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Caption: Large Indian Civet *Viverra zibetha*, Tricoloured Munia *Lonchura malacca* and *Hoya wightii* (Medium—pencil crayon on watercolour paper) © Supriya Samanta.



Updated distribution of seven *Trichosanthes* L. (Cucurbitales: Cucurbitaceae) taxa in India, along with taxonomic notes

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Abstract: In India, lack of revisionary work in the genus *Trichosanthes* L. (Cucurbitales: Cucurbitaceae) over the past 38 years had resulted in several taxonomic and nomenclatural issues, which had implications in determining actual distribution status of taxa. Based on field observations, collected specimens, data from various specimens in herbaria and critical study of all the resources available, here we confirm the extended distribution of *T. anaimalaiensis* Bedd. in the states of Manipur and Nagaland; *T. cordata* Roxb. in Uttar Pradesh and Bihar; *T. cucumerina* L. subsp. *sublobata* (Kundu) K. Pradheep, D.R. Pani & K.C. Bhatt in Gujarat, Madhya Pradesh and Odisha; *T. dicaelosperma* C.B. Clarke in Nagaland; *T. kerrii* Craib in Arunachal Pradesh and Manipur; *T. majuscula* (C.B. Clarke) Kundu in Arunachal Pradesh, Sikkim and Assam; and *T. truncata* C.B. Clarke in Nagaland. Two taxa, namely, *Trichosanthes dicaelosperma* and *T. majuscula*, earlier subsumed with *T. ovigera* Blume or *T. cucumeroides* (Ser.) Maxim., and *T. dunniana* H. Lévl., respectively, have been resurrected at the rank of species. Lectotypes were designated for the names of above two species. For the first time, female plants of *T. majuscula* have been described. This communication provides an updated distribution status of seven taxa of *Trichosanthes* in India along with field and taxonomic notes, and additional taxonomic characters.

Keywords: Lectotypification, new distribution records, northeastern India, range extensions, *Trichosanthes dicaelosperma*, *T. majuscula*.

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INTRODUCTION

Known as the largest genus in the family Cucurbitaceae, *Trichosanthes* L. consists of about 100 species with some having vegetable and medicinal importance, occurring from the Indian subcontinent in the west, to China and Japan in the north and the east, to Australia in the south (de Wilde & Duyfjes 2010, 2012). Chakravarty (1982) and Renner & Pandey (2013) had reported the occurrence of 22 species in India, with more than three-fourths occurring exclusively in the northeastern region of India. Incomplete herbarium collections in species-rich areas, dioecy, nocturnal flowering, heterophylly, and different juvenile morphology, together with the lack of recent revisionary works (since 1982) had resulted to taxonomic misidentifications and nomenclatural instability in the Indian taxa, which in turn led to non-detection of species in a given area, although present. Reporting of extended distribution of wild species related to crop species not only helps updating the floristic databases of the concerned region, but also in augmenting unrepresented germplasm from such regions for conservation and sustainable utilization (Pradheep et al. 2011, 2018).

MATERIALS AND METHODS

This study was based on extensive survey and explorations (23 trips) carried out all over India during 2009–2020 and herbarium studies. Senior author had personally visited various Indian herbaria - ASSAM, BSD, BSHC, BSIS, BSJO, CAL, CUH, DD, KASH, LWG, MH, NEHU, NHCP, PBL, PCM, and RHT [herbaria codes according to Thiers (2020, continuously updated)]. Species geographic occurrence data from the Global Biodiversity Information Facility (GBIF) and various online herbaria – A, B, BM, BR, E, G, HIFB, FRLHT, GH, HBG, IIIM, JCB, K, KFRI, L, LINN, MO, NY, P, PE, and RPRC [herbaria codes according to Thiers (2020, continuously updated)], including type specimens were also consulted. All the specimens cited here were seen either as physical specimens or in the form of online digital images. Detailed observation on qualitative and quantitative characters was made and herbarium specimens were prepared as per standard procedure (Jain & Rao 1977). Thorough verification or cross-checking with floristic as well as other key literature pertaining to the concerned state (Table 1) and other pertinent works (Jeffrey 1980, 1982; Chakravarty 1982; Naithani 1990; Renner & Pandey 2013; Pradheep et al. 2014, 2015; Pandey et al.

2016) was made and the status of species distribution was updated. This resulted in identification of seven *Trichosanthes* species with extended distribution in various Indian states. While herbarium vouchers of these species were deposited in the National Herbarium of Cultivated Plants (NHCP) at ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi, germplasm collections are being conserved in the form of (live) seeds in the National Genebank at ICAR-NBPGR, New Delhi.

Taxonomic Enumeration

1. *Trichosanthes anaimalaiensis*

Bedd., Madras J. Lit. Sci. 3(1): 47. 1864. Chakravarty, Fasc. Fl. Ind. 11: 107. 1982. *T. anamalanus* Bedd. Trans. Linn. Soc. 25: 217. 1865. *T. palmata* Roxb. var. *tomentosa* B. Heyne ex C. B. Clarke, Fl. Brit. Ind. 2(6): 607. 1879. *T. burmensis* Kundu, J. Bombay Nat. Hist. Soc. 43(2): 381. 1942. *T. burmensis* Kundu var. *alba* Kundu, J. Bombay Nat. Hist. Soc. 43(2): 381. 1942. *T. bracteata* (Lam.) Voigt var. *tomentosa* (B. Heyne ex C.B. Clarke) Chakrav., Rec. Bot. Surv. Ind. 17(1): 47. 1959; Chakravarty, Fasc. Fl. Ind. 11: 110. 1982. *T. tricuspida* Lour. var. *tomentosa* (B. Heyne ex C.B. Clarke) Kumari, Fl. Tamil Nadu, Ind., Ser I: Analysis 1: 174. 1983.

Type: India, Tamil Nadu, Anaimalai Mts., *Beddome* 3234 (holotype BM, available at <http://plants.jstor.org/specimen/bm000885793>).

Robust dioecious climber, 15–20 m long. Stems: robust, highly striate, grooved, puberulous, pale green; young twigs often reddish. Tendrils: 2–3 fid, one strong. Probracts: elongate, tail-like, 1.5–2.0 × 0.45 cm, distantly irregularly serrate, reflexed. Leaves: petioles stout, 6–8 cm long, striate, puberulous; lamina membranous, ovate-suborbicular in outline, 12–17 × 13–18 cm, shallowly 3–5-lobed, lobes rarely up to middle, upper lobe half-elliptic, base slightly cordate, adaxially bulbous-strigose, very scabrous, pale green, abaxially reticulate, tomentose on nerves, margin irregularly or deeply serrate, 4–5 nerved at base, glands 10–20, medium-sized, at base and along main nerves. Male racemes: 25–30 cm long, 5–8-flowered; peduncles very stout, grooved, puberulous; rachis ± zigzag, withered bracts intact; bracts pale green, puberulous, cucullate, sub-reniform in outline, 3.5–4.2 × 3.8–4.7 cm, apex rotund, prominently corrugated, highly lacinate-lacerate, nerves 12–15, glands 10–15. Male flowers: pedicel 0.6 mm long; flowers highly fragrant, 4–5.5 cm long, 0.35 cm diameter at base or 0.7–0.9 cm at mouth, calyx tube often pinkish-red, glands few. Sepals: gigantic, cucullate, ovate-triangular in outline (of female flower

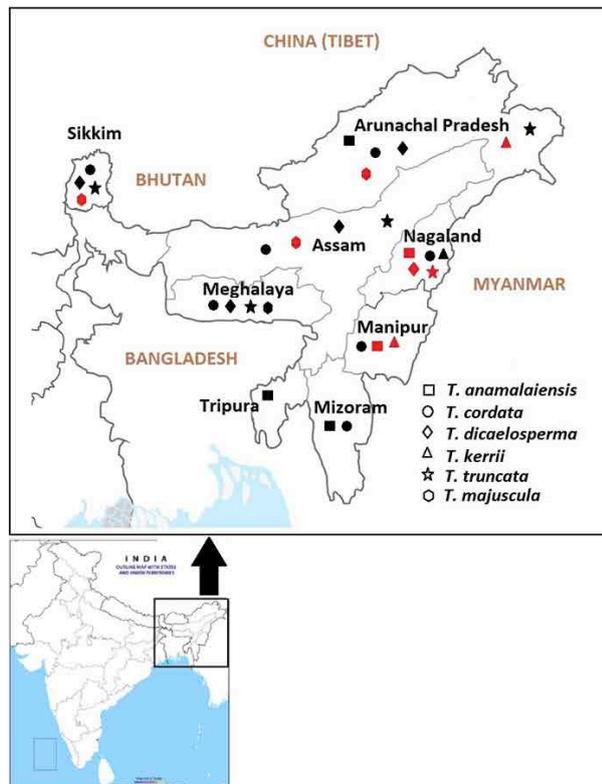


Figure 1. Occurrence of *Trichosanthes anamalaiensis*, *T. cordata*, *T. dicaelosperma*, *T. kerrii*, *T. majuscula* and *T. truncata* in northeastern Indian states (black-filled shapes indicates already-reported, while red-filled ones are new distribution records)

– subulate, entire), 2–2.5 × 1 cm, pale pinkish, apex acuminate, margin lacinate or lacerate. Petals: 1.3 × 1.2 cm (excluding frills, frills 0.5–0.7 cm long), adaxially whitish often with pink veins, hirsute. Anthers: stamens 3, conduplicate, arise just above the rim of corolla tube, 11.5–12.5 × 3–3.2 mm; filaments short, 3 mm long, stout. Stigma lobes 3. Fruits: pedicels 2.3–2.7 cm long; fruits solitary, rarely in clusters (see notes), (sub) globose, 5–6 × 5–5.6 cm, umbonate, pulp greenish black. Seeds: oblong, 9–10 × 4–5 × 1.5–2 mm, reddish, margin ± angular (Image 1A & B).

Flowering and fruiting: May–September and August–November, respectively.

Habitat: Evergreen broad-leaved forests up to 1,600 m; found in red lateritic soils.

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Karnataka, Kerala, Maharashtra, Mizoram, Tamil Nadu, and Tripura; new to Manipur and Nagaland (Figure 1)), Sri Lanka (Jeffrey 1982), and Myanmar (now).

Specimens examined: Manipur: 7162 (CAL), 29.ix.2012, Yumnam Khunou, Bishnupur dt., 780 m, Coll. G. Watt; 12-2 (NHCP), 28.ix.2012, Iroisema, Imphal West dt., 750 m, coll. K. Pradheep; 12-3 (NHCP), 30.ix.2012,

Table 1. Important literature consulted for cross-checking species occurrence in some Indian states.

	State	References
1.	Arunachal Pradesh	Hajra et al. (1996); Dash & Singh (2017)
2.	Assam	Kanjilal et al. (1938)
3.	Bihar	Haines (1921–25)
4.	Manipur	Singh et al. (2000)
5.	Nagaland	Mao et al. (2017)
6.	Odisha	Saxena & Brahmam (1994–1996)
7.	Sikkim	Grierson & Long (1984); Hara (1966)
8.	Uttar Pradesh	Khanna et al. (1999)
9.	West Bengal	Grierson & Long (1984); Paul et al. (2015)

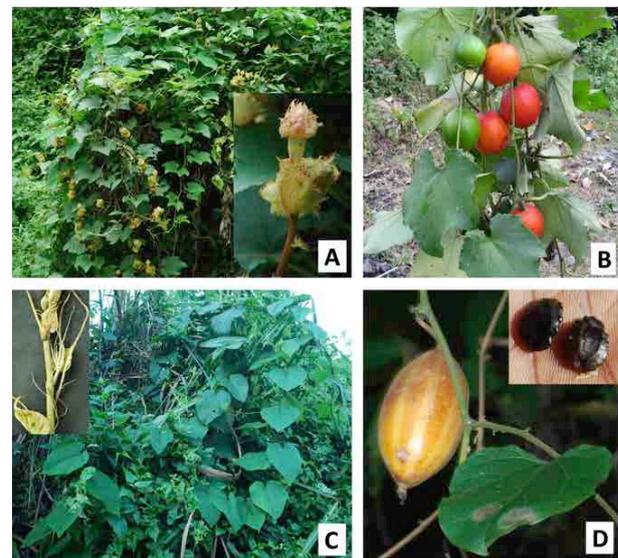


Image 1. A—Male plant of *Trichosanthes anamalaiensis* in Nagaland (inset: bract and male flower bud) | B—Female plant of *Trichosanthes anamalaiensis* in Nagaland | C—Habit of *Trichosanthes kerrii* in Arunachal Pradesh (inset: young twig) | D—Fruiting twig of *Trichosanthes kerrii* (inset: seeds). © K. Pradheep.

Kangla, Imphal East dt., 800 m, Coll. K. Pradheep; KP-1263 (living coll. at NBPGR, New Delhi), 01.x.2012, Lilong, Thoubal dt., 780m, Coll. K. Pradheep. Nagaland: 14-1 (NHCP), 11.viii.2014, Chare, Tuensang dt., 1310 m, Coll. K. Pradheep & Soyimchiten; 14-2 (NHCP), 12.viii.2014, Sangsangyu, Hakchang, Tuensang dt., 1350 m, Coll. K. Pradheep & Soyimchiten; KC/S/I-67 (living coll. at NBPGR, New Delhi), 20.x.2011, Mirima, Kohima dt., 870 m, Coll. K.C. Bhatt et al.

Notes: The striking character ‘fruits borne in cluster’, with which this species traditionally being distinguished from *T. bracteata*, is not a good taxonomic character. It is an unusual tendency of male inflorescence turning

to female, hence retaining bracts; such a kind of sex reversal is of common occurrence in Cucurbitaceae in general, and *Trichosanthes* in particular (Rugayah 1999). In natural conditions as well as in herbaria, authors have come across such tendency in other species too – *T. costata* Blume, *T. cucumerina* subsp. *sublobata*, *T. dicaelosperma*, *T. longispicata* Rugayah, *T. pilosa* Lour., *T. quinquangulata* A.Gray, *T. majuscula* and *T. tricuspidata* Lour. This species is well distinguished from *T. bracteata* (Lam.) Voigt through tomentose nature of leaves (at lower surface), prominent probracts, pinkish-red flowers, highly lacinate bracts and male sepals, and oblong seeds. In herbarium specimens, dried leaves appear dark brownish-red in colour.

Although C.B. Clarke (l.c.) (later Kundu 1943) agreed that *T. palmata* var. *tomentosa* deserves to be a good species with stable diagnostic characters, it appears that Clarke was unaware of *T. anaimalaiensis*, the species which had been published some 15 years back, therefore rule of priority favours latter as the accepted taxon. In agreement with Chakravarty (1959), type specimen (male specimen) study confirms the synonymization of *T. burmensis* and its var. *alba* with var. *tomentosa* (= *T. anaimalaiensis*); however ovoid-oblong fruit shape as mentioned in former's protologue indicates the possibility of erroneous choice of female specimens by Kundu in his herbarium-based study. Renner & Pandey (2013) mentioned its distribution in Andaman & Nicobar Islands, which is clearly outside its distributional range. A live collection (IC587669) at ICAR-NBPGR Base Centre, Cuttack, originally from Mayurbhanj district of Odisha had a close similarity with this species.

2. *Trichosanthes cordata*

Roxb., Fl. Ind. 3: 703. 1832. Clarke in Hook. f., Fl. Brit. Ind. 2: 608. 1879; Prain, Beng. Pl. 1: 363. 1903; Kanjilal et al., Fl. Assam 2: 328. 1938; Chakravarty, Fasc. Fl. Ind. 11: 110. 1982. *T. macrosiphon* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 308. 1872. *T. cordata* Roxb. var. *subpedata* C. B. Clarke. Fl. Brit. Ind. 2: 608. 1879.

Type: Icon. Roxb. 1691 (lectotype K, designated by Jeffrey (1980)), available at <http://d2seqvvy3b8p2.cloudfront.net/a9a143009a2e9f6f09529819e3230496.jpg>

Dioecious; root tuberous. Stems: robust, angular-sulcate, glabrous or puberulent. Tendrils: usually 3-fid, elongate, sulcate, puberulent. Leaves: petioles 8–15 cm long, striate, puberulent; lamina membranous, broadly cordate, 15–20 × 15–20 cm, papery, unlobed or rarely angular-sublobate, both surfaces shortly hirsute, apex acute or shortly acuminate, margin minutely denticulate.

Male racemes: 15–30 cm long, 6–10 flowered; rachis stout, striate, puberulent; bracts ± glabrous, almost entire, oblong-ovate, 4–4.6 cm long as broad. Co-axillary male flower also present. Male flower: pedicels 1–2 mm long; calyx tube 4–5 × 0.5–1 cm, attenuate at apex and base, densely villose; sepals entire, linear-lanceolate, 13–15 × 2–3 mm; petals shortly papillose; Stamens: filaments glabrous; anthers 10–12 × 3–4 mm. Female flower: solitary, pedicel 1 cm long; ovary oblong, puberulent. Fruits: smooth, globose, red, orange-streaked, umbo absent, pulp greenish-black. Seeds: dark brown, oblong, 10–12 × 4–5 × 2–2.5 mm, subquadrangular, belted at middle, slightly angular in margin.

Flowering and fruiting: May–September and August–November, respectively.

Habitat: Occasional in evergreen broad-leaved forest edges/clearings, scrub jungles, Terai areas; 300–1,200 m.

Distribution: India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, and West Bengal (Figure 1), new to Uttar Pradesh and Bihar), Bangladesh, Bhutan, China, India, Myanmar, and Nepal.

Specimens examined: Bihar: 424 (CAL), 12.ix.1965, Naurangia, (West) Champaran dt., Coll. S.P. Banerjee. Uttar Pradesh: 252617 (LWG), 22.x.2010, Nishangara forest, Katarniyaghat WLS, Bahraich dt., Coll. S.D. Maliya (Image 2); EBH 73 (LWG), 08.viii.1979, Chandar Chowk, Lakhimpur-Kheri dt., Coll. S. Saha et al.; EBH 93 (LWG), 08.viii.1979, Bela Parsua, Kheri dt., Coll. J.K. Maheswari et al.

Notes: Notwithstanding the lectotypification (of Roxburgh's drawing) by Jeffrey (1980) for this species, Chakravarty (1982) and Renner & Pandey (2013) mentioned the herbarium specimen, Wall. Cat. 6686A, housed at K (K001124519) as its 'type'. They further mentioned its distribution in Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, and Tamil Nadu, which is clearly out of its range, and is based on misidentified specimens quoted in the earlier works, for instance, Kundu (1943) and Chakravarty (1959). As this species is well documented in Dehradun (Uttarakhand) in the west (Babu 1977) and Sikkim/Darjeeling in the eastern side (Chakravarty 1982), it is expected to occur in the in-between areas falling under the states of Uttar Pradesh and Bihar adjoining to Nepal border. Although Chakravarty (1982) and Renner & Pandey (2013) mentioned its distribution in Uttar Pradesh/Bihar, they didn't attribute to any evidence or herbarium details. Studied herbarium specimens from Bihar and Uttar Pradesh (see 'Specimens examined')

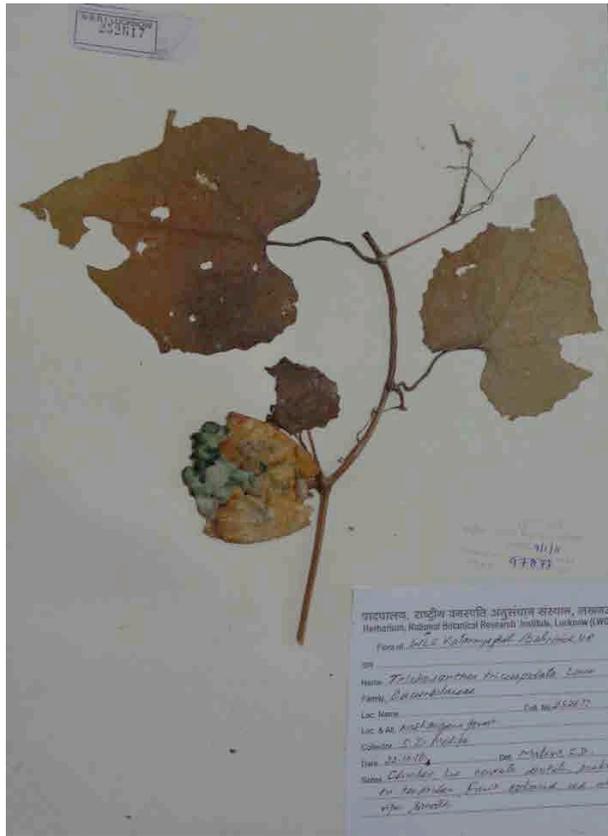


Image 2. Herbarium specimen of *Trichosanthes cordata* from Uttar Pradesh at LWG. © Director, CSIR-NBRI, Lucknow.

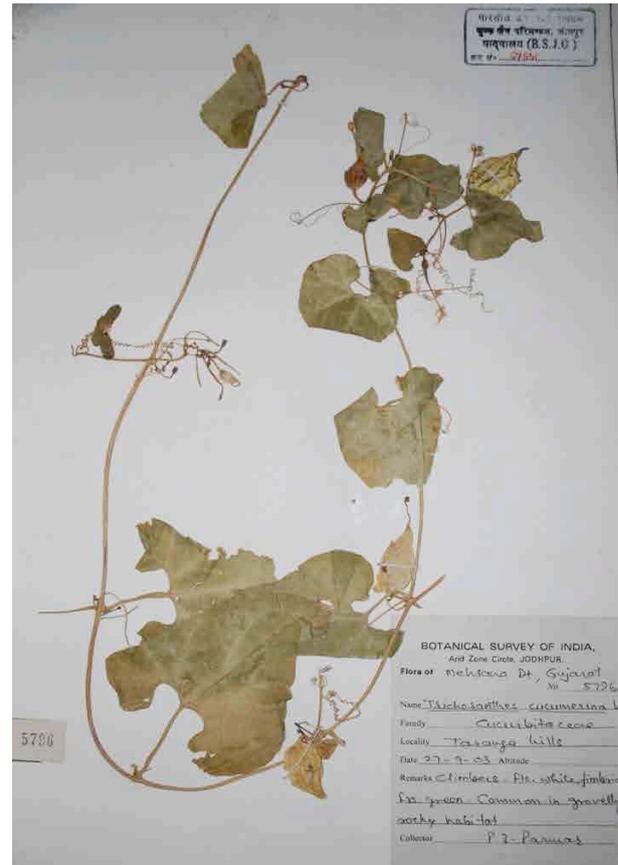


Image 3. Herbarium specimen of *Trichosanthes cucumerina* subsp. *sublobata* from Gujarat at BSJO. © Director, BSI, Kolkata.

were wrongly identified as *T. bracteata* in respective herbaria.

3. *Trichosanthes cucumerina* L. subsp. *sublobata*

(Kundu) K. Pradheep, D.R. Pani & K.C. Bhatt, Novon 24(1): 41. 2015. *T. brevibracteata* Kundu var. *sublobata* Kundu, J. Bot. 77: 11. 1939.

Type: India, Nagpur-Wardha, Central Province, ix.1912, H.H. Haines 3295 (holotype K).

Monoecious, annual climber. Leaves: petioles 4–5 cm long, puberulous; lamina 7–11 × 7–12 cm, shallowly 3-angled or lobed, parrot-green in colour, margins repand, toothed, denticulate, puberulous on both surfaces. Male racemes: puberulous, up to 9 cm long, 6–10 flowered; bracts up to 4 mm long, often 3-lobed. Male flower: pedicels 3–15 mm long, shorter than the associated flower; calyx tube 15–17 mm long, apex stout; sepals 2–4 mm long; petal fringes highly divided. Female flowers: solitary; ovary narrowly elliptic. Fruits: pedicels 2–5 cm long; fruits ovate, 3–4.5 cm long, unripe ones pale green, broadly white-striped, apex strongly beaked, turn orange-red on ripening. Seeds: dark brown, flat, edges toothed-undulate, interspersed in scarlet-red

pulp.

Flowering and fruiting: August–September and October–November, respectively.

Habitat: In herbaria, it was mentioned to have a common occurrence in wastelands and gravelly rocky areas, up to 400 m.

Distribution: Endemic to central and western parts of India (Goa, Maharashtra; new to Gujarat, Madhya Pradesh, and Odisha).

Specimens examined: Gujarat: 5796 (BSJO), 27.ix.2003, Taranga Hills, Mehsana dt., Coll. P.J. Parmar (Image 3); 18095 (BSJO), 19.08.2003 Amirgarh Hills, Banaskantha dt., 300 m, Coll. S.L. Meena; 18218 (BSJO), 23.08.2003, Jessore WLS, Coll. S.L. Meena. Odisha: 5852 (MH), 19.viii.1931, Pachidya, Ganjam dt., Coll. V. Narayanaswami. Madhya Pradesh: Ratapani WLS, Raisen dt., https://www.flickr.com/photos/dinesh_valke/9971030404/

Notes: Originally reported from Ratnagiri, Mumbai and Wardha districts of Maharashtra (Pradheep et al. 2015), this taxon was subsequently spotted in adjoining districts of Thane, Raigad (based on Flickr photos) of this

state. Older collections were kept as subsp. *cucumerina*, from which it is easily distinguished by leaves being parrot green in colour, conspicuous bracts in staminate inflorescence and pale-green broadly white-striped unripe fruits and strongly beaked fruit apex.

4. *Trichosanthes dicaelosperma*

C.B. Clarke, Fl. Brit. Ind. 2: 609. 1879. Chakravarty, Fasc. Fl. Ind. 11: 113. 1982. *T. cucumeroides* (Ser.) Maxim. var. *dicaelosperma* (C.B. Clarke) S.K. Chen, Bull. Bot. Res., Harbin 5(2): 118. 1985.

Type (lectotype, designated here): India, Meghalaya, Khasia Hills, 4000 ft, 13.vii.1850, J.D. Hooker & T. Thomson 1495 (K [digital image K000742692]; isolectotype, CAL0000015132)

Dioecious twinning climber. Stems: long, slender, sulcate, puberulent. Tendrils: 2-fid, stout, puberulent. Leaves: petioles 3–5 cm long, striate, shortly villose; lamina membranous, cordate-ovate, 8–15 × 6.5–11 cm, unlobed, lower surface brown-nerved, apex acute-acuminate, nerves tomentose, margin minutely denticulate. Male inflorescences: paired, one early 1-flowered, other racemose, 6–10 cm long, 7–10 flowered, puberulent; bracts minute. Male flowers: pedicels 0.5–2.0 cm long; calyx tube 2.5–3 cm long, narrow, apex dilated, 3–4 mm long, pubescent, lobe spreading, subulate, ±2 mm long. Female flower: pedicel 0.5–1 cm long; ovary oblong, shortly densely villose. Fruits: immature ones pubescent, 10 pale longitudinal banded, orange-red on ripening; ripe ones globose, 4–5 cm diameter, pulp scarlet-red. Seeds: dark-brown, much compressed, 7–9 × 8–9 × 3 mm, subquadrate, equally 3-celled, lateral cells empty, base appendiculate.

Flowering and fruiting: August–September and September–November, respectively.

Habitat: Occasional in subtropical dense broad-leaved forests, from 850–1,500 m.

Distribution: India (Arunachal Pradesh, Sikkim, West Bengal (Darjeeling) and Meghalaya; new to Nagaland (Figure 1)), Bhutan, China, and ?Myanmar.

Specimens examined: Nagaland: 101 (NEHU), Mokochung, Coll. P.B. Gurung (Image 4).

Notes: While choosing lectotype (J.D. Hooker & T. Thomson 1495, K000742692) according to ICN Article 9.3. and Recommendation 9A.3. (Turland et al. 2018), we have taken into consideration Clarke's annotation on herbarium sheet depicting his justification for new species. Besides, this sheet represents both the male and female plant parts depicting characters of taxonomic value. Renner & Pandey (2013) synonymised this species under an East Asian species *T. cucumeroides*

Maxim., whereas Grierson & Long (1991) kept under southeastern Asian *T. ovigera* Blume. In agreement with Chakravarty (1982), here we recognise *T. dicaelosperma* as a distinct species owing to unlobed leaves, globose fruits, scarlet-red pulp and flat subquadrate seeds. Immature fruits emanate odour similar to that of snake gourd. Renner & Pandey (2013), Chakravarty (1982) and Khanna et al. (1999) reported its occurrence in Uttar Pradesh, which is clearly out of its distribution range and no authentic specimens available to substantiate. Though type specimens (CAL0000015132, K000742692) and other specimens (K000742694, L2988267, P03693959) were collected from Khasi Hills of Meghalaya some 150 years back, sincere efforts made to locate this species in original habitats were futile, possibly due to the extensive changes in landscape over the years; also not a single collection available in various herbaria visited. In Arunachal Pradesh, Hajra et al. (1996) reported this species only from Kameng, however we found its common occurrence in eastern parts of the state, i.e., Anjaw, Dibang Valley, and Lohit districts.

5. *Trichosanthes kerrii*

Craib, Bull. Misc. Inform. Kew 1: 7. 1914. Duyfjes & Pruesapan, Thai For. Bull. Bot. 32: 87. 2004; W.J. de Wilde & Duyfjes, Fl. Thailand 9(4): 523. 2008; Huang & Jeffrey in Lu & Jeffrey, Fl. China 19: 39. 2011. *T. tomentosa* Chakrav., J. Bombay Nat. Hist. Soc. 50(4): 894. 1952; Chakravarty, Fasc. Fl. Ind. 11: 121. 1982.

Type: Thailand, Nan, 25.ii.1912, 3,500 ft, A.F.G. Kerr 2454 (holotype K [K000742680, digital image]; isotype BM [BM000944641, digital image]).

Dioecious gigantic perennial climber. Stems: robust, elongate; twigs dark brown-yellowish, long hairy. Tendrils: 3–5 fid. Probracts: absent. Leaves: petioles robust, brown-tomentose, 5–12 cm long; lamina membranous, entire (unlobed), cordate-ovate in outline, 12–25 × 10–20 cm, base cordate, apex acuminate with caudate tip, upper surface deep green, short hirsute, occasionally with small white specks, lower surface fine reticulate, densely felty villose, margin entire, glands not obvious. Male inflorescences and female flowers not seen. Fruits: pedicels 3–5 cm long; fruits ellipsoid, 7–10 × 6–7 cm, orange, longitudinally pale-striped, glabrescent, pulp creamy yellow. Seeds dark brown, compressed, broad-elliptic, 11–13 × 9–10 × c. 3 mm, base rounded, apex truncate, edges shallowly undulate or crenate (Image 1C & D).

Flowering and fruiting: February–April and September–December, respectively.

Habitat: Forest edges along streams; 1,100–1,400 m.



Image 4. Herbarium specimen of *Trichosanthes dicaelosperma* from Nagaland at NEHU. © NEHU, Shillong.

Distribution: India (Nagaland; new to Arunachal Pradesh and Manipur (Figure 1)), Laos, Myanmar, Thailand, and Vietnam.

Specimens examined: Arunachal Pradesh: 7023 (ASSAM), Tirap F.D., Coll. Panigrahi; 16-1 (NHCP), 27.x.2016, Lalpani, Lohit dt., 1,200 m, Coll. K. Pradheep & G.D. Harish. Manipur: 6508 (CAL), xi.1907, Saithu, 3500 ft, Coll. A. Meebold.

Notes: In Nagaland, apart from Mokokchung (originally known from India from this district only), it is commonly found in Mon (vern. 'okhapatchechui') and Longleng districts, and occasional in Wokha and Tuensang districts. Senior and third authors observed this species also from Dibang Valley in Arunachal Pradesh. Long strigose hairs over the stem and petioles, and dense tomentose hairs over leaf surface at once distinguish it from other species. White stripes over fruits are retained even at dead-ripe stage. A fasciation-like disease symptom was observed on the plants in Mon district of Nagaland, similar observation also made in the herbarium collection (L2995297) from northern

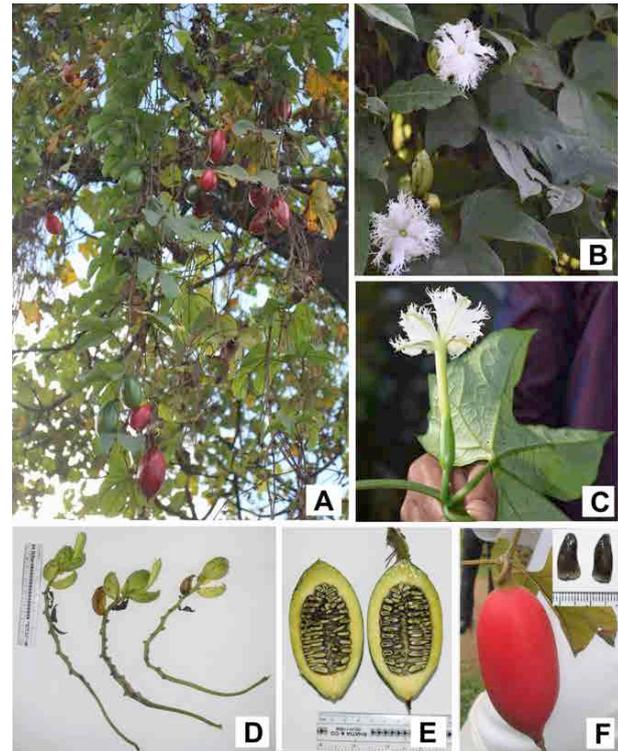


Image 5. *Trichosanthes majuscula*: A—Fruiting plant | B & C—Flowering twigs of male and female plants, respectively | D—Detached male inflorescence | E—Longitudinal section of immature fruit | F—Ripe fruit (inset: seed). © K. Pradheep.

Thailand.

6. *Trichosanthes majuscula*

(C.B. Clarke) Kundu, J. Bot. 77: 12. 1939. J. Bombay Nat. Hist. Soc. 43(2): 378. 1942; Chakravarty, Fasc. Fl. Ind. 11: 118. 1982. *T. multiloba* Miq. var. *majuscula* C. B. Clarke in Hook.f., Fl. Brit. Ind. 2: 608. 1879. *T. wallichiana* (Ser.) Wight var. *majuscula* (C. B. Clarke) Cogn. in A. & C. DC., Monog. Phan. 3: 369. 1881.

Type (lectotype, designated here): India, Meghalaya, Khasia Hills, 4,000 ft, J. D. Hooker & T. Thomson s.n. (K [digital image K000742692]; isolectotype, K000036897 [digital image])

Perennial woody dioecious climber. Stems: robust, sulcate-striate, glabrous; twigs always green. Tendrils: very robust, woody, 3-fid. Probracts: ovate, 0.6 × 0.4 cm, green, crenulate, punctate. Leaves: petioles sulcate, 6–8 cm long; lamina 15–20(–23) × 15–20 cm, membranous, ± glabrous on both surfaces, abaxially pale green, deeply 3(–5)-lobed with 2 mild side lobes, main lobes elliptic-obovate, cuspidate, narrow towards base, leaf base (sub-)truncate to cordate, margins ± undulate-crenate, glands few, small, scattered over main nerves. Male



Image 6. Herbarium specimen of *Trichosanthes majuscula* from Assam at CAL. © Director, BSI, Kolkata.

inflorescences: thick, accrescent; peduncles striate, 8–10 cm long, rachis 20–26(–30) cm long, (13–)15–20(–24) flowered; bracts oblong, cymbiform, punctuate, margin obscurely and finely serrate at least above middle. Flowers: 8 × 4–5 cm, mildly fragrant; pedicels very short; calyx lobe 1 × 0.5 cm, entire, triangular-lanceolate, calyx tube 5.5–6.3 cm long, widening abruptly from 2/3rd length towards apex, inside white-hairy; anthers 3(2+1), 0.4 cm wide, filaments 0.7 cm long. Female flowers: pedicels 0.8–1.3 cm long; calyx tube 5–6 cm long, tubular, slightly broad at apex; sepals 0.7 cm long, entire; ovary oblong, 1.4–1.6 × 0.8 cm, conspicuously grooved longitudinally; style 3 cm long; stigma lobes 3, greenish, 2.5 mm wide. Fruits: pedicels stout; fruit oblong-ovate, reddish on ripening, mesocarp thick, pulp (endocarp) greenish black. Seeds: 70–100, dark brown, ovate-oblong, 12–13.5 × 7.6–8.2 × 2.5–2.8 mm, flat, often with raised central line, ± angular (Images 5 & 6).

Flowering and fruiting: August–October and September–November, respectively.

Habitat: Common in forest edges in Meghalaya; occasional in Assam and Arunachal Pradesh; rare in

Sikkim; (200–)400–1,400 m.

Distribution: India (Meghalaya; new to Assam, Arunachal Pradesh and Sikkim (Figure 1)) and probably also in Bhutan.

Specimens examined: Arunachal Pradesh: 20045 (ASSAM), 12.x.1959, Nampang-Pangsu Pass, Tirap dt., Coll. R.S. Rao; 1107 (NHCP; living coll. at NBPGR, New Delhi), 18.x.2011, Napit, East Siang dt., Coll. K. Pradheep & P.K. Singh; 1114 (living coll. at NBPGR, New Delhi), 19.x.2011, Ranaghat, East Siang dt., 252 m, Coll. K. Pradheep & P.K. Singh; 1156 (NHCP), 18.x.2011, Kabali, Lower Dibang Valley dt., Coll. K. Pradheep & P.K. Singh; 1157 (living coll. at NBPGR, New Delhi), 18.x.2011, Kabali, Lower Dibang Valley dt., 420 m, Coll. K. Pradheep & P.K. Singh; 2677 (NHCP), 27.x.2017, Kornu (Roing), Lower Dibang Valley dt., Coll. K. Pradheep, R.S. Rathi & G.D. Harish; 11-2 (NHCP), 21.x.2011, Chowkham, Lohit dt., Coll. K. Pradheep & P.K. Singh; 1140 (NHCP), 22.x.2011, Tengapani RF, Lohit dt., Coll. K. Pradheep & P.K. Singh; 1146 (NHCP), 24.x.2011, Parasuram Khund, Lohit dt., Coll. K. Pradheep & P.K. Singh. Assam: 32686 (CAL), 25.viii.1909, Sadiya, Lakhimpur dt., Coll. I.H. Burkill; 39364 (ASSAM), viii.1984, Nakhola, Sonaikushi RF, Nowgong dt., Coll. N. P. Balakrishnan; 18-24 (NHCP), 22.ix.2018, Bijoy Nagar, Kamrup dt., Coll. K. Pradheep; 18–23 (NHCP), 19.ix.2018, Rangjuli, Goalpara dt., Coll. K. Pradheep; 1120 (NHCP), 20.x.2011, Simon Chapori, Dhemaji dt., Coll. K. Pradheep & P. K. Singh. Sikkim: 18–15 (NHCP), 13.viii.2018, Kokaley, East Sikkim dt., 813 m, Coll. K. Pradheep; 18-16 (NHCP), Lower Thumnicola, East Sikkim dt., 976 m, Coll. K. Pradheep.

Notes: Out of available syntypes (K000742686, K000036897 and P06393544), former two were selected as lectotype and isolectotype (following Articles 9.3. and 9.12. of ICN; Turland et al. 2018) since Clarke himself annotated on these sheets as "*Trichosanthes multiloba* Miq. var. *majuscula*", in addition, they depict inflorescence characters such as thick and woody rachis, flowers borne from near the base, all of taxonomic value. This distinct species was originally described at reduced rank under a Japanese species *T. multiloba*, thereafter kept under *T. wallichiana* by A. Cogniaux (l.c.), later on synonymised under *T. dunniana* H. Lévl. by Jeffrey (1982), which was adopted by Huang & Jeffrey (2011) and Renner & Pandey (2013). Probable reason for this confusion is the lack of details on female flowers, fruits and seeds. It is easily distinguished from *T. wallichiana* by membranous leaves (vs. chartaceous), small ovate probracts (vs. much elongate), shorter peduncle of male inflorescences (vs. very long), serrate male bracts (vs. lacinate), ovate-oblong fruits (vs. globose) and dark



brown seeds (vs. greenish-brown). From *T. dunniana*, it is different in being robust climber (vs. medium climber), large-sized leaves with 3(-5) lobes (vs. small with 5(-7) deep lobes), cymbiform bract (vs. cucullate), oblong ovary (vs. ovate) and big flat seeds with angular ends (vs. small, only slightly compressed with rounded ends).

7. *Trichosanthes truncata*

C.B. Clarke, Fl. Brit. Ind. 2: 608. 1879. Kanjilal et al., Fl. Assam 2: 328. 1938; Chakravarty, Fasc. Fl. Ind. 11: 122. 1982; S.K. Chen, Fl. Yunnan 6: 364. 1995; Duyfjes & Pruesapan, Thai For. Bull. Bot. 32: 99. 2004; W. J. de Wilde & Duyfjes, Fl. Thailand 9(4): 537. 2008; Huang & Jeffrey in Lu & Jeffrey, Fl. China 19: 39. 2011. *T. ovata* Cogn. in A. & C. DC., Monogr. Phan. 3: 365. 1881; Chakravarty, Fasc. Fl. Ind. 11: 120. 1982; S.K. Chen, Fl. Yunnan 6: 364. 1995.

Type: J.D. Hooker & T. Thomson 1188, Khasia Hills, Meghalaya, India, (lectotype K, designated by Duyfjes & Pruesapan (2004)).

Liana-forming dioecious climber. Stems: robust, angular-striate, glabrous; young shoots greenish. Tendrils: robust, simple or 2–3 fid, glabrous. Probracts minute. Leaves: petioles robust, sulcate, glabrous, 4–6 cm long, sometimes irregularly twisted; lamina glabrous, chartaceous, ovate-oblong or cordate in outline, 12–18(–25) × 6–13(–22) cm, entire or occasionally 3-lobed/angled, apex acuminate, base truncate-hastate or obtuse, 3-prominent nerved, margin denticulate or only remotely denticulate, glands few, minute, 10–20 along main nerves. Male inflorescences: glabrescent, 15–20 cm long, 12–20 flowered; rachis stout, striate; bracts glabrous, suborbicular-elliptic, 14–18 × 5–8 mm, slightly dentate, often 3-nerved. Male flowers: pedicels slender, puberulous, 2–4 mm long; calyx tube shortly tomentose, 2–3 cm long, dilated above, calyx lobe 5–7 × 1–2 mm, corolla yellowish-white. Female flowers not seen. Fruits: pedicels 8 mm long; fruits round-oblong, 8–12 × 4–5.5 cm, greenish-yellow at maturity, epicarp tough, pulp whitish. Seeds: dark brown or reddish-brown, oblong-obovate, 2 × 1.2 × 0.3–0.4 cm, base truncate, apex obtuse, compressed and narrowing towards margin.

Flowering and fruiting: May–August and June–October, respectively.

Habitat: Degraded deciduous or evergreen forests, bamboo forests from 400–1,400 m.

Occurrence in India: Arunachal Pradesh, Assam, Meghalaya, Sikkim, West Bengal; new to Nagaland (Figure 1).

Distribution: Bangladesh, Bhutan, China, India, Myanmar, Thailand, and Vietnam.

Specimens examined: Nagaland: 13-1 (NHCP),

25.xi.2013, Longching, Mon dt., 1,350 m, Coll. K. Pradheep & Soyimchiten.

Notes: Chakravarty (1982) and Renner & Pandey (2013) mentioned this species from Andhra Pradesh which is outside its distribution range. Though type specimen was collected from Khasi Hills (almost 150 years ago), no further collections available thereafter and now failed to locate this species due to the extensive topographic change. This species could be a connecting link between *Trichosanthes* and *Hodgsonia* Hook.f. & Thomson owing to the distinct characters – big chartaceous leaves, yellowish-white flowers, big-sized fruits as well as seeds, and whitish mesocarp and pulp. Hajra et al. (1996) mentioned its occurrence from Kameng, Subansiri and Tirap in Arunachal Pradesh; however, we noticed it occasionally in Lohit district as well.

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