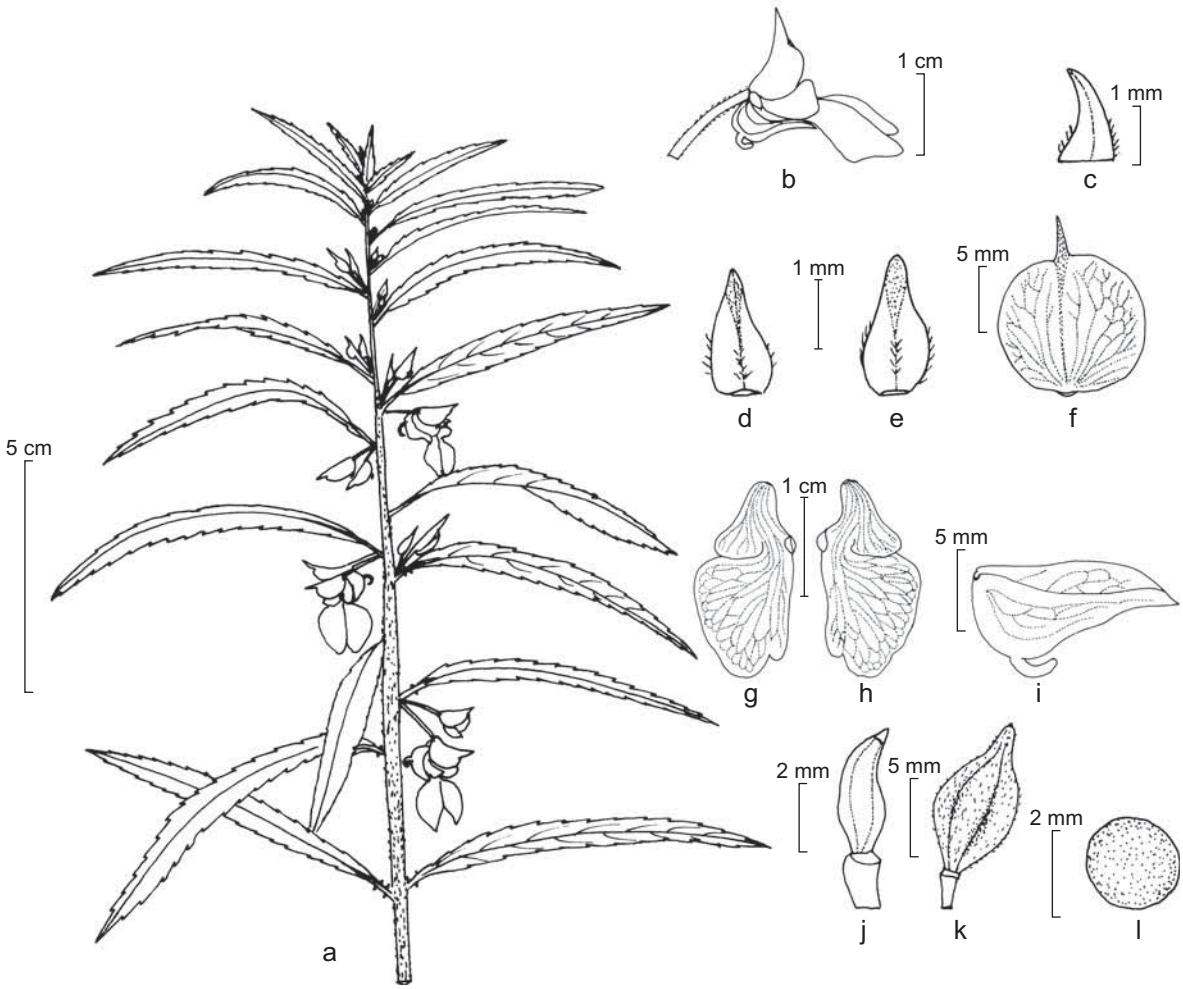


Fig. 27. *Impatiens rosea* Lindl.: a. Habit; b. Flower; c. Bract; d, e. Lateral sepals; f. Standard petal; g, h. Wing petals; i. Lip; j. Pistil; k. Capsule; l. Seed.

Herb, up to 1.5 m high. Stem terete or slightly grooved, branched or not branched, minutely puberulous, green to pinkish red. Leaves alternate, linear-lanceolate or elliptic, lanceolate to linear-oblanceolate, 6 – 14 × 0.6 – 2 cm, attenuate at base, serrate at margins, acuminate at apex, hairy above, glabrous below; nerves 5 – 10 pairs; petioles with 2 – 4 pairs of glands, 0.5 – 1.5 cm long, minutely puberulous, reddish. Flowers 2 or 3 per axil, rarely solitary, 1.8 – 2.5 cm across, pink with white throat having a yellow patch on elevation; bracts triangular, *c.* 1.5 × 1 mm, hairy at margins, acute to acuminate at apex, hairy on costa dorsally; pedicels 1 – 1.2 cm long, puberulous, pinkish red, deflexed in fruits. Lateral sepals ovate to ovate-lanceolate, *c.* 2.5 × 1.25 mm, concave, hairy at margins and on costa dorsally, acute to rounded at apex. Standard petal orbicular, 7 – 11 mm, concave, horned, glabrous to sparsely hairy on dorsal surface, pink; mucro *c.* 3 mm long; wing petals 1.7 – 2 × 0.9 – 1.1 cm, 2-lobed; auricle small, rounded, curved above; basal lobe obovate, 6 – 8 × 4 – 5 mm, obtuse at apex; distal lobe broadly asymmetrically obovate, 1 – 1.2 × 0.8 – 1.1 cm, elevated near base towards inner side, obcordate much below the apex; lip boat-shaped, 10 – 14 × 4 – 7 mm, 5 – 6 mm deep, acuminate at apex, hairy, pink; spur slightly above base, cylindric, 5 – 8 mm long, hooked, rounded at apex, puberulous, pale green. Column *c.* 7 × 3 mm; filaments *c.* 6 × 1.5 mm, pink to white; anthers *c.* 1 × 1.5 mm, pink to white. Pistil *c.* 5 × 1.5 mm, curved at apex; ovary lanceoloid to elliptic-lanceoloid. Capsules broadly ellipsoid, 1 – 1.5 × 0.5 – 0.8 cm, beaked at apex, puberulous; pedicels 1 – 1.5 cm long; seeds globose, *c.* 2.5 mm, granulate, brown.

Flowering & Fruiting: July – December.

Habitat: Commonly found in and around human settlements. Also grows on roadsides, near cultivated lands/fields, and footpaths, rarely in and around forests.

Distribution: Northern Himalaya, Goa, Gujarat, Karnataka, Maharashtra and Tamil Nadu.

Specimens examined: INDIA, **Goa**, South Goa district, Mollem, 26.9.2004, *Jyosna R.N. Dessai* 24 (GUH). **Karnataka**, Belgaum district, Sada, 24.9.2006, *Jyosna R.N. Dessai & M.K. Janarthanam* 157 (GUH). **Maharashtra**, Nasik district, Peint, near PWD rest house, 29.8.1985, *G. Chandramohan* GCM1188 (SPU); Pune district, Purandhar hill, 30.12.1944, *H.S. Santapau* 5780; Top of Purandhar fort, 31.12.1945, *H.S. Santapau* 8345; Raigad district, Matheran, 22.11.1958, *N.A. Irani* 2475; Satara district, Khandala, near St. Xavier's villa, 30.9.1943, *H.S. Santapau* 2754; Khandala, Canval home, 4.9.1950, *H.S. Santapau* 11198, 11199, 11200 (BLAT); Kas, September 1991, *M.P. Bachulkar-Cholekar* 5149 (SUK); 6 km before Kas plateau from Satara, 18.9. 2005, *Jyosna R.N. Dessai* 100; Yuvateshwary, Satara to Kas road, 18.8.2006, *Jyosna R.N. Dessai* 113; Meda, Satara to Mahabaleshwar road, 19.8.2006, *Jyosna R.N. Dessai* 117; Ambeghar, Satara to Mahabaleshwar road, 19.8.2006, *Jyosna R.N. Dessai* 118; Wai, Panchgani to Satara road, 19.8.2006, *Jyosna R.N. Dessai* 122, 123; Sindhudurg district, Tilari ghat, 3.9.2006, *M.K. Janarthanam* 127; Phonda ghat, 30.9.2007, *Jyosna R.N. Dessai & M.K. Janarthanam* 169 (GUH).

Note: The standard petal is persistent on the capsule. It is widespread in the Northern Western Ghats. *Impatiens rosea* is similar to *I. scabriuscula* in its overall morphology but differs in its robust habit and short incurved spur (spur absent in *I. scabriuscula*).

The species belonging to section Uniflorae in the study area can be divided into two groups: 1. Lip with a long spur; lobes of wing petal subequal and 2. Lip with or without a short spur; basal lobe of wing petal much smaller then distal lobe.

Impatiens balsamina shares characters of both the groups i.e., it possessess wing petals with a small basal lobe and the lip is with a long spur, whereas *I. balsamina* var. *rosea* has characters of the second group i.e. a short spur and the basal lobe of the wing petals much smaller than the distal lobe. Hence, *I. balsamina* var. *rosea* is elevated back to the rank of a species.

Hooker (1913a) described *I. trichocarpa* from the Nilgiri hills. In the present study it is found that this species is no different from *I. rosea* Lindl. and hence reduced to a synonym.

IUCN Threat Status: LC.

Impatiens scabriuscula B. Heyne [Wall. Numer. List No. 4736, nom. nud.] ex Wall. in Roxburgh, Fl. Ind. 2: 464. 1824; Wight & Arnott, Prodr. Fl. Ind. Orient. 2: 136. 1834; Hooker & Thomson, J. Proc. Linn. Soc. Bot. 4: 131. 1859; Dalzell & Gibson, Bombay Fl.: 44. 1861; Beddome, Icon. Pl. Ind. Or.: 29, t. 144. 1868 –1874; Hooker, Fl. Brit. India 1: 454. 1874 & Rec. Bot. Surv. India 4: 46. 1906; Cooke, Fl. Bombay 1: 174. 1901; Gamble, Fl. Madras 1: 142. 1915; Blatter, J. Bombay Nat. Hist. Soc. 33: 314. 1933; Yoganarasimhan *et al*., Fl. Chikmagalur District: 60. 1982; Vajravelu in Nair & Henry, Fl. Tamil Nadu 1: 55. 1983; Sharma *et al*., Fl. Karnataka: 39. 1984; Almeida, Fl. Maharashtra 1: 195. 1996; Saldanha, Fl. Karnataka 2: 257. 1996; Vivekananthan

et al. in Hajra *et al*., Fl. India 4: 207. 1997; Mudaliar & Prasad in Singh & Karthikeyan, Fl. Maharashtra State Dicotyl. 1: 462. 2000; Rathakrishnan *et al*. in Daniel, Fl. Kerala 1: 556. 2005. **Fig. 28, 30g – i**

Type: Wall. Numer. List No. 4736 (CAL!).

Herb, 20 – 60 cm high. Stem subterete to terete, sparsely minutely hairy at base, densely hairy above, branched or not; branches alternate. Leaves alternate, linear-elliptic to oblanceolate, 1 – 10.5 × 0.4 – 1.5 cm, attenuate or rarely obtuse and oblique at base, apiculate-crenate to serrate at margins, acuminate at apex, hairy above and on nerves below; petioles 0.5 – 2 cm long, hairy. Flowers 2 – 4 per axil, 0.9 – 1.2 cm across, pink; bracts ovate, *c.* 0.75 × 0.5 mm, acute at apex, dorsally hairy; pedicels 0.6 – 1 cm long, hairy, deflexed in fruits. Lateral sepals *c.* 1.25 mm long, acute to acuminate at apex, dorsally hairy, light green. Standard petal broadly obovate, *c.* 8 × 6 mm, concave, retuse-mucronate at apex, hairy outside; mucro horned, *c.* 2 mm long, hairy; wing petals 1 – 1.4 × 0.4 – 0.6 cm, unequally 2-lobed; basal lobe triangular, 4 – 5 × 2 – 4 mm; distal lobe asymmetrically obovate, 6 – 8 × 4 – 5 mm, acute at apex, notched slightly at base of apex, papillate at base towards inner side; auricle *c.* 1.5 mm long, rounded at apex; lip saccate, 5 – 9 × 4 – 5 mm, 2 – 4 mm deep, hairy, light pink; spur absent. Column *c.* 4 × 1.5 mm; filaments *c.* 3 × 0.5 mm; anthers *c.*

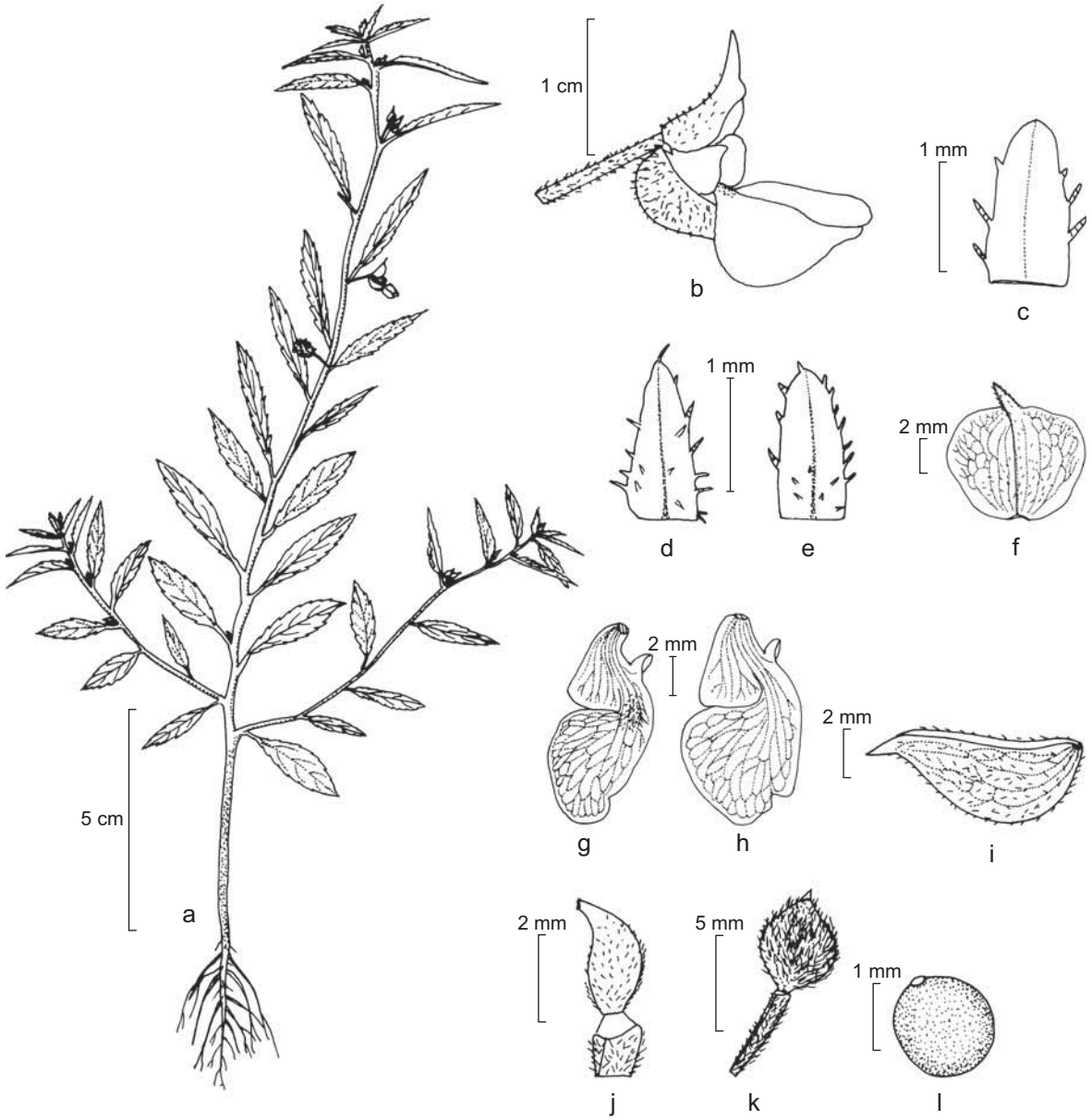


Fig. 28. *Impatiens scabriuscula* B. Heyne ex Wall.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petal dorsal and ventral views; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

0.5 × 0.5 mm. Pistil *c.* 3 × 0.5 mm; ovary lanceoloid to elliptic-lanceoloid, sparsely minutely hairy. Capsules broadly ellipsoid, 0.8 – 1 × 0.5 – 0.7 cm, villous; pedicels 1 – 1.3 cm long; seeds globose, *c.* 1 mm, brown, shortly papillate; papillae dark brown.

Flowering & Fruiting: July – November.

Habitat: On lateritic rocks, periphery of evergreen to semi-evergreen forests, at 1800 m.

Distribution: Endemic to the Western Ghats of Karnataka, Kerala and Tamil Nadu.

Specimens examined: INDIA, Concan, *s. die*, *Stocks s.n*. (CAL). **Karnataka**, Chikmagalur district, Kulhathy, Bababudan, 5000′, October 1908, *A. Meebold* 10702 (CAL); Charmadi ghat, 26.8.1972, *V. Bhaskar* 314 (MGM); Near Shankar falls, Bababudan, 24.7.1973, *V. Bhaskar* 362; Way to Kalhattigiri, Bababudan, 25.7.1973, *V. Bhaskar* 367 (MGM); Bababudan hills, 27.9.1979, *C.J. Saldanha* KFP9560 (JCB); Road to Kemmangundi, 5.9.1980, *C.J. Saldanha* KFP12191 (JCB); Z-point, Kemmangundi, 17.11.2004, *Jyosna R.N. Dessai & M.K. Janarthanam* 26; Kemmangundi, 5.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 80; 2 km before Kemmangundi from Chikmagalur, 5.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 84; Kemmangundi to Kalhatti road, 5.9.2005, *Jyosna R.N. Dessai & M.K. Janarthanam* 86 (GUH). **Kerala**, Palakkad district, Panthanthode, 12.10.1965, *E. Vajravelu* 26173 (MH); Aruvampara, 725 m, 10.10.1979, *N.C. Nair* 64463 (CAL). **Tamil Nadu**, Nilgiri district, Sholur, 26.8.1970, *B.D. Sharma* 35777 (MH); Pykara range, 7.10.1972, *V. Bhaskar* 332 (MGM).

Note: *Impatiens scabriuscula* is similar to *I. mysorensis* but differs in its villous capsules (capsules minutely hairy in *I. mysorensis*), absence of spur (spurred in *I. mysorensis*) and presence of distinct red-coloured stiff hairs on the plant. Individuals growing on lateritic rocks and plains show stunted growth whereas those growing along the periphery of evergreen and semi-evergreen forests show luxuriant growth. Plants exposed to bright sunlight bear white flowers.

When Blatter (1933) revised the Balsaminaceae for the Flora of Bombay Presidency, North Kanara district was also a part of the Bombay presidency and hence Almeida (1990) and Mudaliar & Prasad (2000) might have included the species following Blatter (1933).

Chromosome No.: 2n = 14 (Bhaskar & Razi, 1972 – 1973).

IUCN Threat Status: VU [B1ab(iii)].

Impatiens talbotii Hook.f., Rec. Bot. Surv. India 4: 42, 47. 1906; Blatter, J. Bombay Nat. Hist. Soc. 33: 314. 1933; Sharma *et al*., Fl. Karnataka: 39. 1984; Singh & Kulkarni in Nayar & Sastry, Red Data Book Ind. Pl. 3: 63, t. 64. 1990; Saldanha, Fl. Karnataka 2: 259. 1996; Vivekananthan *et al*. in Hajra *et al*., Fl. India 4: 214. 1997; Dessai & Janarthanam, J. Econ. Taxon. Bot. 32: 625, t. 1. 2008. **Fig. 29, 30j, k**

Type: INDIA, **Karnataka**, Devimane, 24.10.1905, *W.A. Talbot* 3732 (K, photo!)

Herb, 25 – 60 cm high. Stem terete, swollen at nodes, branched, flaccid, glabrous. Leaves alternate, crowded at apex, lanceolate, 5.5 – 14 × 1.5 – 5.3 cm, cuneate at base, apiculate-crenate, ciliate at margins, acute to acuminate at apex, hairy above, glabrous to sparsely hairy (densely so on nerves) below; petioles with 3 – 5 pairs of glands, 2 – 3.5 cm long, hairy on either side. Flowers 2 – 4 in each axil, 2.2 – 2.5 cm across, pink with purple centre; bracts linear-lanceolate, *c.* 3 × 1 mm, acute at apex, glabrous, hairy along margins in upper half; pedicels slender, 1.8 – 2.5 cm long, glabrous to hairy, deflexed in fruits. Lateral sepals ovate to linear-lanceolate, *c.* 2 × 0.7 mm, entire at margins, acute at apex, sparsely hairy dorsally, green; midrib distinct. Standard petal suborbicular, 7 – 9 × 8 – 11 mm, cordate, pink inside, white outside, dorsally keeled; keel green; costa hairy, mucronate; mucro *c.* 2 mm long, green; wing petals 1.3 – 1.7 × 0.8 – 1 cm, unequally 2-lobed; basal lobe oblong to oblong-lanceolate, 8 – 10 × 6 – 8 mm, apiculate at apex, 2-lobulate; distal lobe asymmetrically obovate, 1 – 1.3 × 0.5 – 0.7 cm, bilobulate; dorsal auricle absent; wing petals slightly protruding into a spur at base thus appearing as an auricle; lip conical, 6 – 9 × 3 – 4 mm, 3 – 5 mm deep, glabrous to hairy, light pink; spur tubular, 2.5 – 3.5 cm long, rounded at apex, curved, glabrous to hairy, white to light pink. Column *c.* 3.5 × 2 mm; filaments *c.* 2.5 mm long, pink; anthers *c.* 1 × 1.5 mm, white to light pink. Pistil *c.* 3 × 1 mm; ovary elliptic-lanceoloid, *c.* 2 × 1 mm, glabrous; stigma 5-toothed; tooth *c.* 1 mm long. Capsules asymmetrically lanceoloid, 1 – 1.5 × 0.5 – 0.7 cm, with persistent stigma, tomentose; pedicels 2.6 – 3 cm long; seeds ovoid, *c.* 4 × 2.5 mm, flattened, papillate to hairy, brown.

Flowering & Fruiting: August – November.

Habitat: On either side of the narrow steep path/ footsteps leading to the Jog falls in Karnataka and on roadsides near the waterfalls at Gaondongri (Goa).

Distribution: Endemic to Goa (South Goa), Karnataka (Belgaum, North Kanara and Shimoga dictrict).

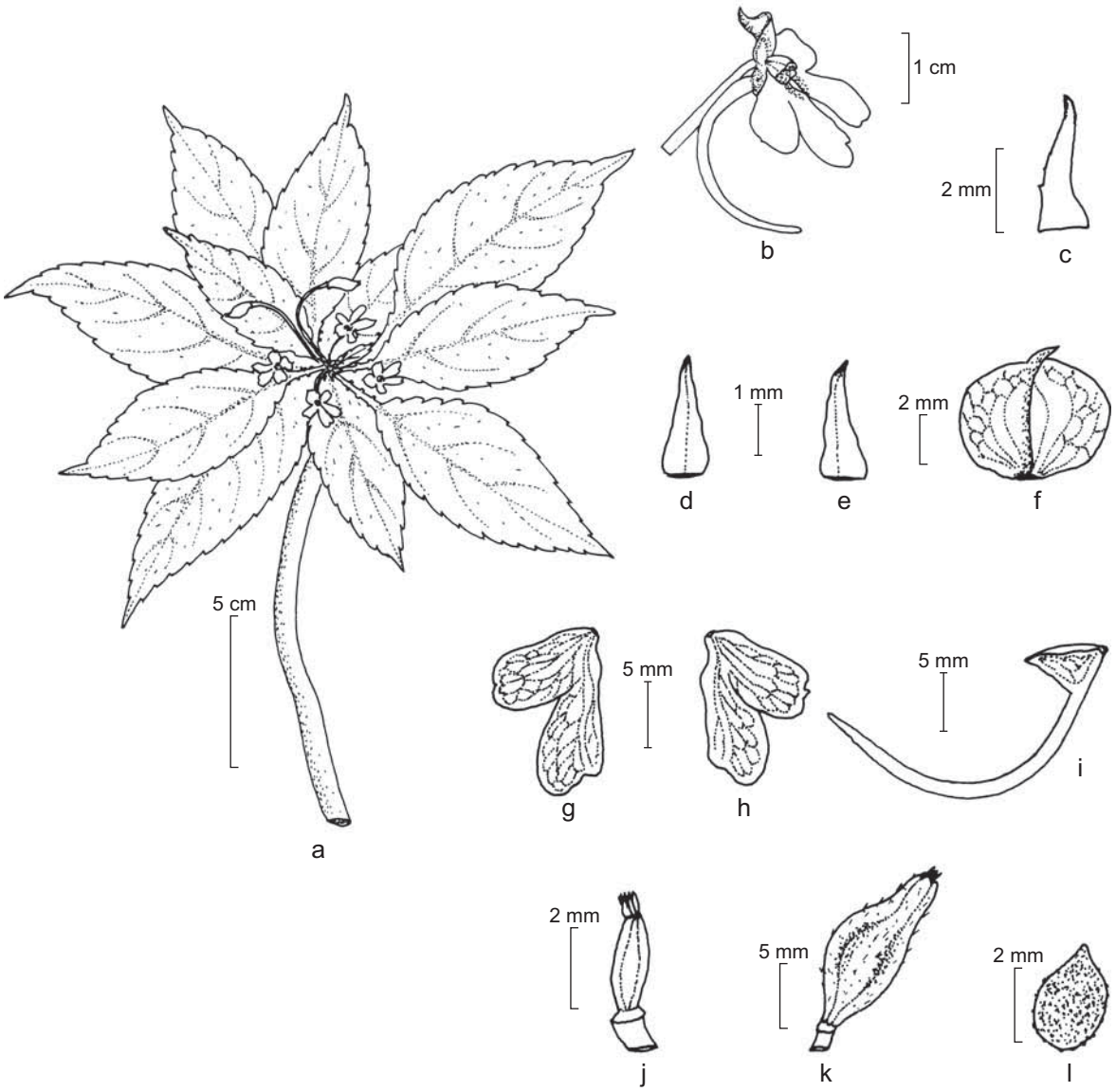


Fig. 29. *Impatiens talbotii* Hook.f.: **a.** Habit; **b.** Flower; **c.** Bract; **d, e.** Lateral sepals; **f.** Standard petal; **g, h.** Wing petals; **i.** Lip; **j.** Pistil; **k.** Capsule; **l.** Seed.

Specimens examined: **Goa**, South Goa district, Gaodongri, Bharsa, near Bamanbuda waterfalls, 12.8.2007, *M.K. Janarthanam* 163; Gaodongri, Bharsa, near Bamanbuda waterfalls, 28.11.2007, *Emilia Mascarenhas* 175 (GUH). **Karnataka**, Belgaum district, Castle rock, *s. die, A. Meebold s.n.* (CAL); North Kanara district, Devimane ghat, 2.11.1903, *W.A. Talbot s.n.* (BSI); Jog falls, 5.11.1972, *V. Bhaskar* 341 (MGM); Jog falls, 6.8.2005, *Jyosna R.N. Dessai* 37; Jog falls, 6.9.2005, *Jyosna R.N. Dessai* 93 (GUH); Shimoga district, Agumbe ghat, 6.11.1972, *V. Bhaskar* 342 (MGM).

Note: *Impatiens talbotii* is similar to *I. dasysperma* but differs in the presence of circular stem, orbicular standard petal and tomentose capsules and not a quadrangular stem, obovate standard petal and glabrous capsules (note under *I. dasysperma*).

Chromosome No.: 2n = 12 (Bhaskar, 1976).

IUCN Threat Status: EN [B2ab(iii)].

Excluded taxa

Impatiens aliciae C.E.C. Fisch., Bull. Misc. Inform. 1934: 389. 1934.

Yoganarasimhan *et al*. (1982) reported this from Bababudangiri of Chikmagalur district which Sharma *et al*. (1984), Saldanha (1996) and

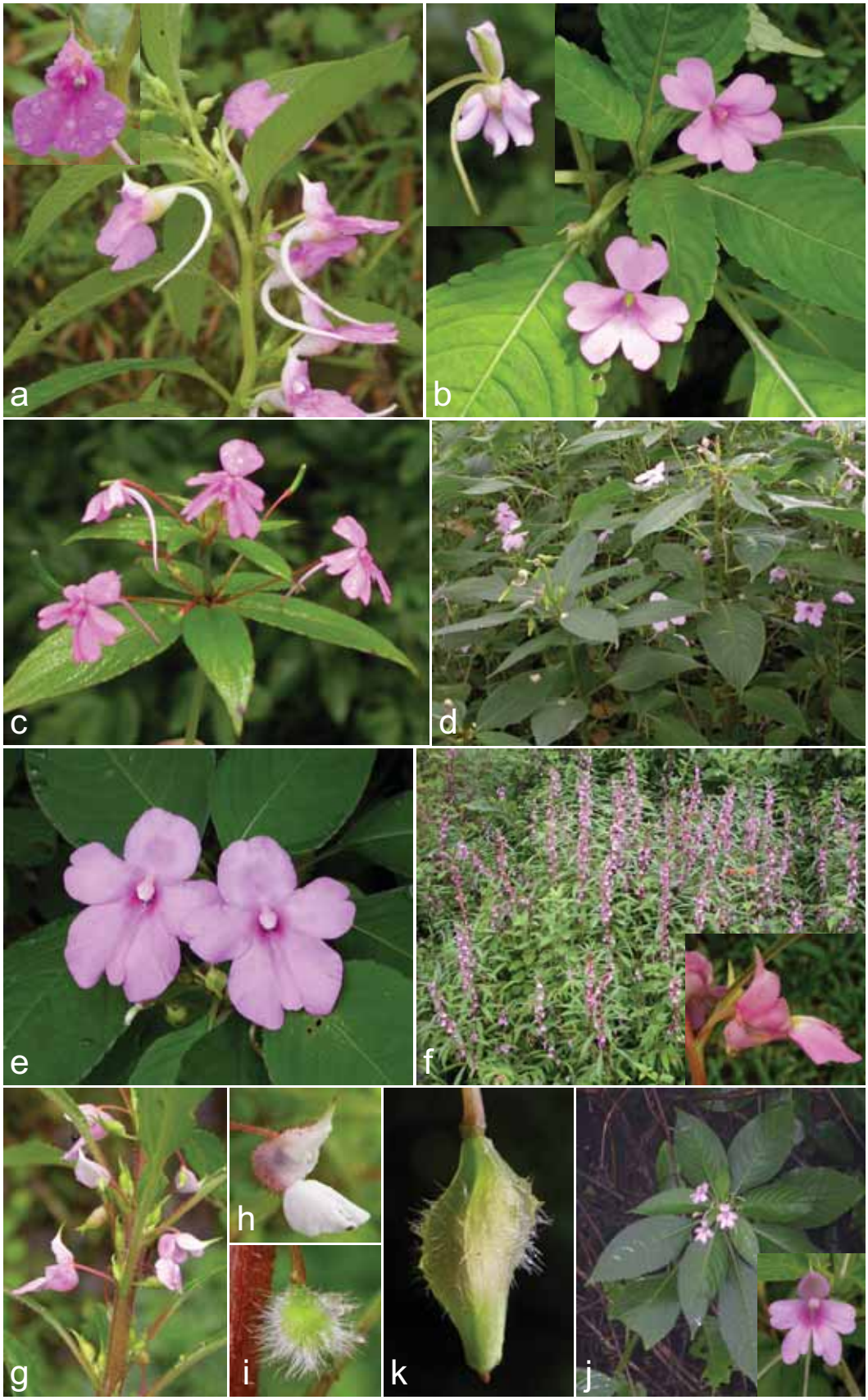


Fig. 30. a. *Impatiens balsamina* L. var. *micrantha* Hook.f.; b. *I. dasysperma* Wight; c. *I. gardneriana* Wight; d, e. *I. pulcherrima* Dalzell; f. *I. rosea* Lindl.; g – i. *I. scabriuscula* B. Heyne ex Wall.; j, k. *I. talbotii* Hook.f.

Vivekananthan *et al*. (1997) followed in their treatment. The characters given by Yoganarasimhan *et al*. (1982) match with *I. tenella* and hence *I. aliciae* is excluded.

Impatiens clavicornu Turcz., Bull. Soc. Imp. Naturalists Moscou 32: 271. 1859.

This species has been included by Almeida (1996) and Mudaliar & Prasad (2000) based on the earlier authors. However there are no specimens to substantiate its presence in Maharashtra. Vivekananthan *et al*. (1997) mention its distribution in Karnataka. But there are no specimens collected from the study area available in any of the Indian herbaria to confirm. Hence, the species is excluded.

Impatiens crenata Bedd., Madras J. Lit. Sci. 2, 20: 69, t. 10. 1859.

The type of *I. crenata* which is housed at K (*Beddome s.n*.) has been studied and it is found to be a distinct entity. *I. crenata* is restricted to Anamalais of Tamil Nadu (vide note under *I. stocksii*)

Impatiens flaccida Arn., Companion Bot. Mag. 1: 322. 1835.

The materials of *I. dasysperma* in Indian herbaria have been determined as *I. flaccida* which is disvtributed only in Sri Lanka. Thus excluded from the study area.

Impatiens henslowiana Arn., Companion Bot. Mag. 1: 322. 1835.

It was recorded by Saldanaha (1996) citing '*Barnes* 964' which could not be traced. However, Murthy & Yoganarasimhan (1998) have not referred to this species.

Impatiens herbicola Hook.f., Bull. Misc. Inform. 1911: 354. 1911.

Saldanha & Nicolson (1978) included this species based on the collection, '*HFP*-2131'. However, the said collection could not be traced at JCB where all the collections are housed. We could not collect it from the locality mentioned by Saldanha & Nicolson (1978) inspite of our repeated attempts.

Impatiens inconspicua B. Heyne [Wall. Numer. List No. 4741, nom. nud.] ex Wight & Arn., Prodr. Fl. Ind. Orient.: 139. 1834.

The materials of *I. oppositifolia* in Indian herbaria are identified as *I. inconspicua*. The former is with a distinct spur while the latter is without a spur and thus excluded from the study area.

Impatiens jerdoniae Wight, Icon. Pl. Ind. Orient. 4(4): 15, t. 1602. 1850.

The occurrence of this species in Karnataka is neither recorded by Wight (1850) in the protologue nor by Hooker & Thomson (1859). However, Hooker (1874) includes Brahmagherrie as one of the sites and quotes Wight as the collector. Subsequently, Bhaskar & Razi (1978b) mentioned that it is endemic to Brahmagiri in Coorg, Karnataka and Sispara in the Nilgiris, Tamil Nadu without citing any collections. Vivekananthan *et al.* (1997) also mention Kodagu and Brahmagiri in Karnataka. However, we could not trace any specimen of *I. jerdoniae* collected from Karnataka in all the major herbaria consulted.

Impatiens lawsonii Hook.f., Rec. Bot. Surv. India 4: 45. 1906.

Bhaskar (1975) referred the collection '*Bhaskar* – 315' from Chikmagalur, Karnataka as *I. lawsonii*. Vivekananthan *et al*. (1997) included it probably based on the same. However, no collection from Karnataka is seen in any herbaria. The specimen quoted by Bhaskar as *I. lawsonii* is a misidentification and it has been subsequently published as *I. bhaskarii* (vide note under *I. bhaskarii*).

Impatiens leschenaultii (DC.) Wight & Arn., Prodr. Fl. Ind. Orient.: 136. 1834.

Vivekananthan *et al*. (1997) cited that this species is present in Kerala, Maharashtra and Tamil Nadu. But no specimen has been seen in the study area and also in any of the herbaria.

Imperfectly known/doubtful taxa

Impatiens balsamina L. var. **corymbosa** Santapau, Bull. Misc. Inform. 1948: 489. 1948.

The type of this taxon could not be located and there are no other collections available in any of the Indian herbaria. Hence, the taxonomic identity of this taxon could not be ascertained.

Impatiens pendula B. Heyne [Wall. Numer. List. No. 4744] ex Wight & Arn., Prodr. Fl. Ind. Orient. 1: 136. 1834.

The type materials and the protologue have been analysed for this taxon. Wight & Arnott (1834) compared the species with *I. scabriuscula* due to the presence of spurless flowers and differentiated *I. pendula* from *I. scabriuscula* based on the presence of much smaller and glabrous flowers. They also mentioned that the species is similar to *I. chinensis* but differs in the presence of small inconspicuous flowers. Hooker (1874) mentions that the material is not good for description. He also quotes that this species is closely related to *I. inconspicua*, wherein spur is absent and *I. tenella* wherein spur is present. As there are no other collections of this taxa in any herbaria, the taxonomic identity of this taxon could not be ascertained and thus considered as a doubtful taxon in this treatment.

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