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RESEARCH ARTICLE

A Revision of the Genus *Cyanotis* D. Don (Commelinaceae) in India

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ABSTRACT: The genus *Cyanotis* D. Don in India is taxonomically revised. Thirteen taxa of *Cyanotis* have been recognized with their updated nomenclature. Detailed descriptions, illustrations and geographical distribution have been provided. *Cyanotis glabrescens* (*C. fasciculata* var. *glabrescens*) and *C. axillaris* var. *cucullata* (*Cyanotis cucullata*) are new combinations and status proposed, notes on the complex of *C. arachnoidea*, *C. burmaniana* and *C. tuberosa* have been given, while some taxa warranting typifications have been lectotypified.

KEY WORDS: *Cyanotis*, Commelinaceae, India, nomenclature, taxonomy.

INTRODUCTION

The family Commelinaceae consists of 41 genera and about 650 species worldwide (Faden, 2000). The genera like *Commelina* Plum. ex L., *Aneilema* R. Br., *Cyanotis* D. Don and *Murdannia* Royle are widespread in Africa and Asia. The paleotropical genus *Cyanotis* D. Don (Commelinaceae) comprises *c.* 56 species worldwide (Govaerts and Faden, 2012), very diverse in Asia (Faden, 2000) and Africa. From India, 16 species listed by Karthikeyan et al. (1989), however, 13 species from India documented in the present work. Earlier findings by Wight (1853); Clarke (1871, 1881); Hooker (1894, 1898); Fischer (1931) and annotations during the current study nearly conclude leading diversity in genus *Cyanotis* is confined to Western Ghats of India.

The genus *Cyanotis* was described by Don (1825) under the section *Tradescantia* L. based on one of the common species of Eastern Asia viz. *Cyanotis vaga* (Lour.) Schult.f. [=*Cyanotis barbata* D. Don]. The history of the genus *Cyanotis* started with *Cyanotis axillaris*. Van Rheede (1690) in his Hortus Malabaricus had first cited *C. axillaris* as "Nir–pulli", which was the first citation of genus *Cyanotis* from India. After a long gap, Salisbury (1812) raised the Linnean *Commelina axillaris* L. (1753) as a distinct genus and named it *Zygomanes axillaris*, but did not describe *Zygomanes* as a new genus. Afterwards, Hasskarl (1867) adopted Salisbury's *Zygomanes* for four African species of *Cyanotis* (*sensu stricto*), and described *Zygomanes* as a new genus. In his consideration, *Zygomanes* was published earlier than *Cyanotis* D. Don (*loc. cit.*) but he has misquoted the year of publication for *Zygomanes* by Salisbury, in addition he failed to give the justification while changing the name. Therefore, genus *Zygomanes* Salisb. was just a nomen nudum and Hasskarl (*loc. cit.*) published valid but illegitimate superfluous substitute for *Cyanotis* (Rao and Kammathy, 1966).

The genus *Cyanotis* is very distinct and falls under tribe 'Tradescantieae–Hexandrae' (Brückner, 1930) and subtribe 'Cyanotinae' (Faden, 1998). The genus is characterized by compact cincinni, basally united petals, six fertile moniliform bearded stamens, filaments and style usually tumid at apex. The habitats of the species of *Cyanotis* are also ecologically diverse. It occurs in grasslands, undergrowth, in rock crevices, as a weed in crops, along roadsides, in open scrub, forest edges, sand flat, while few are strictly grow under shade, on forest floors and near streams. Most of the species are annuals, but few species show perennial habit in continuous water lodged conditions. Four species are truly perennial, having fusiform tuberous or thick, elongated roots. In India, out of thirteen species, four species (*Cyanotis arcotensis*, *C. fasciculata*, *C. glabrescens* and *C. tuberosa*) and one variety (*Cyanotis axillaris* var. *cucullata*) proved to be restricted to peninsular India.

As a part of a revision of the Commelinaceae of India, the authors have carried out extensive field studies during the years 2008–2014. Species descriptions were drawn up using a variety of materials, including literature, herbarium specimens, living plants, preserved flowers and inflorescences and separately collected capsules and seeds. Images of plants were taken with an Olympus SP 550 uz digital camera. Microphotographs were taken with a JEOL-JSM 6360 Scanning Electron Microscope. Digital images were edited and assembled on plates using Adobe Photoshop 7.0 (San Jose, CA, USA). During this work the specimens in herbaria

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ASSAM, BLAT, BSI, CAL, CALI, DEV, MH and SUK were examined. The photographs of Herbarium sheets (types and other herbarium specimens) were examined digitally through JSTOR Global Plants (http://plants.jstor.org/) and other herbaria webpages C, E, G, K, LINN, NY, P, PRE, US and W. The living specimens of the perennials are maintained in the Botanical Garden, Department of Botany, Shivaji University, Kolhapur from 2008 until the present and the herbarium specimens were deposited at SUK, few duplicates were sent to BSI, BLAT, CAL and MH.

TAXONOMIC TREATMENT

Cyanotis D.Don, Prodr. Fl. Nepal. 45: 1825, *nom. cons.*; Hook.f., Fl. Brit. Ind. 6: 384. 1894; Cooke, Fl. Pres. Bombay 2: 791. 1908; Karthik. et al., Fl. India. Enum. Monocot. 28: 1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 139, 2000. TYPE: *Cyanotis barbata* D.Don

Amischophacelus R.S.Rao and Kammathy, J. Linn. Soc., Bot. 59: 305. 1966; Karthik. et al., Fl. India. Enum. Monocot. 23.1989. TYPE: *Commelina axillaris* L.

Zygomenes Salisb. Trans. Hort. Soc. London 1: 271. 1812; Notes Roy. Bot. Gard. Edinburgh 25 (2): 187. 1964. TYPE: *Zygomenes axillaris* (L.) Salisbury.

Annual or perennial herbs; inflorescences terminal and axillary or axillary only, each cincinnus or group of cincinni usually subtended by a foliaceous bract, or inflorescences closed in the leaf sheaths (*Cyanotis axillaris*); flowers sessile to sub-sessile; sepals 3, sub-equal; petals 3, united below forming a tube, apex acute; stamens 6, filaments usually with a sub-apical swelling, bearded with moniliform hairs, anthers with longitudinal dehiscence but pollen usually released from base of anther sacs; style usually with a sub-apical swelling, bearded or glabrous; capsule ciliate at apex, tri-locular; seeds 1–2 per locule, embryotega terminal, hilum punctiform. 2*n* = 16–78 (Faden, 1998).

Key to the species of *Cyanotis* in India

1a. Herbs with basal rosette leaves ……..……..……..……**2**
1b. Herbs without basal rosette leaves ……..……**6**
2a. Roots fibrous or thickened fibrous ..……..……..……..……..**3**
2b. Roots of fusiform tubers ……..……..……**5**
3a. Plants with cormous base ……..……..……..**4**
3b. Plants without cormous base ……..……..…… ***C. pilosa***
4a. Rosette leaves oblong to oblanceolate or elliptic to lanceolate; seeds obscurely pitted, variously striated.……..……***C. arachnoidea***
4b. Rosette leaves linear to linear–lanceolate; seeds finely reticulate ……..……..…… …. ***C. vaga***
5a. Flowering shoots adscendent ……..……..…***C. adscendens***
5b. Flowering shoots sub-erect ……..……***C. tuberosa***
6a. Inflorescences enclosed within the leaf sheaths .....***C. axillaris***
6b. Inflorescences not enclosed within the leaf sheaths **7**
7a. Stem and leaves covered with cobwebby hairs; stamen filaments bearded with bi-coloured moniliform hairs.....***C. fasciculata***
7b. Stem and leaves variously puberulous or glabrous, but never cobwebby; stamen filaments bearded with uni-coloured moniliform hairs **8**
8a. Bracteoles (surface & margin) bearded with cobwebby hairs ……..……..……***C. glabrescens***
8b. Bracteoles glabrous or variously puberulous, ciliate at margins….**9**
9a. Bracts much longer than inflorescences, glabrous; stamen filament not tumid at apex..……..……..…***C. cristata***
9b. Bracts not much exceeding from inflorescences, puberulous; stamen filament tumid at apex……..…….. **10**
10a. Inflorescences subsessile, peduncle < 0.5 cm long ……***C. villosa***
10b. Inflorescences pedunculate, peduncle >0.5 cm long ……..**11**
11a. Plants without definite base; leaves strictly lanceolate, densely appressed silky pubescent to sparsely pilose beneath… ***C. racemosa***
11b. Plants with definite base; leaves ovate to elliptic to linear to lanceolate, variously pilose or hirsute……..……..……**12**
12a. Leaves linear to lanceolate, pointed or rounded at base,leaf sheaths 0.8–1 cm long, ciliate at margins, otherwise glabrous; anthers yellow……..……..……...***C. arcotensis***
12b. Leaves ovate to elliptic to linear to lanceolate, cuneate at base, leaf sheaths 0.1–0.5 cm long, puberulous to velutinous, anthers black with yellow dot.....……***C. burmanniana***

1. *Cyanotis adscendens* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 343. 1852. TYPE: India, Karnataka, Belgaum, July, *Dalzell s.n.* (lectotype: K! *sh. no.795570*), designated here.

Cyanotis sarmatica Wight, Icon. Pl. Ind. Orient. 6: 33. t. 2087. 1853. TYPE: same as for *C. adscendens* Dalzell

Cyanotis tuberosa var. *adscendens* (Dalzell) C.B.Clarke in DC., Monogr. Phan. 3: 249. 1881; Hook.f., Fl. Brit. Ind. 6: 386. 1894; Cooke, Fl. Pres. Bombay 2: 793. 1908; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931; Karthik. et al., Fl. India. Enum. Monocot. 27: 1989.

Fig. 10 A

Perennial herbs with basal rosette leaves, roots fusiform, tuberous; flowering shoots lateral, adscendens, 7–35 cm long, occasionally rooting at the nodes and giving rise to new plants by vegetative means; rosette leaves spirally arranged, sheaths 0.1–2.5 cm, densely pubescent, lamina linear to linear–lanceolate 8–15 × 0.5–1 (–1.5) cm, apex acute to acuminate, base rounded to cuneate, upper surface glabrous to pilose, lower sparsely to densely pilose or pubescent, margins undulate, ciliate; cauline leaves distichous, lamina ovate to lanceolate, slightly to strongly falcate, 5–10 × 1.5–4 cm, margin ciliate, sparsely pilose to glabrous on the surface; inflorescences with terminal and axilary cincinii, bract foliacious, ovate, exceeding the cincinni; bracteoles falcate; sepals 3, lanceolate–oblong, 0.4–0.6 × 0.1–0.2 cm, pilose; petals 3, united at base, pink to purple, lobes with white tips, reflexed apices; stamens 6, filaments with sub-apical swelling, densely bearded with pink to lavender moniliform hairs, anthers yellow; style sub-equal to the stamens, with a sub-apical swelling, bearded below the swelling; capsules 2.5–3 × 2 mm, puberulous in distal half; seeds 2 per locule, ovoid to ellipsoid, 1.3–1.8 × 0.9–1.3 mm, testa orange brown, shallowly and irregularly pitted or faintly striate, hilum ensiform, embryotega terminal.

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Flowering and fruiting: August to December.

Distribution and ecology: India: Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, West Bengal; Sri Lanka; grasslands, rocky crevices, along the forest margins and ditches along the forest side.

Specimens examined: **INDIA**. **Andhra Pradesh:** North Dhena reserve forest, Kurnool, 13th Sept. 1984, *Raju 2523* (CAL). **Assam:** Assam, 1898, *Jenkins s. n.* (CAL). **Bihar:** Duars, Bihar (Fl. of West Duars), Sept. 1899, *Haines 67* (CAL). **Karnataka:** Kupuli hills, Dharwar, 10th Aug. 1888, *Talbot 1715*; Bababudhan Hills, Mysore, 2nd Oct. 1890, *Talbot 2394*; Badami, Sept. 1910, *Meebold 11376*; Gundalpeth, Mysore, Oct. 1910, *Meebold 11482*; Kankapura to Sangam, Bangalore, 19th July 1976, *N. S. Ravindra 1560*; Malabar and Konkan, *Stocks and Law. s. n.* (CAL). **Kerala:** Munnar to Pooparagad, 23rd May, 2011, *Manudev and Nampy 4437* (DEV). **Maharashtra:** Botanical Garden Shivaji University, Kolhapur, 9th Sept. 2012, *M. D. Nandikar 1229* (SUK); Chatushringi Hills, Pune, July 1916, *Moses Ezekiel 30390* (BLAT); Malwan-Kudal road, Sindhudurg, 8th Sept. 2010, *S. S. Kamble and Nandikar C10873* (SUK); Pimpari (Nigadi), Pune, 3rd Sept. 2010, *Manudev 3351* (DEV). **West Bengal:** Durgapur, Burdwan, 17th July 1973, *Mukharjee 18709* (BSA).

Note: Clarke (1881), Hook.f. (1894), Cooke (1908), Fischer (1931) and Karthikeyan *et al.* (1989) treated it as a variety of *Cyanotis tuberosa*. However, it differs from *C. tuberosa* in smaller, weaker habit, inflorescence shoot laterally produced and repent, rooting at nodes and from the nodes giving rise to new plants.

2. *Cyanotis arachnoidea* C.B.Clarke in DC., Monogr. Phan. 3: 250. 1881; Hook. f. Fl. Brit. Ind. 6: 386. 1894; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931; Karthik. et al., Fl. India. Enum. Monocot. 26: 1989. TYPE: Peninsular India, Tamil Nadu, Pulney mountains, 1836, *Herb Wight, 2839* (lectootype: K, *sh. no. K000854110*; other syntypes: *Wight 2839* (GH), Wall. Cat. 8990B, C (K, *sh. no. 854112*), designated here.

Cyanotis pilosa auct. Wight, Icon. Pl. Ind. Orient. 6: 32, t. 2083. 1853, *non* Schult, 1830.

Cyanotis arachnoidea var. *thwaitesii* auct. (Hassk.) Rao and Kammathy in Bull. Bot. Surv. India. 6: 2. 1964. excl. type.

Cyanotis nilagirica Hassk., Commelin. Ind. 127: 1870; Hook.f. Fl. Brit. Ind. 6: 389. 1894; Karthik. et al., Fl. India. Enum. Monocot. 26: 1989. TYPE: India, Nilgiri, *Perrottet 1811* (G, *sh. no. 223653*) ***syn. nov.***

Cyanotis obtusa (Trimen) Trimen, Handb. Fl. Ceylon 4: 812. 1898; Rolla Rao in Blumea 14: 349. 1966; Karthik. et al., Fl. India. Enum. Monocot. 26.1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 127. 2000. TYPE: Sri Lanka: Doluwa Kande, near Kuru negala, *Trimen, s.n.* (PDA) ***syn. nov.***

Cyanotis arachnoidea var. *obtusa* Trimen, J. Bot., British and Foreign 23: 266. 1885. TYPE: Aug 1883, Sri Lanka, Karagam, cultivated in Royal Botanic Gardens Peradeniya *Trimen s. n*. (holotype: K, designated by Faden, 2000).

Cyanotis thwaitesii auct. Karthik. et al., Fl. India. Enum. Monocot. 28.1989. *non* Hassk. 1870.

Cyanotis fasciculata (Roth) Schult.f. var. *thwaitesii* (Hassk.) C.B. Clarke in DC., Monogr. Phan. 3: 254. 1881; Hook.f., Fl. Brit. India 6: 388. 1894. *pro parte*, excl. type.

Fig. 10 B

Annual or pernnial, rosette herbs; stems decumbent, glabrous, 15–70 cm long, sometimes rooting from basal nodes; roots fibrous; whole plant densely to sparsely coverd with cobwebby hairs; rosette leaves oblong to oblanceolate, or elliptic to lanceolate, 8–35 × 1–3 cm, succulent, apex acute to acuminate or obtuse, base attenuate, margin entire densely ciliate with woolly hairs or ciliate with short hairs, sheaths 1–1.5 cm, in young plants sheaths bundled together forming a corm like structure (observed in some well-developed plants also); cauline leaves linear–oblong or lanceolate, or elliptic, ensiform, 1–6 × 0.5–1.5 cm, acuminate at apex, attenuate at base to a leaf sheath, minutely silky pubescent (arachnoid) beneath; leaf sheath *c.* 1 cm long, ciliate; inflorescence composed of one to numerous terminal and axilary cincinni, pedunculate or sessile; peduncle 0.5–1 cm long; bract foliacious, ovate to lanceolate, exceeding the cincinni; bracteoles falcate, minutely pubescent; flowers bisexual; sepals linear–lanceolate, *c.* 0.4 × 0.1 cm, ciliate at margin; petals oblong, *c.* 0.3 × 0.2 mm; stamens 6, filaments bearded with blue or pink moniliform hairs, tumid at apex; anthers yellow; style bearded, with tumid apex, stigma simple; capsules 2 × (1–)1.5 mm, oblong, densely pilose apically; seeds 1–2 per locule, 1 × 1 mm, ovoid to ellipsoid, obscurely pitted, variously striated, gray to brown, embryotega terminal, hilum punctiform.

Flowering and fruiting: September to February.

Distribution and ecology: India: Andhra Pradesh, Bihar, Maharashtra, Kerala, Odisha, Tamil Nadu; Sri Lanka; in rocky crevices, slopes of grassland, partial to fully exposed sun.

Specimens examined: **INDIA**. **Andhra Pradesh:** Sumkerimettha, Vishakhapattanam, 11th May 1956, *S. K. Wagh 77032, H. Santapau 77029*; Paderu, Vishakhapattanam, 24th Sept. 1956, *S. K. Wagh 77030, 77031* (BLAT); Anantgiri, Vishakhapattanam, 25th Sept. 1961, *N. P. Balakrishnan 820* 'as *C. fasciculata*' (CAL); Tirumala, Chittor, 26th Dec. 1986, *Ranga Charyulu 148288*; Sumkerimetta, Vishakhapattanam, 30th Aug. 1960, *G. V. Sbbarao 21515*; on the way to Sapparala Gedda, 975 m alt, Vishakhapattanam, 28th Oct. 1972, *G. V. Subbarao 82417* (MH). **Bihar:** Patna, Oct. 1959, *G. Panigrahi 20981* (ASSAM). **Maharashtra:** Khandala?, Pune, 5th Sept. 1981, *M. R. Almeida 1000726* (BLAT). **Kerala:** Koomankundu, Silent Valley National Park, 16th Oct. 1982, *T. Sabu 10833*; way to north Walakkad, Silent Valley National Park, 11th Nov. 1983, *C. Satish Kumar 11548*; Chembra peak, Meppadi, Wayanad, 23rd Sept. 1984, *R. T. Balakrishnan 40625*; Silent Valley National Park, 17th Oct. 1984, *Mathew 166*; Pongalapara, Trivendrum, 14th May 1988, *N. Mohanan 9782*; Kovilthérimala, Trivendrum, 22nd Dec. 1987, *N, Mohanan 9194*; Athirumala, Trivendrum, 15th Oct., 1988, *N. Mohanan 4453* 'as *C. fasciculata*'; Mangaladevi, 1400 m. alt, Periyar, 10th Dec. 1994, *Jomy Augustine 14121*; Vellimala, Periyar, 12th Dec. 1994, *Jomy Augustine 13976*, 'as *C. axillaris*' (CALI); Vagamon hills, Kottayam, 2nd Nov. 2002, *Sibachen Thomas 860*; Naduvattom, Malappuram district, 23rd Feb. 2010, *Nampy 175*; Dodabetta, Nilgiri, 8th Oct. 2010, *Nampy 146*; Dodabetta, Nilgiri, 24th Feb. 2010, *Nampy 3409* (DEV). **Odisha:** Deomali Parbat, 6th Dec. 1962, *G. V. S. Rao 29921* (ASSAM). **Tamil**

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Nadu: Bodirange, Madurai, 15th Sept. 1961, *K. M. Sebastine 12895* (CAL); Shevaroy hills, Salem district, 10th Aug. 2004, *A. K. Pradeep 93153* (DEV); Shevaroy hills, Oct. 1876, *G. Bidie 73078*; On the rocks of Kodaikanal, Pulney hills, 19th July 1899, *M. Chandrabose 52456*; Sirumalai, Madurai district, 23rd Aug. 1913, *K. C. Joest 72084*; Hassanur, Coimbatore, 25th Aug. 1914, *K. C. Joest 78081*; Pulney hills, 22nd March 1928, without coll. *78068*; Ponmachi Betta, Kollegal, Coimbatore, 7th Feb. 1930, *V, Narayanswamy 78804*; On the way to Thekumalai, Courtallum, 15th Dec. 1957, *K. Subramaniyan 9543*; Akkamalai to Anamalai, 12th Sept. 1961, *J. Joseph 26445*; Kuthraivetti, Thulukkamparai, Triunelveli, 31st Aug. 1963, *A. N. Henry 39294*; Near Pillar rocks, Kodaikanal, Madurai district, 27th July 1965, *K. M. Sebastine 49208*; Mahendragiri slopes, Kanyakumari district, 30th July 1966, *B. V. Shetty 54457*; Cumbummedu, Ramnad, 14th March 1970, *E. Vajravelu 65059*; Muthukurzhivayal, Kanyakumari, 27th Aug. 1976, *A. N. Henry 92803*; near Papanashanam falls, Tirunelvelly district, 27th Nov. 1986, *Subraminayan 13609*; Longwood reserve forest, Nilgiri, *s. d.*, *E. Vajravelu 67942* (MH).

Note: *Cyanotis arachnoidea* can be easily recognized by its arachnoid or cobwebby or silky pubescent woolly, robust, perennial habit; rosette and cauline, narrowly elongated, oblong–lanceolate, obtuse to acute leaves; terminal and axillary, more often sessile spikes and dark foveolate to smooth seeds. This is one of the variable species, closely related with Sri Lankan *Cyanotis thwaitesii* by having perennial rosettes, cobwebby pubescence, lanceolate leaves and floral character that made it difficult to distinguish both the species in a narrow context. A type specimen of *C. thwaitesii* from Sri Lanka, was avaliable to screen placed at CAL (*Thwaites* in *C. P. 2433*), but not found any peculiar character (apart from more linear and glabrous leaves) to conclude identity of Sri Lankan *C. thwaitesii* or its relation with Indian *C. arachnoidea*. More live and herbarium specimens need to be studied to draw any conclusion. Herbarium specimens placed at various herbaria in India, were labeled like *C. thwaitesii*, *C. obtusa*, *C. arachnoidea* var. *thwaitesii*, *C. fasciculata* var. *thwaitesii*, *C. arachnoidea* var. *obtusa* are now been found out to be *C. arachnoidea* only.

Extreme morphological variations, has been observed in live and herbarium specimens from different populations, even within population, but it is within a range of *Cyanotis arachnoidea*. Therefore, in the present investigation we treated *C. arachnoidea* in broader sense. According to Faden (2000), the Sri Lankan plants of *C. thwetesii* are distinct than the Indian *C. obtusa* [=*C. arachnoidea*], but we strongly think that all Indian plants tagged with *C. obtusa*, *C. thwaitesii* and various varieties belong to the same species.

3. *Cyanotis arcotensis* R.S.Rao in Blumea 14: 345. 1967; Karthik. et al., Fl. India. Enum. Monocot. 28: 1989. TYPE: Tippukadu, Arcot district, Tamil Nadu, India, 10th Nov. 1963, *Joseph 89886A* (holotype: CAL!; isotypes: *Joseph 89886B*, BSI!).

Cyanotis papilionacea auct. C.B.Clarke in DC., Monogr. Phan. 3: 246. 1881; Hassk. Commel. Ind. 158. 1870; Hook.f., Fl. Brit. Ind. 6: 384. 1894; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931; Rao and Kammathy in Notes Roy. Bot. Gard. Edinburgh 25(2): 185. 1964. *pro. parte. non* (Linn) Roem. and Schult.

Annual hirsute herb with fibrous roots; stem erect to slightly decumbent, branched from the base, if decumbent rooting sparsely from the nodes; leaf sheaths 0.8–1 cm long, ciliate at margins, leaves cauline, distichous, 3–10 × 0.4–1 cm, linear to lanceolate, hirsute, apex acute, base pointed or rounded, margin entire and finely ciliate; inflorescence mostly terminal comprises single to four cincinni, pedunculate, peduncle 1.5–6 cm long; bracts foliaceous; bracteoles ovate to acute or falcate, 1 × 1 cm, prominently curved at maturity (Rao, 1966), margin ciliate; flowers many per cincinni; sepals white, ovate–elliptic, pubescent; petals fused basally, free at apices, blue to pink; stamens 6, filaments *c.* 1 cm long, bearded with blue moniliform hairs, tumid apically, anthers yellow; style slender, glabrous (Rao, *loc. cit.*), or sparsely bearded; ovary hairy in upper half; capsule 3 × 2 mm, hairy above; seeds 2 per locule; seeds 1.5 × 1 mm, ovoid to ellipsoid in outline, testa dark brown to gray, warty or faintly reticulate, embryotega terminal, hilum ovoid.

Flowering and fruiting: October.

Distribution and ecology: Endemic to India: Tamil Nadu; known to occur in alluvial and lateritic soil.

Specimens examined: **INDIA**. **Tamil Nadu:** Srivilliputhur, Virudhunagar, 14th Nov. 1953, *J. S. Rao 96439*; Theppakadu, Mudumalai, 22nd Nov. 1963, *Ramamurthy 34316*; Jamnamrathur, North Arcot, 10th Nov. 1985, *M. B. Viswanathan 149338* (MH).

Note: Originally, the species collected from very few localities of Sothern India in between year 1963–1964, all those collections deposited in different herbaria as different types by Rao (1966). After studying the holotype (*Joseph 89886A*– CAL!), isotypes (*Joseph 89886B*– BSI!) and images of paratypes from E and K, it was found that the species is more close to *C. burmaniana* in its habit, pubescence, cincinni, flower and seed characters while differs in long, narrow, more hairy leaves and cincinni with long peduncles. No any qualitative difference found in *C. burmannia* and *C. arcotensis*, but to confirm the proper identity of this species, it needs further verification and have to see more live specimens.

4. *Cyanotis axillaris* (L.) Sweet, Hort. Brit.: 430.1826; C.B.Clarke in DC., Monogr. Phan. 3: 244. 1881; Dalz. and Gibs., Bombay Fl. 56. 1861; Hook.f., Fl. Brit. Ind. 6: 388. 1894; Cooke, Fl. Pres. Bombay 2: 794. 1908; Fischer in Gamble, Fl. Pres. Madras, 1550. 1931.

Amischophacelus axillaris (L.) Rao and Kammthy in J. Linn. Soc. Bot. 59: 306. 1966; Karthik. et al., Fl. India. Enum. Monocot. 23: 1989.

Tonningia axillaris (L.) O. Ktze., Rev. Gen. Pl. 2: 721. 1891.

Zygomanes axillaris (L.) Salisb. Trans. Hort. Soc. London, 1: 271. 1812.

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Commelina axillaris L., Sp. Pl. 42. 1753. TYPE: Plukenet, Phytogr., t. 174, f. 3. 1692 (lectotype designated by Faden, 2000). "Nir–pulli" Rheede, Hort. Malb. 10: 28, t. 13, 1690.

Annual herbs; roots thin fibrous; stems erect or creeping or scrambling and rooting at the nodes; much branched from the base, 30–40 cm; leaves all cauline; leaf sheath tubular to cucullate, leaf blade linear, 2–8(12) × 0.5–0.8 cm, abaxially glabrous or sparsely pubescent, oblong to linear lanceolate, apex acute to acuminate, base rounded to attenuate, margin entire, rarely ciliate; inflorescence axilary enclosed within leaf sheaths (bract); bracteoles *c.* 1 cm, linear, inserted, cincinni 3–6 flowered; sepals free, linear–lanceolate, 0.6–0.9 × 0.5 cm, sparsely to densely ciliolate; petals blue to bluish purple, *c.* 1.2 cm wide; stamens 6, filament densely bearded with moniliform hairs; style sparsely bearded, tumid at apex; ovary elliptic-ovate, sparsely pilose in upper half; capsule shortly stipitate to sessile, beaked or with three projections (horned), obovoid or oblong–ellipsoid, 3–6 × 1.5–2.5 mm, glabrous except the beak; seeds 2 per locule, ovoid to ellipsoid, compressed, truncate at base 1.5–3 × 1.8 mm, testa gray to gray brown, mottled, striate in between the deep reticulations or with puncticulate from the scattered deep pits, embryotega terminal, hilum punctiform.

Flowering and fruiting: Throughout year.

Distribution and ecology: One of the common herbs of wet places occurs throughout India, Sri Lanka to northern Australia and West Indies.

Note: Most distinctive species of the genus *Cyanotis*, beaked capsule and leaf sheath enclosed inflorescence are the diagnostic characters. Chiefly found in aquatic, marshy and wet habitat, within cultivation as a weed. Kammathy and Rao, 1964 and Rao and Kammathy, 1966 made two generic combinations, *Zygomanes* and *Amischophacelous* based on some identical generic characters and on cytological evidences, but apart from few similarities, no any convincing character to spill out genus from *Cyanotis.*

Type specimen of *C. cucullata* [=*Tradescantia cucullata* Roth (India, *Roth s. n.*)] placed at B, was collected by Heynii, owed and described by Roth from India and he stated, the species is distinct from *C. axillaris*, because of cucullate leaf spathe and glabrous filaments. Afterwards, many of Indian workers followed Roth's portrayal, many of them given vague description (like filaments are nearly glabrous, capsule hooded and all) to enumerate *C. cucullata* is a distinct species. In 1989, Naik and Nirgude proposed a new name with a status change and made a variety as *Tonningia axillaris* var. *depressa*. They were right in some circumstances like type of *Tradescantia cucullata* (B) having a naked filaments. However, the other characters stated by them when proposing the new name were vague viz. 'leaf sheath tubular' while the cucullate leaf sheaths can clearly seen in type. Further, they have given justification that "the later (after Roth) plants are not referable to *Tradescantia cucullata* Roth and it deserves the name". It is true that after Roth, no one has collected the specimens with bearded filaments but it does not mean that someone has to reduce the character like cucullate sheaths, which was used as epithet by Roth. (as *cucullata*) while describing the species.

Naik and Nirgude (1989) proposed var. *depressa* is under the genus *Tonningia*, which has been synonymised in *Cyanotis*, therefore the var. *depressa* need to be treated as again a new combination as '*Cyanotis axillaris* var. *depressa*'. However, in the original description Naik and Nirgude, omitted the unique character i.e. cucullate sheaths, from the type it is clear that the species has cucullate sheaths. Therefore, to avoid further misinterpretation, in present study, the variable forms of *Cyanotis axillaris* are referred as var. *cucullata.* Both the distinct verities are illustrated bellow,

1. Leaf sheaths tubular; capsule ellipsoid, stipitate, beaked……..…….....var. ***axillaris***
– Leaf sheaths cucullate; capsule oboviod, sessile, with three red projections at apex with depression or horn..……var. ***cucullata***

var. *axillaris*

Fig. 1; 10 C

Annual herb of moist and wet areas; leaf sheath tubular (slightly bulged during flowering and fruiting but never cucullate); leaves long, lanceolate, not succulent; capsule ellipsoid, sub-sessile or shortly stipitate, beaked at apex without any depression; seeds striate in between the deep striations.

Flowering and fruiting: Throughout year.

Distribution and ecology: Occurs throughout India, Sri Lanka to northern Australia and West Indies; commonly occurs in wet fields.

Specimens examined: **INDIA**. **Andhra Pradesh:** Addatigala, East Godavari, 16th Sept. 1956, *S. K. Wagh 77036*; Valley Gardens, Vishakhapattanam, 17th Oct. 1956, *S. K. Wagh 77034*; Shriharikotta, Nellore, 14th Jan. 1958, *S. K. Wagh 77042* (BLAT). **Karnataka:** Khanapur, Belgaum dist., 26th Sept. 2009, *M. D. Nandikar C0903* (SUK); Karwar, North Kannara, Oct. 1919, *Hall and McCann 77043, 77292* 'as *papilionacea*' (BLAT). **Kerala:** Nedumkayam, Eravikulam, 27th Nov. 1980, *P. Mathew 29182*; Karimpuzha, Eravikulam, 2nd June 1982, *P. Mathew 34322* (CALI); Muthunga WLS, Wayanad district, 29th Nov. 2002, *Joby Paul 892*; Nilambur forest, Malappuram district, 6th Jan. 2010, *Nampy 2725* (DEV). **Maharashtra:** Sanjay Gandhi National Park, Borivali, Mumbai, 26th Sept. 1953, *H. Santapau 77055*; Matunga, Mumbai, Aug. 1925, *R. D. Acland 77062, 63, 64*; Dattatray road, Malad, Mumbai, 4th Oct. 1957, *G. L. Shah 7706* (BLAT); Ajara–Amboli road, Kolhapur, 3rd Oct. 2009, *M. D. Nandikar C0924* (SUK). **Odisha:** Koinjur to Kusadandi, 26th June 1900, *s. coll. 73089* (MH); Puri, Odisha, Bakkond WLS, 3rd Dec. 2011, *Nampy and Sheeba 4297* (DEV). **Tamil Nadu:** North Arcot, 12th Dec. 1958, *Subramanayan 14542*; Chidambarnath, 31st Jan. 1958, *K. M. Sebastine 10138*; Chingulpet, Coimbatore, Sept. 1958, *K.*

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Subramanayan 14541; Bund side, Vedanthangal Sanctuary, 26th Jan. 1976, *A. N. Henry 91658*; South Arcot, 18th Jan. 1978, *K. Ramamurthy 100644*; Kanyakumari, 17th Oct. 1985, *R. Gopalan 166855*; Selugai, Ramnathpuram, 11th Nov. 1989, *Balasubramanayan 146152* (MH). **West Bengal:** Plant of Gangetic trop., July 1841, *Hook. f. and Thomson s. n.* (MH).

var. *cucullata* (Roth) Nandikar and Gurav ***comb. et stat. nov.***

Fig. 10 D

Tradescantia cucullata Roth, Nov. Pl. Sp. 189. 1821. TYPE: India, 1814, *Roth s. n.* (holotype: B, *sh. no. 296350*) excluding "filamentis imberbibus".

Cyanotis cucullata (Roth) Kunth, Enum. Pl. 4: 107. 1843; C.B.Clarke in DC., Monogr. Phan. 3: 245. 1881; Hook.f., Fl. Brit. Ind. 6: 389. 1894; Fischer in Gamble, Fl. Pres. Madras, 1550. 1931; Rao and Kammathy in J. Bombay Nat. Hist. Soc. 59:1. 1962; Karthik. et al., Fl. India Enum. Monocot. 28: 1989.

Zygomanes cucullata (Roth) Rao and Kammathy in Notes Roy. Bot. Gard. Edinburgh 25(2): 187. 1964.

Amischophacelus cucullata (Roth) Rolla and Kammathy in J. Linn. Soc. Bot. 59: 306. 1966.

Tonningia cucullata (Roth) Kuntze, Revis. Gen. Pl. 2: 722. 1891.

Tonningia axillaris (L.) Rafin. var. *depressa* Naik and Nirgude in Asian J. Pl. Sc. 1: 75. 1989; Naik in Fl. of Marathwada 2: 883. 1998. ***syn. nov.*** excluding description "leaf sheath tubular".

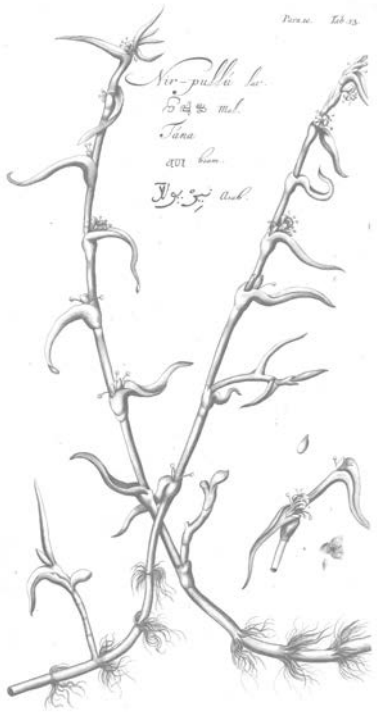


Fig. 1. ***Cyanotis axillaris*** **(L.) Sweet A: Habit, B: Flowering shoots, C: Flower and stamen [image reproduced from "Nir–pulli" Rheede, Hort. Malb. 10: 28, t. 13, 1690]**

Annual herb of dry or semiarid situations; leaf sheath cucullate; leaves small, succulent; capsule oboviod, sessile, with three red projections at apex with depression; seeds puncticulate from the scattered deep pits.

Flowering and fruiting: August to January.

Distribution and ecology: Endemic to India: Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Madhya Pradesh, Rajasthan, species is more common in Deccan peninsular India to Gujarat, East coast of India and Maharashtra; mostly along the cultivated weeds and barren fields.

Specimens examined: **INDIA**. **Andhra Pradesh:** Osmania University campus, Hyderabad, *Kammathy 73974* (BSI); Nagarjunsagar, Nalconda district, 13th Dec. 1959, *K. M. Sebastine 9731* (CAL, MH). **Gujarat:** Behind station Rajkot, Saurashtra, 20th Oct. 1953, *H. Santapau 77209* (BLAT). **Karnataka**: Badami plateau, Bagalkot, 11th Nov. 2010, *M. D. Nandikar C1006* (SUK). **Maharashtra:** Diva Ghat, Pune district, Dec. 1917, *Blatter and McCann 77202*; near bus stand Purandhar, Pune district, 11th Oct. 1950, *H. Santapau 77201* (BLAT); Pandharpur, Solapur district, 26th Aug. 1912, *Wiliam Butus 3476*; near Veruba hill, 3 miles from Atit, Satara district, *Rolla Rao 73036* (BSI). Kankuri, Nashik district, 31st Dec. 1964, *Arora 1363* (CAL). **Madhya Pradesh:** Abaidullahganj, East Bhopal, *s. d.*, *Wadhwa 59597* (BSI). **Rajasthan:** Banswara to Udaipur road, Banswara, 23rd Aug. 1976, *V. Singh 2994* (CAL). **Tamil Nadu**: Near Marudamalai temple, Coimbatore, 24th Nov. 2010, *Nandikar and Gurav C1003* (SUK).

5. *Cyanotis burmanniana* Wight, Icon. Pl. Ind. Orient. 6: 34. t. 2089. 1853; Hassk. Commel. Ind. 158: 1870; Karthik. et al., Fl. India. Enum. Monocot. 26: 1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 121. 2000. TYPE: India, Kerala, Kollam (Quilon), Oct. 1835, *Wight s.n.* (lectotype: K, *sh. no. 854122*; isolectotypes: K, *sh. no. 854123*), designated here.

Cyanotis papilionacea auct. Hook.f. Fl. Brit. Ind. 6: 384. 1894; Cooke, Fl. Pres. Bombay. 2: 791. 1908; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931, *pro. parte. non* (L.) Roem. and Schult.

Cyanotis papilionacea var. *burmanniana* auct. (Wight) C.B.Clarke in DC., Monogr. Phan. 3: 246. 1881; Hook. f. Fl. Brit. Ind. 6: 385. 1894, *non* (L.) Roem. and Schult.

Cyanotis vaginata Wight, Icon. Pl. Ind. Orient. 6: 34. t. 2088. 1853; Hook.f., Fl. Brit. Ind. 6: 385. 1894. TYPE: India, Malabar (Kerala), *s.d. Wight s.n.* (lectotype: K, *sh. no. 854120*; isolectotype: K, *sh. no. 854121*) designated here.

Cyanotis papilionacea var. *vaginata* auct. (Wight) Fischer in Gamble, Fl. Pres. Madras, 1549. 1931. *non* (L.) Roem. and Schult.

Cyanotis hispida Dalzell in Hooker's J. Bot. Kew Gard. Misc. 3: 139. 1851. TYPE: India, Malwan (Bombay) *Dalzell 745* (lectotype: CAL!, isolectotype: NYBG), designated here.

Cyanotis hirtella Miq. ex Hassk., Commelin. Ind. 112. 1870. TYPE: India, Mangalore (North Kanara), 1847, *Hohenacker, R. F. 130* (lectotype: E, *sh. no. 393349*; isolectotypes: S, *sh. no. S-G-8065*, C, *sh. no. 10009567*), designated here.

Fig. 2; 10 E

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Erect to decumbent, procumbent or profusely branched, annual herb, 5–40 cm long or spreads; root fibrous; leaves cauline, distichous, sheaths 0.1–0.5 cm long, puberulous to velutinous, lamina ovate to elliptic or lanceolate, 0.5–10 × 0.4–0.8(–1) cm, apex acute, base cuneate, lamina of both the surfaces are densely to sparsely pilose; inflorescence terminal and axillary, with 2–5 cincinni, cincinni pedunculate, peduncle (0.5–)1–4(–6) cm long, tomentose; bract ovate to lanceolate, foliaceous, mostly shorter than the cincinni; bracteoles ovate, margins ciliate, surface variously pubescent or rarely glabrous; flowers few–many per cincinni, bisexual; sepals lanceolate–oblanceolate, 0.4 × 0.5 cm, sparsely to densely pilose; corolla blue to pale pink or violet, lobes free, reflexed; stamens exserted half of the corolla tube, filament densely bearded with blue to violet moniliform hairs, below sub-apical swelling, anthers black with yellow dot; style bearded as in stamens, sub-equal to stamen filaments, sub-apically swelled; capsule 2 × 2 mm, sparsely pilose at apex and along the ridges; seeds 1–2 per locule, 1–2 × 1–2 mm, ovoid to ellipsoid in outline, testa brown, striate.

Flowering and fruiting: September to January.

Distribution and ecology: Peninsular India and Sri Lanka; common in grasslands of southern India during monsoon, on barren rock (apparently lithophytic), along sandy sea shore, low to high altitude lateritic plateaus.



Fig. 2. ***Cyanotis burmanniana*** **Wight, A: Habit, B: Flowering shoots, C: Inflorescences, D: Flower, E: Stamen, F: Pistil, G: Capsule, H: Seeds dorsal and ventral view respectively. Drawn by Mayur Nandikar from** ***Gurav & Nandikar C1110*** **(BLAT).**

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Specimens examined: **INDIA**. **Andhra Pradesh:** Northern hump of the Island, Rameshwaram, Ramanathapuram district, 23rd Dec. 1960, *V. A. Rao 603* (CAL). **Goa:** Ordofond, Butpal, 4th mile, 25th Aug. 1963, *K. C. Kanodia 89536* (CAL). **Kerala:** Waynad to Calicut road, 19th Sept. 2011, *S. S. Kamble and Nandikar C1107* (SUK); Chikala–Chalakudy, Trichur, 9th Dec. 1965, *K. M. Sebastine 26689* 'as *C. papilionacea*'; Chalakudy to Adirapally, Trichur district, 27th Sept. 1982, *K. Ramamurthy 74881*; Way to Kattapana, Iddukki, 5th Oct. 1983, *C. N. Mohanan 80008* (CAL); Alleppey (Alappuzha), Nov. 1910, *Meebold 12724*; Muzhapplangad, Cannanore, 17th Aug. 1980, *V. S. Ramchandran 66999*; on the way from Iddukki to Kattappana, Iddukki, 8th Nov. 1981, *C. N. Mohanan 72416*; Calvary Mountain, Erattayar, Iddukki, 14th Oct. 1982, *C. N. Mohanan and V. S. Ramchandran 74622* 'as *C. fasciculata*'; Beemanadi, 250 mt., Kasargod district, 27th Sept. 1982, *R. Ansari 74343*; Aruvanpara, Silent Valley National Park, 20th Aug. 1982, *Satish Kumar 10726*; Malappara, Periyar, *s. d., Jomy Augustine 17175* 'as *C. fasciculata*'; Vadapuram–Anapara, Ervivullam, 31st Aug. 1989, *P. Mathew 33479*; Uallakkadavu, Periyar, 9th Nov. 1996, *Jomy A. 16900* (CALI); way to Kakkadampoil, 13th Nov. 2009, *Nampy and Manudev 1259* (DEV); Kannoth, Malabar, 5th Dec. 1913, *s. coll. 52533* (MH). **Maharashtra:** Vengurla, Sindhudurg, 17th Sept. 2011, *S. S. Kamble and Nandikar C1101*; Dukanwadi, Kudal, Sindhudurg, 2nd Oct. 2011, *Gurav and Nandikar C1110* (BLAT, BSI, CAL, CALI, MH, SUK). **Tamil Nadu:** Poomachi, Anamalai, 10th Oct. 1908, *C. A. Barber 3708*; *s. loc. Herb. Wight 1163*; Alleppy, Travancore, 13th Aug. 1913, *M. Rama Rao 2221* 'as *C. vaginata*'; Calimere, Tanjavur, 17th Jan. 1961, *J. Ellis 11751* (CAL).

Note: Common and widespread plant fromwest coast and southern India, morphologically extremely variable, consist of 3 to 4 morphotypes depending on their habitats. However, under cultivation not retains natural habit. In India this species was described under different epithets and verieties viz. *C. vaginata*, *C. papillionacea*, *C. papillionacea* var. *burmaniana*, *C. hispida* and *C. hirtella*. Most of these names were synonymised earlier within *C. burmaniana* while *C. papillionacea* dropped by Rao (1964) because he found that it was based on a specimen of *C. cristata*.

6. *Cyanotis cristata* (L.) D.Don, Prodr. Fl. Nepal. 46: 1825; Hassk., Commel. Ind. 120. 1870; Wight, Icon. Pl. Ind. Orient. 32. t. 2082. 1853; C.B.Clarke in DC., Monogr. Phan. 3: 247. 1881; Hook.f., Fl. Brit. Ind. 6: 385. 1894; Cooke, Fl. Pres. Bombay. 2: 793. 1908; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931; Karthik. et al., Fl. India. Enum. Monocot. 26: 1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 123. 2000.

Commelina cristata L., Sp. Pl. 1: 42. 1753, *non* Burm. Fl. Ind. t. 7. fig. 1. 1768. TYPE: Illustr. in *Hermann herb*. used by Linnaeus, Fl. Zeyl. 13. 1747, to illustrate his species 32; (BM), lectotype designated by Faden, Revis. Handb. Fl. Ceylon 14: 123. 2000.

Cyanotis racemosa auct. C.B.Clarke, Commel. et Cryt. Beng. 56, t. 36. 1874, *non* Heyne ex Hassk, 1870.

Tradescantia cristata L., Syst. Nat. (ed. 12) 233. 1767. TYPE: Uppsala, Sweden, *s. coll.*, Linnean Herb. *406-6* (LINN).

Cyanotis papilionacea (L.) Roem. and Schult., Syst. Veg. 7: 1151. 1830. *nom. illeg.*

Fig. 3; 10 F

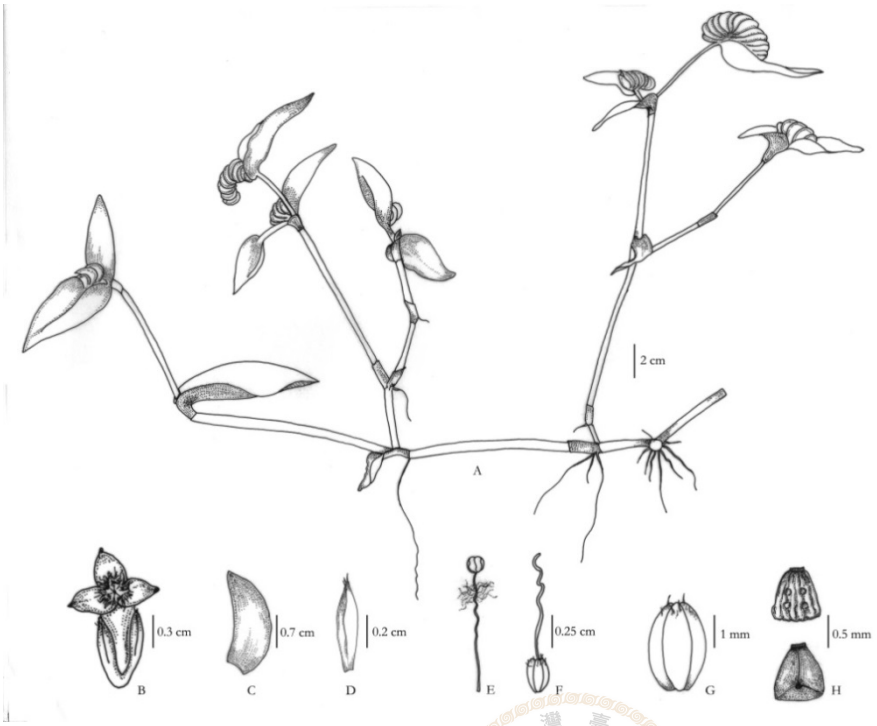


Fig. 3: ***Cyanotis cristata*** **(L.) D.Don, A: Habit, B: Flower, C. Bracteole, D. Sepal, E. Stamen, F. Pistil, G. Capsule, H. Seeds dorsal and ventral view. Drawn by Mayur Nandikar from** ***M.D.Nandikar C1008*** **(SUK).**

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Branched to unbranched, annual herb with erect to ascending or decumbent shoots; roots fibrous; stem if branched, branched from the base, rooting at lower nodes, glabrous or with line of cilia on internodes, internodes 1–5 cm; leaves cauline, sheathes 0.1–1.8 cm long, with a line of hairs along the fused edges, sometimes sparsely pilose elsewhere, ciliate at the apex, lamina ovate-elliptic to oblong–lanceolate, 1–10 × 0.3–2 cm, acute or obtuse at apex, cordate or rounded base, ciliate at margin, surfaces glabrous; inflorescences terminal and axillary, solitary, deeply recurved cymes, pedunculate, peduncles 1–5, 0.5–8 cm long, with a line of pubescence opposite the bract, otherwise glabrous; bracts foliaceous, ovate–lanceolate, much exceeding the cymes, 1–6 cm long, glabrous, apex acuminate, margins cilate or ciliolate, glabrous; bracteoles falcate, 0.5–1.5 × 0.3–0.6 cm, glabrous on the margin, glabrous; flowers blue to bluish purple; sepals oblong to narrowly oblanceolate, 0.2–0.6 cm long, sparsely pilose at the apex; petals not much exceeding from sepals, united forming a tube, apices free, lobed, lobes ovate, apex acute; stamen filaments twisted, densely bearded with moniliform blue hairs, anthers yellow or orange yellow; style twisted, glabrous; capsule 2–3 × 1.2–2 mm, pilose at the apex; seeds 1–2 per locule, ovoid to ellipsoid in outline, 1–1.5 × 0.7–1 mm, testa brown, striated with 1–4, circular pits on dorsal side of the midline.

Flowering and fruiting: Throughout year.

Distribution and ecology: Common, widespread throughout India; East Asia; an common herbaceous element of the wet soil, roadside ditches and banks, along the ghats, undergrowth of forests; sun exposed or partial shade.

Specimens examined: **INDIA. Andhra Pradesh:** Kondapalli, Krishna, 24th Aug. 1956, *S. K. Wagh 77123*; Mellavagu, Guntur, 4th Sept. 1956, *S. K. Wagh 77124* (BLAT); Tirupati, 12th Dec. 1987, *Ranga Charyulu 148234* (MH). **Arunachal Pradesh:** Aka Hills, Aug. 1934, *N. L. Bor 17263*; Nongpoh, 29th July 1964, *J. Joseph 37401* (ASSAM). **Gujarat:** Junagadh forest road, Junagadh, 28th Aug. 1952, *H. Santapau 77098* (BLAT). **Karnataka:** Madikeri, 26th Nov. 2010, *Gurav and Nandikar C1005*; Badami plateau, Bagalkot, 11th Nov. 2010, *M. D. Nandikar C1008*; Charmudi Ghat, 8th Nov. 2011, *M. D. Nandikar C1113* (SUK). **Kerala:** J. L. Hills, Sultan Battery, Calicut, 12th Aug. 1964, *B. D. Naithani 48451*; Kuttukanam, Kottayam, 21st Sept. 1964, *K. Viveknathan 40017*; Palghat, 19th July 1964, *K. M. Sebastine 39737*; Thekkady, 17th Nov. 1975, *K. Viveknathan 90953*; Quilon, 26th July 1978, *C. N. Mohanan 134005*; Mukkali forest, Palghat, 11th Oct. 1979, *N. C. Nair 125314*; Tellicherry, Cannanore, 16th Aug. 1980. *V. S. Ramchandran 132626*; Idukki, 23rd Sept. 1981, *C. N. Mohanan and Ramanujam 137579*; Walyar. Malabar, *s. d.*, *S. R. Raju and Ratnavelu 78073*; Trichur, 26th Nov. 1982, *R. Rajan 131534* (MH); Canoli, Eravikulam, 7th Nov. 1980, *P. Mathew 29115*; Neyyar, Trivendrum, 28th Sept. 1993, *N. Mohanan 11557* (CALI) Karachkkaval, Periyar, *s. d.*, *Jomy Augustine 13936* (CALI); Vilanyad forest, Kozhikode, 26th Sept. 2003, *Nampy and Joby 981* (DEV). **Maharashtra:** Chatushringi, Pune, 20th July 1916, *Moses Ezekiel 77277*; Battery hill, Khandala, Pune, 5th Sept. 1943, *H. Santapau 77164*; Marve road, Malad, Mumbai, 4th Aug. 1956, *G. L. Shah 77129*; Tungar hills, Thane, 21st Aug. 1956, *H. Santapau 77147*; Aarey Milk colony, Goregaon, Mumbai, 6th Aug. 1958, *S. C. Tavakari 77189*; Vihar Lake, Mumbai, 22nd Aug. 1959, *H. Santapau 77136*; Matheran near forest office, Raigad district, 10th Sept. 1959, *N. A. Irani 77118*; Koyna Dam, Satara district, 12th Nov. 1960, *P. Divakar 77182* (BLAT). **Tamil Nadu:** Perumal hills, Thuraiyur, Tiruchirappalli, 15th Aug. 1906, *N. P. Murgesan 305* (Herb. Madras Christan College, Chennai); Rawnad, 29th Jan. 1945, *Daniel and Raju 88176*; Trichurpalli, 29th Oct. 1958, *K. M. Sebastine 13811*; Tirunevelly, 12th Nov. 1962, *J. Joseph 30104*; Flora of Madras state without loc. 24th Nov. 1964, *E. Vajravellu 42981*; Salem, 2nd Dec. 1964, *A. V. N. Rao 44437*; Ramnathapuram, 29th Nov. 1977, *N. C. Nair 101698*; Jamnarmarathur, Jawadi Hills, 10th Nov. 1985, *Viwanathan 152517*; Ramnathapuram, 30th Dec 1987, *Balasubraminam 146221* (MH). **Tripura:** Cherilam Reserve Forest, Tripura, 27th August 1957, *R. S. Rao 8853* (ASSAM).

Note: This is the most common species of genus *Cyanotis* in India, easily distinguished by ovate to lanceolate, foliaceous bracts and bi-seriately arranged falcate bracteoles.

7. *Cyanotis fasciculata* (B. Heyne ex Roth) Schult.f. in Roem. et Schult., Syst. Veg. 7: 1152. 1830; Dalz. and Gibs., Bombay Fl. 255: 1861; Hook.f., Fl. Brit. Ind. 6: 387. 1894; Cooke, Fl. Pres. Bombay. 2. 793. 1908; Fischer in Gamble, Fl. Pres. Madras, 1550. 1931; Karthik. et al., Fl. India. Enum. Monocot. 26. 1989.

Tonningia fasciculata (B. Heyne ex Roth) Kuntze in Revis. Gen. Pl. 2: 722. 1891.

Tradescantia fasciculata B. Heyne ex Roth, Nov. Pl. Sp. 189. 1821. TYPE: Indian Orientalis, Herb. Heyne.

Cyanotis lawiana Wight, Icon. Pl. Ind. Orient. 6: 32. t. 2086. 1853. TYPE: India, Karnataka, Belgaum, *s.d.*, *Law 89* (holotype: K, *sh. no. 854099*).

Tradescantia rupestris J.S.Law ex J.Graham Cat. Pl. Bombay, 223. 1839. TYPE: Purusgur Fort, Near Dharwad, North Kanara, India *Herb. Stocks* or *Law s.n.* (lectotype: K, *sh. no. 854216*), designated here.

Cyanotis karliana Hassk., Commelin. Ind. 146: 1870; Karthik. *et al.*, Fl. India. Enum. Monocot. 26.1989. TYPE: Poonah (Pune) India, Hugel? ***pro parte***

Fig. 4; 11 A-B; 13 D-F

Ascending to creeping or erect, branched annual herb with densely lanate young branches; roots fibrous; stem purple or green; internodes 0.7–5 cm, sparsely cobwebby; leaf heath 0.5–1.2 cm, cobwebby, overlapping in younger branches and lower nodes, mouth ciliate; leaves cauline, distichous, sometimes succulent, purple-green, lanceolate, 0.8–5(–6) × 0.3–1(–1.2) cm, base cuneate, margin ciliate, surface glabrous to densely or sparsely lanate, densely lanate in case of younger branches, apex acuminate; inflorescence terminal or axillary, peduncles up to 4 cm long, sparsely cobwebby; bracts foliaceous, lanceolate-ovate, 0.2–0.4 × 0.3–0.8 cm, margins ciliate, lower surface lanate, apex acuminate; bracteoles purple, lanceolate, 0.2–0.6 mm, apex acuminate, margin ciliate, cobwebby; sepals pale white, lanceolate, 0.1 × 0.5 cm, basally connate, margin ciliate; petals blue to pink, 0.4 × 0.8 cm, united; stamenal filaments bearded with blue-purple and white moniliform hairs with subapical swelling; ovary, ovate-oblong, apex ciliate; style blue, bearded as in stamens, with subapical swelling; capsule yellowish

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Fig. 4. ***Cyanotis fasciculata*** **(B.Heyne ex Roth) Schult. and Schult.f. A: Habit, B: Inflorescence, C: Flower, D: Stamen, E: Pistil, F: Capsule, G and H: Seeds dorsal and ventral view respectively. Drawn by Mayur Nandikar from** ***M.D.Nandikar C102*** **(SUK)**

brown, ovoid, 1 × 2–3 mm, apex hirsute; seeds deltoid or pyramidal, 0.5 × 1–1.5 mm, brown or grey with mid ventral ridge, testa rugose, hilum ventral, rounded, embryotega terminal.

Flowering and fruiting: August to December.

Distribution and ecology: Endemic to India: Andhra Pradesh, Assam, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Rajasthan and Tamil Nadu. It is found growing on exposed rock crevices and soil pockets on rocky hills at an elevation of 600–1000 m.

Specimens examined: **INDIA**. **Andhra Pradesh:** Sissini, NEFA, *s. d.*, *R. S. Rao 1433* (ASSAM); way to Pathalaganga, Kurnul district, 20th Oct. 1964, *J. L. Ellis 22112* (CAL). **Gujrat:** Sasangiri (Gir), Junagadh, 22nd Aug. 1960, *S. R. Rao 63875* (CAL). **Karnataka:** Badami plateau, Bagalkot, 11th Nov. 2010, *M. D. Nandikar C1007* (SUK). **Maharashtra:** Shivaji University campus, Kolhapur, 12th Oct. 2009, *M. D. Nandikar 102* (SUK); Ganesh khind, Pune, Sept. 1908, *G. B. Patwardhan 1652*; Junnar, Pune, 10th Oct. 1962, *R. S. Rao 83577*; Khamdale, Chandgad, Kolhapur, 9th Aug. 1971, *R. S. Rao 131572*; Katraj Ghat, Pune district, *s. d.*, *R. K. Bhide 1682* (BSI); Katraj, Pune, 6th Oct. 1957, *G. S. Puri 25602*; Seminary Hills, Nagpur, 1st Sept. 1959, *Mukharjee 618*; Khadakwasala, Pune, 15th Sept. 1960, *R. S. Raghavan 64265* (CAL). **Madhya Pradesh:** Sundartekari, Indore, 9th Sept. 1986, *Khanna and Saran 37438* (BSA); Sanchi, Bhopal (Flora of Central India), Sept. 1908, *Meebold 9044* (CAL). **Rajasthan:** Bhawani Mandir, Jhalawar, 26th Sept. 1964, *B. M. Wadhwa* (BSA, CAL); Canoor Ghat, Oct. 1910, *Meebold 12006*; Manigudi, Nilgiri district, Nov. 1986, *Gamble 18491*; Amer, Jaipur, 20th Sept. 1964, *S. Sharma 846* (CAL). **Tamil Nadu:** Hassanur, Coimbatore, 21st Aug. 1914, *s.coll. 10542* (MH); near Marudamalai temple, Coimbatore, 24th Nov. 2010, *Nandikar and Gurav C1002* (BSI, CAL, SUK).

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Note: This is one of the common, widespread and variable species of *Cyanotis* in peninsular India. Clarke (1881) has made varieties based on variation in habit and pubescence, these varieties can be recognized easily in the field and herbariums also, but most distinctive element from this complex is *C. glabrescens* which is described below as a distinct speices.

8. *Cyanotis glabrescens* (C.B.Clarke) Nandikar and Gurav ***comb. et stat nov.***

Cyanotis fasciculata (B.Heyne ex Roth) Schult. and Schult.f. var. *glabrescens* C.B.Clarke in DC., Monogr. Phan. 3: 253. 1881; Hook.f., Fl. Brit. Ind. 6: 388. 1894; Cooke, Fl. Pres. Bombay. 2: 793.1908; Karthik. et al., Fl. India. Enum. Monocot. 26.1989. TYPE: India, Belgaum, *Ritchie n. 746* (holotype: K!).

Cyanotis karliana Hassk., Commelin. Ind. 146: 1870; Karthik. et al., Fl. India. Enum. Monocot. 26.1989. TYPE: Poonah (Pune) India, *Hugel* ? ***pro parte***

Fig. 5; 11 C; 13 A-C

Erect to ascending, annual herbs; roots fibrous; stem 15–50 cm high, rooting at lower nodes; internodes 2.5–10 cm long, green to purple, terete, ciliate on ridge; nodes swollen; sheath 0.2–1 cm long, margin with scattered hairs, densely hairy along the fused edges at base; leaves linear-lanceolate, (1.5–)5 × 0.5(–1) cm, glabrous, lamina entire, apex acute to acuminate, margins finely hairy; inflorescences terminal and axillary, composed of 2–6 flowered cincinni, leaf opposed; peduncle (0.3–)0.5–4(–5) cm long, with a line of cilia; bract foliaceous, obovate–lanceolate, longer than (rarely equal to or shorter than) cincinni, (0.5–)1 × 0.2–0.5 cm, margin entire, sparsely to densely hairy, surfaces glabrous, apex acute; bracteoles falcate, (0.3–)0.6 × 0.1 cm, sparsely to densely bearded on surface and margins with cobwebby hairs; flowers *c*. 1 cm long; sepals 0.3–0.5 cm long, free, elliptic to lanceolate, basally densely bearded with cobwebby hairs, glabrous above; petals 0.5–0.7 cm wide, fused to form a tube below, lobes spreading, blue; stamens 6, filaments 0.8 cm long, filiform, spirally twisted, usually with subapical swellings, bearded apically with blue moniliform hairs, anthers elliptic, *c*. 0.1 cm long, yellow to orange yellow; ovary 0.1 cm long with tuft hairs at apex, oblong; style 0.8 cm long with the subapical swelling, glabrous or sparsely bearded with blue hairs; stigma simple; capsule 3 × 2(–3) mm, oblong, tri-valved, dehiscent, apex densely covered with tuft, pointed hairs, sparsely on the ridges; seeds 1–2 per locule (sometimes capsules are single seeded and indehiscent), elongate or elliptical in outline, 1.5 × 1–1.5 mm, testa brown, striate, finely pitted dorsally; embryotega terminal; hilum ventral, rounded.

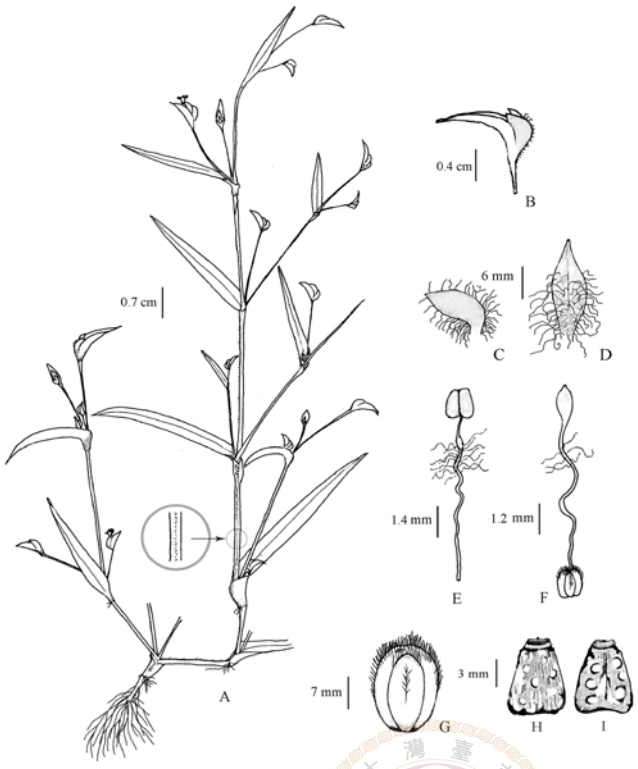


Fig. 5. *Cyanotis glabrescens* (C. B. Clarke) Nandikar and Gurav A: Habit, B: Bract and bracteole with short peduncle, C: Bracteole, D: Sepal, E: Stamen, F: Pistil, G: Capsule, H and I: Dorsal and ventral view of seeds. Drawn by Mayur Nandikar from *M.D.Nandikar 096*(SUK)

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Flowering and fruiting**:** August to November.

Distribution and ecology: Endemic to peninsular India. It commonly occurs in Konkan and North Kanara, in middle to high altitude lateritic plateaus of northern Western Ghats at 800–1200 m. It grows in lateritic, red soil and on rock ledges; apparently look like lithophytes. Plants of *Cyanotis glabrescens* are frequently associated with *Murdannia nimmoniana* (J. Graham) Bole & M. R. Almeida, *Murdannia versicolor* (Dalzell) Brückner, *Rotala densiflora* Koehne and *Flemingia nilgiriensis* Wight ex T. Cooke.

Specimens examined: **INDIA. Maharashtra:** Wilson Point, Mahabaleshwar, 1958, *H. Santapau 77220*; Matheran, Aug.1924, *R. D. Acland 77246* (BLAT); Khandala, 22 Sept. 1902, *G. A. Gammie 1691, 1681* Cooke's Herbarium; Panchgani, 24th Aug.1892, T. *Cooke 1684, 1686, 1688, 1689*; Khandala to Khopoli, 30th Aug.1902, *R. K. Bhide 1690*; Sakarpathan Plateau, Lonavala, 29th Sept.1964, *B. Venkata Reddi 98772, 100924*; Lingmala, Mahabaleshwar, 15th Oct.1961, *R. V. Kammathy 32826*; Table Land, Panchagani, 14th Oct.1961, *R. V. Kammathy 328021*; Danoli, Ratanagiri District, 18th Sept.1964, *R. D. Pataskar 02127*; Sinhagad, 2nd Sept.1966, *M. Y. Ansari 104855* (BSI); Shelap, Radhanagari, elev. 900-1100m, 18th Oct.2009, *M. D. Nandikar 108*; Morjai, Gaganbawda, 16th Sept.2009, *M. D. Nandikar 096*, 097; Radhanagari, 24th Sept.2010, *M. D. Nandikar 336* (SUK). **Karnataka**: Belgaum, *Ritchie n. 745* (E); Kankumbi, Belgaum, 26th Sept.2008, *M. D. Nandikar 043* (SUK); Hulical Ghat, 25th Oct. 1885, *W. A. Talbot 1351*; Anmod, north Kanara, 15th Sept. 1891, *W. A. Talbot 2603*; Castle Rock, north Kanara, Oct. 1908, *Meebold 10678* (CAL); Belgaum, on the roadside rock, *Ritchie 745* (E).

Note 1: *Cyanotis fasciculata* (B.Heyne ex Roth) Schult.f. var. *glabrescens* C.B.Clarke (1881: 253), was based on a Ritchie's collection from Belgaum, Karnataka state of India. Clarke (*loc.cit.*) recognized three varieties under *C. fasciculata* (B.Heyne ex Roth) Schult.f.: *C. fasciculata* var. *glabrescens* C.B.Clarke, with linear, glabrous, minutely reticulate leaves, glabrous bracts and woolly bracteoles; *C. fasciculata* var. *rosea* (Wight) C.B.Clarke, with sessile, ovate, obtuse leaves; *Cyanotis fasciculata* var. *thwaitesii* (Hassk.) C.B.Clarke, with its dense divaricate branches, was regarded by Clarke as intermediate between *C. arachnoidea* C.B.Clarke and *C. fasciculata*. *Cyanotis fasciculata* var. *thwaitesii* is now recognized as distinct species (*C. thwaitesii* Hassk.) because of its diagnostic rosette leaves and perennial habit (Faden, 2000). However, *C. fasciculata* var. *rosea* needs further study to establish its identity and affinities. Subsequently, Hooker (1894) and Cooke (1908) followed the Clarke's depiction to articulate *C. fasciculata* var. *glabrescens*. In addition, Cooke examined Ritchie's collection and widened the distribution of *C. fasciculata* var. *glabrescens* by adding his own collection (24 Aug. 1892, *T. Cooke 1684, 1686, 1688, 1689* placed at BSI) from Panchgani, Satara district, Maharashtra State, even though he might not have critically examined the characters and rather followed Clarke's portrayal and this interpretation has generally been followed by subsequent workers.

Clarke in 1871 doubted the existence of Wight's *Cyanotis lawiana* Wight (1853: 2086), *C. rosea* Wight (1853: 2086), *C. sarmentosa* Wight (1853: 2087), *C. dichrotricha* Wight (1853: 2087) and *C. decumbens* Wight (1853: 2088) as distinct species. He opined that all these species should be reduced to varieties of *C. fasciculata* and *C. barbata* D.Don (1825: 46). He also stated that the colour of petals and colour of filament hairs are quite variable in the genus *Cyanotis*. In addition to this, characters such as habit, leaves, inflorescence, seeds, etc. are also pinpointing the species complex within genus, and such characters warranted distinct species status e.g. *Cyanotis sarmentosa* and *C. barbata* are recently synonymized in *C. adscendens* Dalzell and *C. vaga* (Lour.) Schult.f. respectively.

Note 2: *Cyanotis glabrescens* appears to be most closely related to *C. fasciculata*, a widely distributed species throughout peninsular India, with which it shares some similarities in their succulent habit, inflorescence, and capsule shape and size. *C. glabrescens* is a distinctive species characterized by glabrous habit with a line of cilia on the stem, linear-lanceolate leaves, 2–6 flowered cymes with long glabrous peduncles, single-coloured moniliform hairs on filament and elongate to elliptic, striate seeds with fine pits on the dorsal sides.

9. ***Cyanotis pilosa*** Schult.f. in Syst. Veg. 7: 1154. 1830; C.B.Clarke in DC., Monogr. Phan. 3: 251. 1881; Hook.f., Fl. Brit. Ind. 6: 387. 1894; Fischer in Gamble, Fl. Pres. Madras, 1549. 1931; Karthik. et al., Fl. India. Enum. Monocot. 26. 1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 129. 2000. TYPE: India, 1800, *Klein s. n.* in Willdenow Herbarium no. *6362* (holotype: B, *sh. no. B-W-6362*).

Cyanotis wightii C.B.Clarke in DC., Monogr. Phan. 3: 250 1881; Cooke, Fl. Pres. Bombay. 2: 793. 1908. Replaced name for: *Cyanotis longifolia* Wight, Icon. Pl. Ind. Orient. 6: 33, t. 2084. 1853, *non* Benth, 1849. *nom.illeg.* TYPE: India, Tamil Nadu, Bolamputty, near Coimbatore, November 1852, *Wight s.n.* (lectotype: K, *sh. no. 854105*; isolectotype: associated material with Bolamputty, marked with arrow by Faden, 1978, pasted on sheet from Iyamallay, September 1852, *Wight s.n. sh. no. 854106*, non *sh. no. 854107*), designated here.

Fig. 6; 12 A

Robust perennial, rosette herb; root fibrous, thick; stems (flowering shoots) lateral, elongate, branched, usually villous, ascending to erect, rooting at lower nodes; internodes 2–10 cm long; rosette leaves spirally arranged, sheaths 1–2 cm long, loose, pillose, ciliate at margins, lamina linear to lanceolate, 8–60 × 0.5–1 cm, apex acuminate, base cuneate, surface sparsely pillose,

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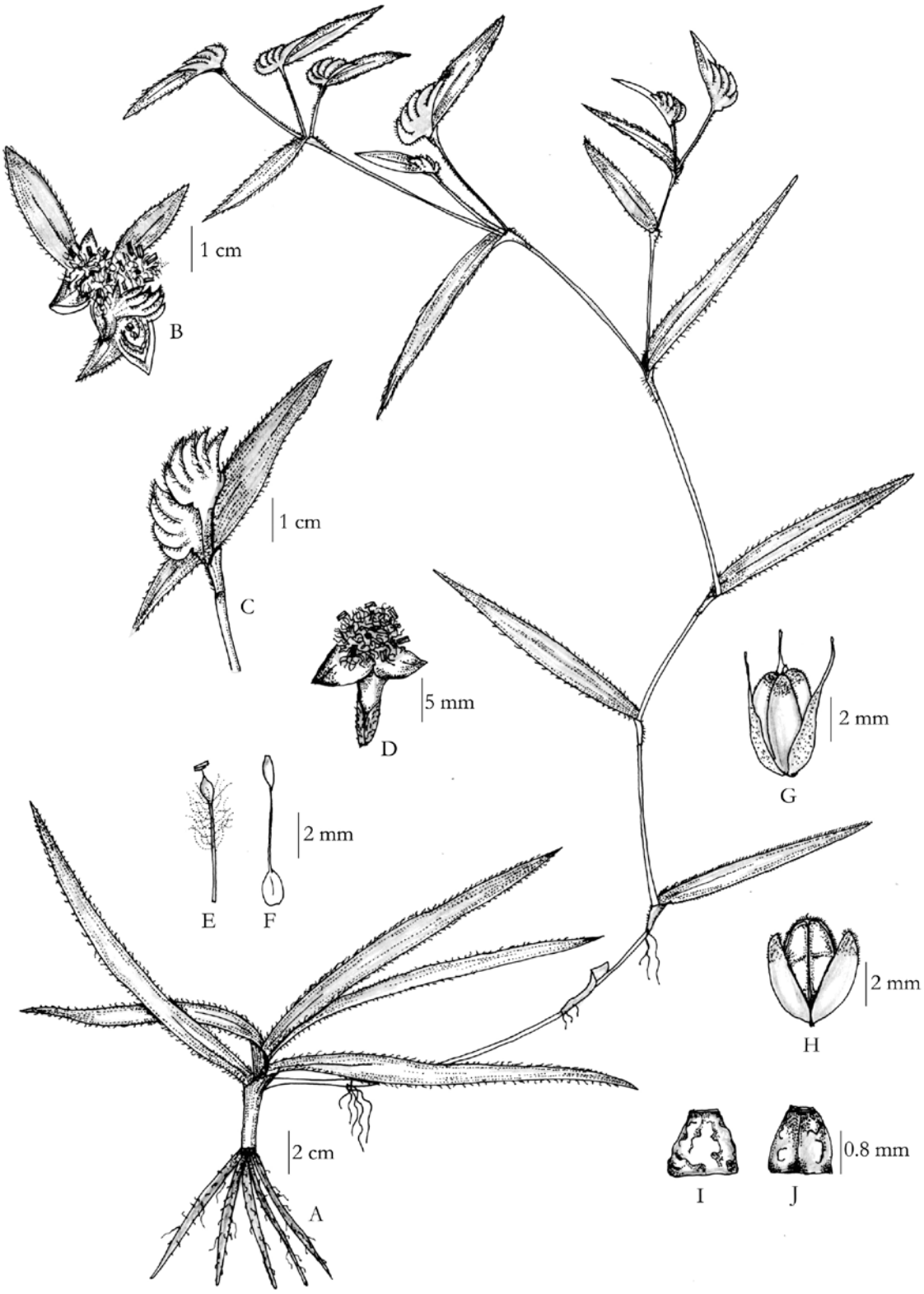


Fig. 6. ***Cyanotis pilosa*** **Schult. f., A: Habit, B–C: Inflorescence terminal and lateral view D: Flower, E: Stamen, F: Pistil, G: Capsule with sepals, H: Dehisced capsule, I–J: Seeds dorsal and ventral view respectively. Drawn by Mayur Nandikar from** ***M.D.Nandikar C1109*** **(SUK)**

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margin ciliate; leaves on flowering shoot arranged distally, ovate to linear-lanceolate, 4–20 × 0.5–1 cm, apex acute, base rounded, surface pilose; inflorescence composed of many, axillary and terminal cincinni, pedunculate, peduncle variable in length; bracts ovate to lanceolate, foliaceous, usually longer than the cincinni; bracteoles falcate–ovate, acuminate, 0.4–0.8(–1.2) × 0.5 cm, margin ciliate; flowers blue; sepals oblong–lanceolate, 5 × 2 mm, acute, pilose; petals united forming a tube, blue, lobes shorter than the tube; stamens exceeding the corolla, filaments apically tumid and bearded below with blue moniliform hairs, anthers yellow; ovary obovoid, style sparsely bearded as in stamens; capsules 2 × 2 mm, obovoid, obtuse and hirsute at apex; seeds 1–2 per locule, ovate to elliptic in outline, 1–2 × 1–2 mm, testa gray to brown, striate and irregularly pitted.

Flowering and fruiting: August to November.

Distribution and ecology: India: Maharashtra, Karnataka, Kerala, Tamil Nadu, West Bengal; Sri Lanka; one of the robust species of *Cyanotis*, rarely found in rocky crevices, grassland slopes, full exposed sun.

Specimens examined: **INDIA**. **Kerala:** Kodaikanal, Pulney hills, 29th June 1901, *Bourne 1999*; way to Valiyaparathodi, Silent Valley National Park, 12th Oct. 1983, *C. S. Kumar 11290*; Periyar Reserve Forest, Wayanad, 25th Aug. 1984, *R. T. Balakrishnan 40453*; Bramhagiri, Wayanad, 20th Sept. 1986, *R. T. Balakrishnan 42035*; Karamanayar, Trivendrum district, 17th Nov. 1991, *N. Mohanan 10011* (CALI). **Maharashtra:** Manohar Mansantoshgad, Kudal, Sindhudurg, 2nd Oct. 2011, *Gurav and Nandikar C1109* (BLAT, BSI, CAL, CALI, MH, SUK). **Tamil Nadu:** downwards within a radius miles of Mukerti Dam, along the Pykara river, 7000 ft alt., Nilgiris, Nov. 1951, *M. J. Hackney 77347*; Westbrooke, 6500 ft alt., Niligiris, 19th May 1954, *S. J. Saldanha 77294* (BLAT); Ootucmand, Nilgiris, 10th Aug. 1878, *King. s. n.*; Ootucmund, Nilgiris, Oct. 1884, *Gamble 15387*; Kodaikanal, 9th Oct. 1913, *Saulieve 1066* (CAL); Dodabetta, Nilgiris, 21st Nov. 2001, 2600 mts. Alt., *Nampy 175* (DEV); Pulluhalli, Salem, 26th Dec. 1913, *s. coll. 52452* (MH). **West Bengal:** Lloyd Bot. Garden, Darjeeling, 8th July 1956, *D. Chatterjee 107* (CAL). **Locality unknown:** without locality, 1878, *N. Dalzell s. n.* (CAL).

Note: A distinct species with linear rosette, pilose leaves; inflorescence with long to short peduncled cincinni and beautiful blue flowers. The only difference found in Sri Lankan and Indian specimens is bearded and glabrous style respectively.

10. *Cyanotis racemosa* Heyne ex Hassk., Commelin. Ind.: 125. 1870; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 131. 2000; Nampy and Joby, Rheedea 21(1): 8–9. 2011. TYPE: Sri Lanka, in 1857, *Thwaites s.n.* in *C. P. 2332* (lectotype: CAL!, isolectotypes: B, G, K, P, PDA), designated here.

Cyanotis lanceolata Wight, Icon. Pl. Ind. Orient. 6: 33, t. 2085. 1853; Clarke in DC., Monogr. Phan. 3: 252. 1881, *pro parte, non* Thwaites, 1864. TYPE: India. Courtallum, Aug. 1835, *Herb. Wight 971* (lectotype: CAL!, isolectotypes: CAL!), designated here.

Cyanotis villosa auct. C.B.Clarke in DC., Monogr. Phan. 3: 252. 1881, *pro parte, non* (Spreng.) Schult. f. 1830.

Annual to perennial, repent herbs, without definite base; root fibrous; stem with 0.5–5 cm long internodes, with line of pubescence; flowering shoots much branched, erect; leaf sheath 0.2–1.5 cm long, sparsely to densely pilose; leaves lanceolate, 3–12 × 1–2.2 cm, apex acuminate, base rounded to cuneate, adaxial surface glabrous, abaxial densely appressed silky puberulous; inflorescences terminal and axilary, cincinni pedunculate; peduncles 1–8 together; bracts lanceolate, foliaceous; bracteoles 0.5–1.2 × 0.3–0.5 cm, ovate to falcate, margin ciliate; flowers blue or purple or pale pink; sepals oblanceolate 0.5–0.7 × 0.1–0.2 cm, densely pilose along the keel and apex, sparsely ciliate on the margins; petals blue to purple or pale pink, united to form a tube, lobes free; stamens exserted, filaments apically tumid, densely bearded with blue to pale pink moniliform hairs, anthers yellow; style apically tumid, sparsely bearded with blue moniliform hairs; capsule *c.* 2 × 2 mm, ovoid to ellipsoid, sparsely to densly puberulous at apex; seeds 1–2 per locule, ovate to elliptic, 1–2 × 1–2 mm, testa brown, striate and variously pitted.

Flowering and fruiting: August to March.

Distribution and ecology: India: Tamil Nadu; Sri Lanka; near seasonal streams, waterfalls, undergrowth; in partial shade.

Specimens examined: **INDIA**. **Tamil Nadu:** Pulney Hills, Nilgiris, 600ft. March 1960, *C. Saldanha 5055* 'as *villosa*' (BLAT); Pulney Hills, 13th June 1897, *Bourne 408*; Pakasuramalai, Nilgiris, 2000 m, 28th March, 1958, *K. M. Sebastine 5662*; Beside the stream in Vellimalai, Madurai, 27th April 1960, *Shetty 10320*; Kuthiraimetii, Tirunelvelli district, 31st Aug. 1963, *Henry 17385* 'as *C. villosa*' (MH); Gudalur to Ooty road, Nilgiris, 04th Oct. 2009, *M. D. Nandikar C0915* (SUK).

Note: *Cyanotis racemosa* misinterpreted in India as *Cyanotis villosa* (Spreng.) Schult f. since long time. The reason for this delusion may be similarity in their habit and inflorescence characters. Typical lanceolate leaves, with acuminate apex; pedunculate few–many cincinni made it distinct from *C. villosa.* Only difference found within Sri Lankan and Indian specimens is perennial and annual habit. Recently Nampy and Joby (2011) added this species to Indian flora, but has been in India since 1835, during present study it was found that, collection placed at CAL (*Herb Wight 971*) as '*C. lanceolata*' from Courtallum in Aug. 1835 is *C. racemosa* has lectotypified here.

11. *Cyanotis tuberosa* (Roxb.) Schult.f. in Syst. Veg. 7: 1153. 1830; Voight, Hort. Sub. Cal. 678. 1845; Dalz. and Gibs., Bombay Fl. 256: 1861; C.B.Clarke in DC., Monogr. Phan. 3: 249. 1881; Hook.f., Fl. Brit. India 6: 386. 1894; Cooke, Fl. Pres. Bombay. 2: 793. 1908 *pro parte*; Karthik. et al., Fl. India. Enum. Monocot. 27. 1989.

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Tradescantia tuberosa Roxb., Pl. Coromandel, 2: 5, t. 108. 1799 & Fl. Ind. 2: 19. 1832. TYPE: India, Coromandel Coast.

Cyanotis concanensis Hassk. in Commelin. Ind. 114. 1870; R. S. Rao in Blumea 14: 348. 1966; Almeida, Fl. Savantwadi 44: 1990; Lakshminarshiman in Sharma et al., Fl. Maharashtra (Monocot.) 163: 1996; Yadav and Sardesai, Fl. Kolhapur Dist. 504: 2002. TYPE: India, Malabar & Konkan, *s.d.*, Herb. Ind. Or., *Stocks & Law* (lectotype: B, *sh. no. 0296345*, isoletotypes: K, *sh. no. K000854116*), designated here. ***syn. nov.***

Cyanotis stocksii Hassk. in Commelin. Ind. 118: 1870. TYPE: India, Malabar and Concan (Konkan), *Stocks and Law s. n.* (*Cyanotis* no. *9*) (lectotype: B, *sh. no. B100296348*; isolectotypes: K, *sh. no. 854113 & 14*), designated here.

Cyanotis thomsonii Hassk. in Commelin. Ind. 133. 1870. TYPE: India, Mysore and Carnatic, *Thomson s. n.* (*Cyanotis* no. 8) (lectotype: B, *sh. no. 296348*; isolectotypes: *sh. no. 296348*), designated here.

Cyanotis sahyadrica Blatter in J. Bombay Nat. Hist. Soc. 33: 77. 1928; Raizada in Bull. Bot. Surv. Ind. 18(1): 15. 1959. TYPE: India, Maharashtra, Panchgani to Wai, Satara district, 4000 ft, 19th July 1925, *Frenchman P 38* (holotype: BLAT!).

Cyanotis tuberosa auct. Dalzell and Gibs., Bombay Fl. 256, 1861; Cooke, Fl. Pres. Bombay 2: 793. 1908. *pro. parte. non* Schult.f., 1830.

Fig. 7; 11 D-E

A stout, hairy perennial, rosette herb; roots fusiform, tubers; flowering shoots lateral, suberect, hirsute, thin at base, internodes 2–9.5 cm; leaf sheath 1.4–5.5 cm, hirsute or densely puberulous, mouth ciliate; rosette leaves linear-lanceolate to ensiform, 15–40 × 1–3 cm, margin ciliate, upper surface usually glabrous to sparsely pubescent, lower surface densely to sparsely puberulous, apex acute; cauline leaves distichous, pilose; sheath 1–2 cm long, puberulous to hirsute, mouth ciliate, lamina linear-lanceolate to ensiform, 3–13 × 0.8–2 cm, surface and apex acute, base scarcely narrowed below or amplexicaul, sparsely to densely puberulous both the surfaces; inflorescences terminal or axillary scorpoid cymes, many flowered, villous, pedunculate, peduncles ridged, 0.5–3 cm, hirsute with a band of cilia, usually several together from a large ovate to lanceolate, 1–6 × 0.3–2 cm, acute at apex, base cordate, margin ciliate, puberulous at both the surface, usually glabrous above, deflexed, foliaceous, green to purple bracts; bracteoles, ovate to falcate, 0.4–1.4 × 0.3–0.9 cm, margins ciliate, hirsute, exposed areas purple in colour; sepals pale white, villous without, glabrous within, lanceolate to oblanceolate or linear lancelolate, 0.5 × 0.2 cm, basally connate, margins ciliate, hirsute; petals blue violet or purple, 0.7 × 0.3 cm, fused, forming tube, lobes free, acute to apiculate; stamens 6, 0.5–1 cm long, filaments with subapical swelling, blue, bearded with blue to violet moniliform hairs, spirally twisted below the anthers, anther lobe yellow to orange yellow, dorsifixed; ovary 0.1–0.2 × 0.1 cm, ovoid to ellipsoid, pale green, densely ciliate with stiff brown hairs, style violet–blue, subapically tumid, twisted at apex, glabrous or with sparse blue moniliform hairs, stigma simple; capsule ovoid to ellipsoid, 3–4 × 2–3 mm, apex ciliate, glabrous elsewhere; seeds 2 per locule, broadly ovoid to pyramidal, 1.5 × 1 mm, , testa rugose to reticulate, shallowly and irregularly pitted, pale brown or grey or reddish; hilum ventral, punctiform, embryotega terminal.

Flowering and fruiting: August to December.

Distribution and ecology: Endemic to India: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Odisha and Tamil Nadu. It strictly occurs at peculiar eco-situations of high to medium altitude lateritic plateaus. Similarly, it is most robust gregarious species with beautiful blue flowers. It grows on lateritic plateaus of Sahyadri in crevices of rocks on accumulated soils. It also grows in the Ghats along the slopes, in grasslands.

Specimens examined. **INDIA**: **Andhra Pradesh:** Malapukonda reserve forest, Anantpur, 12th July 1957, *S. K. Wagh 6167, 6168, 7733* (BLAT); Locky hills, west Pyapali, Kurnool, *s. d., Gamble 16338*; Araku Valley, 14th Sept. 1961, *Balakrishnan 508* (CAL); Near Uedurupalli, Vishakhapattanam, 27th Oct. 1972, *G. V. Subbarao 82410*; Tirumalai, 7th Oct. 1974, *G. V. Subbarao 89539* (MH). **Karnataka:** Belve, South Kanara, *s. d., C. Saldanha 77330* (BLAT); Bandipur road from Mysore, Mysore, 1964, *B. D. Naithani 45967, 68* (MH). **Kerala:** Munnar to Poopar road, 23rd May 2011, *Manudev and Nampy 4425* (DEV). **Maharashtra:** on the way to Durgwadi, Junnar, Pune District, 8th Oct. 2011, *Nandikar and Gurav C1112* (CAL, SUK, BSI, MH); Panhali Dongar, Jat, Sangali, 22nd July 2009, *M. D. Nandikar C0902* (SUK); St. Xavier's Villa, Khandala, Pune, 24th Oct. 1943, *H. Santapau*; The Tweleve Apostles St. Xavier's Villa, Khandala, Pune, Sept. 1942, *H. Santapau 855*; Behran's plateaus, Khandala, Pune, 13th Sept. 1942, *H. Santapau 934*; Purandhar, Pune, July 1945, *Leszezruski 77303*; On the way to Kate's Point, Mahableshwar, Satara, *s. d., P. V. Bole 2097*; Purandhar, Pune, Sept. 1945, *Leszezeruski 291*; Slopes behind PWD rest house, Purandhar, Pune, 12th Oct. 1957, *G. L. Shah 9227*; Slopes along railway line below part, Matheran, Raigad, 10th Oct. 1960, *N. A. Irani 77301*; Mahableshwar, Satara, *s.d., R. D. Acland 1249* (BLAT); for Fl. of Deccan, *s. loc.*, 1884, *T. Cooke 96*; Kedarnath hill slopes, Harishchadragad, Takwada range 17th Nov. 1968, *K. V. Billore115551* (CAL); Kas Plateau, Satara, 14th Aug. 2008, *M. D. Nandikar C0801*; Bhudargad fort, Kolhapur, 24th Aug. 2008, *M. D. Nandikar C0812* (SUK). **Odisha:** Keonjhargarh, 8th July 1957, *G. Panigrahi 8738* (ASSAM). **Tamil Nadu:** Hosur Cattle farm, Salem, 8th June 1930, *Narayanswamy 79434*; Upper camp, Suranganar, Madurai, 21st June 1959, *Subramanayan 15898*; Nellimalai, Coimbatore, 16th Oct. 1962, *Ramamurthy 31060*; Palamalai, Coimbatore, 5th Sept. 1969, *M. V. Viswanathan 95858*; Sirur to Gundati road, Niligiris, 31st Aug. 1970, *G. V. Subba Rao 70368, 70369*; Way to Thenynmarada, Niligiri district, 6th Nov. 1970, *E. Vajravelu 70973*; Varudevanallur reserve forest, Tirunelveli, 3rd Oct. 1971, *E. Vajravelu 75819* (MH).

Note: One of the robust, gregarious species of the genus *Cyanotis*, recognized by linear-lancolate to ensiform basal rosette, lateral, erect, flowering scapes with many flowered cincinni, foliaceous bract and green to purple bracteoles. Interestingly, during the collections, found one dwarf form of *C. tuberosa* from the lower altitude, and typical form medium and high altitude region. Kammathy and Rao (1964) reported the gigantic

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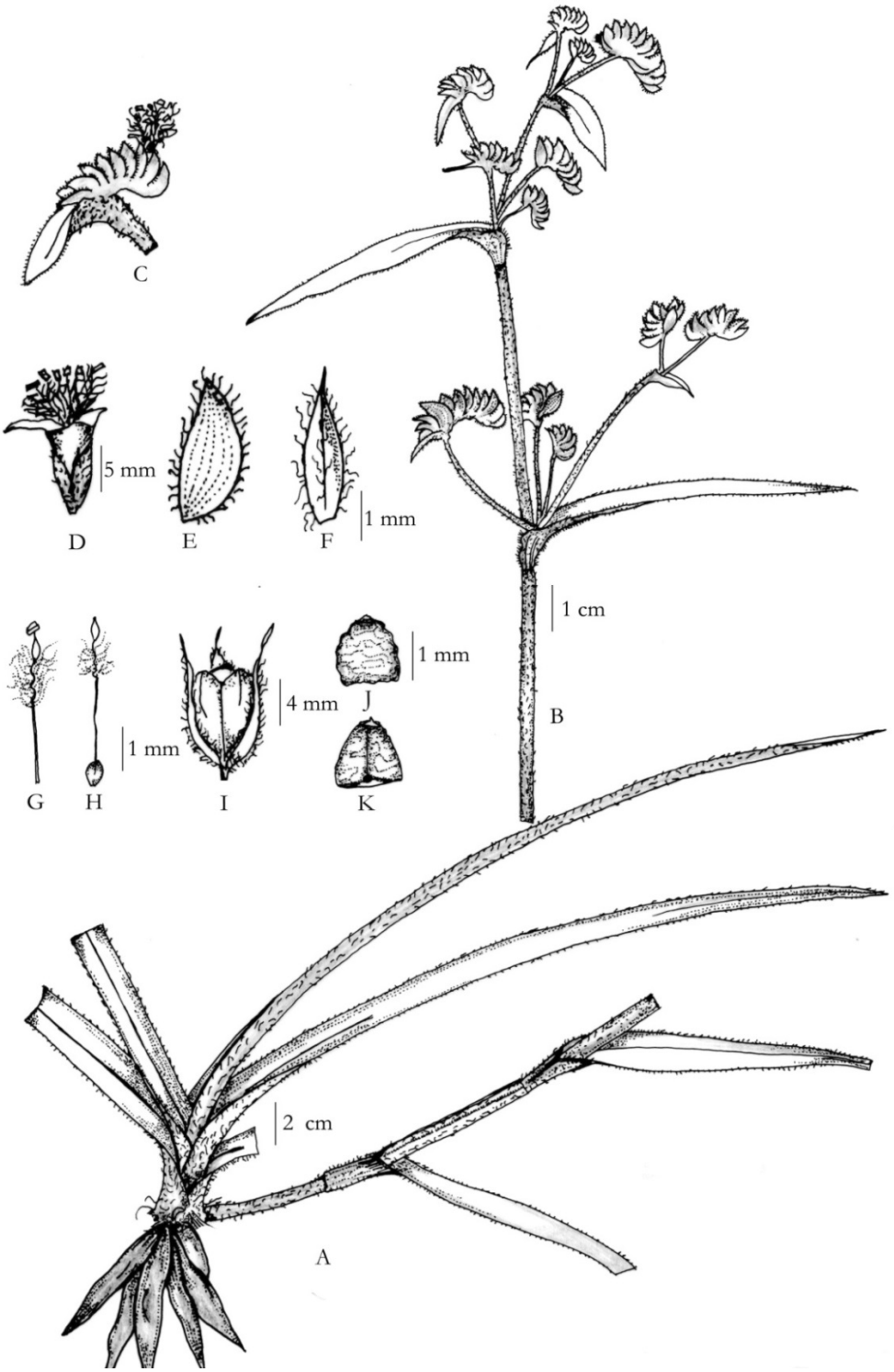


Fig. 7. ***Cyanotis tuberosa*** **(Roxb.) Schult. f. A: Habit, B: Flowering scape, C: Inflorescences, D: Flower, E: Bracteole, F: Sepal, G: Stamen, H: Pistil, I: Capsule, J & K: Seeds dorsal and ventral view. Drawn by Mayur Nandikar from** ***M.D.Nandikar C902*** **&** ***Gurav & Nandikar C112*** **(SUK).**

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hexaploid plants from high altitude regions of Maharashtra, so our collections from lower altitude may be a distinct from typical one, but it needs more population studies to conclude status.

While examining the type specimens of *Cyanotis concanensis*, *C. stocksii* and *C. thomsonii*, it has been observed that all these are shares the same characters as that of *Cyanotis tuberosa*. Hasskarl (1870) described these species based on Thomson, Law and Stocks collections form Malabar and Concan, and distinguished from its allies by the characters like leaves pilose to hirsute, peduncle solitary or 2 to 3 together, bract falcate to sub-falcate, etc. which were recognized as *Cyanotis tuberosa* by Clarke (1881: 249). Perusal of protologue and critical examination of type specimens of the taxa raised by Hasskarl were found to be conspecific with *C. tuberosa* and therefore synomised.

12. *Cyanotis vaga* (Lour.) Schult and Schult.f. in Roem. and Schult. Syst. Veg. 7: 1153. 1830; Merill in Trans. Amer. Phil. Soc. 24(2): 102. 1935; R.S. Rao in Notes Roy. Bot. Gard. Edinburgh 25(2): 186. 1965; Hara, Fl. East. Himal. 400. 1966; Babu, Herb. Fl. Dehra Dun, 529. 1977; Karthik. et al., Fl. India. Enum. Monocot. 27.1989; Das in Nelumbo, 52: 99–116. 2010

Tradescantia vaga Lour., Fl. Cochin. 1: 239. 1790; Blume, Enum. Pl. Java. 1: 5. 1827; Hassk. Commel. Ind. 62. 1870, *non* Zollinger. TYPE: Cantona, China.

Cyanotis barbata D. Don, Prodr. Fl. Nepal 46. 1825; Hook.f., Fl. Brit. India, 6: 385. 1894. TYPE: Nepal, in *Herb. Wallich 4?* (K–WALL).

Fig. 8; 12 B

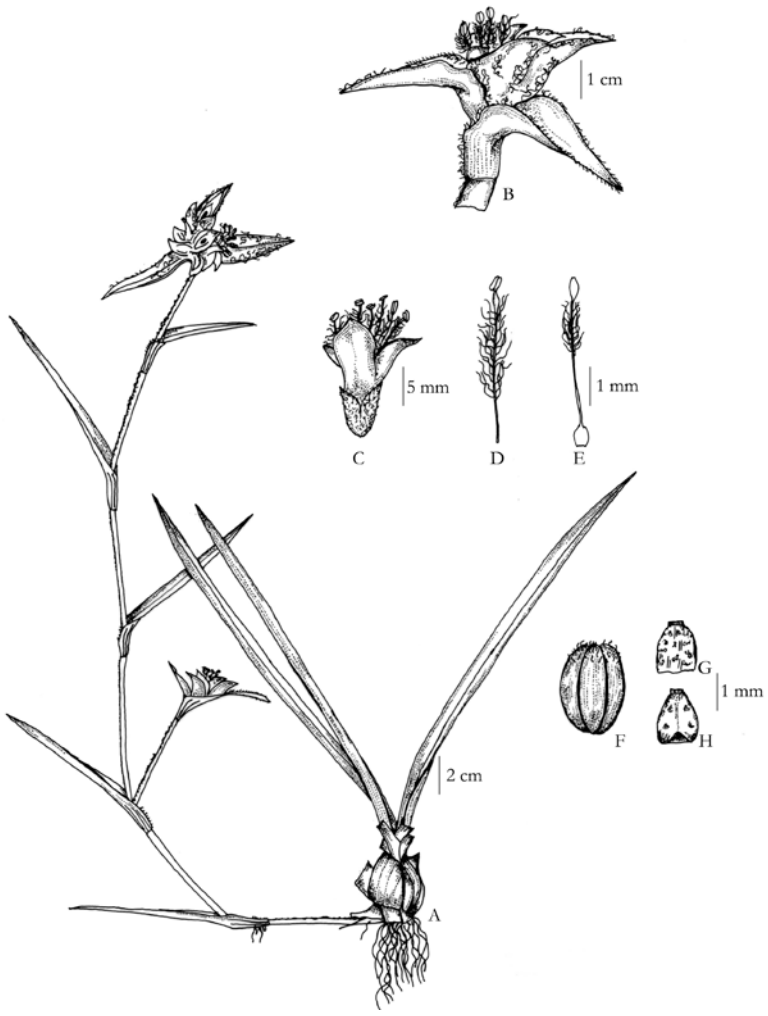


Fig. 8. *Cyanotis vaga* (Lour.) Schult.f. and Schult f. A: Habit, B: Inflorescence, C: Flower, D: Stamen, E: Pistil, F: Capsule, G–H: Dorsal and ventral view of seed. Drawn by Mayur Nandikar from *M.D.Nandikar 1230* (SUK).

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Annual to perennial herb, with or without tunicate corms (tunicate with pale brown sheaths), roots fibrous; leaves rosette & cauline; flowering shoots lateral, ascending to erect, rooting at lower nodes giving rise to a new plants; rosette leaves linear to linear-lanceolate, 8–25(30) × 0.5–1(1.5) cm, apex acute to acuminate, base widely cuneate, with a broad pale brown sheath, many spirally arranged rosette leaves are gathered together and overlapping sheaths of all leaves form a tunicate corm, upper surface sparsely glabrous, rarely pilose, lower surface densely pilose, margins undulate or entire, ciliate; cauline leaves or leaves on lateral branches with elliptic to lanceolate margins, 10–15 × 0.5 cm, apex acute, base rounded, margin entire, serceous, leaf sheath 0.3–1 cm long, ciliate, pubescence like that of the rosette leaves, but upper surface usually glabrous; inflorescences terminal, sub terminal and axillary, composed of 1–4(5) cincinni, cincinni sessile to pedunculate, peduncle 1–5 cm long, densely pubescent or ciliate at margins; bract 1–3 × 0.2–0.4 cm, lanceolate, foliaceous, pilose beneath; bracteoles aggregate at axils of leafy bracts, ovate to lanceolate, strongly falcate, sparsely to densely pilose or glabrous; flowers bisexual, sepals oblanceolate to oblong, 0.4–0.6 × 0.2 cm, pilose or glabrous; petals blue–purple or violet; stamen filaments with sub-apical swelling, densely bearded with blue to purple moniliform hairs, anthers yellow; style equal to stamens, with a subapical swelling, bearded sparsely with blue moniliform hairs; capsule 2.5–3 × 3 mm, puberulous in distal half; seeds 1–2 per locule, 1.3–1.5 × 1.5 mm, ovoid to ellipsoid, testa grey–brown, finely reticulate.

Flowering and fruiting: July to December.

Distribution and ecology: North Eastern parts of India; Bhutan; Taiwan; Nepal; Yunnan; Laos; Myanmar; Sikkim; Thailand and Vietnam; common in all type of forests, especially in pine forests as well as in grassy areas and in abandoned cultivated lands, often forms dense population looks bluish when in bloom forming a mat.

Specimens examined: **INDIA**. **Arunachal Pradesh:** Qnuandale road, 7000 ft alt. 3rd Sept. 1878, *J. S. Gamble 52432* (MH); Anini, Dibang Valley, 12th Nov. 1996, *M. Bhoumik 1222* (CAL). **Manipur:** Shngnu, 12th Sept. 1954, *D. B. Deb 2660* (CAL). **Meghalaya:** Umsaw Forests, Shillong, 11th Oct. 2012, *M. D. Nandikar 1234* (BSI; SUK); Seven Sisters Falls, Cherapunjee, 13th Oct. 2010, *M. D. Nandikar 1242*; New Guest House, NEHU, Shillong, 9th Oct. 2012, *M. D. Nandikar 1230* (SUK); Barapani Dam, Shillong, 31st Aug. 2011, *Nampy 4706* (DEV); Shillong, 17th Sept. 1886, *C. B. Clarke 45532C* 'as *C. vaga* var. *nobilis*'?; Cherapunjee, Khasi Hills, 1st June 1911, *I. H. Burkill and Banerjee 163*; Saloni forest (Bomidila), Kameng district, *J. Joseph 39946* (CAL); Shillong, Khasi and Jayantia Hills, 10th Sept. 1942, *G. K. Dekha 21528* (ASSAM). **Nagaland:** Naga Hills, Tuensang Division, June 1935, *N. L. Bor 21355*; Treminyu, 12th Nov. 1973, *T. M. Hynniewta 56044* (ASSAM). **West Bengal:** Darjeeling, Aug. 1874, without coll. *52434*; Himalaya, Herb. Ind. Or. *Hook. f. & Thomson 52281* (MH).

Note: Common, perennial element of eastern Indian flora. A distinct species basal corms and laterally spread flowering shoot are the key characters for the species.

13. *Cyanotis villosa* (Spreng.) Schult f. in Syst. Veg. 7: 1155. 1830; Hook.f., Fl. Brit. India 6: 387. 1894; Karthik. et al., Fl. India. Enum. Monocot. 27: 1989; Faden in Dassanayake, Rev. Handb. Fl. Ceylon 14: 134. 2000.

Tradescantia villosa Spreng., Syst. Veg. 2: 116. 1825. TYPE: *s.loc., s.coll., Herb. K. Sprengel s.n.* (B designated by Faden, 2000).

Cyanotis lanceolata Wight, Icon. Pl. Ind. Orient. 6: 33, t. 2085 1853; C.B.Clarke in DC., Monogr. Phan. 3: 252. 1881, *pro parte, non* Thwaites, 1864. TYPE: India, Tamil Nadu, on the eastern slopes of Nilgiris.

Cyanotis racemosa var. *thomsonii* Hassk. Commel. Ind. 126. 1870. TYPE: India, Mysore-Carnatic, *G. Thomson*, *Cyanotis* no. *10* (holotype: B!, *sh. no. 6296346*) ***syn. nov***.

Cyanotis cerifolia R.S.Rao and Kammathy, J. Linn. Soc., Bot. 59: 306. 1966; Karthik. et al., Fl. India. Enum. Monocot. 26: 1989. TYPE: Weverly Estate, Anamalai Hills, Coimbatore district, Tamil Nadu, India. (Type specimen from Cultivated plant in Botanical Survey of India, Western Circle, Pune, India), 8th Aug. 1962, *Kammathy 77785A* (holotype: CAL!); *Kammathy 77785B* and *77785C* (isotypes: BSI!, K) ***syn. nov.***

Fig. 9; 12 C

Repent or erect to ascending annual, forming a florescent green to dark green mat on loose soil; stem with short internodes, internodes pilose to variously pubescent, 15–25 cm high (flowering shoot); leaves compactly arranged; sheath pubescent, ciliate at apex; lamina elliptic–lanceolate or ovate, 2–10 × 0.5–3 cm, apex acute to acuminate, base rounded, lamina densely to sparsely pilose, margin entire, ciliate; inflorescence terminal and axillary, composed of 1–4 subsessile cincinni, subsessile, peduncle not exceeding 5 mm; bracts ovate to lanceolate, foliaceous; bracteoles falcate, *c.* 0.5 × 0.3 cm, margin ciliate; flowers blue to purple; sepals linear–lanceolate, 0.5 × 0.2 cm, sparsely to densely pilose; petals blue to purple, united basally forming a tube, lobes ovate, free; stamens exserted, filaments tumid apically, densely bearded with blue moniliform hairs, anthers yellow; ovary ellipsoid, pubescent at obtuse apex, style as long as stamen, tumid at apex, sparsely bearded as in stamen; capsule ellipsoid, 3 × 2.5 mm, sparsely to densely pilose at apex; seeds 1 to 2 per locule, ovoid to ellipsoid, *c.* 1.5× 1.2 mm, testa dark brown, striate and pitted.

Flowering and fruiting: August to April.

Distribution and ecology: India: Karnataka, Kerala, Tamil Nadu; Sri Lanka; one of the common *Cyanotis* species of southern India, chiefly found along the wet places, slope along the Ghats, roadsides, in rocky crevices, open meadows, full or partial shade, forming a mat or bed.

Specimens examined: **INDIA**. **Kerala:** Nedumpoyil, Cannanore, 27th Feb. 1979, *V. S. Ramahandran 119422* 'as *cerifolia*'; way to Marayoor, Erviculum–Chinnar–Munnar, 1780 m, 9th Jan. 2004,

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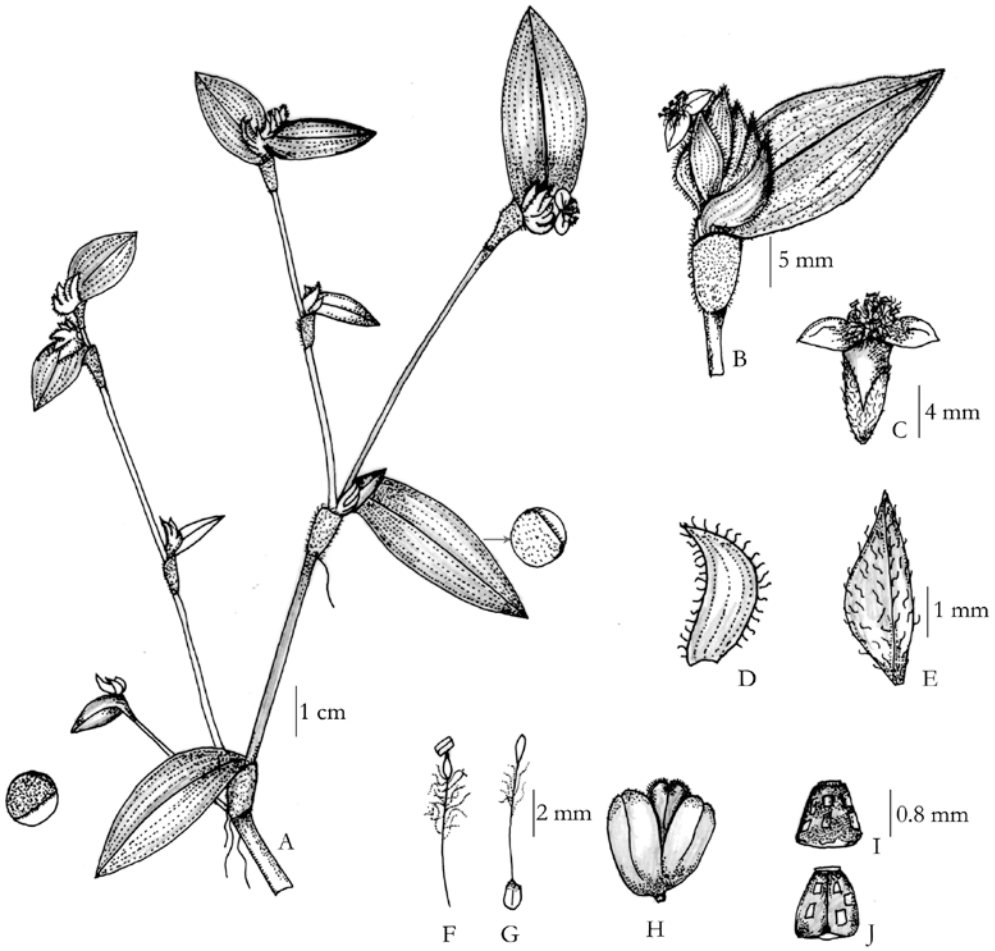


Fig. 9. ***Cyanotis villosa*** **(Spreng.) Schult f., A: Habit, B: Inflorescence, C: Flower, D: Bracteole, E: Sepal, F: Stamen, G: Pistil, H: Capsule with sepals, I–J. Dorsal and ventral view of seeds Drawn by Mayur Nandikar from** ***M.D.Nandikar C1001*** **(SUK)**

K. K. Rakendo 97157 (MH); Vellikukm, way to Vagamon hills, Kottayam, 26th Dec. 2001, *Nampy 429* (DEV).Silent Valley National Park, 10th Oct. 1965, *E. Vajravellu 26054* 'as *C. pilosa*' (CAL). **Tamil Nadu:** on the way to Ooty from Gudalur, Nilgiris, 22nd Nov. 2010, *M. D. Nandikar C1001* (BSI, CAL, CALI, SUK); Cannoor, 7000ft., 8th March 1870, *C.B.Clarke 10513 B* 'as *C. pilosa*'; Ootacamund, 15th Aug. 1878, *King s.n.*; Blachhide, Niligiris, June 1883, *Gamble 12125*; Kalivayalpil, Tirunelvelly, 31st May 1901, *C. A. Barber 3036*; North Coimbatore, 30th Nov. 1906, *C.E.C. Fischer 1266*; Neddurvaddam, Nilgiris, Oct. 1910, *Meebold 13870*; Cannoor Ghat, Niligiris, 8th Jan. 1910, *Fischer 1575* 'as *C. lanceolata*'; High Wavy Mountains, Theni, May, 1917, *Blatter and Hallberg 842*; Marapalam, Nilgiris, 20th Jan. 1957, *K. M. Sebastine 2106* (CAL); Kodaikanal, 18th Oct. 2010, *Nampy and Sibachen 3811* 'as *C. cerifolia*' (DEV); Shola forest, Coimbatore, 24th June 1930, *V. N. Narayanswami 79458*; Vellirmalai, along the stream, Madurai, 29th April 1960, *B. V. Shetty 20331*; Anamalais, Coimbatore, 12th Sept. 1961, *J. Joseph 26259*; Selvam Koppu, upper Kodayar, Kanyakumari, 1963, *A. N. Henry 107030*; Agasthamalai, Tirunelvelli, 22nd Aug. 1963, *A. N. Henry 39267* (MH). **Karnataka:** on the way to Thalkauvery from Coorg, 26th Nov. 2010, *Nandikar and Gurav C1004* (BSI, SUK).

Note: One of the variable species of genus *Cyanotis*. From Sri Lanka Faden (2000) described var. '*A*' based on robustness, hairiness and perennial habit. This kind of variations are also been observed in Indian plants of *Cyanotis villosa* but to determine or to erect a species or infra-specific taxa, it needs further detailed study. Rao and Kammathy in 1966 described a new species, as *C. cerifolia* but after critical examinations of type specimens, fresh collections from the type locality and collections from other localities reveled that species is conspecific with *C. villosa* and the variations mentioned are merely quantitative. Therefore, *C. cerifolia* treated as a new synonym of *C. villosa* in present treatment.

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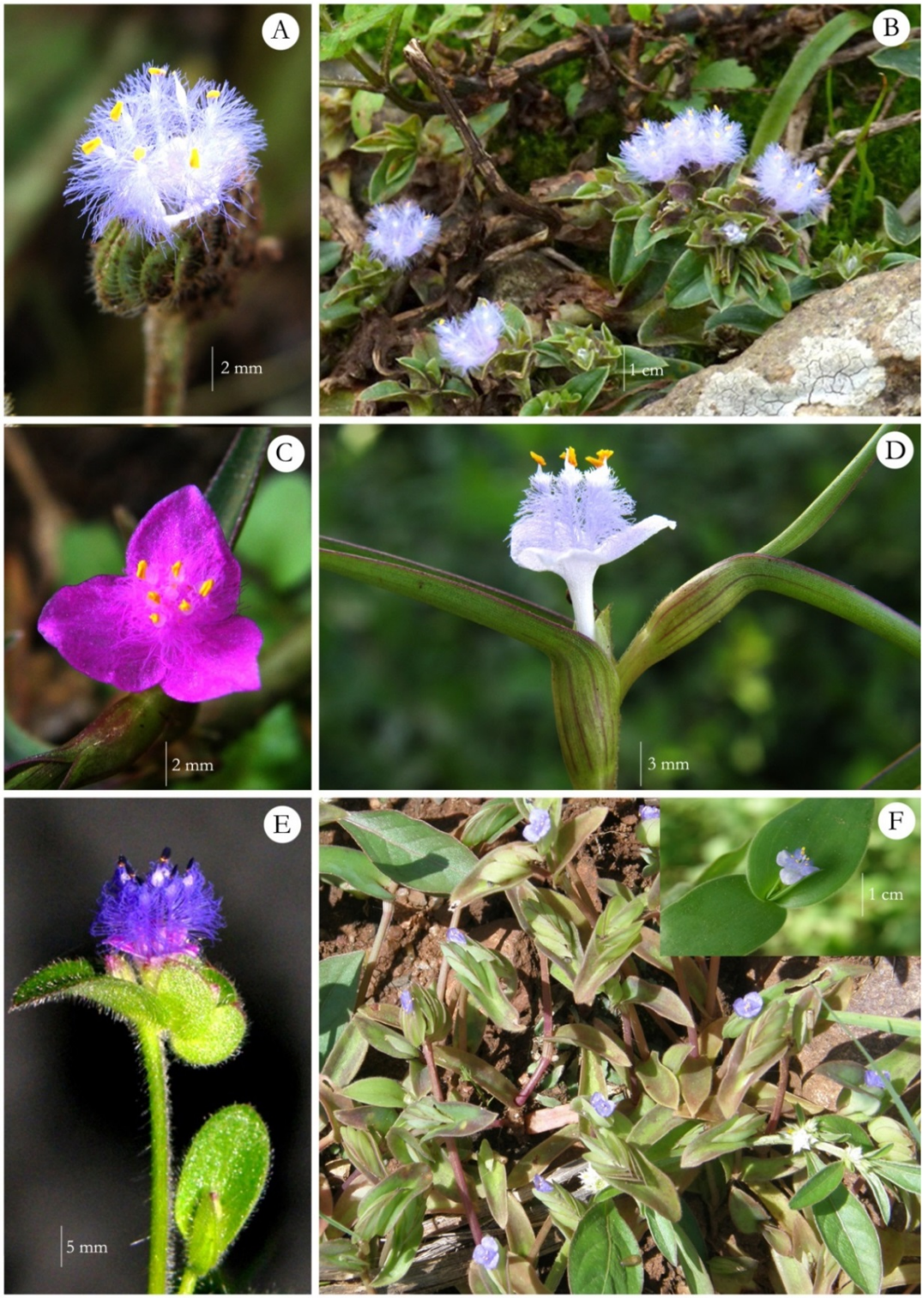


Fig. 10. A: *Cyanotis adscendens* Dalzell; B: *C. arachnoidea* C.B.Clarke; C: *C. axillaris* var. *axillaris* D: *C. axillaris* var. *cucullata* (Roth) Nandikar and Gurav; E: *C. burmanniana* Wight; F. *C. cristata* (L.) D.Don, habit and flower (inset).

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Fig. 11. A-B: ***Cyanotis fasciculata*** **(Heyne ex Roth) Schult. & Schult.f., habit and flowers respectively; C.** ***C.glabrescens*** **(C.B.Clarke) Nandikar and Gurav; D-E:** ***C. tuberosa*** **(Roxb.) Schult.f, habit and inflorescences respectively.**

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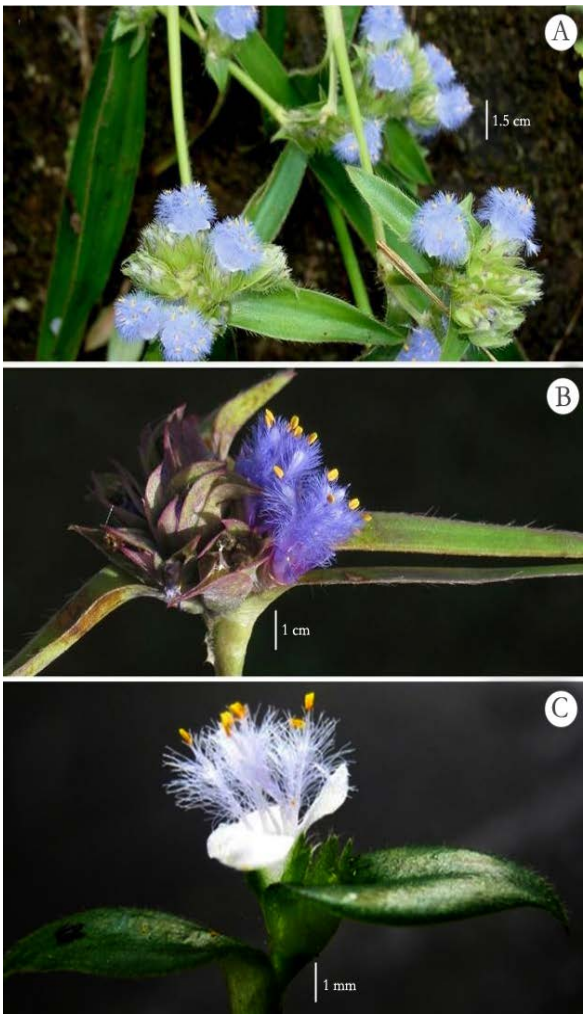


Fig. 12. A: *Cyanotis pilosa* Schult. f.; B. *C. vaga* (Lour.) Schult & Schult.f.; C. *C.villosa* (Spreng.) Schult f.

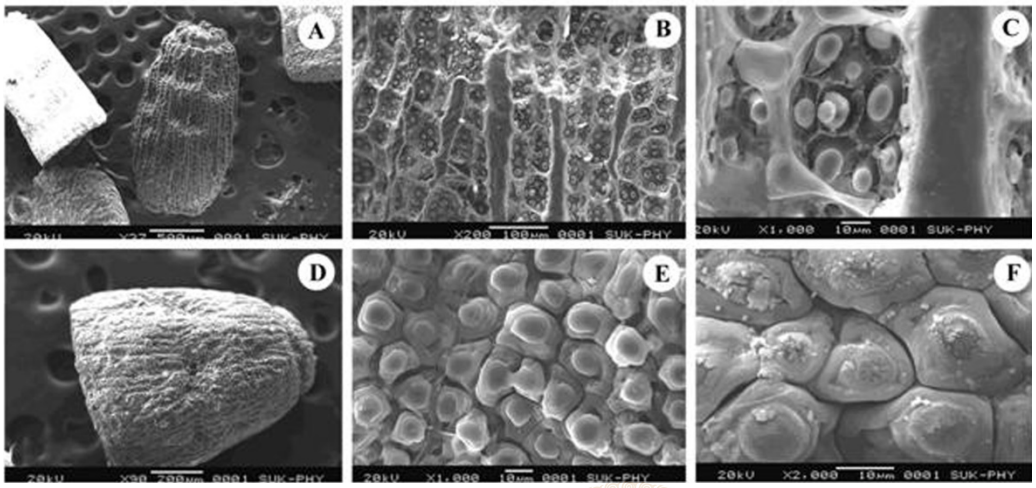


Fig. 13. Scanning electron micrographs of seeds of A–C: *Cyanotis glabrescens* (C.B.Clarke) Nandikar & Gurav; D–F: *C. fasciculata* (B. Heyne ex Roth) Schult. & Schult.f.

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