

MONOGRAPH ON *BRACHYSTEMMA* AND *CEROPEGIA* IN INDIA



Thammineni Pullaiah
Subbiah Karuppusamy
Kondragunta Sri Rama Murthy



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Monograph on
Brachystelma and
Ceropegia in India



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Preface

In recent years, many new species of *Brachystelma* and *Ceropegia* have been described from India. These two genera have not been revised in India and hence an attempt has been made to bring out a consolidated account on *Brachystelma* and *Ceropegia* in India along with other aspects of these two genera.

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1

Introduction

1.1 Introduction

Apocynaceae, including its subfamilies, has about 4800 species and 480 genera (Struwe et al., 1994; Mabberley, 2008). Endress and Bruyns (2000) proposed a revised classification of Apocynaceae, which includes five subfamilies: Rauvolfioideae, Apocynoideae, Periplocoideae, Secamonoideae, and Asclepiadoideae. The subfamily Asclepiadoideae was formerly known as Asclepiadaceae (Endress and Bruyns, 2000). Asclepiadoideae has 177 genera and 3,000 species (Meve, 2002) and has four tribes – Fockeeae, Asclepiadeae, Marsdenieae, and Ceropegieae (Endress and Bruyns, 2000). Asclepiadoideae has the most elaborate and complex flowers of all dicots (Endress, 1994).

The genera *Brachystelma* R. Br. ex Sims. and *Ceropegia* L. were earlier included in the family Asclepiadaceae. In APGIV Classification, the former family Asclepiadaceae has been reduced to subfamily Asclepiadoideae under the family Apocynaceae, and these two genera have been included in tribe Ceropegieae, subfamily Asclepiadoideae. The roughly 710 species of the tribe Ceropegieae (Apocynaceae-Asclepiadoideae) are made up of the four major groups: *Brachystelma* (120 spp.), *Ceropegia* (200 spp.), the stem-succulents popularly known as the stapeliads (350 spp. in 33 genera), and an early-divergent group of about 45 species (Bruyns et al., 2014, 2015).

The genus *Brachystelma* was described by Robert Brown in 1822 based on Meerburgh's *Stapelia tuberosa* from the Cape of Good Hope, South Africa. It is more similar vegetatively to the genus *Ceropegia* (erect/twining leafy herbs with terete stems) than to *Frerea* (pendulous, succulent, leafy herbs with terete stems) or *Caralluma* R. Br. (leafless herbs with fleshy four-angled stems) of the same tribe Ceropegieae. *Brachystelma* has distinctive features from others with slender stems (stout and fleshy in *Frerea*), corolla not tubular (tubular in *Ceropegia*), and relatively narrow lobes (compared to *Ceropegia*). The genus ranks second (in number of species) in the tribe Ceropegieae and is represented by about 160 species distributed chiefly in sub-Saharan Africa, India, Sri Lanka, Southeast Asia, and Northern Australia (Meve, 2002; Venu and Prasad, 2015) but missing in Arabia (Meve, 2002; Masinde, 2007; Mabberley, 2008).

The genus *Ceropegia* Linnaeus (1753: 211), the largest genus in the tribe Ceropegieae (Asclepiadoideae, Apocynaceae), is represented by 244 taxa worldwide (cf., The Plant List, 2013), distributed only in the Old World ranging from the Spanish Canary Islands in the West, through central, southern, and northern Africa, Madagascar, Arabia, India, Southeastern Asia and Southwestern Pacific region (including Papua New Guinea, Indonesia, and Philippines), and Northeastern Australia (Ansari, 1984;

Meve and Liede-Schumann, 2007; Murthy et al., 2012; Bruyns et al., 2015). *Ceropegia* species are found in subtropical Africa toward the eastern side of the continent (Dyer, 1983; Bruyns, 2003; Bruyns et al., 2015). Significant lantern flower diversity is also found in Madagascar and in the Indian subcontinent (Bruyns, 2003; Murthy et al., 2012; Bruyns et al., 2015). *Ceropegia* spp. have certain universally used names, viz., lantern flower, Christensen parasol flower, parachute flower, bushman's pipe, string of hearts, snake creeper, wine-glass vine, rosary vine, necklace vine flower, Chinese lantern, lantern plant, trap flowers, and pitfall trap flowers (Yadav, 1996; Quattrocchi, 2000). The maximum diversity of *Ceropegia* is found in subtropical Africa toward the eastern side of the continent where more than 50 species have been reported (Dyer, 1983). Apart from this region, significant species diversity occurs in Madagascar and in the Indian subcontinent (Bruyns, 1997).

In China, there are 17 species with 2 species overlapping with India (Li et al., 1995). In India, there seems to be two major distributions of this genus, the Himalayan region and Peninsular region. The Himalayan species do not possess tubers and are non-succulent and herbaceous (Bruyns, 1997).

Ceropegia was revised by Huber (1957), who recognized 153 species in 21 sections, including 1 for the 6 species of *Riocreuxia*, which he included in *Ceropegia*. Apart from Huber's placing of *Riocreuxia* in *Ceropegia* (from where it was removed again by Dyer, 1980), the generic circumscription of *Ceropegia* has not been controversial, as the generic synonymy of *Ceropegia* shows (Huber, 1957; Dyer, 1980). Huber's sections (Huber, 1957) have not been used by any subsequent authors, with Dyer (1980) dismissing Huber's emphasis on pubescence as having led to 'some unnatural groupings'. Exploration since 1957 has unearthed much new information, from which regional revisions were published by Ansari (1984) for India; Bruyns (1985, 1986, 1989) for the former Cape Province in South Africa, the Canary Islands, the Arabian Peninsula, and Namibia, respectively; Dyer (1980, 1983) for Southern Africa; Archer (1992) and Masinde (2012) for East Africa; and Forster (1988) for the single Australian species.

Many new species of *Brachystelma* and *Ceropegia* have recently been described from India. These two genera have not been revised in India and hence an attempt has been made to bring out a consolidated account on *Brachystelma* and *Ceropegia* in India along with other aspects of these two genera.

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2

Brachystelma Taxonomy

2.1 Introduction

The genus *Brachystelma* belongs to the tribe Ceropegieae of the subfamily Asclepiodoideae of the family Apocynaceae. The name *Brachystelma* comes from the Greek words “*brachy*” (short) and “*stelma*” (crown), a description of the short corona in the flower of some species. The genus *Brachystelma* was described by Robert Brown in 1822 based on Meerburgh’s *Stapelia tuberosa* from the Cape of Good Hope, South Africa. It is more similar vegetatively to the genus *Ceropegia* (erect/twining leafy herbs with terete stems) than to *Frerea* (pendulous, succulent, leafy herbs with terete stems) or *Caralluma* R. Br. (leafless herbs with fleshy four-angled stems) of the same tribe Ceropegieae. *Brachystelma* has distinctive features from others with slender stems (stout and fleshy in *Frerea*), corolla not tubular (tubular in *Ceropegia*) and the lobes relatively narrow (compared to *Ceropegia*).

The members of *Brachystelma* are essentially herbaceous, bearing medium-sized tubers and fleshy roots, stems terete, unbranched to 1.5 m high (a couple of them are twiners) with opposite leaves; variedly ornamented flowers, either solitary or few (more than 20 flowers in *B. swarupa*), usually in umbels, free calyx lobes, corolla tube absent, rarely much smaller (*B. brevitubulatum* and *B. parviflorum*); lobes usually broad (filiform in *B. attenuatum*), glabrous (*B. elenaduense* and *B. mahajanii*), hairy (*B. laevigatum*, *B. vartakii*, and *B. naorojii*) and with striations (*B. nallamalayana*), gorgeously colored (brown/black with pink hairs in *B. malwanense*; white to whitish-pink in *B. vartakii*; deep purple in *B. elenaduense*; greenish yellow in *B. mahajanii*), either spreading and star-like (*B. penchalakonense* and *B. pullaiahii*), rarely reflexed and the whole flower resembling the Ashoka emblem (*B. ciliatum*) or fused at the tips to give the appearance of a bird’s cage (*B. brevitubulatum*, *B. kolarense*, and *B. malwanense*), and corona uniquely structured and brilliantly colored (yellow in *B. pullaiahii*, greenish or reddish-yellow in *B. penchalakonense*, black in *B. nallamalayana*, pinkish in *B. vartakii*, greenish yellow spotted purple in *B. mahajanii*), biseriate, outer cup-like, either annular or angled, shallowly undulate or five-lobed (which is often further lobed), inner forming a cup or not, with five simple oblong segments, incumbent over stigma; pollen masses solitary in each locule, with extra pellucid margins on the inner side of pollinia. Follicles are solitary or in pairs, linear, bearing comatose seeds. On the whole, with brilliant display of corolla and coronal structures, they appear small but beautiful (Venu and Prasad, 2015).

The first account of Indian *Brachystelma* was presented by Hooker, enumerating seven of them discovered by him; four species from peninsular India, three of them based on Beddome’s collections (*B. glabrum*, *B. brevitubulatum*, and *B. volubile*)

and one of Law's collection (*B. maculatum*); two from northwestern India based on Royle's collections (*B. parviflorum* and *B. attenuatum*) and one from sub-Himalaya (Uttar Pradesh) based on Hamilton's collection (*B. laevigatum*). All these species exhibit either erect (five species) or twining habit (two species). They show highly restricted distribution and are yet to be collected outside the type localities. Hooker had stated that his specific descriptions were "imperfect" because these species have very complex coronal processes and he faced difficulties in the description of the colors as well as coronal structures of the flowers in dried specimens. He assumed that the future explorers, with newer collections and dissections on fresh materials, would possibly enrich diagnostics and species delimitations.

Hooker (1883) in his *Flora of British India* (volume 4, page 65) rightly pointed out that there might be many species of this singular genus in India, which owing to their slender habit and inconspicuous flowers may be overlooked.

As predicted by Hooker, later published floras added a few more new species, *B. bourneae* and *B. rangacharii* by Gamble (1921) from Madras Presidency and *B. pauciflorum* Duthie (1911) from the Bahariach district in Uttar Pradesh. Thus, of the 10 species listed until the 1930s, excluding 2, which have been claimed to be recollected—*B. volubile* from Kadapa hills, Andhra Pradesh (Kullayiswamy et al., 2012) and *B. brevitybulatum* from the Tiruvannamalai district, Tamil Nadu (Vijayasankar et al., 2003)—others remained hidden and evaded recollections by the explorers. Unfortunately, the latter Floras (Sharma et al., 1984; Srinivasan et al., 1987; Hanumanthappa, 1997) merely cited these species based on the old, often single collections cited by earlier workers. Even the generic review was done based on old collections in the revision of *Asclepiadaceae* (Jagtap and Singh, 1999), with no additional data. It is pertinent to mention that many species are devoid of description on intricate details regarding coronal structures and fruits/seeds crucial for better delimitation of species and perhaps the genus itself. *B. attenuatum* and *B. parviflorum* are based on mere illustrations (both in Wight herbarium) and without any specimens; an illustration along with a single collection as old as 200 years is the basis of description for *B. laevigatum*; *B. pauciflorum* has neither a specimen nor an illustration for the basis of the name. We have nothing but representation of types in the case of *B. bourneae*, *B. glabrum*, *B. maculatum*, and *B. rangacharii*. This has in fact forced reconsideration on their continued existence in India (Venu and Prasad, 2015).

There were no additions in Indian *Brachystelma* for almost 40 years (1930–1970), but altogether 13 taxa were added between 1970 and 2015 and another 7 species in the year 2016 alone (Table 2.1). It is unfortunate that except for *B. ciliatum*, other names are associated with single collections and single reports.

Till date, 33 species have been reported from India (majority from Peninsular India (Table 2.1); 31 of them are endemic and 30 (about 94%) had no recollections after the types (Venu and Prasad, 2015; Prasad et al., 2016, 2017). In the Botanical Survey of India, Pune Herbarium, apart from type specimens, there is only one specimen of *Brachystelma*. In Madras Herbarium (apart from type specimens), there are only 7 specimens of *Brachystelma* to which 3 specimens have been added recently. *Brachystelma laevigatum* has no type specimen. Even a description as mentioned by Duthie is based on only one specimen. For many species there is only flower description and no description of fruit, e.g., *B. penchalakonense*. When asked about the situation, authors of this species informed us that they could collect only two specimens. The same is the case for many other species. The majority of the species occur in small

TABLE 2.1

List of New Species/New Records of *Brachystelma* Species from India Between 1970 and 2017

1971–1980

1. *B. elenaduense* Char, Proc. Indian Sci. Congr. Assoc., 1971, **58**, 435 ex Sathyan, Curr. Sci., 1978, **47**(24), 965.

1981–1990

2. *B. ciliatum* Arekal & T.M. Ramakrishna, Curr. Sci., 1981, **50**, 145.
3. *B. kolarensis* Arekal & T.M. Ramakrishna, Proc. Indian Acad. Sci., Plant Sci., 1981, **90**, 203.

1990–2001

4. *B. malwanense* S.R. Yadav & N.P. Singh, Kew Bull., 1993, **48**, 59.
5. *B. naorojii* P. Tetali et al., Rheedea, 1998, **8**, 75.
6. *B. swarupa* K.K. Kumar & Goyder, Kew Bull., 2001, **56**, 210.

2011–2018

7. *B. pullaiyahii* B.R.P. Rao et al., Taiwania, 2011, **56**(3), 223.
 8. *B. nallamalayana* K. Prasad & B.R.P. Rao, J. Threat. Taxa, 2013, **5**(14), 4904.
 9. *B. penchalakonense* Rasingam et al., Kew Bull., 2013, **68**, 663.
 10. *B. mahajanii* Kambale & S.R. Yadav, Kew Bull., 2014, **69**(1), 9493 (2).
 11. *B. vartakii* Kambale & S.R. Yadav, Kew Bull., 2014, **69**(1), 9493 (4).
 12. *B. annamacharyae* Prasad et al., Nord. J. Bot., 2015, **34**, 360.
 13. *B. seshachalamense* Prasad & Prasanna, Bangladesh J. Plant Taxon., 2016, **23**, 53.
 14. *B. matthewianum* Bruyns & Britto, Haseltonia, 2016, **22**, **48**, 51.
 15. *B. rapinatianum* Bruyns & Britto, Haseltonia, 2016, **22**, **48**, 50.
 16. *B. saldanhae* Bruyns & Britto, Haseltonia, 2016, **22**, **48**, 52.
 17. *B. gondwanense* Govekar et al., Rheedea, 2016, **26**, 145.
 18. *B. nigdianum* Raja Kullayisw et al., Kew Bull., 2016, **71**, 1.
 19. *B. shrirangii* Kambale et al., Rheedea, 2016, **26**, 145.
 20. *B. mahendragiriense* Prasad et al., Rheedea, 2017, **27**, 135.
 21. *B. ananathapuramense* Prasad et al., Kew Bull., 2018, **73**, 16.
 22. *B. vemanae* A. Madhusudhana Reddy, M.V. Suresh Babu & K. Prasad, Nordic J. Bot. 2018, **36**, 1.
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areas with localized populations. There is also a chance that many species might be evading collections because they are small, tender, and delicate with short growing/flowering periods, and grassier than any distinctive appearance in grasslands/grass-dominated habitats. It is unfortunate that grasslands/grass-dominated habitats, where its members often thrive, are regarded as waste and unproductive with no worthwhile protection. They are encroached upon for agriculture and often fragmented by habitations, urbanization, forest fires, and invasive species. The habitats are also prone to elimination since many grass species, primarily those of *Cymbopogon*, are harvested as fodder or for thatching by locals. There is the likelihood of these species being removed along with them. The edible tubers of the members of this genus and allied genus *Ceropegia*, known variedly as *Nematai*, *Nematigaddalu*, *Potha*

Jougu Nimatayalu, *Petta Jougu Nimatayalu*, *Singati galya*, are often dug out by the locals. Wild animals, rodents, wild boar, and langurs also relish these tubers and thus threaten their natural regeneration.

Many focused publications on endemic and threatened species of India surprisingly omitted this genus as a whole (Ahmedullah and Nayar, 1987; Nayar and Sastry, 1987–1990). Rao et al. (2003) and Nayar (1996) placed *B. bourneae* under “indeterminate” and “possibly extinct” categories, respectively. In spite of their rarity and distinctiveness from African *Brachystelma* (Meve, 2007; Surveswaran et al., 2009), they were neither considered for any focused collection nor regarded for IUCN conservation status. The genus as a whole falls in the most deserving zone for focused conservation. The whole group is to be attempted in a project mode primarily for recollections of all the documented species, taxonomic revision, assessing their distribution in the field and assigning IUCN conservation status, promoting studies on coronal structures, pollination ecology, *ex situ* conservation, and rehabilitating them in protected natural habitats by acclimatizing and multiplying them in gardens, thereby giving a whole insight into their taxonomy and conservation. They are true blinking stars of angiosperms and require due care.

In India, *Brachystelma* is represented by 33 species and, 31 of them are endemic to the country (Venu and Prasad, 2015; Prasad et al., 2016, 2017, 2018). Duthie (1911) reported two species of *Brachystelma* from the Upper Gangetic Plain. Gamble (1923) described six species of *Brachystelma* from Presidency of Madras. S.R. Srinivasan (1987) reported four species of *Brachystelma* from the state of Tamil Nadu. Ramakrishna et al. (1995) reported seven species of *Brachystelma* from the state of Karnataka. Jagtap and Singh (1999) in Fascicles of Flora India reported 14 species of *Brachystelma* from India. Karthikeyan et al. (2009) listed 17 species of *Brachystelma* in India. Pullaiah et al. (2011) reported three species of *Brachystelma* from Eastern Ghats. The genus is now represented by 9 species in Eastern Ghats (Hooker, 1883; Gamble, 1921; Rao et al., 2011; Prasad and Rao, 2013; Rasingam et al., 2013; Prasad et al., 2017). Four species are with twining habit, namely *Brachystelma brevitybulatum* Hook. f., *B. nigidianum* Kullayis., *B. seshachalmensis*, and *B. volubile* Hook. f., which are endemic to Tamil Nadu and Andhra Pradesh, respectively. These species were recollected by Kullayiswamy et al. (2016) (*B. volubile*, Tirumala Hills, Andhra Pradesh) and Vijayasankar et al. (2003) (*B. brevitybulatum*, Tiruvannamalai District, Tamil Nadu). Singh et al. (2015) reported that 16 species of *Brachystelma* are endemic to India. Sasidharan (2004) recorded only one species of *Brachystelma* (*B. swarupa*) from Kerala.

2.2 Systematic Enumeration

Brachystelma R.Br., Bot. Mag. tab. 2343. 1822. *nom. cons.*

Herbs erect or twining, perennial. Rootstock usually a subglobose tuber (sometimes a cluster of swollen roots). *Leaves* opposite, sessile, or subsessile. *Inflorescence* umbel-like or raceme-like. *Pedice* slender, short. *Calyx* with 5 basal glands. *Corolla*

campanulate to subrotate; lobes erect or spreading, valvate. *Corona* double, attached to staminal column, outer series of 5 deeply 2-cleft lobes exceeding staminal column, inner series of 5 oblong lobes incumbent over stigma head, not or hardly exceeding staminal column. Filaments connate into a short tube; anthers without membranous apex; pollinia 2 per pollinarium, erect or ascending, with a translucent margin. Stigma head depressed. *Follicles* often linear, usually paired. *Seeds* comose.

Key to the species

- 1a. Erect herbs; not branching; flowers axillary or terminal umbels.....2
- 1b. Climbing herbs; sometimes branching; flowers in axillary cymes29
- 2a. Corona without any processes, shortly toothed.....3
- 2b. Corona with five subulate lobes, undulate or toothed7
- 3a. Flowers solitary; corolla deeply 5-lobed4
- 3b. Flowers 3-56
- 4a. Flowers c. 2 cm in diameter; leaves c. 5 cm long **B. attenuatum**
- 4b. Flowers c. 0.5 cm in diameter; leaves c. 10 cm long5
- 5a. Corolla dark purplish, glabrous, margins recurved;
corona 5-toothed **B. pauciflorum**
- 5b. Corolla purplish brown, villous within, margin not recurved;
corona irregularly toothed **B. parviflorum**
- 6a. Corolla lobes narrowly lanceolate; cup-like outer corona raised above the
corolla tube **B. saldanhae**
- 6b. Corolla lobes linear; corona lobes not raised above
the corolla tube..... **B. glabrum**
- 7a. Plants less than 5 cm high; corolla lobes more than 1.5 cm long,
cage globular **B. ananthapuramense**
- 7b. Plants more than 5 cm high; corolla lobes less than 1.2 cm long,
cage conical 8
- 8a. Corolla glabrous; stems pubescent at maturity.....9
- 8b. Corolla puberulous within; stems glabrous at maturity10
- 9a. Corolla purplish brown; stamens and anthers deep yellow **B. swarupa**
- 9b. Corolla purple with yellow or white spots; stamens and anthers orange red:
- 10a. Leaves linear or linear-lanceolate; flowers in terminal umbels; corolla
reflexed; outer corona cupular 11
- 10b. Leaves ovate-oblong; flowers axillary, in 3-flowered cymes; corona 5-lobed,
yellow 12
- 11a. Flowers solitary on axils; interstaminal corona lobes deeply divided, erect;
pollinarium with a winged corpusculum..... **B. vemanae**
- 11b. Flowers 2-4 on axils; interstaminal corona lobes not divided, pendulous;
pollinarium without winged corpusculum **B. ciliatum**
- 12a. Leaves minute, subulate; flowers sessile..... **B. laevigatum**
- 12b. Leaves filiform to lanceolate, acute..... 13
- 13a. Herbs up to 30 cm high; leaves to 2.8 cm long; flowers brightly colored 15

- 13b. Herbs up to 80 cm high; leaves to 19 cm long; flowers pale white with black spots..... **B. nallamalayana**
- 14a. Tubers small, <4 cm in diameter; flowers with purple spot on the corolla lobes **B. kolarense**
- 14b. Tubers large, >4 cm in diameter; flowers without purple spots on the corolla lobes 14
- 15a. Outer corona 5-lobed, densely ciliate **B. annamacharyae**
- 15b. Outer corona cupular, slightly 5-lobed with sparse long white hairs..... **B. naorojii**
- 16a. Corolla lobes tapering; connate or twisted at the apex 16
- 16b. Corolla lobes free at apex; lobes not broad at base 24
- 17a. Plants up to 15 cm high; leaves up to 1 cm broad; flowers 1-3 in axillary node 17
- 17b. Plants up to 30 cm high; leaves up to 2.5 cm broad; flowers usually four..... **B. malwanense**
- 18a. Peduncle present; cyme up to 5-flowered; corolla base urceolate, lobes free **B. rapinatium**
- 18b. Peduncle absent; cyme 3-flowered; corolla base campanulate, lobes free or connate..... 18
- 19a. Corolla glabrous..... 19
- 19b. Corolla hairy 20
- 20a. Flowers pendulous; corolla connate, hairy at margins..... **B. gondwanense**
- 20b. Flowers erect; corolla spreading, densely hairy on the surface and margins **B. vartakii**
- 21a. Corona glabrous..... 21
- 21b. Corona hairy 22
- 22a. Inflorescence 1–8-flowered, drooping; bract green, hairy at tip, persistent; sepals subulate; corolla lobes ovate, yellow but green at base; corona greenish yellow, blotched purple inside and outside **B. mahajanii**
- 22b. Inflorescence 2-flowered at every node, upright; bract greenish pink, glabrous, caducous; sepals triangular-acuminate; corolla lobes oblong-ovate, yellow, mottled dull/bright pink at base; coronal cup blackish yellow **B. mahendragiriensis**
- 23a. Thin-stemmed; staminal corona short; petals connate **B. shrirangii**
- 23b. Thick-stemmed; staminal corona long-lobed, deeply indented toward the center; petals spreading 23
- 24a. Corolla deep yellow, slightly pubescent within; corona lobes notched above **B. megamalayanum**
- 24b. Corolla purple with yellow tips, glabrous; coronal lobes simple **B. matthewianum**
- 25a. Flowers sessile or subsessile; corolla lobes linear 25
- 25b. Flowers peduncled; corolla lobes not linear 28
- 26a. Flowers 3–5 or less; corolla lobes 3 mm long, with purple hairs within 26

- 26b. Flowers 5 or more; corolla lobes 9–10 mm long, white villous within **B. rangacharii**
- 27a. Corolla tube ash-colored, corona pure yellow **B. pullaiahii**
- 27b. Corolla tube other than ash-colored, corona greenish or reddish yellow 27
- 28a. Corolla tube with radial compressions, dark green colored, lobes with white hairs along the margins; corona cupular, staminal corona lobes shorter than anthers **B. penchalakonense**
- 28b. Corolla tube without radial compressions, green and red spotted, lobes with purple hairs along margins; corona annulate, staminal corona lobes projecting above anthers **B. maculatum**
- 29a. Corolla lobes narrowly triangular, hairs on lobes **B. bourneae**
- 29b. Corolla lobes lanceolate, glabrous within **B. elenaduense**
- 30a. Corolla tube base quite flat, bulging limitedly with a constricted neck; more than 1 cm long 30
- 30b. Corolla tube campanulate; less than 5 mm long 31
- 31a. Calyx segments 9–10 mm long; corolla tube urceolate; corona reddish maroon; follicle connate apically **B. nigidianum**
- 31b. Calyx segments 5 mm long; corolla tube slightly bulged; corona purplish; follicle divergent **B. volubile**
- 32a. Corolla tube glabrous; lobes connate at apex, glabrous, interstaminal corona glabrous; staminal corona flesh colored **B. brevitubulatum**
- 32b. Corolla tube with a ring of hairs around the corona and pubescent inside; lobes spreading, hairy; intrastaminal corona with hairs; staminal corona lemon yellow **B. seshachalamense**

Brachystelma ananthapuramense Prasad et al., Kew Bull. 73: 16. 2018.

Type: India, Andhra Pradesh, Ananthapuramu district, Gorantla hills, 800 m, 8 June 2014, A.N. Swamy & K. Prasad 44922 (holotype CAL; isotype SKU).

Etymology: The new species is named after the type locality Ananthapuramu, which is a part of the Southern Deccan plateau of Andhra Pradesh.

Dwarf perennial herb, 2–5 cm tall. *Tubers* globose or subglobose, *c.* 3 × 2 cm, pale white, with a few short roots. *Stem* short, erect, solitary, unbranched, pubescent, or glabrous; internodes *c.* 3 mm, short. *Leaves* light greenish brown, opposite-decussate, subsessile, oblong-lanceolate, elliptic-lanceolate, or ovate-lanceolate, 2–5 × 0.5–1 cm, apex acute or acuminate, margins and midrib below with hairs or glabrous. *Inflorescence* extra-axillary, sessile, solitary flower either side of the node; bract small, greenish pink, subulate, 0.2–0.4 mm long, acute, persistent, bracteoles absent. *Flowers* large, erect; pedicels short, greenish pink, cylindrical, 3–4 mm long, less than 1 mm broad, pubescent. *Calyx* gamosepalous, green or greenish pink, glabrous; sepals ovate-lanceolate or linear-lanceolate or subulate, 1–1.5 × 0.6–0.8 mm, acute. *Corolla* divided near to base, uniformly purple but darker inside; corolla tube much shorter than the lobes, *c.* 1 mm long; corolla lobes erect, connate at apex to form a globose cage, linear, 1.5–2.5 × 0.1 cm, acute, margins recurved, glabrous outside, and puberulous and sparingly white pilose within. *Corona* biseriate, 5-angled, uniformly dark purple, and densely

pubescent; interstaminal corona cup-shaped, 2–2.5 mm across, 5-lobed near to the middle; lobes erect, triangular, thickened in middle, *c.* 1 mm long; staminal corona included in the interstaminal corona cup, 5-lobed; lobes incurved, narrowly triangular, 0.6–0.8 mm long, incumbent, and adpressed on the anther lobes. *Pollinium* yellow, subglobose or oblong-ovoid, 0.2–0.4 × 0.2 mm, with pellucid lateral margin, basally attached to corpusculum by short, tubular caudicles. *Follicles* solitary or paired, cylindrical, tapering toward the apex, 6–8 cm long. *Seeds* comose, narrowly elliptic, 4–5 × 2–3 mm (Figures 2.1 and 2.2).

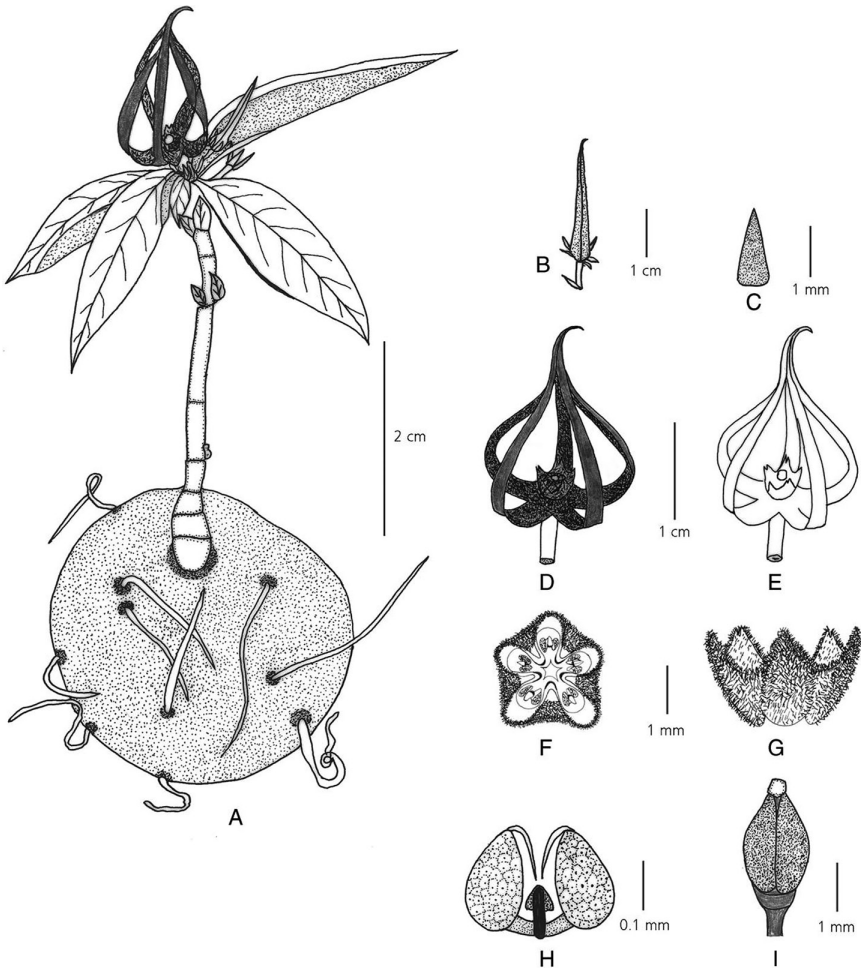


FIGURE 2.1 *Brachystelma ananthapuramense* Prasad et al.: (A) Habit, (B) Flower bud, (C) Calyx lobe, (D) Flower, (E) Flower without hairs, (F) Corona top view, (G) Corona side view, (H) Pollinia, and (I) Gynostegium. (Reproduced from Prasad, K. et al., *Kew Bull.*, 73, 16, 2018. With permission from Trustees of the Royal Botanic Gardens, Kew.)

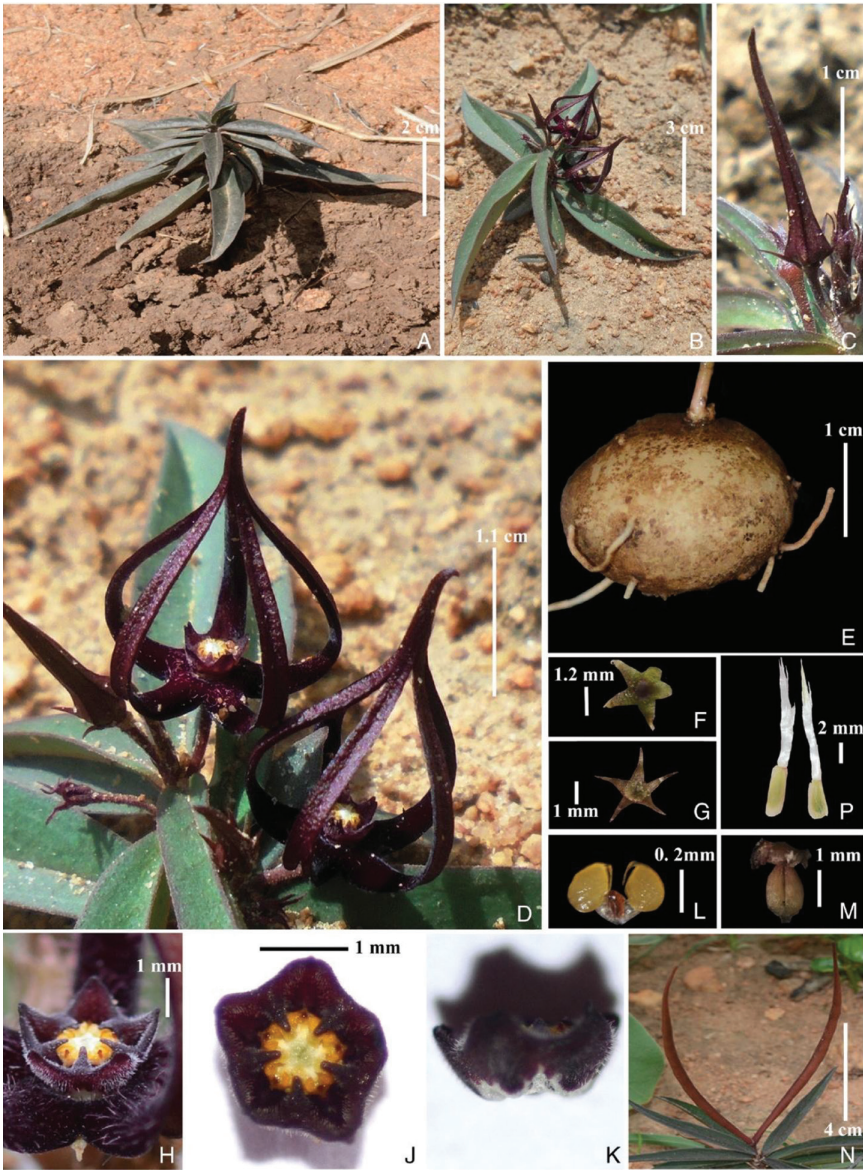


FIGURE 2.2 *Brachystelma ananthapuramense* Prasad et al.: (A) Habit, (B) Flowering plant, (C) Flower bud, (D) Flowers, (E) Tuber, (F & G) Calyx lobes, (H–K) Details of corona, (L) Pollinia, (M) Gynostegium, (N) Follicles, and (P) Seeds. (Reproduced from Prasad, K. et al., *Kew Bull.*, 73, 16, 2018. With permission from Trustees of the Royal Botanic Gardens, Kew.)

Found growing on black and red mixed soils in open, dry deciduous forests at an altitude of 800 m a.s.l. The common associates include *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult., *Tripogon bromoides* Roth, *Randia dumetorum* (Retz.) Lam., *Euphorbia fusiformis* Buch.-Ham. ex D. Don and *Drimia* spp.

Fl. & Fr.: May–July.

Andhra Pradesh: Ananthapuramu distr., Gorantla hills, 800 m, A.N. Swamy & K. Prasad 44965 (SKU), B.R.P. Rao & A.N. Swamy 45011 (SKU).

Note: *B. ananthapuramense* is morphologically similar to the *B. kolarensis* complex but differs by its small habit, short internodes, large flowers with more than 1.5 cm long corolla lobes, globular cage, and densely pubescent corona.

IUCN Category: The species has a restricted distribution with more than 100 individuals in the Gorantla hills of Ananthapuramu, and further explorations in the adjacent hill tracts are necessary to ascertain its status. The current known habitat is prone to annual forest fires and grazing. Being edible, its tubers are harvested heavily by local people and also ploughed out by wild animals. It is currently categorized as Data Deficient (DD) (Prasad et al., 2018).

Brachystelma annamacharyae Prasad et al., Nordic J. Bot. 34: 360. 2016.

Type: Andhra Pradesh, Kadapa Distr., Sanipaya, P.V. Prasanna, K. Prasad, M. Sankara Rao and T. Thulasaiah 4568 (Holotype BSID, Isotype BSID).

Etymology: The new species is named after the renowned saint composer Sri Tallapaka Annamacharya, who has composed devotional songs in praise of Lord Balaji, the presiding deity of Seshachalam hills.

Dwarf, perennial herb, 4–12 cm tall. *Tubers* globose, c. 4 × 4 cm, dirty brown. *Stem* short, erect, solitary, unbranched, 1.5–2 mm thick, in juvenile stage pubescent becoming glabrous at maturity; internodes c. 1.5 cm long. *Leaves* light greenish brown, simple, opposite-decussate, petiolate; petiole 1–2 mm long, glabrous; lamina lanceolate, ovate-lanceolate, ovate-oblong, 2–5.5 × 1–2.2 cm, acute, with puberulent margins; midrib puberulent and prominent below. *Inflorescence* extra-axillary, sessile, solitary; bract one, pinkish, linear, 0.6–0.8 × 0.2 mm, acute, glabrous, caducous. *Flowers* horizontally spreading with long pedicel. *Pedicel* cylindrical, filiform, 3–3.5 cm long, pubescent. *Calyx* gamosepalous, glabrous, greenish yellow, lobes ovate, 1 × 0.5 mm, acute or obtuse. *Corolla* yellowish, spotted with purple, tube short, campanulate, pilose, c. 1.5 mm long; corolla lobes ovate, 2–2.5 × 1 mm, acute, reflexed, margins slightly recurved, densely pilose inside and glabrous outside; trichomes pinkish white, 2–3 mm long. *Corona* biseriate, staminal and interstaminal parts fused to a cup-shaped structure, c. 2 mm across, basally bright yellowish; interstaminal corona lobes erect, purplish, much taller than gynostegium, oblong, keeled, 0.8 × 0.4 mm, rounded at apex, with few white trichomes at apex margins; staminal corona basally fused to interstaminal corona ring, its lobes triangular, c. 0.4 mm long. *Pollinium* subglobose, c. 0.2 × 0.18 mm, is yellow, with pellucid lateral margin, basally attached to c. 0.1 mm long corpusculum by light-brown, short, tubular caudicles. *Follicles* solitary, purplish-yellow, cylindrical, tapering towards apex, 8–9 cm long; fruiting pedicels straight, spreading to erect. *Seeds* comose, narrowly elliptic, 4–5 × 1.5–2 mm, light brown at center (Figures 2.3 and 2.4).

Endemic to the Seshachalam hills in the Kadapa district of Andhra Pradesh.

Fl.: June–September; Fr.: December–January

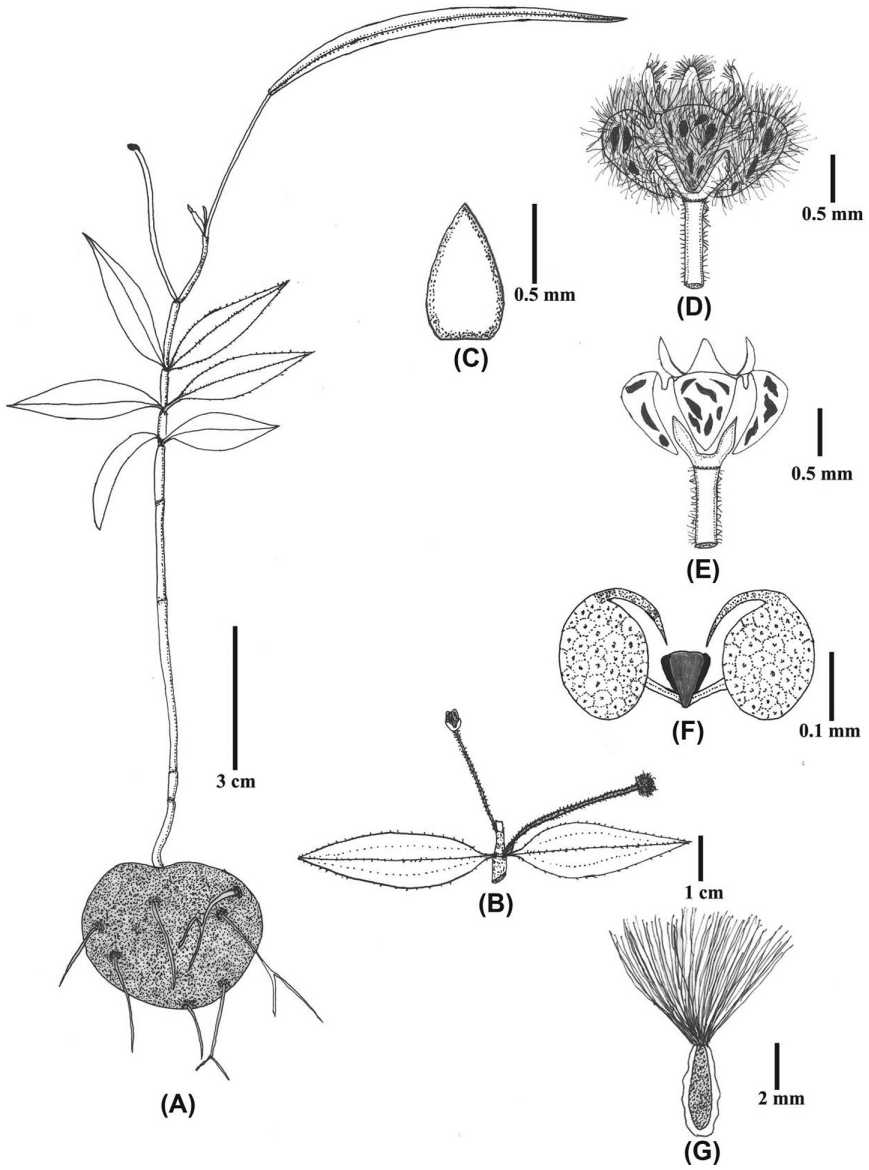


FIGURE 2.3 *Brachystelma annamacharyae* Prasad et al.: (A) Habit, (B) Flowering twig, (C) Calyx lobe, (D) Flower, (E) Flower without hairs, (F) Pollinia, and (G) Seed. (After Prasad, K. et al., *Nordic J. Bot.*, 34, 360, 2016. With permission.)

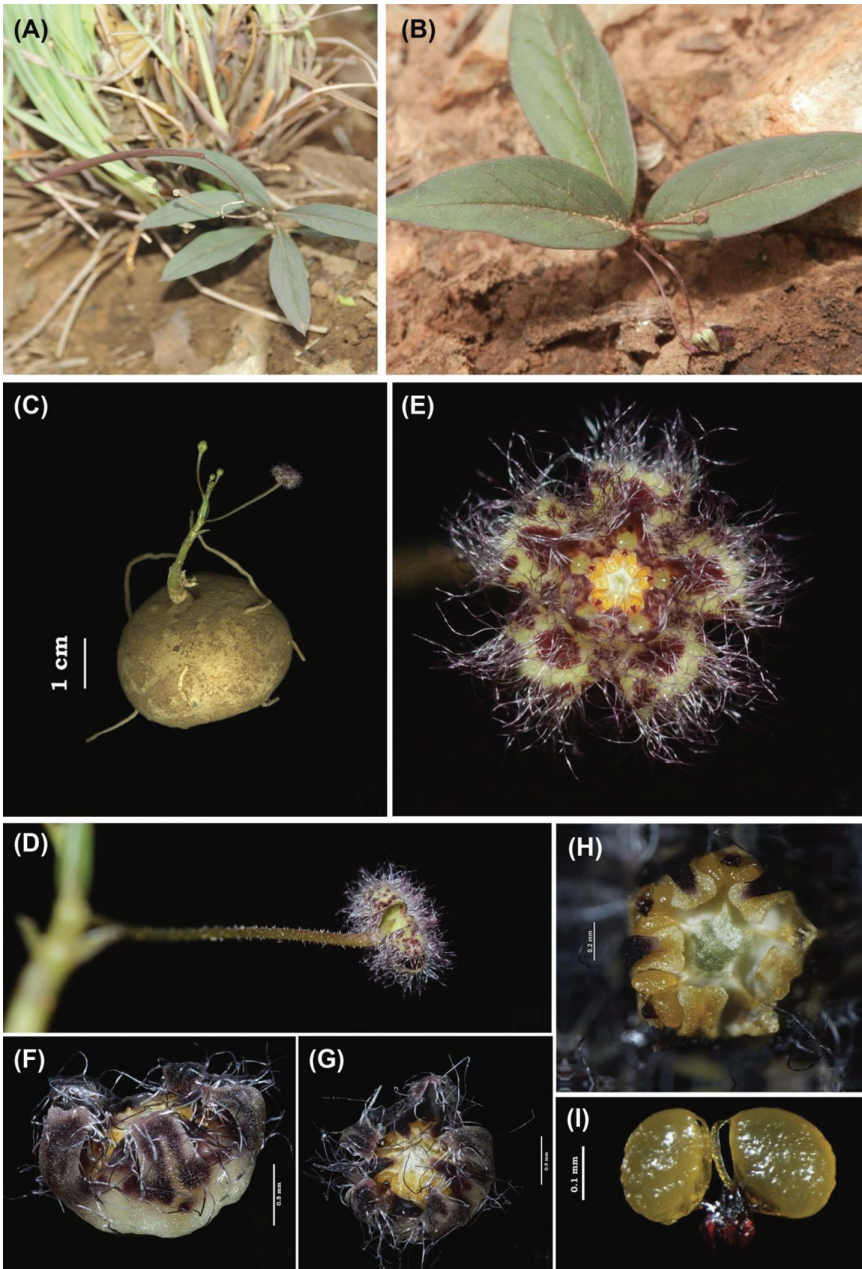


FIGURE 2.4 *Brachystelma annamacharyae* Prasad et al.: (A), (B), Habit in August–September, (C) Habit in December, (D) Flower, (E) Top view of flower, (F) Side view of column, (G) Top view of column, (H) Top view of gynostegium, and (I) Pollinia. (After Prasad, K. et al., *Nordic J. Bot.*, 34, 360, 2016. With permission.)

India: Andhra Pradesh. Endemic.

IUCN Category: Following the IUCN guidelines ver. 11 (IUCN, 2014), *Brachystelma annamacharyae* is assessed as “Data Deficient” (DD), as only a few individuals were located during the floristic survey. Further explorations in the adjacent hill tracts are necessary to ascertain the status of the species. Presently, the area is well protected as it falls under the Seshachalam biosphere reserve. Therefore, there is no immediate threat to this species, but the habitat is prone to seasonal, anthropogenic forest fires and to grazing (Prasad et al., 2016).

Affinities: *Brachystelma annamacharyae* is most closely allied to *B. swarupa*, as is expressed by the possession of small flowers with reflexed corolla lobes and an exposed corona. *Brachystelma annamacharyae* differs from *B. swarupa* in certain characters as tabulated (Table 2.2). This species is easily distinguishable by the dense indumentum of the adaxial corolla surface of long pinkish white hairs, a character that is very rare in the genus as a whole. Another Indian species, *Brachystelma ciliatum* Arekal & T.M. Ramakrishna (1981) from Karnataka and Andhra Pradesh, is obviously also related to these two species, but it possesses 2–4-flowered cymes, ciliate corolla lobe tips, and a short, flattened corona.

Vegetatively, *B. annamacharyae* is also unusual with its dwarf growth; the single stem reaches only a few centimeters in height and the light greenish brown colored leaves are more or less ovate (vs. green, narrowly lanceolate in

TABLE 2.2

Morphological Comparison of *Brachystelma annamacharyae* and *B. swarupa*

Characters	<i>B. swarupa</i>	<i>B. annamacharyae</i>
Plant height (cm)	30–60	4–12
Leaves (cm)	Green, subsessile, narrowly lanceolate, 6–12 × 0.3–0.7	Greenish brown, petiolate, lanceolate, ovate-lanceolate or ovate-oblong, 2–5.5 × 1–2.2
Inflorescence	24–28-flowered	1-flowered
Calyx lobes	Puberulent on the outside	Glabrous
Corolla tube	Less than 1 mm long, flat to reflexed	1.5 mm long, campanulate, not reflexed
Corolla lobes	Elliptic-ovate, glabrous, 4–6 mm long cilia present near the rim of the tube, completely reflexed when mature	Ovate, adaxially densely covered with purplish white trichomes, more or less reflexed
Interstaminal corona	Tip bifid, glabrous, margins long-ciliate	Apex entire, obtuse, margins with few long trichomes
Staminal corona lobes	Without free tips	With free tips
Corpusculum	Laterally with wing-like projections	Without projections

Source: Prasad, K. et al., *Nordic J. Bot.*, 34, 360, 2016.

B. swarupa). Habitually and florally, however, the two South African species—*Brachystelma arnottii* Bak. and *B. minimum* R.A. Dyer—show most congruence with *B. annamacharyae* (cf. Illustrations in Dyer, 1883). Both represent dwarf herbs only a few cm high, with small flowers possessing recurved corolla lobes. In particular, *B. minimum* resembles *B. annamacharyae* with its single-flowered inflorescences bearing the little flower on a long stalk. But there, as in *B. swarupa* as well, the corolla is nearly tubeless and the corona exposed, and corolla surfaces are glabrous. However, the considerable morphological similarities between these species are obviously due to parallel evolution and not an expression of phylogenetic closeness (Prasad et al., 2016).

Brachystelma attenuatum (Wight) Hook. f., Fl. Brit. India 4: 65. 1883; Albers & Meve, Ill. Handb. Succ. Pl. Asclepiadaceae 21. 2002. *Eriopetalum attenuatum* Wight, Contr. Bot. India 35. 1834.

Type: *s.coll. s.n.* (K000794639)

Etymology: *attenuatum* = tapering, narrowing; in allusion to corolla segments being filiform and 4–5 times longer than the corolla tube.

Segments of corolla filiform, 4–5 times as long as the tube, villous, corona shortly irregularly toothed. Flower 2 cm in diameter.

North-Western India. Native of West Himalayas.

Note: J.D. Hooker (*loc. cit.*) mentioned that he has seen only a single flower in Herb. Wight.

IUCN Category: This species has not been recollected after the type collection. It is probably extinct.

Brachystelma bourneae Gamble, Bull. Misc. Inform. Kew 1922: 120. 1922 & Fl. Madras 2: 851. 1923; S.R. Srinivasan in Henry et al., Fl. Tamil Nadu Ind., Ser I: Analysis 2: 80. 1987; A.P. Jagtap & N.P. Singh, Fasc. Fl. India 24: 179. 1999.

Type: India: South India: Madurai Distr., Pulney hills, on Kodaikanal Ghat and in Perumal and Vailpatti Valley, east slope, May 1898 and June 1899, *Sir A.G. and Lady Bourne* 1020, 2751, 2752 (K)

Etymology: The name honors Lady Emily Tree Bourne; she was a well-known botanical artist. Her illustrations were used in the “Flora of the Nilgiri and Pulney Hill-tops” by P.F. Fyson.

Herbs erect, *c.* 30 cm tall, tuberous. *Tubers* fusiform, 3–4 cm in diam. *Leaves* linear, 7–10 × 0.2 cm, opposite, glabrous above and puberulous below, midrib prominent, lateral veins obscure, margin puberulate, reddish; petiole subsessile or 0.1 mm long, puberulate. Flowers in cymes, axillary, sessile, 3-flowered. *Pedicels* filiform, 5–15 mm long, glabrous. Bracteoles minute. *Calyx* 5-lobed, 0.1 × 0.4 mm, lobes linear, glabrous, acute, 2 mm long. *Corolla* tube short, rotate, 0.2 mm long, white with dark green spots, lobes triangular-lanceolate, 0.1 × 0.3 mm, acute, purple hairs on the lobes and margins, corona purple, lobes very thin, ciliate, torti apex, *c.* 1 cm long, inflexed. *Stamens* obtuse, pollinia globose, *c.* 0.5 × 1.2 mm, yellowish with pellucid margins. Style apex pentagonal (Figure 2.5).

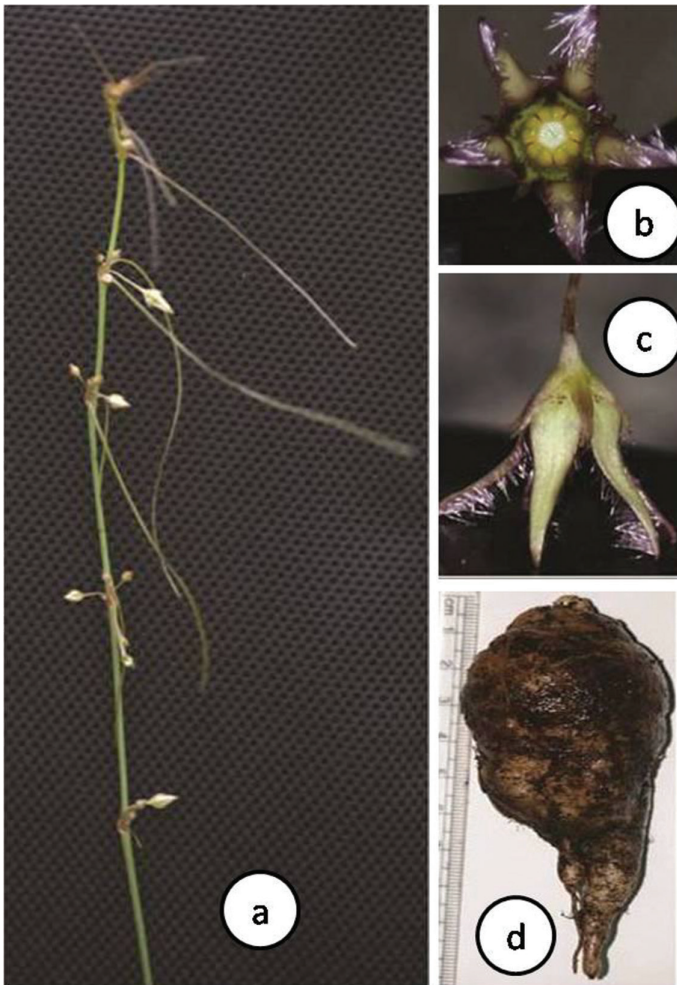


FIGURE 2.5 *Brachystelma bourneae* Gamble: (a) Habit, (b) Flower—front view, (c) Flower-lateral view, and (d) Tuber. (Courtesy of Karuppusamy.)

Rare in Dry deciduous forests of the Western Ghats (Eastern slopes of Palni hills on Kodaikanal Ghat and in Perumal and Vilpatti valley) in Tamil Nadu.

Fl. & Fr.: May–June

Tamil Nadu: Dindigul Distr., Kodaikanal Taluk, Perumalmalai, Grass peak, *S. Karuppusamy* 1244 (SGH).

India: Tamil Nadu. Endemic.

IUCN Category: The fresh collection of this species is not available at MH or CAL. The second author collected this specimen recently in the Perumal Malai Peak of Palni hills, which showed the rediscovery of this species after a gap of 120 years from the type locality.

Brachystelma brevitubulatum (Bedd.) Gamble, Fl. Madras 2: 852. 1923; S.R. Srinivasan in Henry et al., Fl. Tamil Nadu Ind., Ser I: Analysis 2: 80. 1987; A.P. Jagtap & N.P. Singh, Fasc. Fl. India 24: 179. 1999; Albers & Meve, Ill. Handb. Succ. Pl. Asclepiadaceae 23. 2002; Vijayasankar et al., Phytotaxonomy 3: 130. 2003; Pullaiah et al., Fl. Eastern Ghats 4: 91. 2011. *Ceropegia brevitubulata* Bedd., Ic. Pl. Ind. Or. t. 174. 1839. *Brachystelma beddomei* Hook.f., Fl. Brit. India 4: 66. 1883.

Type: Tamil Nadu: Amerdy hills, near Vellore, 1000 ft., *Beddome* 232 (flowers & fruits), December 1871 (K).

Etymology: Short-tubed *Brachystelma* (short corolla-tubed *Brachystelma*).

A weak-stemmed, tuberous, annual, twining herb. Sap colorless, watery. *Tubers* depressed-globose, 1.5–2 × 2.5–3 cm, dull brown outside, whitish inside, with transparent thin skin. *Stems* unbranched, slender, cylindrical, twining, internodes 7–10 cm long. *Leaves* opposite, pairs often unequal, linear-lanceolate, 8–11 × 0.4–0.8 cm, thinly chartaceous, puberulous above, glabrous beneath, with scattered hairs on nerves beneath along with scattered white dots, cuneate and with a brownish gland at base, apex gradually acuminate, margin minutely ciliate and slightly thickened along margin, midrib grooved above, raised beneath, reticulations distinct; lateral nerves indistinct, alternate, 9–14 pairs, joining along margins; petioles 3–8 mm long, hyaline, ciliate, dilated at base. *Stipules* axillary, 3-fid, setaceous, up to 1 mm long. *Inflorescence* axillary and terminal, umbellate cymes, 3(4)-flowered; peduncles 2–3 mm long, puberulous, pedicels 5–10 mm long, hyaline, puberulous. *Bracts* 2, setaceous, c. 3 mm long, puberulous. *Flowers* c. 3.5 cm long and c. 1.5 cm across. *Calyx* 5-lobed, free from base, lobes linear-subulate to lanceolate, long acuminate at apex, 2–5 mm long, hyaline along margins, glabrous within, scattered hairy on nerves without. *Corolla* tube short, connected at base and apex, up to 3 mm long, lobes 5, ovate-lanceolate, 2–3.5 × 0.5–0.8 cm, subfleshy, long-acuminate at apex, cohering at their tips, purple-brown within, greenish yellow without. *Coronal* processes entirely confluent with anthers. *Follicles* usually paired, almost equal, narrowly cylindrical, c. 7.5 × 0.4 cm, gradually tapering towards apex, blunt at tip, greenish with purple tinge, with thin powdery coating. *Seeds* c. 10 in each follicle, oblong, compressed, 0.5 × 0.2 cm, brownish, coma silky white, terminal, unequal, up to 3 cm long, smooth (Figure 2.6).

Rare in dry deciduous forests.

Fl. & Fr.: November–January.

Tamil Nadu: Tiruvannamalai Distr., Polur Taluk, Paruvathamalai R.F., R. Vijayasankar 71248 (flowers), 10-11-2002 (FRLH), R. Vijayasankar & K. Ravikumar 71358 (fruits, 12-01-2003 (FRLH); Chengam taluk, Swamimalai R.F., R. Vijayasankar 59183 (flowers), 10-10-2003 (FRLH).

India: Tamil Nadu. Endemic.

Note: Beddome first collected this species during 1871 from the Thellay hills of Amerdy (Amirthi) forest near Vellore at about 350 m altitude; the type specimens are housed in the Kew Herbarium. The Amirthi forest, though close to Vellore, falls in the Tiruvannamalai district in Tamil Nadu. To realize the beauty and rarity of this species, it is imperative to quote Beddome's words from his protologue "...this beautiful rather abnormal species appears to be very rare" and he had seen only one plant. He further adds that his attempt to grow the plant by means of tuberous roots at his

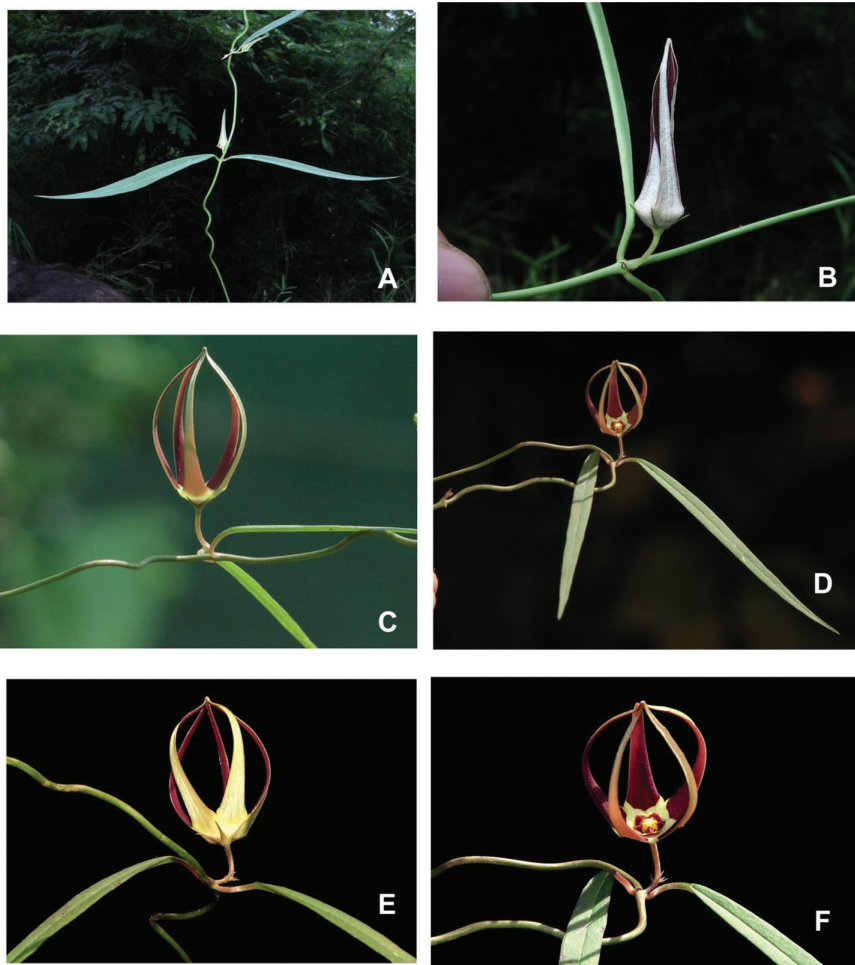


FIGURE 2.6 *Brachystelma brevityubulatum* (Bedd.) Gamble: (A) Habit, (B) Flower bud, and (C–F) Flowers in different angles. (Courtesy of Vijayasankar Raman.)

residence were futile. Vijayasankar et al. (2003) collected this species in 2002, from the Tiruvannamalai district nearly 131 years after the type collection from a locality other than the type locality.

Ramakrishna (1995) recorded this species in Karnataka and this report is based on Hooker’s *Flora of British India*, which is once again based on Beddome and states “Mysore; Vellore hills alt. 1000 ft, Beddome.” Vellore hills, as given above, is in Tamil Nadu and not in Karnataka. Hence, report of this species from Karataka is not correct; it does not occur in Karnataka. Perhaps based on this report, P. Singh et al. (2015) record this species also from Karnataka, but we could not locate any Herbarium specimen in any Indian Herbaria and have not recorded this from Karnataka.

Nomenclatural Note: The Plant List database lists the name *Brachystelma beddomei* as the accepted name based on the reference Fl. Brit. India 4: 66 1883 <http://www.theplantlist.org/tpl1.1/record/kew-2681511>. This data has been derived from the World Checklist of Selected Plant Families (WCSP), which includes the name *Ceropegia brevitybulata* Bedd. as an accepted name. As per IPNI, the name *B. beddomei* Hook.f. is illegitimate and superfluous. Therefore, *B. brevitybulatum* (Bedd.) Gamble should be the correct accepted name.

IUCN Category: Not assessed.

Brachystelma ciliatum Arekal & T.M. Ramakrishna, Curr. Sci. 50: 145. 1981; T.M. Ramakrishna et al., Asclepiadaceae Karnataka 38. 1995; Albers & Meve, Ill. Handb. Succ. Pl. (Asclepiadaceae) 2: 30. 2002; Kullayiswamy et al., Nelumbo 55: 191. 2013 & Fl. Thummalpalalli Uranium Mining Area 256. 2017.

Type: Karnataka, Kolar Distr., Sonnipally 920 m, 27 June 1979, *Ramakrishna* 1311 A (Holotype CAL, Isotype BSI!, K); *Ramakrishna & Arekal* 1340 A-E (Paratype, BSI!, Mysore Univ.); *Ramakrishna* 1316 (Paratype, BSI!).

Etymology: *Brachystelma ciliatum* = ciliated *Brachystelma*; in allusion to corolla lobe tips being ciliated.

Vern.: Telugu: *Wootakunimmata gadda*, *Pithu Jougu Nimmatayalu*

Perennial tuberous herb. *Tuber* brown, subglobose–globose, 4 cm across and dorsiventrally compressed, 5.6 × 5.6 × 1.5 cm. *Stem* erect, 30–35 cm high, 1.5–2 mm in dia., rarely branched, purplish, pubescent, buried part of the stem 3–4 cm, white, glabrous. Leaf scales opposite, 3–4 pairs from the base, ovate, *c.* 3 × 2 mm, brown puberulent, sessile; leaves opposite in middle of the shoot, 4–5 pairs, linear, linear–lanceolate, 5–9 × 0.2–0.3 cm, nerves 9–12 pairs when young, semi-succulent, brown, midrib pubescent beneath, base acute, margins entire, apex acuminate, pubescent, sessile with 2–3 ovate glands at base, greenish pink; epidermal hairs unicellular. *Inflorescence* axillary, 2–4-flowered umbel, pendulous. *Pedicels* filiform, 3.38–3.81 cm long, pubescent, stout and erect in fruits; bracts 4 at each node, each *c.* 1 mm, ovate, pubescent. *Calyx* 5-lobed, minute, *c.* 0.5 mm, connate at base, ovate, pubescent. *Corolla* 5-lobed, connate at base, lobes oblong to ovate, *c.* 5 × 2 mm, glabrous, narrowing at apex with 2 mm long shiny cilia, greenish yellow, dark pink at apex and middle; tube *c.* 1 mm long, lobes reflexed when mature. *Corona* 2whorled; outer whorl 5-lobed, *c.* 2.5 mm across, cupular, glabrous, dark pink dotted, 10-lobed at margin; inner whorl 5-lobed, alternate with stamens, ovate–oblong, extended to staminal column. *Staminal* column 5-lobed, yellow, elliptic, winged; stigma light greenish yellow, pentagonal, truncate, minute, sticky. *Pollinarium* yellow, 60 μm across, erect; corpusculum brown. *Follicles* 1–2, linear–lanceolate, 7–8 × 0.2–0.3 cm, light reddish brown, glabrous, unequal, curved at apex when young, acuminate and stronger when mature. *Seeds* 8–12, brown, ovate, 7–8 × 2–25 mm, thin; coma white, 2–2.5 cm long (Figures 2.7 and 2.8).

Rare in the Anantapur district, Andhra Pradesh associated with *Ophioglossum gramineum*, *Heteropogon* sp., *Chrysopogon* sp., etc., in sandy moist places of dry deciduous forests. In Karnataka, it occurs in a 7 km area in the Kolar district in

scrub jungle usually associated with short grasses and among dicotyledons such as *Canthium parviflorum* and *Dodonaea viscosa*.

Fl. & Fr.: August–October

Chromosome No: $2n = 22$

Andhra Pradesh: Anantapur Distr., Nigidi forest, KRKS 41870 A–D (SKU, MH & CAL); Batrepalli, S.S. Kambale & K. Raja Kullayi Swamy 250 (SUK);

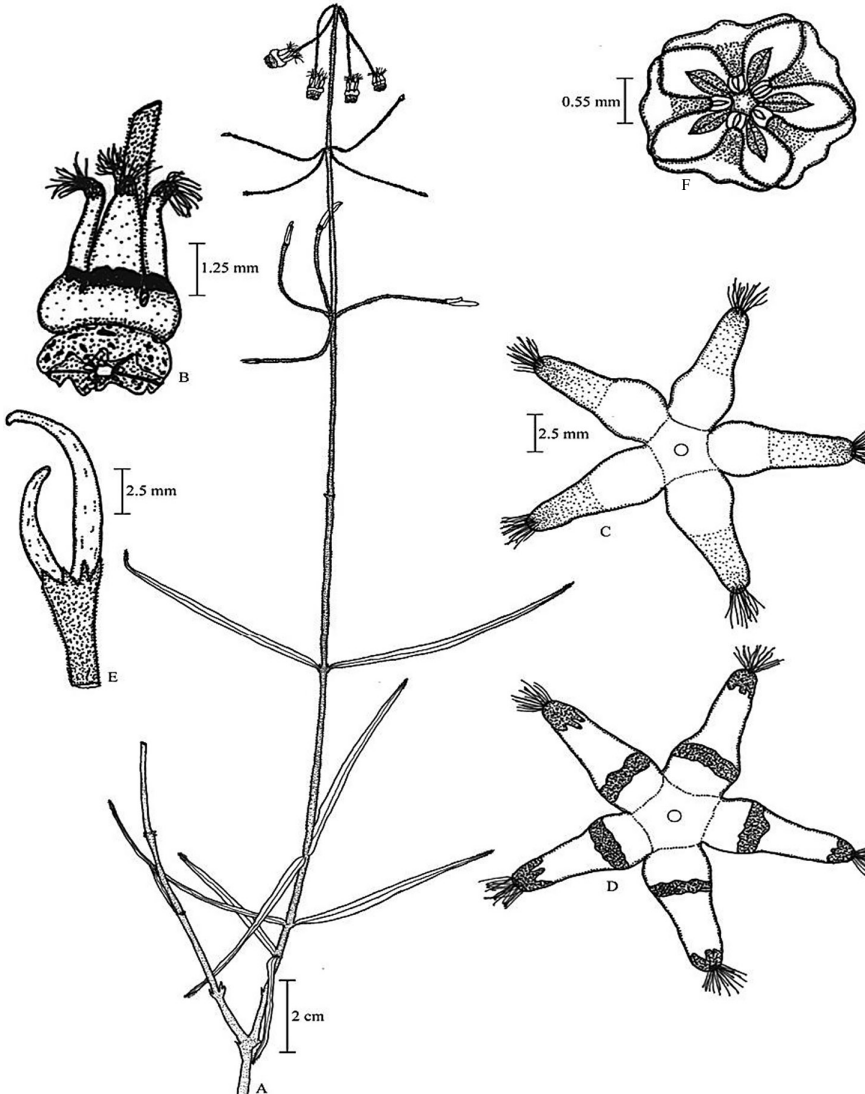


FIGURE 2.7 *Brachystelma ciliatum* Arekal & T.M. Ramakrishna: (A) Twig, (B) Flower, (C) Corolla dorsal view, (D) Corolla ventral view, (E) Corona, and (F) Young fruit. (Courtesy of K. Raja Kullayiswamy.)