



# *Boesenbergia pulcherrima* and *B. tiliifolia* (Zingiberaceae) in India: Notes on the identity, variability and typification

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## Abstract

*Boesenbergia pulcherrima* (Wall.) Kuntze is a misunderstood taxon in India. Whatever described from India under this name is known to belong to *B. tiliifolia* (Baker) Kuntze. Our discovery of *B. pulcherrima* in Meghalaya, Northeast India, as a new record for the country has made it possible to describe and identify this species authentically. Also, the authors have typified *B. pulcherrima*. Many variants of *B. tiliifolia* had also been collected from different parts of Kerala based on which a detailed description, illustration and other relevant notes are provided.

**Keywords:** lectotypification, misidentification, new record, variation

## Introduction

The genus *Boesenbergia* was established by Kuntze (1891) to include two species, *B. pulcherrima* (Wall.) Kuntze and *B. longiflora* (Wall.) Kuntze which were earlier treated under the genus *Gastrochilus* Wall. (1829, non Don 1825). The genus commemorates Kuntze's artist brother-in-law, Walter Boesenberg. It includes about 80 species (Saensouk & Larsen, 2002), which are mainly distributed in India, Indochina, the Malay Peninsula, Myanmar, Sumatra, Borneo, the Philippines and southern China (Sirirugsa, 1987 & 1992).

Holtum (1950) selected *B. pulcherrima* as the type species of the genus as its illustration in the protologue (Wallich, 1829: t.24) shows with better clarity the two-ranked arrangement of the bracts of the inflorescence which is considered as the most important character of the genus. Holtum's view was subsequently endorsed by Burt and Smith (1972). Wallich described the species based on a specimen collected from Rangoon. A specimen collected by Wallich in 1826 from Rangoon, *i.e.*, Wallich 6588 (K & CAL, K000639535 image!), which was later published by Wallich (1832) was traced. However, this specimen is not in perfect agreement with his illustration and description. This is in corroboration with the observation made by John Mood (Personal communication dtd. 30.09.2014).

Paxton (1840) and Hooker (1842) had treated *B. pulcherrima* along with a drawing based on the

original material sent by Wallich. In 1890, Baker treated six species, which included *B. pulcherrima*, based on material from Pegu, Tavoy, Tenasserim and Penang, and illustrations in earlier works. Also, three taxa under imperfectly known and undescribed species were treated, which included *B. tiliifolia* (Baker) Kuntze as a new species. Schumann (1904) treated *B. pulcherrima* based on specimens from Myanmar (Pegu, Tavoy and Tenasserim) and *B. tiliifolia* based on specimens from India. Schlechter (1913) treated both these species and considered them native to India. Probably because the type of *B. pulcherrima* is from Burma (present Myanmar), then a province of British India, he considered *B. pulcherrima* as native to India.

Ridley (1907, 1924) recorded *B. pulcherrima* from Penang (Maingay) and reported it as very rare. Later, Holtum (1950) treated it in his 'The Zingiberaceae of the Malay Peninsula' based on a living specimen collected from Government Hill, Penang and also compared it with the illustration in Hooker (1842) and Wallich's original figure (1829: t.24). Sirirugsa (1992) treated this species in the revision of the genus *Boesenbergia* for Thailand.

As part of the revision of *Boesenbergia* in India, a number of specimens from different parts of India were studied in detail. The specimen collected from Galwangiri, Meghalaya is identified as

*B. pulcherrima* after studying the protologue, herbaria and illustration of Wallich.

The present study based on fresh material also reveals that *B. pulcherrima* (*sensu* Wallich) was not reported from India until now. Even though Das and Sikdar (1982) reported this species from India, it was on the basis of herbarium specimens, viz. vide *Hassan Fl. Proj.* 2209 (St. Joseph's College Herbarium) and *Wallich* 6588 (CAL), and not on living collections. There is no specimen of *B. pulcherrima* (*sensu* Wallich) available in any of the Indian Herbaria other than those collected from Myanmar and Malay Peninsula which are deposited at CAL. Thus, it may be concluded that this species reported from India by various authors (Ramamoorthy, 1976; Mangaly & Swarupnandan, 1981; Manilal, 1988; Ramachandran & Nair, 1988; Vijravelu, 1990; Sasidharan & Sivararajan, 1996; Sivarajan & Mathew, 1997; Bhat, 2003; Sabu, 2006), including the painting (Fig. 6) stated by Sabu (2006), are all misidentifications. Also, it was observed that Wallich's specimen (*Wallich* 6588) shows more similarity to *B. tiliifolia*, and that may be the obvious reason for its misidentification by the Indian authors. Subsequently, whatever described as *B. pulcherrima* from India, belongs to *B. tiliifolia*. Thus, the present discovery of *B. pulcherrima* from Meghalaya is a new record for India.

Also, there is no type designated for the species *B. pulcherrima* until now. So, the illustration in the protologue, i.e., Wallich (1829: t.24), is designated here as its lectotype. Even though Burtt and Smith (1972) cited the specimen of Wallich from Burma (present Myanmar) as a type of *B. pulcherrima*, important details regarding the specimen, were not mentioned, making that typification ambiguous.

Moreover, *B. tiliifolia* with a wide range of variations in morphological characters was collected from different parts of Kerala and detailed description, illustration and other relevant notes are provided. However, no specimen could be collected from the type locality in Meghalaya due to habitat destruction.

Mangaly and Swarupnandan (1981) also described this species based on specimens collected from Palakkad, Kerala, and they noted considerable amounts of phenotypic plasticity within populations. In contrast, Das and Sikdar (1982) reported this species as endemic to Meghalaya and rare. Sabu (2006) also described the species based on specimens from Palakkad.

### Key to the allied species

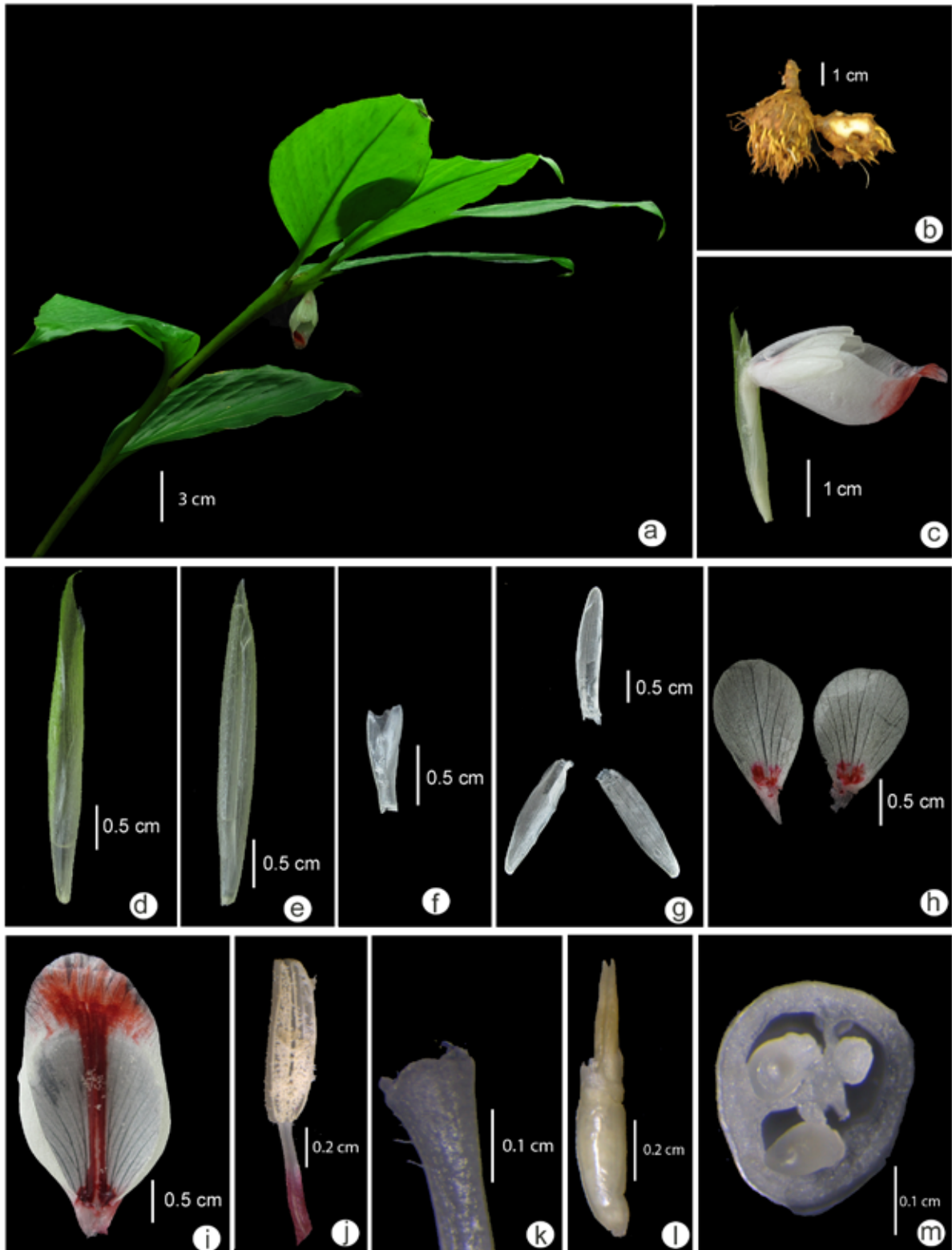
1. Anther connective crested ..... 2
1. Anther connective not crested ..... 3
2. Leaf margin straight; bract and bracteole of equal length; labellum deep pink towards apex and white with crimson spots and bands radiating laterally in the throat ..... **B. rotunda**
2. Leaf margin wavy; bracteoles shorter than bract; labellum white with maroon apex and maroon spots in the throat ..... **B. meghalayensis**
3. Rhizome globose, 2.1–3.0 × 1.8–2.5 cm; leaves shortly petioled or sessile; petiole, if present, 0.4–0.9 cm long ..... **B. pulcherrima**
3. Rhizome cylindrical, 5–15 × 0.3–0.4 cm; leaves distinctly petioled; petiole 1.3–3.5 cm long ..... **B. tiliifolia**

1. **Boesenbergia pulcherrima** (Wall.) Kuntze, *Rev. Gen. Pl.* 2: 685. 1891; K.Schum. in Engler, *Pflanzenr.* 4(46): 93. 1904 (as '*pulcherrimum*'); Ridl., *Mat. Fl. Malay. Penins.* 2: 14. 1907; Schltr. in Feddes *Repert.* 12: 316. 1913; Ridl., *Fl. Malay Penins.* 4: 247. 1924; Holtum, *Gard. Bull. Singapore* 13: 109. 1950; B.L.Burtt & R.M.Sm., *Notes Roy. Bot. Gard. Edinburgh* 31: 215. 1972; Das & Sikdar, *Bull. Bot. Soc. Bengal* 36: 44. 1982; Sirirugsa, *Nat. Hist. Bull. Siam Soc.* 40: 69. 1992. *Gastrochilus pulcherrima* Wall., *Pl. Asiat. Rar.* 1: 22. t. 24. 1829; Paxton, *Paxton's Mag. Bot.* 7: 75. 1840; Hook. in S.Curtis, *Bot. Mag.* 15. t. 3930. 1842; Baker in Hook.f., *Fl. Brit. India* 6: 217. 1890.

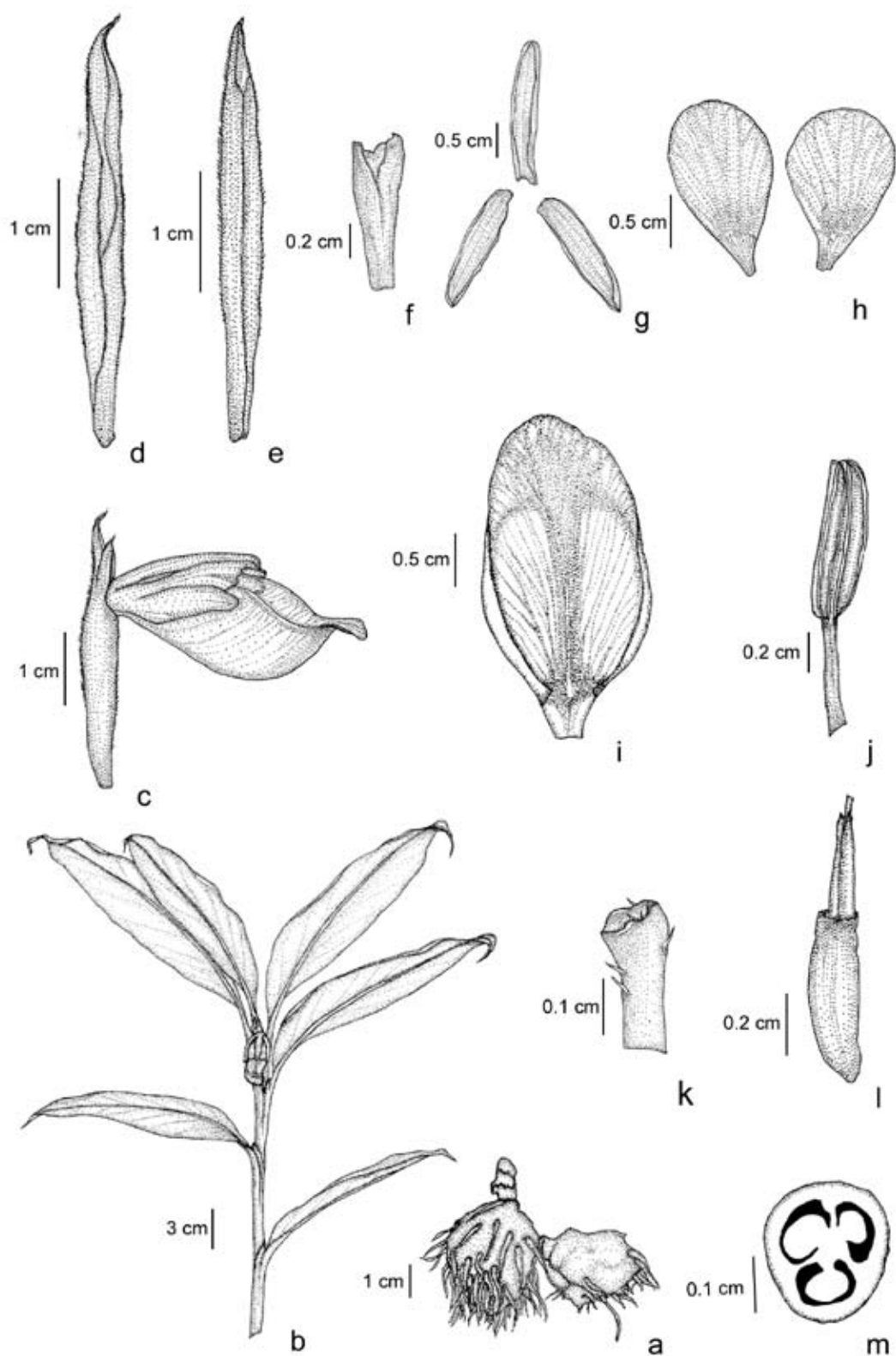
**Figs. 1, 2**

*Lectotype* (designated here): Wallich, *Plantae Asiaticae Rariores.* 1: t. 24. 1829 (K!) **Fig. 3**

Herbs perennial, rhizomatous. Rhizomes globose, 2.1–3.0 × 1.8–2.5 cm, non-aromatic, outer surfaces brownish, white inside. Roots many, fleshy; tubers cylindrical or spindle-shaped, 2.3–2.7 × 1.7 cm, white inside. Leafy shoot 45–75 cm, internodes 4–8 cm long. Leaves 5–7, arranged towards the upper part of the stem, 19–22 cm long, shortly petiolate or sessile; petiole, if present, 0.4–0.9 cm long, green, sheaths maroon in the younger stage; lamina elliptic-lanceolate, 13–21 × 4–5 cm, membranous, apices acuminate, bases tapering, glabrous, veins raised at regular intervals, lower surfaces maroon in the younger leaves; ligules oblong, c. 0.8–1.3 cm long, bilobed, membranous, hyaline, light green, glabrous or minutely pubescent at tip. Inflorescences sessile, enclosed within the terminal leaf sheaths, 6–14 cm long. Bracts distichous, c. 10–11, each subtending a single flower, oblong,



**Fig. 1.** *Boesenbergia pulcherrima* (Wall.) Kuntze: **a.** Habit; **b.** Rhizome; **c.** Flower; **d.** Bract; **e.** Bracteole; **f.** Calyx; **g.** Corolla lobes; **h.** Lateral staminodes; **i.** Labellum; **j.** Stamen; **k.** Stigma; **l.** Ovary with epigynous glands; **m.** Cross-section of ovary



**Fig. 2.** *Boesenbergia pulcherrima* (Wall.) Kuntze: **a.** Rhizome; **b.** Habit; **c.** Flower; **d.** Bract; **e.** Bracteole; **f.** Calyx; **g.** Corolla lobes; **h.** Lateral staminodes; **i.** Labellum; **j.** Stamen; **k.** Stigma; **l.** Ovary with epigynous glands; **m.** Cross-section of ovary.



**Fig. 3.** *Boesenbergia pulcherrima* (Wallich, *Plantae Asiaticae Rariores*. 1: t.24. 1829, K; Lectotype designated here).

3.8–4.8 × 0.4–0.5 cm, membranous, translucent, green, minutely hairy on the outer surfaces, apices acuminate. Bracteoles oblong-lanceolate, 3.4–3.7 × 0.4–0.5 cm, entire, translucent, light green or white, inner surface glabrous, outer surface hairy. Flowers 3.4–5.8 cm, shows basipetal succession; pedicels 0.2–0.3 cm long. Calyx tubular, 0.8–0.9 cm long, white, base truncate, split open on one side, tip obscurely tridentate, membranous, hyaline and glabrous. Corolla tube 2.2–2.8 cm, slender, glabrous, shorter than the bract and bracteole, white, apex stooping. Corolla lobes 3, oblong, hyaline, glabrous, white, tip deeply pouched, margins entire; dorsal lobe 1.9–2.2 × 0.3–0.5 cm; lateral lobes 1.9–2.0 × 0.4 cm. Lateral staminodes 2, obovate, 1.8–2.0 × 0.9–1.0 cm, white with red blotch at base. Labellum, elliptic-saccate, 3.3–3.7 × 1.8–2.6 cm, tip stretched out, margin wavy at tip, white with saffron red bands in the depression radiating towards the tip and base. Stamen 1.4–1.8 cm long, attached with labellum forming a tube; staminodial tube 0.6–0.7 cm long, white; filament 0.4–1.0 cm long, pubescent with bulbous hairs, white or white with red tinge; anther 0.8–0.9 × 0.3 cm, creamy white; connective not crested or spurred, hairs present on

the connective. Ovary barrel-shaped, 0.5–0.7 cm long, glabrous, tricarpeal, trilobular with many ovules on axile placentum. Style filiform, 4.2–4.4 cm long, glabrous, white. Stigma cup-shaped, sparsely hairy, white. Epigynous glands two, linear, 0.3–0.6 cm long, cream coloured. Fruit not seen. Bulbil formation is common.

*Distribution:* Myanmar, Thailand and Northeast India.

*Flowering:* June – September.

*Specimens examined:* INDIA, **Meghalaya**, East Khasi Hills District, Galwangiri, way to Rangeera Peak, N 25° 35. 063' E 090° 12. 505', 538 m, 08.08.2007, *E. Sanoj & Rajesh Kumar* 95145 (CALI). MYANMAR, Chin Hills, 06.1892, *Abdul Huk* 466404 (CAL); Toungoo District, Douzayit, 04.08.1911, *J.H. Lace* s.n. (E, E00389694 & E00389694); Upper Burma, Kachin Hills, Myitkyina, 08.1899, *Shaik Mokim* 140 (CAL); *Ibid.*, 24.09.1897, *D. Prain* 466401 (CAL). Burma & Malay Peninsula, 1863-1864, s.c. 5690 & 5741 (CAL).

**2. *Boesenbergia tiliifolia*** (Baker) Kuntze, *Rev. Gen. Pl.* 2: 685. 1891; K.Schum. in Engler, *Pflanzenr.*



**Fig. 4.** *Boesenbergia tiliifolia* (Baker) Kuntze in a two volume paintings of the local plants of Malappuram and some adjacent areas, in natural colours by an unknown artist (presently at the Botany Department Library, University of Calicut)

4(46): 94. 1904 (as '*tiliifolium*'); Schltr. in Feddes Repert. 12: 317. 1913; Mangaly & Swarupan., Bull. Bot. Surv. India 23(3&4): 236. 1981 (as '*tiliaefolia*'); C.R.Das & Sikdar, Bull. Bot. Soc. Bengal 36: 45. 1982 (as '*tiliaefolia*'); M.Sabu, Zingiberaceae and Costaceae of South India 124. 2006 (as '*tiliaefolia*'). *Gastrochilus tiliaefolia* Baker in Hook.f., Fl. Brit. India 6: 218. 1890 (as '*tiliaefolia*')

*Boesenbergia pulcherrima* auct. non Wall. 1829: Ramamoorthy in C.J.Saldanha & Nicolson, Fl. Hassan Dist. 765. 1976; Mangaly & Swarupan., Bull. Bot. Surv. India 23(3& 4) 235. 1981; Manilal, Fl. Silent Valley 310. 1988; Ramach. & V.J.Nair, Fl. Cannanore 467. 1988; Vijr., Fl. Palghat District 498. 1990; Sasidh. & Sivar., Flowering Plants of Thrissur District 458. 1996; Sivar. & P.Mathew, Fl. Nilambur 706. 1997; K.G.Bhat, Fl. Udupi 624. 2003; M.Sabu, Zingiberaceae and Costaceae of South India 121. 2006. **Figs. 4, 5, 6**

*Type*: INDIA, **Meghalaya**, Khasi Hills, Tropical region, *s.die.*, J.D. Hooker & Thomson (Monolophus 6, *Herb. Ind. Or.*) 262178 (lectotype W, W1889-0262178 image!).

Herb perennial, rhizomatous. Rhizome cylindrical, 5–15 × 0.3–0.4 cm, non-aromatic. Roots many with slender root fibres, tuberous; tubers cylindrical or spindle-shaped. Leafy shoot 20–40 cm, internode 1–6 cm long. Leaves 3–5, 9–27 cm long, petiolate; petiole 1.3–3.5 cm long, glabrous, sheath green or maroon; lamina ovate-elliptic, 8–23 × 4–12 cm, fleshy, green or green above and maroon beneath, glabrous or lower surfaces with few hairs, apices acute, bases unequal; ligules 0.1–0.7 cm long, bilobed, light green or maroon, glabrous or scarcely hairy. Inflorescences terminal, 4.0–10.5 cm long. Bracts distichous, *c.* 8–10, each subtending a single flower, oblong, 1.7–2.8 × 0.5–1.0 cm, membranous, light green or white with green tinge, minutely hairy on the outer surfaces, apices acuminate and wavy. Bracteoles oblong-lanceolate, 1.7–2.4 × 0.3–0.5 cm, bilipped, membranous, translucent, light green or white, outer surfaces densely hairy, margins entire. Flowers 2.6–3.7 cm, shows basipetal succession; pedicels 0.1–0.6 cm long. Calyx tubular, 0.4–1.0 × 0.2–0.5 cm, base truncate, side split open on one side, membranous, translucent, white, glabrous, tip slightly tridentate. Corolla tube 1.5–2.0 × 0.15 cm, almost equal to the relative length of bract and bracteole, white with pink tinge, outer surfaces glabrous and inner surfaces with few hairs. Corolla lobes 3, oblong, 1.0–1.4 × 0.3–0.6 cm, tip deeply pouched, translucent, white, glabrous, margins entire. Lateral staminodes 2, obovate, 0.8–

1.8 × 0.4–0.9 cm, white, glabrous, margins entire. Labellum obovate-cuneate, 1.8–3.0 × 0.9–1.4 cm, white with laterally radiating pink bands in the depression and pink colour towards the tip, margin wavy towards upper half (sometimes emarginate). Stamen 0.6–1.1 cm long, white; filament 0.2–0.5 × 0.15–0.3 cm; anther 0.4–0.6 × 0.2 cm; connective not crested or spurred. Ovary oblong to elliptic, 0.2–0.5 cm long, glabrous, tricarpeal, trilocular with ovules on axile placentum (also appear unilocular with basal or marginal placentation due to incomplete septum); style filiform, 1.7–3.4 cm long, glabrous, white; stigma cup-shaped, non-ciliate, white. Epigynous glands two, linear, 0.2–0.5 cm long, cream coloured. Capsule with 2–4 seeds. Seeds *c.* 0.4 cm, brown when mature, minutely hairy, arillate; aril lacerate.

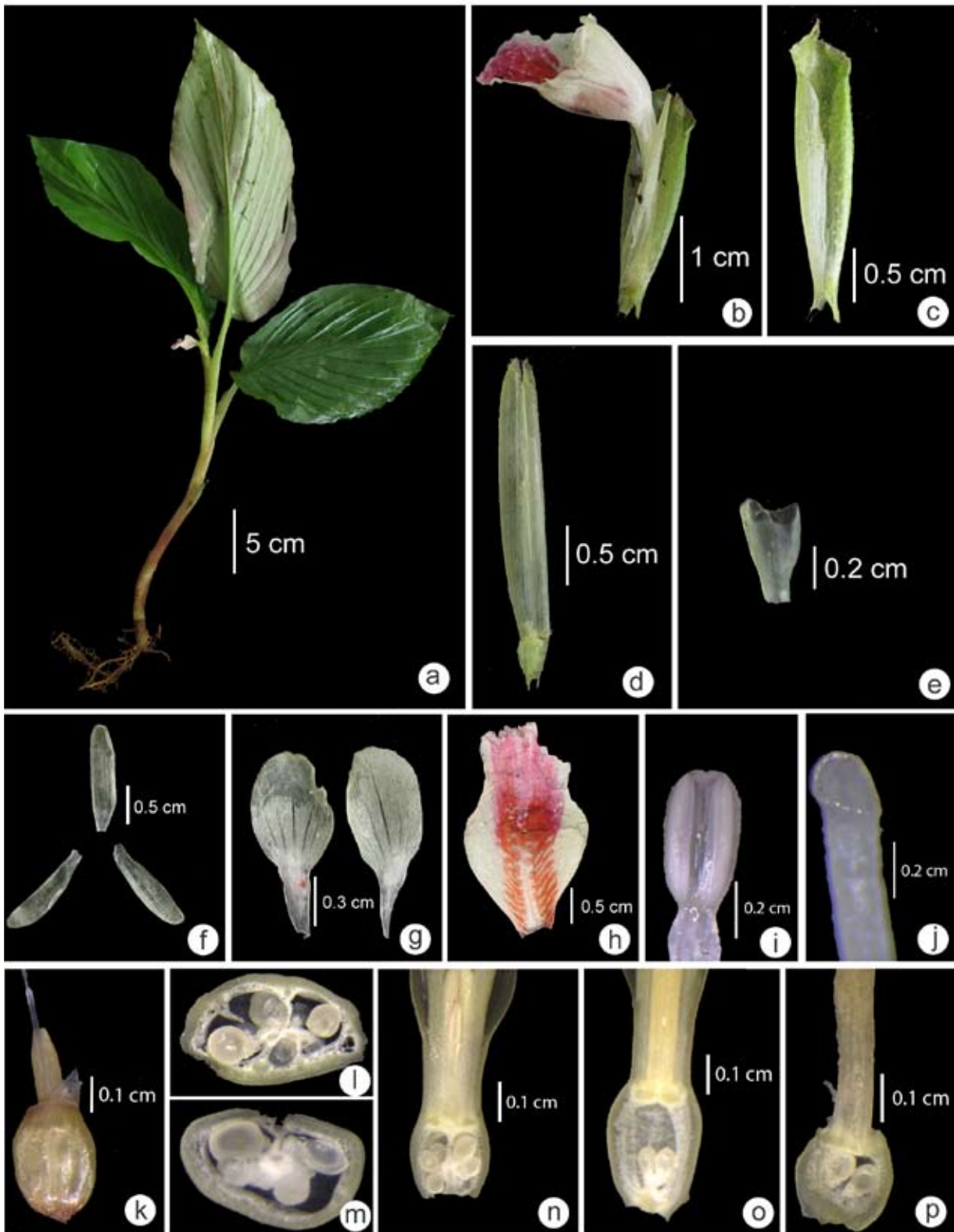
*Distribution*: Endemic to India.

*Flowering & Fruiting*: June – December.

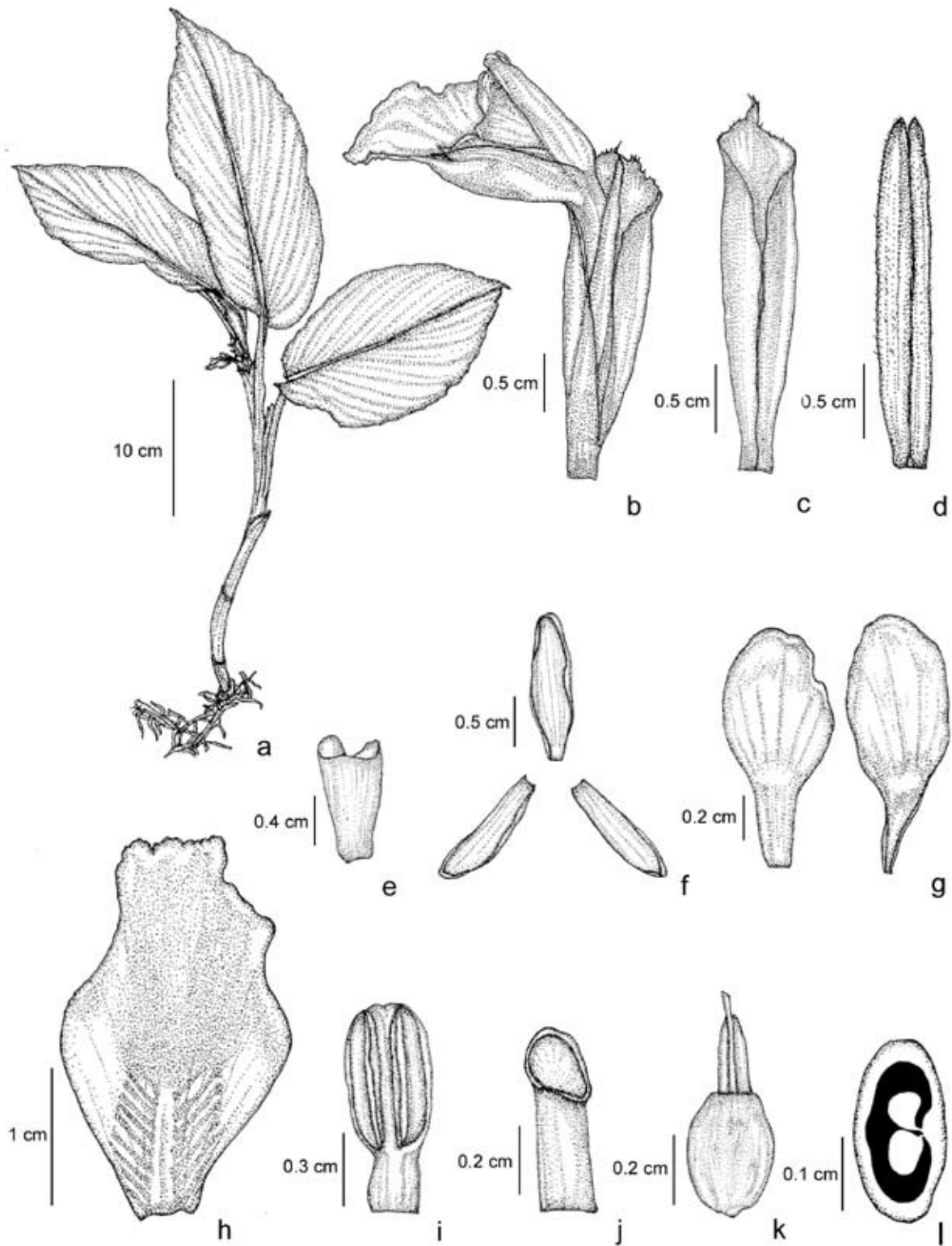
*Note*: The authors have corrected the epithet of *Boesenbergia tiliaefolia* as '*tiliifolia*' as per Article 60.8 of Melbourne code (McNeill *et al.*, 2012).

A wide range of variation was observed in *B. tiliifolia* within a population, especially with respect to the size of floral parts. Besides this variability, some of the present observations are not in agreement with the original description of the species by Baker (1890), *i.e.*, according to Baker (1890), lateral staminodes are shorter than the corolla segments and the corolla tube is as long as the bract. Some of the present collections used for the study have lateral staminodes that are longer than the corolla segments and the bract extending only up to half the length of corolla tube.

*Specimens examined*: INDIA, **Karnataka**, Hassan District, Shiradi Ghat (border), 20.08.1970, C. Saldanha & T.P. Ramamoorthy HFP 549 (E); North Kanara District, Hulickal Ghat, 60 km from Kunthapur, on the way to Jogigundi Waterfalls, *s.die.*, Sabu M. 39118 (CALI). **Kerala**, Idukki District, Pindimedu, Pooyamkutty, 50 m, 06.07.1988, P. Bhargavan 87385 (MH); Way to Ayyappan temple, 800 m, 02.09.1977, N.C. Nair 50791 (MH); Kannur District, Near Forest Quarters, N 11. 93314° E 75. 86222°, 294 m, 23.07.2012, Alfred Joe 130858 (CALI); Kariyankappu, Aralam Wild Life Sanctuary, N 11. 93314° E 75. 86222°, 294 m, 22.07.2012, Alfred Joe 130849 (CALI); Kannothe R.F., 13.08.1980, V.S. Ramachandran 66969 (MH); *Ibid.*, 21.08.1979, V.S. Ramachandran 64041 (MH); Ezhimalai, 10.09.1978, Swarupanandan & Jose K. Mangaly 17566 (CALI);



**Fig. 5.** *Boesenbergia tiliifolia* (Baker) Kuntze: **a.** Habit; **b.** Flower; **c.** Bract; **d.** Bracteole; **e.** Calyx; **f.** Corolla lobes; **g.** Lateral staminodes; **h.** Labellum; **i.** Stamen; **j.** Stigma; **k.** Ovary with epigynous glands; **l-m.** Cross-section of ovary; **l.** Trilocular, **m.** Unilocular; **n-p.** L.S of ovary; **n.** Axile placentation; **o.** Basal placentation; **p.** Marginal placentation.



**Fig. 6.** *Boesenbergia tiliifolia* (Baker) Kuntze: **a.** Habit; **b.** Flower; **c.** Bract; **d.** Bracteole; **e.** Calyx; **f.** Corolla lobes; **g.** Lateral staminodes; **h.** Labellum; **i.** Stamen; **j.** Stigma; **k.** Ovary with epigynous glands; **l.** Cross-section of ovary.



Iritty, Kootupuzha, *s.die.*, Sabu M. 39390 (CALI); Kottiyur, Pannimala, *s.die.*, Sabu M. 37384 (CALI); Kasargode District, Konnakadu, 700 m, 30.09.1982, R. Ansari 74382 (MH); Kollam District, Thenmalai, 09.07.2002, Prasanth Kumar M.G. 86376 (CALI); 26.07.1983, Sabu M. 10382, 10383, 10384, 10385 & 10386 (CALI); near guest house, *s.die.*, Sabu M. 37374 (CALI); Malappuram District, on the way to Thalichola, Nilambur, 1380 m, 2008, Rajesh Kumar & Sanoj E. 103226, 103232 (CALI); Manimooly, Nilambur, *s.die.*, Sabu M. 37363 (CALI); Palakkad District, Dhoni Forest, Eruvalankunnu, N 10° 52. 007' E 076° 37. 388', 261 m, 07.07.2012, Alfred Joe, Gokul Das & Prabhu Kumar 130869 (CALI); Thonnakundu, N 10° 51. 936' E 076° 37. 180', 127 m, 07.07.2012, Alfred Joe, Gokul Das & Prabhu Kumar 130868 (CALI); 2<sup>nd</sup> H.P. bend, *s.die.*, Sabu M. 39110 (CALI); Mannarghat, on the way to Ezhuthupallipara, 15.07.2007, Mohammed Shameer 94867 (CALI); Mannarghat-Anakatty road, 6<sup>th</sup> H. P. bend, along roadside forest, *s.die.*, Sabu M. 39156 (CALI); Kanjirapuzha, 850 m, 22.06.2002, Prasanth Kumar M.G. 86863 & 86864 (CALI); Mandampathy forest, 525 m, 14.10.1979, N.C. Nair 64639 (MH); Silent Valley, 1000 m, 23.09.1977, R. Ansari 51456 (MH); Mukkali, ± 350 m, 22.06.1976, Jose K. Mangaly, 17545 (CALI); Mukkali Forest, 530 m, 14.10.1965, E. Vajravelu 26229 (MH); Trissur District, Vazhachal, N 10° 18. 286 E 076° 37.299, 296 m, 09.07.2012, Alfred Joe, Sreejith P.E. & Manudev 130880 (CALI); Vazhachal to Sholaiyar, 400 m, 23.09.1982, K. Ramamurthy 74744 (MH); Sholayar, *s.die.*, Sabu M. 37335 (CALI); Wayanad District, Vythiri, ± 400 m, in fruits, 24.07.1975, Jose K. Mangaly 6691 A-C (CALI). Tamil Nadu: Tirunelveli, Kularatti Estate, Sengattheri, 21.12.1980, E. Vajravelu 76406 (MH).

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