



Novelties in the family Acanthaceae from South Western Ghats, India

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Abstract: Within the context of the floristic study of the family Acanthaceae from south Western Ghats, one new species, *Strobilanthes philipmathewiana* J.Mathew & Yohannan is described. In addition, a new combination, *Hygrophila auriculata* (K.Schum.) Heine var. *alba* (Parmar) P.M.Salim, J.Mathew & Yohannan, and substantiate the occurrence of *Aystasia variabilis* (Nees) Trimen in India are made here. Their taxonomic description, morphological differences to their allied taxa and colour photographs are provided to facilitate easy identification in the field.

Key words: Acanthaceae; *Aystasia variabilis*; *Hygrophila auriculata* var. *alba*; new species; *Strobilanthes philipmathewiana*

Introduction

The southern Western Ghats, situated at the crossroads of the Indian peninsula and South Asia, is considered a significant biogeographical hotspot area of the world. It has a unique status as an ancestral area holding varied concentrations of endemic species. Botanical explorations in southern Western Ghats during 2010–2016 have yielded some interesting specimens of the family Acanthaceae. This has resulted as some novelties in the flora of south Western Ghats as follows.

1. *Strobilanthes philipmathewiana* J.Mathew & Yohannan, *sp. nov.*

The genus *Strobilanthes* Blume comprises about 450 species (Mabberley, 2005) mainly distributed in tropical Asia and Australia. According to Karthikeyan *et al.*, (2009), 146 species of *Strobilanthes* have been recorded from India and 43 species from Kerala (Sasidharan, 2013). Botanical explorations in the Vellarimala forests of southern Western Ghats during 2014–2015 yielded specimens of *Strobilanthes* that we feel are sufficiently distinctive to warrant taxonomic recognition as a new species. *Strobilanthes philipmathewiana* is here described and illustrated.

Strobilanthes philipmathewiana J.Mathew & Yohannan, *sp. nov.*

Diagnosis: *Strobilanthes philipmathewiana* resembles *Strobilanthes kunthianus* (Nees) Anders. ex Benth., but differs by its large shrubby, tomentose and woody habit, winged stem, auricled petiole, short unbranched spike of 2–4 cm, wine red coloured

bract and straight corolla tube with glabrous and wavy margins of corolla. *S. philipmathewiana* is also morphological similar, with similar ecological preferences to those of *Strobilanthes sessilis* Nees var. *sessilis* Hook. f. and *Strobilanthes sessilis* Nees var. *sessiloides* (Wight) Clarke, but differs from these species as indicated in Table 1.

Erect shrubs, ca 2 m high; stems tetragonous, winged, densely cottony-tomentose, nodes swollen, jointed. Leaves opposite, ca 2.5–4 x 1.5–2.5 cm, elliptic-lanceolate, from an acute base tapering into petiole, serrate at margin, acute or acuminate at apex, brownish in colour, silky or tawny woolly upper and lower surfaces; lateral nerves 8–10 pairs, venation compound, recti-pinnate, impressed above, prominent below; petioles winged, 0.5–0.7 cm long, dense-tomentose. Inflorescence spikes, axillary or terminal, usually single, rarely basally branched, 2–4 cm long, with grey or tawny wool; bracts ovate or lanceolate, wine red coloured, acute, ca 1 cm long, tomentose outside, glabrous and shining inside; bracteoles linear-oblong, ca 1 cm long, tomentose outside, glabrous inside. Calyx ca 0.7–0.9 cm long; tube ca 2 mm long; lobes linear, equal, pubescent outside, glabrous and shining dark violet inside. Corolla ca 2.5–3 cm long, pale blue; tube not curved, ca 9 mm long, gradually widening above, ca 1.9–2.4 cm long, 5-lobed; lobes wavy, ovate, ca 4 mm. Stamens 4; filaments ca 1.5 cm long, included, very hairy. Ovary ca 2 mm long, hairy above; style linear, ca 1.3 cm glabrous; stigma oblique. Capsules not found. **Fig.1**

Table 1: Prominent morphological differences between *Strobilanthes philipmathewiana* with its allied taxa

Characters	<i>S. philipmathewiana</i>	<i>S. kunthianus</i>	<i>S. sessilis</i> var. <i>sessilis</i>	<i>S. sessilis</i> var. <i>sessiloides</i>
Habit	shrubs, to 2 m	bushy, to 0.7 m	shrubs, to 1 m	shrubs, to 1 m
Stem	winged, tomentose	not winged, glabrous	not winged, tomentose	not winged, tomentose
Petiole	auricled	not auricled	not auricled	not auricled
Leaf shape	elliptic-lanceolate	elliptic	ovate	ovate
Leaf base	attenuate	obtuse	subcordate	subcordate
Leaf surface	glandular hairy	glabrous	glandular hairy	glandular hairy
Inflorescence	unbranched or rarely basally branched	branched	branched	branched
Bracts	wine red colour	green	green, red tinge in apex	green
Corolla tube	straight	curved	straight	straight
Corolla lobe	wavy	entire	entire	entire

Type: INDIA, Western Ghats, Kerala, Kozhikode District, REC Para, altitude 1950 m, 5 November 2014, J.Mathew 4176 (holo: MSSRF!; iso: SESH!).

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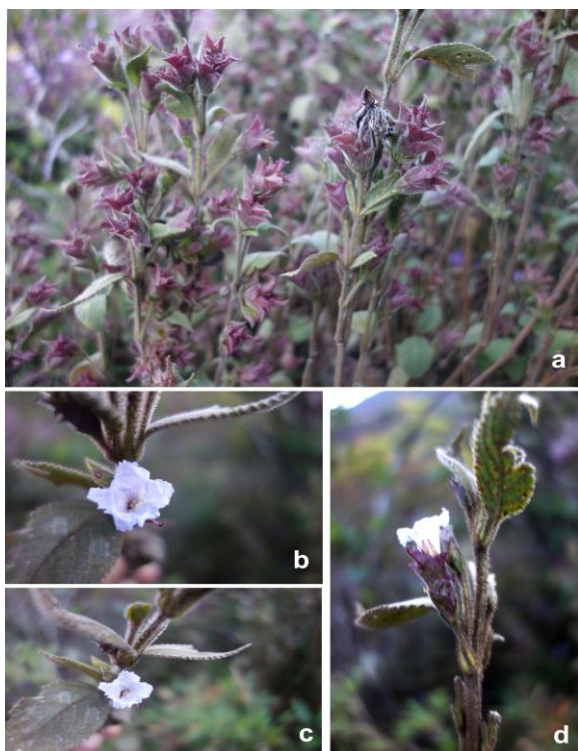


Fig. 1: *Strobilanthes philipmathewiana* J.Mathew & Yohannan: **a.** Plants in natural habitat; **b & c.** Flowering twigs; **d.** Inflorescence side view. Photographed by J.Mathew

Other specimen examined: India: Kerala: S Western Ghats, Kozhikode district, Kanjippara, 9 January 2016, J.Mathew 4699, 4700 (SESH, Mahatma Gandhi University, Kottayam, Kerala).

Etymology: The specific epithet honours Dr. Philip Mathew, Professor of Botany (Retd.), University of Calicut, Kerala, and recognizes his immense contributions to botany, especially in the fields of angiosperm biodiversity and taxonomy.

Distribution and ecology: *Strobilanthes philipmathewiana* is endemic to the Southern Western Ghats, currently known only from two localities from Vellarimala in the Kozhikode District. The species grows in evergreen forests at altitudes of ca. 1800 m in association with *Strobilanthes rubicundus* (Nees) Anders, *Clematis smilacifolia* Wall., *Lobelia leschenaultiana* (Presl) Skottsb. and *Meineckia longipes* (Wight) Webster.

Flowering: November-February

Conservation status: This new species is currently known only from 2 localities of REC Para region of Vellarimala, each separated by 100 m. A total of 90 mature individuals were found in the area. The data gained from the field studies were evaluated according to the IUCN (2012) categorization and at least “vulnerable” status has been proposed for the species.

2. *Hygrophila auriculata* (K. Schum.) Heine var. *alba* (Parmar) P.M. Salim, J.Mathew & Yohannan comb. nova.

Hygrophila R. Br., a swamp weed genus comprising ca. 100 species distributed across the tropical and subtropical world (Jiaqi et al., 2009). According to Karthikeyan et al., (2009), 24 taxa of *Hygrophila* have been recorded in India, of which, 5 taxa viz., *Hygrophila balsamica* (L.f.) E.Hossain, *H. ringens* (L.) R. Br. ex Spreng., *H. ringens* R.Br. subsp. *longifolium* J.Mathew & Kad.V.George, *H. auriculata* (Schumach.) Heine and *H. triflora* (Roxb.) Fosb. & Sachet are recorded from the Kerala, part of southern Western Ghats (Sasidharan, 2013; Mathew & George, 2013). Among those plants, *H. auriculata*, a spectacular medicinal plant is distinguished by its characteristic thorns and strigose hispid leaves / stems. Botanical explorations in the Wayanad forests during 2012–2015 have yielded some interesting specimens of *H. auriculata*. Critical analysis of the literature as well as of herbarium specimens revealed that some of them belonging to an impressive variety of *Hygrophila auriculata* (K. Schum.) Heine, and it represents the rediscovery of Van Rheed’s ‘White’ *Babell schulli* from Malabar after 330 years.

Table 2: Characteristics that separate *Hygrophila auriculata* var. *alba* from *Hygrophila auriculata*

Character	<i>H. auriculata</i>	<i>H. auriculata</i> var. <i>alba</i>
Leaf		
number	8 leaves in a whorl	6 leaves in a whorl
size	6-10 x 2-4 cm	10-20 x 0.9-1.2 cm
margins colour	violet colorations	light green
Stem		
shape	quadrangular	imperfectly quadrangular
internode length	4-6 cm	3-3.6 cm
colour	red	green
Flower		
colour	purple to pink	white
hairs in acanth-aceous mark	1 mm	3 mm



Fig. 2: a & b. *Strobilanthes kunthianus* (Nees) Anders. ex. Benth.; c & d. Plants *Strobilanthes sessilis* Nees var. *sessilis* Hook. f.; e. *Strobilanthes sessilis* Nees var. *sessiloides* (Wight) Clarke. Photographed by J.Mathew

Van Rheedee (1636-1691), the Dutch Admiral of Malabar realized Malabar as the land of spices and medicinal plants and took interest to collect and document the plant wealth of Malabar. The first assortment of 'White' *Babell schulli* was appeared in his second volume of Hortus Malabaricus (Rheedee, 1679). He wrote "there is yet another species of *Babell schulli*, growing in sandy soil which have stalk and leaves light green and not red, but white flowers, somewhat bordering on blue" (Manilal, 2003).

Thereafter, this species remained unknown until it was rediscovered from the *Nandur Madhmeshwar* Sanctuary, Nasik, Maharashtra (Almeida & Almeida, 1986) and Mehsana district in north Gujarat (Parmar, 2008) after 300 years. Parmar ranked this taxon as a variety of *H. schulli* and named as *H. schulli* (Buch. -Ham.) M. R. & S. M. Almeida var. *alba* Parmar. He distinguished it from typical *H. schulli* by its pure white flowers and light green leaves.

Later, *Hygrophila schulli* var. *alba* was reduced to synonymy of *H. schulli* without proper investigation of the type material. In the most recent treatment of the genus *Hygrophila*, variety *alba* as belonging to *H. schulli* was continued (Roskov et al., 2014). A critical examination of types and other materials of *H. schulli* var. *alba* and *Hygrophila schulli* coupled with the materials collected from Wayanad and field observations showed that the former has a distinct warrant to be a good and individual variety. Thus, we argue that Parmar (2008) was correct in treating *Hygrophila schulli* var. *alba* as a distinctive variety, and which should be reinstated.

But there is an ambiguity still remains in the naming of this taxa. Because, M.R. Almeida & S.M. Almeida (1986) intended *H. schulli* as a new combination based on "*Babell schulli* Buch. -Ham., Trans. Linn. Soc. London 14:289. 1825.", "*Barleria longifolia* L., Amoen. Acad. 4: 320. 1759.", "*Barleria auriculata* Schumach., Beskr. Guin. Pl. 285. 1827.", and "*Hygrophila auriculata* (Schumach.) Heine, Kew Bull. 16: 172. 1962." Unfortunately, the status of "*B. schulli*" has been in dispute (invalid or illegitimate), and either way, it cannot serve as a basionym. Therefore, *H. schulli* was superfluous and illegitimate, when published. Therefore, "*H. schulli* var. *alba* Parmar" cannot be used as an accepted name.

Based on the USDA treats, *H. schulli* act as a synonym of *H. auriculata* (Schumach.) Heine (Kew Bull. 16: 172. 1962). Then we can resolve the problem by proposing a new combination to the taxa viz, *Hygrophila auriculata* (K. Schum.) Heine var. *alba* (Parmar) P. M. Salim, J.Mathew & Yohannan *comb. nova*.

***Hygrophila auriculata* (K. Schum.) Heine var. *alba* (Parmar) P.M.Salim, J.Mathew & Yohannan *comb. nova*.**
Hygrophila schulli M. R. Almeida & S.M. Almeida var. *alba* Parmar, J. Econ. Taxon. Bot. 32(1): 149. 2008.

Type: INDIA, Gujarat, Mehsana, from stagnated rain water in swampy habitat near Kadi, Kanajari, 30 sept. 2003, P.J. Parmar 12988 (Holo: CAL; Iso: BSJO! 12988).

Perennials to 2 m tall, unbranched, rooting at lower nodes. Stems erect, hispid, imperfectly 4-angled, green, pubescent with white hairs. Internodes 3-3.6 cm long. Nodes pulvinous, thickly pubescent, with leaves and thorns. Thorns 6-8 per nodes, each with 2-2.6 cm in length. Leaves 6 in each nodes, whorled, Petiole 0.8-1 cm, pubescent; leaf blade linear-lanceolate, light green, 10-20 × 0.9-1.2 cm in size, both surfaces with numerous multicellular hairs, margins entire and

sometimes undulate, apex acute-acuminate, base cuneate; primary veins 12-16 pairs with creamy white-greenish white in colour. Flowers in axillary whorls, 6-8; bracts and bracteoles resembles leaves; bracts pale green, pubescent, 4-5 mm in length. Calyx narrowly campanulate, ca. 0.7-1 cm in length, 4-lobed, lobes linear-lanceolate, pubescent, apex acuminate. Corolla pure white, 5 lobed, 14-17 mm x 4-6 mm in size, tube 10-13 mm x 2 mm wide, glabrous; limb 2-lipped; upper lip bifid and lower lip trifid, acanthaceous mark field in ciliate with 3 mm length. Stamens 4, in didynamous, filaments glabrous, longer pair ca. 6-8 mm, shorter pair ca. 3-4 mm; anther slightly versatile, golden yellow, 2-3 mm. Ovary glabrous; style filiform, ca. 8 mm; stigma simple, 2 -2.2 cm in length. Capsule narrowly oblong, 0.8-2.2 cm, ca. 1.5 mm wide, glabrous, 12-18-seeded. Seeds ca. 3 mm, pubescent. **Fig. 3.**

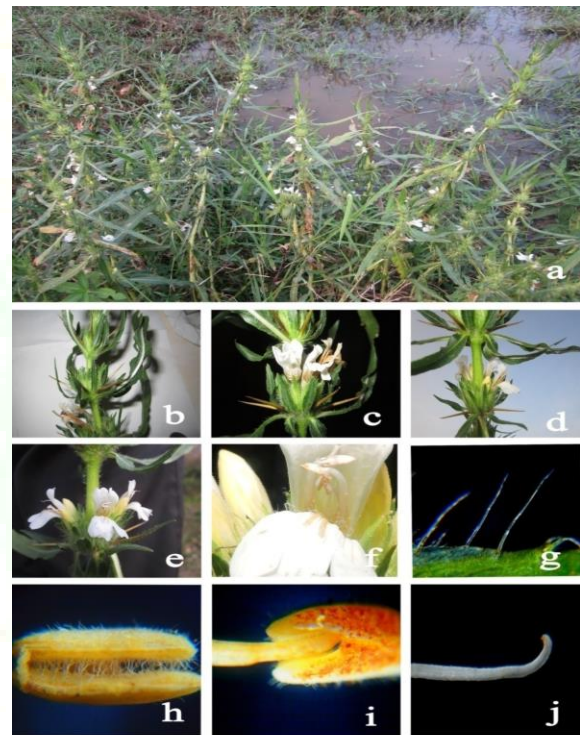


Fig. 3: *Hygrophila auriculata* (K. Schum.) Heine var. *alba* (Parmar) P.M. Salim, J.Mathew & Yohannan: a. Plants in natural habitat; b, c, d & e. Vegetative and flowering twigs; f. Acanthaceous mark regions with hairs; g. Multicellular hairs on leaves; h & i. Stamen; j. Stigma. (a-f. Photographed by P.M. Salim, g-j. Photographed by R. Yohannan)

Flowering & Fruiting: September- January

Distribution and ecology: Found in swampy habitats of stagnated rainwater (altitude ± 860 m) of the Kuzhimoova vayals, 12 km away from Muthanga WLS, Wayanad, south Western Ghats, Kerala, India. It grows in associated with *Lagenandra toxicaria* Dalz. var. *toxicaria* Hook. f., *Colocasia esculenta* (L.) Schott, *Cyanotis axillaris* (L.) D. Don, *Eleocharis retroflexa* (Poir.) Urban ssp. *chaetaria* (Roem. & Schult.) Koyama, *Ludwigia hyssopifolia* (G. Don) Exell and *Paspalum scrobiculatum* L.

Conservation status: *Hygrophila auriculata* var. *alba* is currently known from only six populations in Wayanad, separated by a distance of only 50-60 m. A total of 150 mature individuals were found in the area. According to the IUCN categorization (IUCN 2012), the conservation status of this variety is data deficient. Further survey for this variety is suggested, which would need to be conducted in September to January when

plants are flowering in order to differentiate it from the typical *Hygrophila auriculata*. Here, this taxon faces considerable pressure by habitat fragmentation, invasion of alien species and the scarcity of water.

Additional specimen examined: India: Kerala: South Western Ghats, Wayanad, Kuzhimmoola near Muthanga, \pm 860 m, 15 Jan 2012, P.M. Salim 0405, 0406, 0407 (MSSRF); 10 Feb 2016, R. Yohannan, 3116, 3117 (SN. College Herbarium, Kollam).

3. *Asystasia variabilis* (Nees) Trimen

Asystasia Blume, the genus has about 70 species distributed in the tropics of Old World (Mabberley, 2005; Chowdhery & Bhattacharjee, 2006). According to Sasidharan (2013), six taxa of *Asystasia* have been recorded from the Kerala part of the Western Ghats. Of which, *Asystasia travancorica* Bedd. is strictly endemic to the southern Western Ghats. While the floristic explorations in Kerala, we came across a small population of *Asystasia* characterized by a semi scandent, with elliptic lanceolate leaves and simple raceme at the semi evergreen forests of Peerumedu, near Periyar Tiger Reserve. After critical analysis of the literature as well as of herbarium specimens revealed that, these are belonging to *Asystasia variabilis* (Nees) Trimen, a spectacular taxon hitherto unknown from Kerala and India.

Critical note: In Flora of British India, Clarke proposed a new variety of *Asystasia* viz., *Asystasia chelonoides* var. *quadrangularis*. Subsequently, Gamble (1924); Mohanan (1984); Vajravelu (1990); Mohanan & Henry (1994) are mentioned this plant from Kerala part of Western Ghats and Matthew (1991) from Tamil Nadu. Later, this taxon was reduced to synonymy of *Asystasia chelonoides* Nees without proper investigation of the type material. In the most recent treatment of the genus *Asystasia* in India, variety *quadrangularis* as belonging to *Asystasia chelonoides* Nees was continued (Sasidharan, 2013; GBIF, 2016).

On the other hand, a combination made in Handbook of Flora of Ceylon by Trimen in 1895 viz., *Asystasia variabilis* (Nees) Trimen (3:324) based on *Ruellia variabilis* and *Asystasia gangetica* var. *variabilis* to treat a Sri Lankan species. Now, this name is an accepted name but confined in the Sri Lanka. Critical examination on large number of herbarium sheets and pertinent literature revealed that, our specimen belonging to *Asystasia variabilis*. In fact, the south Indian *quadrangularis* variety and Sri Lankan *A. variabilis* are currently assigned to single taxon, *Asystasia variabilis*.

Asystasia variabilis (Nees) Trimen, Handb. Fl. Ceylon 3:325.1895.

Asystasia gangetica var. *variabilis* Nees in DC., Prod. 11: 165.1847

Asystasia chelonoides sensu Thw., Enum. Pl. Zeyl. 256. 1860

Asystasia nemorum Nees var. *angustifolia* Thw. Ex T. Anders., J. Linn. Soc. Bot. 9: 525. 1867

Asystasia chelonoides Nees var. *quadrangularis* Clarke in Hook.f., Fl. Br. Ind. 4: 494.1885

Stem erect at first upto 1 m high, then semi scandent, sharply grooved on opposite sides, slightly tumid above nodes. Leaves variable, linear-elliptic, to 12-20 x 1.2-2.5 cm, from an acute base tapering into petiole, tip acuminate, thinly hairy above, glabrous below, lateral veins 7- 8 pairs; petiole to 1.8 cm. Raceme terminal, compact, 4-6 cm long; pedicel 1.5 mm, bracteoles similar linear, c. 0.5 cm long, green, acute, pubescent, persistent. Calyx divided to the base or nearly so, lobes 5, linear-lanceolate, 6-8 mm long, acute, densely pubescent on both surface. Corolla tube funnel- shaped, 0.9-

1.5 cm long, bent at base, pubescent, pinkish-violet, lobes 5, ovate oblong, 6-7 x 4-5 mm, lower midlobe broader with two raised ridges. Stamens 4, didynamous, included, filaments 5-7 mm long, with few small hairs, connate at the base in pairs; anthers oblong, 2-3 mm long. Ovary c. 2 cm long, pubescent, 2 celled, ovules 2 in each cell; style linear, 1.5-1.8 cm long, basal portion hairy; stigma 2-fid or subcapitate. Capsule clavate shaped, 2-2.5 x 0.3-0.4 cm, densely pubescent, opening widely in a reflexed curve; seeds 4, 3-4 mm across, compressed angular, orbicular. **Fig. 4.**



Fig. 4: *Asystasia variabilis* (Nees) Trimen: a. Flowering twig; b. In habitat, c, d & e. Leaves; f. Stem; g & h. Flowers in inflorescence; i. Stamen; j & k. Infructescence; l. Seeds (Photographed by J.Mathew).

Flowering & Fruiting: August- March

Distribution and ecology: Found in semi evergreen forests (altitude \pm 1050 m) of the Peerumedu, 50 km away from Periyar Tiger Reserve, Idukki, south Western Ghats, Kerala, India. A small population of 30 plants were grows in associated with *Dicliptera cuneata* Nees, *Lepidagathis incurva* Buch. -Ham. ex D. Don var. *incurva* Manilal & Sivar., *Grenia serrulata* DC., *Celastrus paniculatus* Willd. and *Colocasia esculenta* (L.) Schott.

Table 3: Characteristics that separate *Asystasia variabilis* from *Asystasia chelonoides*

Character	<i>A. variabilis</i>	<i>A. chelonoides</i>
Habit	semi scandent, upto 2.5 m long	erect, 1 m long
Leaf		
form	linear- elliptical	ovate to oval elliptic
size	12-20 x 1.2-2.5 cm	5-12 x 2.1-4.5 cm
hairs	present in upper surface	absent in both surface
Inflorescence		
form	raceme	panicle
length	4-6 cm	6-16.5
Bracts, bracteoles	linear ovate	
Corolla lobes	ovate-oblong	rounded

Specimens examined: INDIA. **Tamil Nadu:** On the way to Melpet-Javadi hills, 880 m.a.s.l., 01-02-1986, *MB Vishwanathan 152867* (MH!); Near Papanasam falls, 800 m.a.s.l., 14-10-1958, *K Subramanyan 13633 & 13634* (MH!); Yercaud, Kiliyur waterfalls, 1380 m.a.s.l., 02-08-1966, *S Karthikeyan 56551* (MH!); Yercaud, Kiliyur waterfalls, 1380 m.a.s.l., 02-08-1966, *S Karthikeyan 56551 & 56552* (MH!); On the way to Kambukudy, 900 m.a.s.l., 08-09-1958, *K Subramanyan 12705 & 12706* (MH!); **Kerala:** Pamba, 1025 m.a.s.l., 24-06-1968, *DB Deb 58007 & 58007* (MH!); Kuttikanam, Peerumaed, 1022 m.a.s.l., 23-11-1967, *K Vivekanandan 59781 & 59781* (MH!); Idukki to Kattapana, 900 m.a.s.l., 26-09-1981, *CN Mohanan & B Ramaniyam 137725* (MH!); Pindimedu, Pooyamkutty, 75 m.a.s.l., 24-12-1988, *P Bhargavan 149304* (MH!); Near the foothills of Agasthyamalai, 900 m.a.s.l., 05-10-1973, *J Joseph 85990* (MH!); Kottur RF, 150 m.a.s.l., 25-09-1973, *J Joseph 80863* (MH!); Kuttikanam, Peerumaed, 1025 m.a.s.l., 20-11-2014, *J.Mathew 5123-5127* (SESH!).

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