



Taxonomy and distribution of *Andrographis longipedunculata* (Acanthaceae)

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Abstract

Andrographis longipedunculata (Sreem.) L.H. Cramer (Acanthaceae), a lesser known endemic species of India is reported here for the first time from Myanmar and twelve more states of India. Also, illustrations, colour photographs, Scanning Electron Micrographs of pollen grains and seeds and a comparative table showing differences between its allied species, *A. echioides* are provided to facilitate accurate identification.

Keywords: *Andrographis*, Distribution, *Indoneesiella*, Myanmar, Taxonomy

Introduction

Sreemadhavan (1967) proposed a new genus, *Neesiella* Sreem. (*nom. illeg.*) to accommodate *Andrographis echioides* (L.) Nees (= *Justicia echioides* L.) and a new species, *Neesiella longipedunculata* Sreem. based on the collection [K. Subramanyam 4696] from Nagpur district in Maharashtra. He later realised that his *Neesiella* (1967) is a later homonym of *Neesiella* Schiffn. (1893) and therefore provided a substitute name, *Indoneesiella* Sreem. in 1968. However, Cramer (1996) reduced it to a subgenus of *Andrographis* Wall. ex Nees and proposed a necessary combination, *A. longipedunculata* (Sreem.) L.H. Cramer.

The present paper is a part of a systematic study on the genus *Andrographis* in India (Gnanasekaran, 2015), which is primarily based on the critical examination of fresh and herbarium specimens housed at BSD, BSI, BSJO, CAL, CALI, E, G, MH, P, RHT, SKU and SUK. The examination of specimens revealed that majority of *A. longipedunculata* specimens have been mistakenly identified as *A. echioides* (L.) Nees, an allied species and also showing an extended distribution from thirteen more states of India hitherto not recorded. Further, it is reported here as an new addition to the Flora of Myanmar for the first time. Thus, detailed taxonomic account along with illustration (**Fig. 1**),

colour and Scanning Electron Micrographs of pollen grains and seeds (**Fig. 2**) and a comparative table showing differences between its allied species is provided here to facilitate accurate identification.

Andrographis longipedunculata (Sreem.) L.H. Cramer, Kew Bull. 51: 555. 1996; Karthik. *et al.*, Fl. Pl. India 1: 3. 2009; U.L. Tiwari & K. Ravik., Taprobanica 6: 132. 2014. Type: INDIA, Maharashtra, Nagpur district, Ambazeri tank, 317 m, 18.11.1957, K. Subramanyam 4696 (holo, MH00000796!; iso, MH00000797–MH00000802!).

Figs. 1,2

Neesiella longipedunculata Sreem., Phytologia 15: 271. 1967, *nom. illeg.*

Indoneesiella longipedunculata Sreem., Phytologia 16: 466. 1968; K.M. Matthew, Fl. Tamilnadu Carnatic 3: 1182. 1983; Kumari in A.N. Henry *et al.*, Fl. Tamil Nadu 2: 150. 1987; Moulali in Pull. & Moulali, Fl. Andhra Pradesh 2: 715. 1997; K.M. Matthew, Fl. Palni Hills: 940. 1999; S.S. Rani & Nazeeruddin in Pull. *et al.*, Fl. Eastern Ghats 4: 436. 2011; Vij. Sank. *et al.*, Pl. Resources Tiruvannamalai Distr.: 473. 2012.

Erianthera longipedunculata (Sreem.) M.R. Almeida, Fl. Maharashtra 4A: 41. 2003.

Herb, to 80 cm high. Stems 4-angled, swollen at nodes, densely glandular-villous. Leaves sessile,

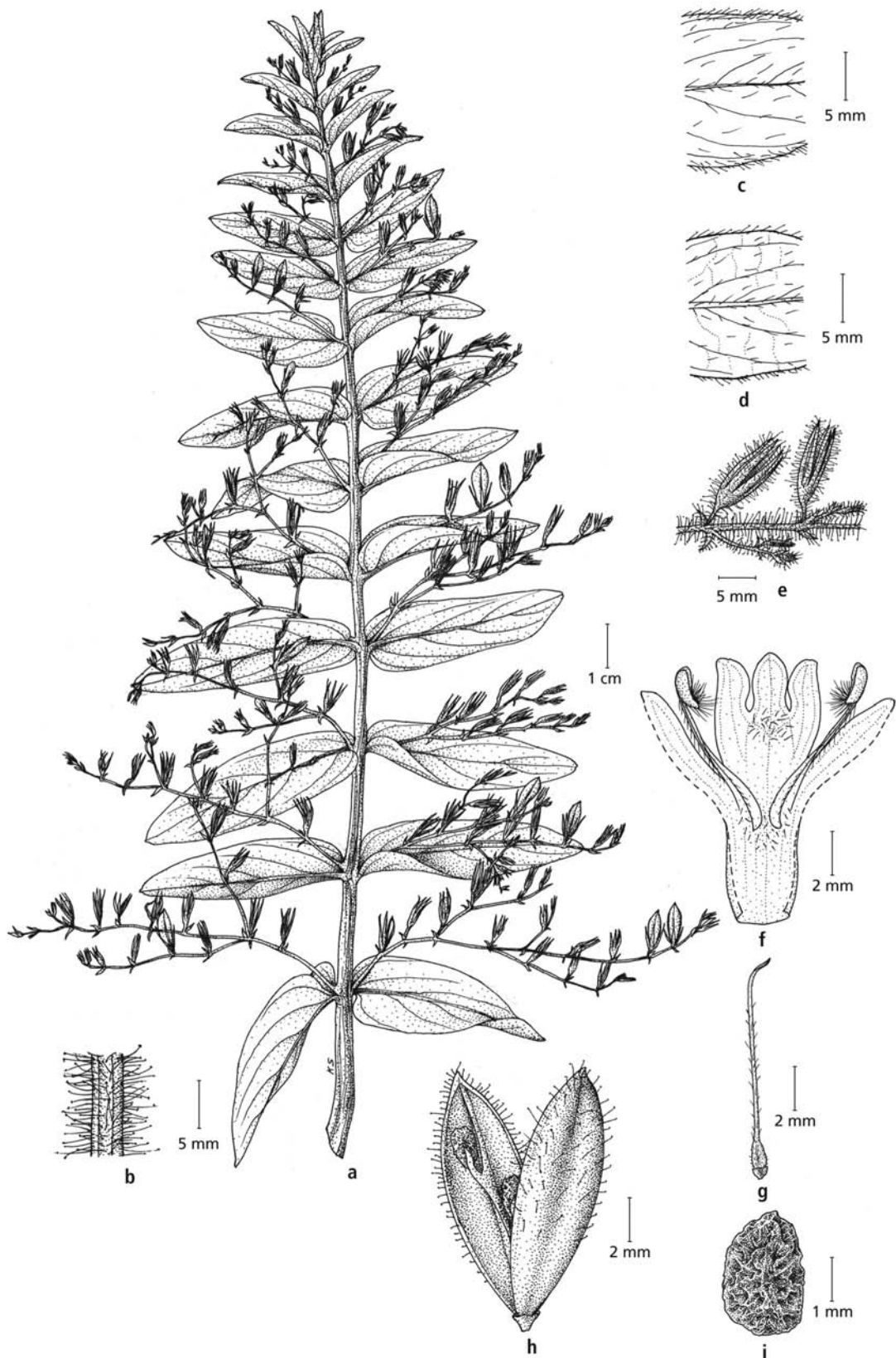


Fig. 1. *Andrographis longipedunculata* (Sreem.) L.H. Cramer: a. Habit; b. Close-up of indumentum on a portion of stem; c,d. Leaf surfaces: c. adaxial, d. abaxial; e. Close-up of indumentum on a portion of inflorescence; f. Corolla – Split-open; g. Pistil; h. Fruit – Split-open; i. Seed (a [s. coll. 9671, MH], b–i [*J.V. Sudhakar* 126914, MH]).

ovate-lanceolate, 2–7.5 × 0.5–2.5 cm, base obtuse, acute or slightly cordate, margins entire, apex acute or obtuse; midrib conspicuous beneath; lateral veins 5–7 pairs, conspicuous beneath, strigulose intermixed with long glandular hairs on both surfaces. Inflorescence racemose, axillary, 4–10 cm long, often branched; axis 4-angled, densely glandular-pubescent; flowers distantly arranged (interstices 0.8–1.5 cm long), twisted at right angles to each other, one-sided; peduncles to 3 cm long, densely glandular-pubescent; pedicels indistinct, stout, 0–2 mm, densely glandular-pubescent. Bracts 2, subulate-lanceolate, 1.3–2.5 × 0.2–0.3 mm, apex acute, glandular-pilose. Bracteoles 2, linear, 0.5–0.8 × 0.05–0.15 mm, apex acute to acuminate, glandular-pilose. Calyx 5-lobed; lobes linear, subequal, 5–8 × 0.3–0.5 mm, margins hairy, apex acute to subacuminate, strigulose inside, glandular-hairy outside. Corolla 2-lipped, 1–1.3 cm across, white; tube prominently ventricose, 6–7 × 1.2–1.8 mm, glandular-hirsute above, glabrous below; upper lip spatulate-oblong, margins entire, minutely 2-lobed (c. 0.5 mm long) at apex, 3.8–4.2 × 2–2.8 mm, glabrous inside, glandular-hirsute outside, 4-veined; lower lip 3-lobed, 4.5–5.5 × 3.5–4.3 mm, margins entire, apex acute or obtuse, glabrous inside except at centre of middle lobe, glandular-hirsute outside, dark purple-striped with yellow shade at centre; middle lobe narrowly ovate, 2–2.2 × 1.5–1.7 mm, hispid at centre, 3-veined; lateral lobes oblong, 1.2–1.4 mm across, 3-veined. Stamens 2, exerted, adnate to base of ventricose portion of corolla tube; filaments 5–7 mm long, distinctly dilated at base, retrorsely pilose above, glabrous below; anthers linear-oblong, 1.8–2.2 × 0.3–0.5 mm, woolly at base, deep purple. Ovary ellipsoid, 0.8–1 × 0.5–0.7 mm, glandular-hairy above, glabrous below, green; ovules 2 in each cell; style 8–10 mm long, sparsely antrorsely bristled-hairy, pinkish; stigma linear, green. Capsules ellipsoid, 8–10 × 3–4 mm, compressed at right angles to septum with a median longitudinal groove, apiculate, glabrous below, glandular-hairy towards apex,

4-seeded; seeds narrowly elliptic-obovoid, 3–3.2 × 1.8–2 mm, base oblique, apex obtuse, very hard, lacunosus (deeply pitted), echinate, glabrous, yellowish brown.

Flowering & fruiting: July–March.

Habitat: Plains, foothills, wastelands and barren ground; ready colonizer; occasional.

Distribution: India [Andhra Pradesh, Bihar, Diu and Daman, Goa, Gujarat, Haryana, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal] and Myanmar.

Conservation Status: *Andrographis longipedunculata* is widespread in the Indian states and is also represented by a large collection in the Indian herbaria. Therefore, it is evaluated here as of '**Least Concern [LC]**' using the IUCN Red List Categories and Criteria version 3.1 (IUCN, 2017).

Etymology: The specific epithet '*longipedunculata*' denotes the long (5 longi) peduncle of the inflorescence.

Inter-relationship: *Andrographis longipedunculata* is morphologically very similar to *A. echioides* and it can be distinguished from this species as given in Table 1.

Specimens examined: INDIA, India Orientalis, *s.die*, Roxburgh s.n. (E00435367, E00435368, images!); India Orientalis, *s.die*, V. Jacquemont 1534 (P03590506, P03590512, P03590512, images!); India Orientalis, *s.die*, R. Wight 2239 (P03590511, image!). **Andhra Pradesh:** Anantapur district, NS Right Canal, 125 m, 26.9.1985, V. Ramakrishnaiah 3558 (SKU); Danduvuri palli, 356 m, 28.12.2009, B. Ravi Prasad Rao & D. Veeranjalanu 35955 (SKU); Chittoor district, Chandragiri, 26.2.1914, *s.coll.* 10102 (MH); Cuddapah district, Palakonda R.F., 19.1.1987, D.A. Moulali 4682 (SKU); East Godavari district, Rampa hills, 26.9.1920, V. Narayanaswami 124 (CAL); Guntur district, Nagarjunakonda hills,

Table 1. Differentiating characters between *Andrographis longipedunculata* and *A. echioides*

Characters	<i>A. longipedunculata</i>	<i>A. echioides</i>
Leaves	Often narrowly ovate-lanceolate	Oblong-linear, oblanceolate or elliptic
Inflorescences	Longer than leaves, to 10 cm long, much-branched; flowers distantly arranged	Shorter or almost equal to leaves, to 5 cm long, simple, rarely branched; flowers comparatively closely arranged
Peduncles	Up to 4 cm long	Less than 1.5 cm long

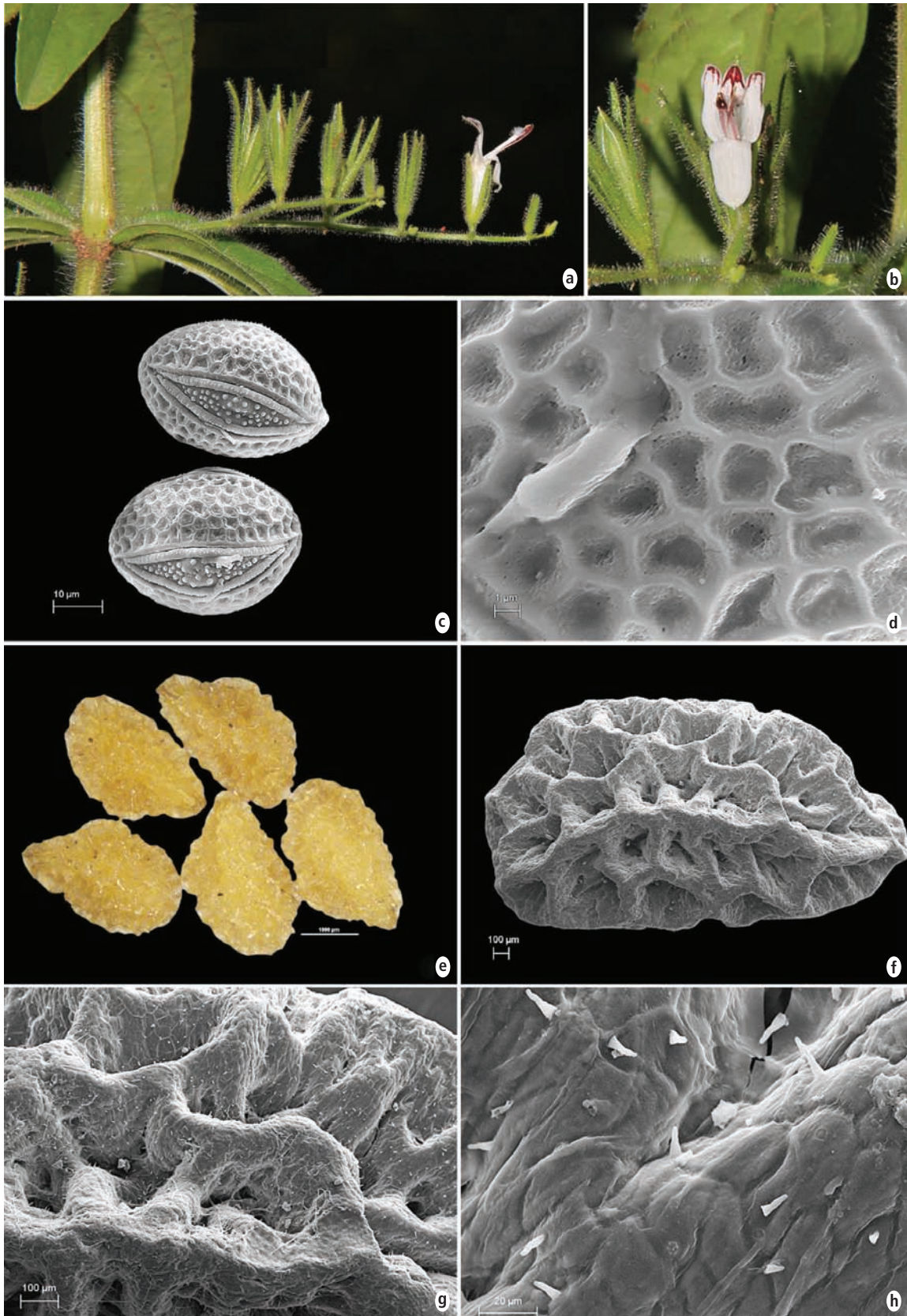


Fig. 2. *Andrographis longipedunculata* (Sreem.) L.H. Cramer: a. Flowering-twig; b. Flower; c,d. SEM micrograph of pollen; e-h. Optical and SEM micrographs of seeds.

500 ft (c. 150 m), 26.11.1961, *K. Thothathri* 9762 (CAL); Mangalagiri, 21.10.1998, *s.coll.* 21616 (SKU); Krishna district, Kondapalli R.F., 13.9.1984, *P. Venkanna* 5306 (MH); Kurnool district, Pathikonda, *s.die*, *A. Lakshmaiah* 27894 (SKU); Erramalai hills, North Dhone R.F., 09.10.1983, *R.R.V. Raju* 1616 (SKU); Nellore district, Chintaldevi, 6.1.1920, *s.coll.* 16422 (MH); Balayapalli, 23.7.1995, *P.M. Rajeswaramma* 16457 (SKU); Prakasam district, Mussiri river side, Vengalapalem, 5.12.1983, *R.K. Mohan* 0338 (CAL); Vishakapatnam district, Anakapalli, 27.1.1916, *s.coll.* 12544 (MH); West Godavari district, Along railway tracks, Undi, Bhimavaram, 160 m, 15.10.2013, *J.V. Sudhakar* 126914 (MH). **Bihar:** Santal Pargams, Trikut hills, 21.9.1992, *J.K. Das* 22297 (CAL); Gajgir, Vipulgiri, 13.9.2003, *P. Pillai* 32850 (CAL). **Diu & Daman:** Diu island, 22.11.1962, *T.A. Rao* 1984 (CAL); Airport: NAGOA, 2.9.1964, *K. Hemadri* 102663 (CAL). **Goa,** North Goa, Near Pernem, 4.9.2015, *Keshav Koli* 413 (SUK). **Gujarat:** Ahmedabad, *s.die, s.coll.* s.n. (CAL); Ahmedabad, 24.10.1903, *G.A. Gammie* 163654 (BSI); Broach district, Gora opposite Narbada, 1.9.1967, *R.D. Pateskar* 110379 (BSI). **Haryana:** Damdama lake, 1.9.1999, *S. Kumar* 95237 (BSD). **Jammu and Kashmir:** Lauki Khad, 17.9.1996, *B.P. Uniyal* 92770 (BSD). **Jharkhand:** Chota Nagpore, Ramghur ghat, 1500 ft (c. 450 m), 19.10.1883, *C.B. Clarke* 33903 (G00304825, image!); Chota Nagpore, Cheteu, tori, November 1880, *J.S. Gamble* 8721 (CAL); Hazaribagh district, Canary hills, 9.11.1964, *K.C. Kanodia* 1026 (CAL); Ranchi district, Duli forest, 20.11.1964, *K.C. Kanodia* 1317 (CAL); Basia, 21.2.1981, *K.C. Malick & al.* 9775 (CAL); Santal Parganas district, Trikat hills, 1600 ft (c. 480 m), 21.9.1992, *J.K. Das & al.* 22297 (CAL). **Karnataka:** Bellary district, Canara and Mysore, *s.die, Law* s.n. (CAL); Jogikallagudda R.F., 3.11.1975, *N.P. Singh* 141315 (BSI); Dharwar district, Dumbal, 20.9.1889, *W.A. Talbot* 1701 (CAL). **Kerala:** Kottayam district, Changanacherry, 28.4.1984, *V.J. Antony* 430 (CAL); Calicut University Campus, 5.5.1987, *K. Laxmana* 3732 (CALI). **Madhya Pradesh:** Indore district, Patalpani falls, 20.10.1962, *A.S. Rao* 83963 (CAL, BSI); Along rail track, Choral, 16.12.1961, *A.S. Rao* 79169 (BSI); Choral beride rail track, 21.10.1962, *A.S. Rao* 84045 (CAL, BSI); Jabalpur district, Water pool, Jabalpur, 26 December ?, *G.T. Puri* 30255 (BSI); Raisen district, Silwani, 29.8.1949, *V. Narayanaswami* 3599 (CAL); Sidhi district, Gandhigram, 22.10.1962, *G. Panigrahi* 5592 (CAL). **Maharashtra:** Akola district, Palodi, Mangarulpur, 2.9.1977, *S.Y. Kamble* 150360 (BSI); Aurangabad district, Near Ajanta caves, 6.11.1961, *Rolla S. Rao* 714007 (BSI); Buldhana district, Sultanpur, 23.9.1982, *P.G. Diwakar* 164085 (BSI); Chandrapur

district, Kolsa Demi Road, 26.1.1972, *B.M. Wadhwa* 127308 (BSI); Khedsinghri Khurdrela, 16.10.1972, *B.M. Wadhwa* 130132 (BSI); Mohrhisam, 21.10.1972, *B.M. Wadhwa* 130237 (BSI); Moharh-Khahda Road, 18.8.1973, *B.M. Wadhwa* 137375 (BSI); Nandurbar district, Shahada, Susari dam, 18.9.2014, *K.V.C. Gosavi* 408 (SUK); Bhaler, 25.11.2015 *K.V.C. Gosavi* 409 (SUK); Nagpur district, Bandra Jungle, Pench National Park, 16.10.1984, *B.D. Sharma* 168707 (BSI); Nashik district, Chopda, 7.1.1957, *S.K. Jain* 11214 (BSI); Osmanabad district, Ghatangiri hill, 12.9.1964, *K.P. Janardhanan* 100656 (BSI); Pune district, Chakan, 15.10.1902, *G.A. Gammie* s.n. (BSI); Solapur district, Nannaj, 19.9.2010, *J. Jayanthi & S.C. Yadav* 198125 (BSI). **Odisha:** Bargarh district, Padarupur, 29.10.1959, *G. Panigrahi* 20525 (CAL); Amarakhol, 3.11.1959, *G. Panigrahi* 20770 (CAL). **Punjab:** Punjab, *s.die*, *J.J. Thomson* s.n. (CAL, P03590498, image!); Bhaeawal, 21.12.1904, *L.D. Garade* s.n. (BSI); Bhaeawal, 21.12.1904, *G.A. Gammie* s.n. (BSI); Bankhandi, 11.11.1959, *T.A. Rao* 10770 (BSD); Gurudaspur district, Pathankot, 500 m, 30.8.1969, *U.C. Bhattacharyya* 39446 (BSD); Hoshiarpur district, Mangunal, 27.8.1970, *O.P. Mishra* 41545 (BSD, image!); Shiwaliks district, Talwara, October 2000, *Surendra Singh* 97132 (BSD). **Rajasthan:** Erimpura, 1.10.1960, *Rolla S. Rao* 66774 (CAL); Dungarpur, 18.11.1957, *J.A. Vasavada* 20357 (BSI); Ajmer district, Nagpahar R.F., 1550 ft (c. 460 m), 3.12.1992, *R.P. Pandey & P.M. Padhye* 11250 (BSJO); Alwar district, Kanwari forest block, 23.10.2003, *P.J. Parmar* 2782 (CAL); Bhilwara district, Badnor, 20.9.1978, *A.N. Singh* 6260 (CAL); Bremer district, Sela forest Block, 375 m, 16.11.1981, *R.P. Pandey* 8047 (BSJO, CAL); Marwar district, Marwar, ? 1868, *G. King* s.n. (CAL). **Tamil Nadu:** Cuddalore district, Willingdon-Tholuthur, 100 m, 6.10.1978, *P. Perumal* 18183 (RHT); Dharmapuri district, Buddireddipatti, 19.12.1913, *s.coll.* 9671 (MH); Ramanathapuram district, Uttarakosamangai, 6 25 m, 1.1.1988, *V. Balasubramaniam* 1508 (MH); Salem district, Mettur hills below dam, 170 m, 17.12.1976, *K.M. Matthew* 5778 (RHT); Mettur, Gonur R.F., 350 m, 21.12.1976, *K.M. Matthew & V. Alphonse Raj* 5995 (RHT); Chinnakalrayans, Thumbal R.F., 500 m, 9.1.1978, *V.A. Amalraj* 11052 (RHT); Thiruvannamalai district, Pakamalai R.F., 175 m, 21.1.1978, *K. Ramamurthy* 52876 (CAL, MH); Vilupuram district, Kallakurichi, Thottiam village tank, 150 m, 24.9.1978, *N. Venugopal & C. Manoharan* 17709 (RHT); Vellimalai slopes (Kalrayan), 500 m, 21.10.1983, *K. Ramamurthy* 79627 (CAL, MH); Kallakuruchi tank land, 300 m, 23.10.1983, *K. Ramamurthy* 79679 (MH); Virudhunagar district, Sirumalai Pudupatti, 22.1.1979, *N.C. Nair* 61079 (CAL). **Uttar Pradesh:** Allahabad district, on the

way to Moluli forest, 20.10.1964, G. Panigrahi 3604 (CAL); Kaligora, 15.12.1964, C.M. Arun 3997 (CAL); Banda district, Kalinpur, December 1902, A.S. Bell s.n. (CAL); Jansi district, Barwasagar, 8.3.1959, T.A. Rao 8342 (BSD, image!); Mirzapur, 9.2.1961, U.C. Bhattacharyya 13605 (BSD, image!). **West Bengal:** Midnapur district, Krishnager, 11.11.1997, T.K. Das & U.P. Samder s.n. (CAL); Chiligarih, 12.11.1997, T.K. Das & U.P. Samader s.n. (CAL). **MYANMAR,** Upper Burma, 12.9.1890, Abdul Huk s.n. (CAL); Upper Burma, February 1892, Abdul Huk s.n. (CAL); Mundu, September 1902, Shaik Mokim 220 (CAL).

Note: Sreemadhavan (1967) indicated that the holotype of this species is housed at CAL. However, both holotype and isotypes are available only at MH.

Geographical Distribution

The scrutiny of literature pertaining to the geographical distribution of the species revealed that it was hitherto reported to occur only in Maharashtra (Sreemadhavan, 1968), Tamil Nadu (Kumari, 1987), Andhra Pradesh (Moulali, 1997), Karnataka (Babu, 2011), Gujarat and Rajasthan (Tiwari & Ravikumar, 2014), and Odisha (Murugan *et al.*, 2017) from India. A thorough examination of specimens housed at various national and international herbaria in addition to the intensive field exploration in different parts of India resulted in ascertaining the occurrence of this lesser known endemic species from thirteen more states namely Bihar, Diu and Daman, Goa, Haryana, Jammu and Kashmir, Jharkhand, Kerala, Madhya Pradesh, Odisha, Punjab, Telangana, Uttar Pradesh and West Bengal from India. Further, while examining the specimens at CAL, senior author found a few specimens of this species collected from Upper Burma (Myanmar) were mistakenly identified as *A. echioides*. Therefore, the species is no longer can be considered as an endemic to India as it is reported here for the first time as a new record for Myanmar, showing an extended distribution of the species from outside of the Indian political boundaries.

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