

Strobilanthes brittoi (Acanthaceae), a new species from the Western Ghats, India

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Abstract: *Strobilanthes brittoi* B.Mani, Sinj.Thomas & A.K.Pradeep, a new plietesial species from Kerala, India, is described and illustrated here. It bears a close resemblance to *S. heyneana* Nees and *S. lupulina* Nees, but is clearly distinct owing to its elliptic to ovate leaves with obtuse-rounded bases, a greater number of lateral nerves, longer and pilose petioles, elliptic bracts with obtuse apices, unequal calyx lobes, broadly elliptic corolla lobes, ellipsoid capsules, and hairy seeds.

Keywords: Agasthyamala Biosphere Reserve, Endemic, Kerala, Ponmudi Hills.

Introduction

The genus *Strobilanthes* Blume belongs to family Acanthaceae and is primarily found in South and Southeast Asia and Melanesia (Carine & Scotland, 1998, 2002; F.G. Chen *et al.*, 2019; Deng, 2019; J.T. Chen *et al.*, 2020; Manzitto-Tripp *et al.*, 2021). About 150 species of the genus occur in India, of which 70 are recorded from Peninsular India (Venu, 2006; Krishnapillai, 2020; Thomas *et al.*, 2020, 2021). Notably, most of the latter species are plietesial and over 40% of them are endemic, particularly to the Western Ghats (Carine & Scotland, 2002; Venu, 2006; Thomas *et al.*, 2018), a mountain range characterized by unique biophysical and ecological processes (IUCN, 2012).

Bremekamp (1944) coined the term “plietesial” to describe perennial monocarpic plants, particularly those in the *Strobilanthininae* subtribe of Acanthaceae, including *Strobilanthes* and related genera. These plants typically grow in groups, flower simultaneously after several years, produce seeds, and then die. In the plietesial cycle, the seeds germinate shortly after

the mass death of the parent plants, initiating a new cycle with the same periodicity. *Strobilanthes* has reported more plietesial species than any other genus in Acanthaceae, but the total number of plietesial *Strobilanthes* species is unknown (Daniel, 2006). Bremekamp (1944) observed significant variation in the life history of *Strobilanthes*. Most plietesial *Strobilanthes* take around 10 to 15 years to flower, set seed, and die. This may range from 8-16 years in most species in the Western Ghats (Pradeep, 2018). However, the flowering periodicity in all individuals is rarely 100%, leading to sporadic flowering of few individuals in non-mass flowering years. In some *Strobilanthes* species, mass flowering occurs on a species-specific cycle over a wide area, while in others, populations in different regions follow their own cycles. Some species exhibit gregarious flowering in certain years but do not die after mass flowering, making them non-plietesial (Daniel, 2006).

During our comprehensive examination of *Strobilanthes* in South India, we had the opportunity to study an intriguing specimen from the Rapinat Herbarium (RHT). It was collected by K.M. Matthew in Ponmudi, Kerala, in 1968 which was erroneously labelled as *Strobilanthes aspera* Wight. In 1995, the same material was examined by Robert W. Scotland and determined as *S. lupulina* Nees. We have been monitoring the population in Ponmudi since 2015, and observed sporadic flowering in 2017, followed by profuse flowering in 2018. After scrutinizing both herbarium materials and living plants in the field, the authors found that it neither corresponds to *S. lupulina* nor matches any known species within the genus. Therefore, we describe it as a species new to science here.

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Materials and Methods

The protologues of *S. heyneana* Nees and *S. lupulina* and relevant literature were collected from databases such as the Global Biodiversity Information Facility (<https://www.gbif.org/>), Biodiversity Heritage Library (<http://www.biodiversitylibrary.org>), and Tropicos (<http://www.tropicos.org>), as well as from institutional libraries (Nees von Esenbeck, 1836, 1847; Anderson, 1867; Clarke, 1884; Wood, 1995; Carine & Scotland, 1998; Carine et al., 2004; Venu, 2006). Herbarium specimens, including type specimens, of *S. heyneana* (K001115726, K000883030), and *S. lupulina* (K001115721, K001115722) deposited at all major herbaria in India and abroad were examined (original specimens were consulted at: CAL, CALI, DD, KFRI, MH, RHT, and TBGT; digital images at online virtual herbaria were consulted at: BM, BSI, E, K, L, LINN, and P). Field trips were conducted in Ponmudi to sample the new species and throughout the Western Ghats to sample the allied taxa, such as *S. heyneana*, and *S. lupulina*. Images of the plants and flowers of the new species and allied species were obtained in the field using D2X digital camera (Nikon, Tokyo, Japan), and all parts of the flowers were detached and photographed. Specimens with flowers were collected and preserved using both dry and wet methods (Jain & Rao, 1977). Mature pollen grains were collected and kept in 70% alcohol. The pollen grains were prepared for SEM analyses following the method of Lynch and Webster (1975) and air-dried before mounting on aluminium stubs. SEM micrographs of the gold sputter-coated pollen were then taken using a JEOL Scanning Electron Microscope with EDS (Jeol Ltd., Tokyo, Japan) at an accelerating voltage of 0.5 to 30 kV with a tungsten filament at a magnification of 3,00,000 \times .

Taxonomic Treatment

Strobilanthes brittoi B.Mani, Sinj.Thomas & A.K.Pradeep, **sp. nov.** Figs. 1, 2 & 3a–c

Strobilanthes brittoi shares morphological features with *S. lupulina* but distinguishes itself in several characteristics. Notably, it has an obtuse or rounded lamina base (*vs.* attenuate-decurrent), pilose petioles (*vs.* pubescent), elliptic bracts (*vs.* obovate), unequal calyx lobes (*vs.* equal), broadly elliptic corolla lobes (*vs.* ovate), ellipsoid capsules (*vs.* oblong-clavate), hairy seeds (*vs.* glabrous), ellipsoid pollen grains (*vs.* barrel shaped), and fusion of spiral and conical

pollen ribs into two groups at the poles (*vs.* fusion of straight rounded pollen ribs into one group at the poles). Simultaneously, this new species bears resemblance to *S. heyneana*. However, it can be easily differentiated by the obtuse or rounded lamina base (*vs.* acute), pilose petioles (*vs.* pubescent), unequal calyx lobes (*vs.* equal), broadly elliptic corolla lobes (*vs.* ovate), ellipsoid capsules and pollen grains (*vs.* oblongoid and terete), as well as the fusion of spiral and conical pollen ribs into two groups at the poles (*vs.* fusion of straight rounded pollen ribs into one group at the poles).

Type: INDIA, **Kerala**, Thiruvananthapuram district, Ponmudi, 950 m, 19.09.1968, K.M. Matthew 9162 (holo RHT [RHT047864!]).

Plietesimal shrubs, up to 1.5 m tall. Stems branched, rooting from lower nodes, quadrangular when young, then becoming terete when old, young stem channelled and pilose, old stem lenticellate. Leaves unequal; laminae elliptic-ovate, 6–20 \times 4.2–9.5 cm, obtuse-rounded at base, crenate at margins, acuminate-caudate at apex, chartaceous, pilose on both surfaces; lateral nerves 5–11 pairs on each side of midrib, prominent on both surfaces; petioles 2.8–8.5 cm long, pilose. Inflorescences compound spikes, primary and secondary peduncles pubescent; bracts elliptic, 9.5–11.5 \times 5.5–8 mm, obtuse at apex, longer than calyx, glabrous, green, veins prominent; bracteoles absent. Calyx tubular, 5–5.5 mm long, 5-lobed, creamy white; tube 1.5–2 mm long, glabrous; lobes unequal, narrowly linear-lanceolate, 3–4 \times 1–1.5 mm, apex acute, glabrous, purple. Corolla ventricose, 2–2.5 cm long, pale blue, 5-lobed; tube 4–5 mm long, glabrous out, hairy in; lobes equal, broadly elliptic, 4–4.5 \times 4–5 mm, glabrous. Stamens 4, didynamous, included, staminal sheath hairy in throat region; filaments hairy, posterior filaments *c.* 5.5 mm long, straight, anterior *c.* 2 mm long, curved at apex; anthers oblong-elliptic, *c.* 2 \times 1 mm, thecae two. Pollen grains prolate, ellipsoid, tricolporate, somewhat oblique at poles; exine divided into longitudinal ribs, slightly twisted, giving a spiral appearance; ribs coalesce into two groups at poles; tectum conical with micro-perforations at base. Pistils 1.8–2 cm long, attached to disc; ovary globose, *c.* 1 \times 1 mm, glandular hairy at apex, 2-locular, ovules 2 per locule; style 15–17 mm long, slender, puberulent, included; stigma simple, straight, *c.* 2 mm long, glabrous. Capsules ellipsoid,



Fig. 1. *Strobilanthes brittoi* B.Mani, Sinj.Thomas & A.K.Pradeep: **a.** Flowering branch; **b.** Inflorescence; **c.** Bract–abaxial side (left) and adaxial side (right); **d.** Calyx–entire **e.** Calyx–cut open, outside (left) and inside (right); **f.** Corolla–cut open, outside (top) and inside (bottom); **g.** Posterior stamens–side view; **h.** Anterior stamens–side view; **i.** Pistil; **j.** Ovary–cut longitudinally; **k.** Ovary–cut transversally (from *K.M. Matthew* 9162; drawn by Philominal Selvi).



Fig. 2. *Strobilanthes brittoi* B.Mani, Sinj, Thomas & A.K.Pradeep: **a.** Habit; **b.** Inflorescence; **c.** Bracts—abaxial side (left) and adaxial side (right); **d.** Calyx—entire; **e.** Corolla—cut open, inside; **f.** Pistil (from B. Mani & Pradeep 68828; photos by Pradeep A.K.).

c. $9 \times 3\text{--}4$ mm, glabrous, 4-seeded. Seeds ovate, c. $2.5 \times c. 2$ mm, hairy, areoles small.

Flowering & fruiting: The species is plietesial; flowers from September to November and fruits from January to March.

Habitat: The new species is found growing along the banks of small streams and on wet rocks along grassland margins at an elevation of 900–1000 m above sea level. The common associated species are *Elaeocarpus weibelii* (Zmarzty) Shareef, S.P.Mathew & Shaju (Elaeocarpaceae), *Hedyotis ramarowii* (Gamble) R.S.Rao & Hemadri (Rubiaceae), *Jasminum cordifolium* Wall. ex G.Don (Oleaceae), *Osbeckia aspera* (Meerb. ex Walp.) Blume (Melastomataceae),

Syzygium gardneri Thwaites, *S. myhendrae* (Bedd. ex Brandis) Gamble (both Myrtaceae), *Tarenna alpestris* (Wight) N.P.Balakr. (Rubiaceae), and others.

Distribution: Its habitat is localized to the Ponmudi hills, situated in the southernmost region of the Western Ghats in India. Currently, the new species is known only from its type locality.

Etymology: The specific epithet honours Late Rev. Dr. Susai John Britto SJ, whose significant contributions to the field of Indian plant systematics and other valuable services to society in general are notable.

Specimens examined: INDIA, **Kerala**, Thiruvananthapuram district, Ponmudi, 975 m, 16.11.1977, M. Mohanan 52517 (MH); *Ibid.*, 950 m, 12.10.2017,

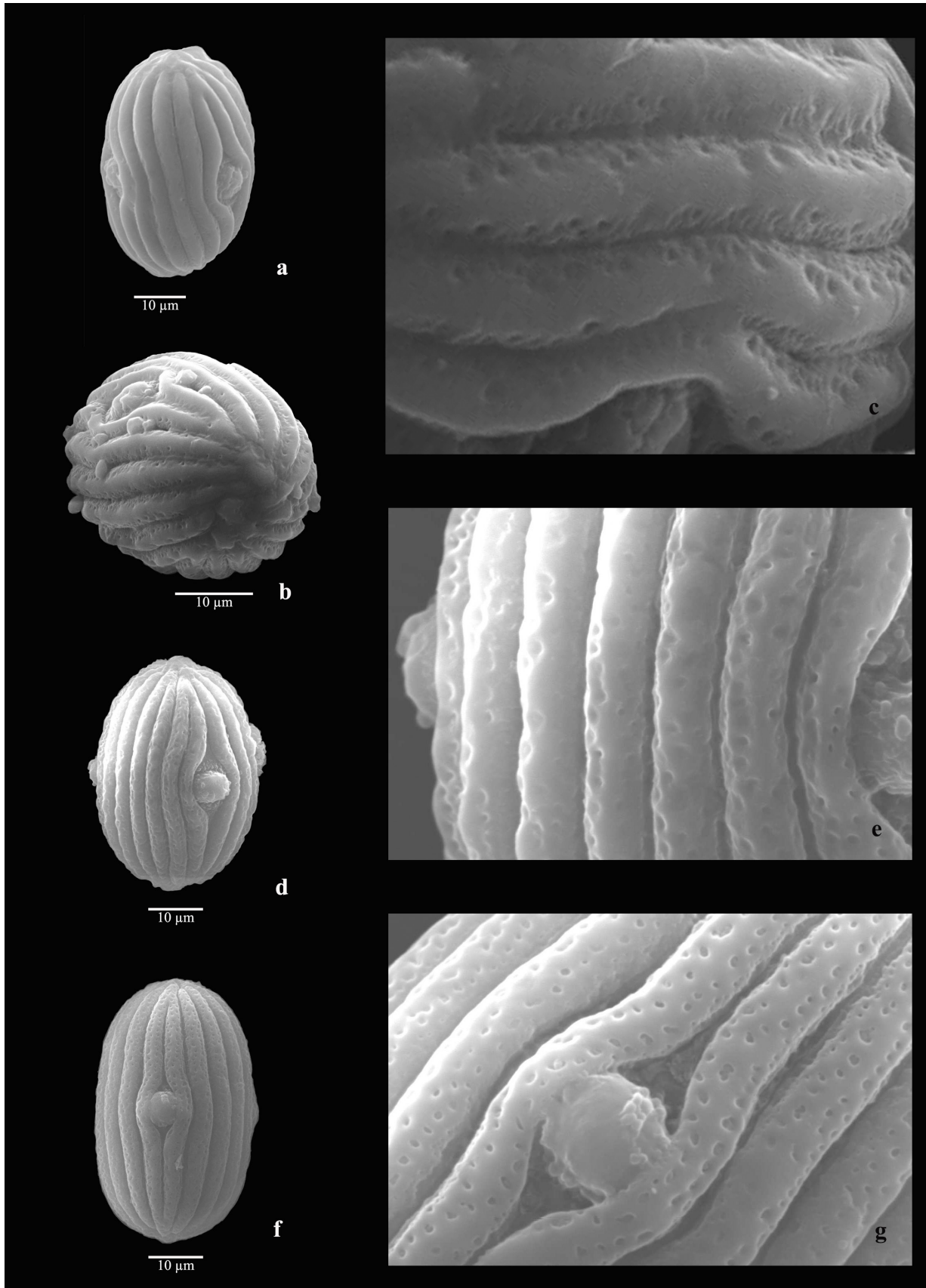


Fig. 3. SEM image of pollen grains. **a–c.** *S. brittoi* B.Mani, Sinj.Thomas & A.K.Pradeep; **d–e.** *S. lupulina* Nees; **f–g.** *S. heyneana* Nees.

B. Mani 68826 (RHT, MH); *Ibid.*, 12.12.2017, *B. Mani* 68827; *Ibid.*, 1000 m, 26.01.2018, *B. Mani & Pradeep* 68828; *Ibid.*, 975 m, 20.09.2018, *B. Mani & Pradeep* 68840 (RHT).

Notes: *Strobilanthes brittoi* is akin to *S. lupulina* and *S. heyneana* in the absence of bracteoles, as well as in having four didynamous stamens and four-seeded capsules. However, it markedly differs in several morphological features (Table 1; Figs. 4 & 5). Pollen morphology serves as a valuable tool for distinguishing species of *Strobilanthes* (Bremekamp,

1944; Terao, 1982; Carine & Scotland, 1998; Deng et al., 2006). The pollen grains of the new and the morphologically similar species studied here are ellipsoid, but in *S. brittoi*, they are oblique at the poles. A distinctive characteristic is the presence of conical ribs in *S. brittoi*, which are twisted and united into two groups at the poles, with none extending across the poles. In contrast, pollen of *S. lupulina* and *S. heyneana* exhibit straight ribs united in one group. This unique feature sets *S. brittoi* apart and is not observed in any known species of South

Table 1. Diagnostic characters of *Strobilanthes brittoi*, *S. lupulina* and *S. heyneana*

Characters	<i>S. brittoi</i> B.Mani, Sinj. Thomas & A.K.Pradeep	<i>S. lupulina</i> Nees	<i>S. heyneana</i> Nees
Leaves	Elliptic-ovate	Ovate	Broadly elliptic
Leaf base	Obtuse or rounded	Attenuate-decurrent	Acute
Leaf apex	Acuminate-caudate	Acuminate	Acuminate
Petioles	Pilose	Pubescent	Pubescent
Bracts	Elliptic, obtuse at apex, green	Obovate, obtuse or faintly emarginate at apex, pink	Elliptic, obtuse to notched at apex, green
Calyx lobes	Unequal; narrowly linear-lanceolate	Equal; linear-oblong	Equal; linear
Corolla lobes	Broadly elliptic	Ovate	Ovate
Capsule	Ellipsoid	Oblong-clavate	Oblongoid
Seeds	Hairy	Glabrous	Glabrous, except for minutely ciliate margins
Pollen grains			
P (μm)	51–54	49–51	49–53
E (μm)	33–35	33–37	35–38
P:E ratio	1.50–1.58	1.40–1.46	1.34–1.45
Outline & Shape	Prolate, ellipsoid	Prolate, barrel	Prolate, terete
Number of ribs	16–18	18–20	19–23
Coalescence of Ribs	Two groups	One group	One group
Shape of Ribs	Conical	Rounded	Rounded
Orientation of Ribs	Spiral	Straight	Straight
Pseudocolpi	Visible	Not visible	Visible
Ecto apertures	Circular	Circular	Fusiform
Tectum	Non-reticulate, conical	Reticulate, round	Reticulate, round
Tectum perforations	Less frequent, absent on top conical tectum	Frequent, present throughout rounded tectum	Frequent, present throughout rounded tectum

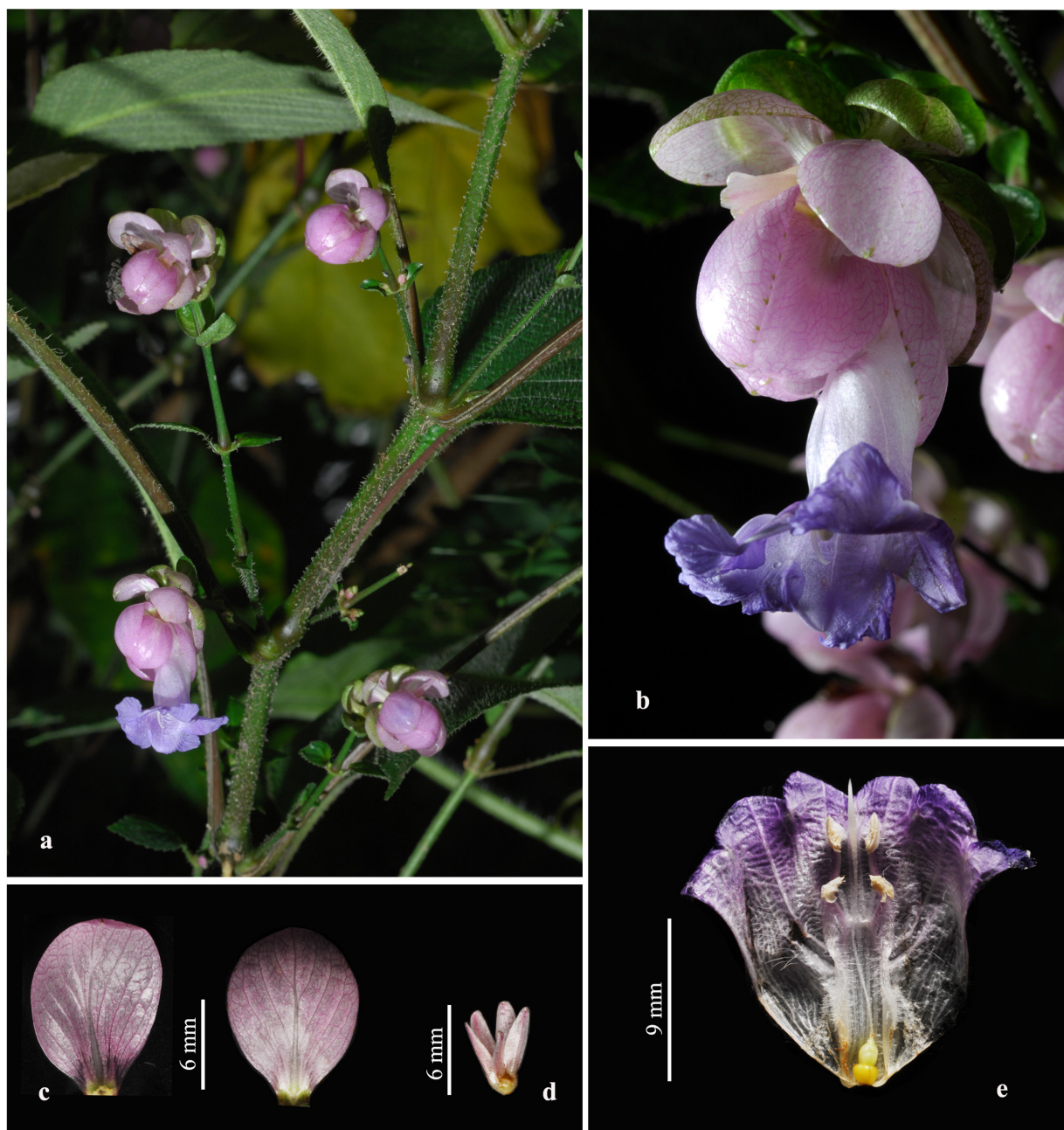


Fig. 4. *Strobilanthes lupulina* Nees. a. Flowering branch; b. Inflorescence; c. Bracts—adaxial side (left) and abaxial side (right); d. Calyx—entire; e. Corolla—cut open, inside with pistil (from Pradeep & B. Mani 65176; photos by Pradeep A.K.).

Indian and Sri Lankan *Strobilanthes* (Scotland, 1993; Wood, 1995; Carine & Scotland, 1998; Thomas *et al.*, 2020). Consequently, pollen of *S. brittoi* represent an intermediate state between those of *S. lupulina* and *S. heyneana* (with straight ribs united in one group) and related Sri Lankan species, such as *S. anceps* Nees, *S. punctata* Nees, and *S. zeylanica* T.Anderson. In these the ribs are straight, with some encircling the poles while the rest join into two groups at the poles (Scotland, 1993; Wood, 1995). Moreover, a recent

study has shown that the pollen grains of *S. lupulina* from Sri Lanka are exactly the same as those in this study (Nilanthi *et al.*, 2022). A detailed comparison of pollen morphology between *S. brittoi* and its allied species is provided in Table 1.

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Fig. 5. *Strobilanthes heyneana* Nees. **a.** Flowering branch; **b.** Inflorescence; **c.** Bracts—abaxial side (left) and adaxial side (right); **d.** Calyx—entire; **e.** Corolla—cut open, inside; **f.** Pistil (from B. Mani & Pradeep 58640; photos by Pradeep A.K.).

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