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Ceropegia khasiana (Apocynaceae: Ceropegieae), a new species from Meghalaya, Northeast India

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ABSTRACT. A new species of *Ceropegia*, *Ceropegia khasiana* Murug., A.A.Mao, Meitei & Kambale (Apocynaceae), is described and illustrated from Meghalaya, Northeast India. The new species is superficially similar to *Ceropegia macrantha* Wight but it differs in having fewer, shorter fascicled roots up to 8 cm long, linear-lanceolate leaves with long acuminate apices, smaller flowers up to 4.7 cm long, 12–18-flowered inflorescences with two flowers open at a time, two umbels per node, corolla tube pinkish outside with dark reddish stripes, reddish inside in mature flowers, greenish or pinkish to reddish at the apex of corolla lobes which are densely ciliate hairy, inflated base with reddish patch at middle, outer corona with very sparse small ciliate hairs, and each pair of follicular mericarps unequal in length.

Keywords. Asia, Ceropegieae-Stapeliinae, Flora of India, Ri-Bhoi district

Introduction

The genus *Ceropegia* L. (Apocynaceae: Ceropegieae) has about 244 species distributed from southern Africa and around the perimeter of the Indian Ocean to Australia (Ansari, 1984; Bruyns, 1997, 2003; Jagtap & Singh, 1999; Kambale & Yadav, 2019; Kumar et al., 2018; Li et al., 1995; Mabberley, 2008; Manudev et al., 2016; Maurya et al., 2018; Punjani et al., 2017; Rahangdale & Rahangdale, 2012; Sachin et al., 2006). The highest diversity in the genus *Ceropegia* occurs in South Africa, followed by Kenya, Madagascar and India (Sri Rama Murthy et al., 2012). The genus *Ceropegia* can be distinguished from other genera of Ceropegieae such as *Caralluma* R.Br. by the presence of root tubers, either as single large potato-like tubers or fascicled tuberous roots, and the distinctive cage-like structure of the flowers formed by the corolla lobes, which are apically connate to various degrees (Clarke, 1883; Huber, 1957; Ansari, 1984; Li et al., 1995; Meve, 2009; Kullayiswamy et al., 2013; Kidyoo & Paliyavuth, 2017). Typically, the root system is species-specific. The genus exhibits tremendous diversity with respect to habit, habitat, flower architecture and ecological adaptations

(Dyer, 1983; Bruyns, 1997; Kambale et al., 2012). The basally inflated corolla tube, lined with downwardly pointing hairs, forms a temporary trap for small flies and other insects and hence this group is popularly called the "fly trap flowers" (Masinde, 2004; Ollerton et al., 2009). Many species of this genus are narrow endemics and they are included in various IUCN Red Lists (Nayar & Sastry, 1987–1989).

In India, the genus is represented by 69 taxa (62 species, two subspecies and five varieties) (Manudev et al., 2016; Kambale & Yadav, 2019), of which 37 are endemic to Peninsular India (Ahmedullah & Nayar, 1987; Kumar et al., 2018; Kambale & Yadav, 2019). There are 11 species in the North-eastern region of India, viz., *Ceropegia angustifolia* Wight, *C. arnottiana* Wight, *C. hookeri* C.B.Clarke ex Hook.f., *C. kachinensis* Prain, *C. longifolia* Wall., *C. lucida* Wall., *C. macrantha* Wight, *C. mizoramensis* Ram.Kumar & S.Sharma, *C. murlensis* Ram.Kumar & S.Sharma, *C. pubescens* Wall. and *C. wallichii* Wight. Of these, eight species are in Meghalaya (Jagtap & Singh, 1999).

During a botanical exploration to the Sumer forested areas in Ri-Bhoi district (Meghalaya) to collect plants for ex situ conservation projects, the authors collected an interesting species of *Ceropegia*. Five plants (flowering & fruiting) were collected and grown in the Experimental Botanical Garden, Botanical Survey of India, Eastern Regional Centre, Barapani, Shillong. After examination of these plants, comparison to the relevant literature, and the study of herbarium material deposited in ARUN, ASSAM, BSHC, CAL, MH and further field surveys, we concluded that these materials did not match with any described species. Therefore, it is described here as a new species along with photographic illustrations (Fig. 1).

Taxonomic treatment

Ceropegia khasiana Murug., A.A. Mao, Meitei & Kambale, **sp. nov.**

The new species is superficially similar to *Ceropegia macrantha* Wight but it differs in having fewer, shorter fascicled roots up to 8 cm long (see Table 1 for the character states in *C. macrantha*), linear-lanceolate leaves with long acuminate apices, smaller flowers up to 4.7 cm long, 12–18-flowered inflorescences with two flowers open at a time, two umbels per node, corolla tube pinkish outside with dark reddish stripes, reddish inside in mature flower, greenish or pinkish to reddish at the apex of corolla lobes which are densely ciliate hairy, inflated base with reddish patch at middle, outer corona with very sparse small ciliate hairs and each pair of follicular mericarps unequal in length. – TYPE: India, Meghalaya, Ri-Bhoi District, Sumer forests of East Khasi Hills (25°62′33.8″ N, 91°90′21.4″ E), 950 m elevation, 10 July 2017, *M. Murugesan 137313* (holotype ASSAM; isotypes MH). (Fig. 1).

Perennial, twining herb up to 4 m long. Stem wiry, slender, terete, pinkish, red-maroon or pale green, sparsely minutely hairy or rarely glabrous; internodes 7–25 cm long, 1–2 mm in diam. Roots 9–12, fascicled, fusiform, fleshy, short, up to 8 cm long, 2–5 mm in diam. ***Leaves*** simple, opposite, decussate, petiolate, lanceolate or linear-lanceolate,

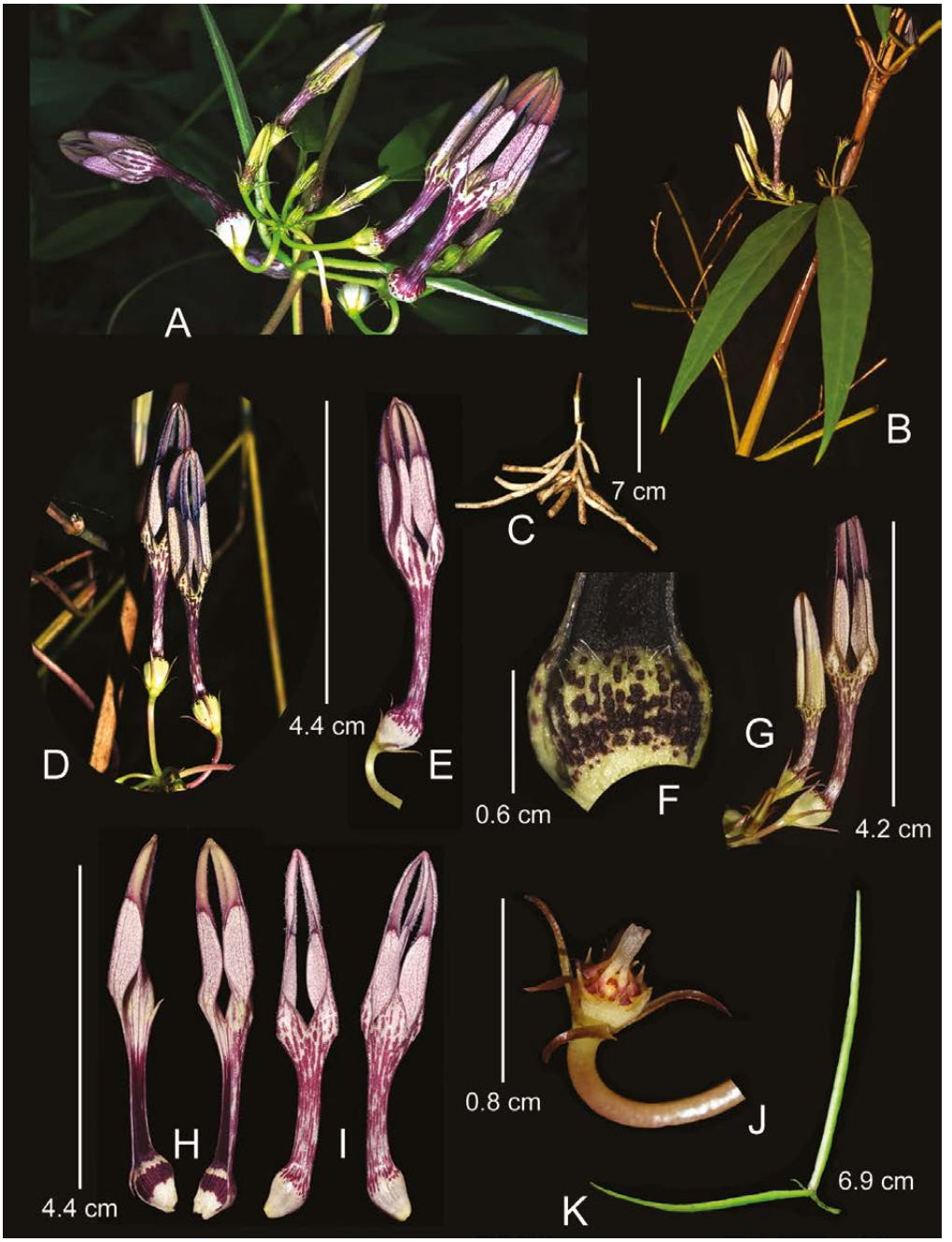

Fig.1. *Ceropegia khasiana* Murug. et al. **A.** Habit. **B.** Plant from *ex-situ* conservation collection. **C.** Fascicled roots. **D.** & **E**. Mature flowers. **F.** L.S. of young flower showing hairs. **G.** Young flowers. **H.** Ventral view of flowers. **I.** Dorsal view of flowers. **J.** Corona. **K.** Mericarp. (Photos: M. Murugesan).

Table 1. Major differences between *Ceropegia khasiana* Murug. et al. and its closely allied species *Ceropegia macrantha* Wight.

Characters	*Ceropegia khasiana* sp. nov.	*Ceropegia macrantha* Wight
Fascicled roots	Few, up to 8 cm long	Many, up to 18 cm long
Leaves	Linear-lanceolate, long acuminate at apex	Ovate-lanceolate or elliptic-lanceolate, short obtusely acuminate at apex
Inflorescence	Umbels 2 per node, 12–18-flowered, two flowers open at a time in an umbel	Umbel 1 per node, 4–10-flowered, only one flower open at a time in an umbel
Flowers	Smaller, 4–4.7 cm long	Larger, 5.2–6.5 cm long
Corolla tube	1.5–2 cm long, 2–4 mm in diam., purplish maroon streaked and blotched with pinkish white on outer surface, reddish maroon on inner surface except at the tip of corolla tube, pinkish white with red lines towards top	2.5–3.5 cm long, 3–6 mm in diam., greenish white with purplish maroon streaks and blotches on outer surface, black purple within
Corolla lobes	Up to 2.2 cm long; base pinkish with reddish reticulate veins inside and pinkish white and purplish maroon streaked and blotched outside; pinkish or maroon towards apex, minute ciliate hairy within	Up to 3.5 cm long; mottled purple-maroon above, with dense brown-black, long ciliate hairy within
Dilated base of corolla tube	Pink blotched at middle, pinkish or greenish white at base and apex	Prominently rugose, maroon-brown vertical stripes within, greenish white in between the vertical stripes
Inner corona lobes	Equal in length, smaller	Unequal in length, longer
Outer corona lobes	Very sparse minutely ciliate hairy	Densely 5–7 mm long ciliate hairy
Pollinia	Yellowish	Brownish
Follicular Mericarps	Unequal in length	Equal in length

5–15 × 0.5–2 cm, slightly attenuate or cuneate at base, acute-acuminate at apex, entire at margins, minutely pubescent hairy on adaxial surface and along the margins, abaxially glabrous, except on nerves; petiole up to 1.5 cm long, 1.2–2.2 mm in diam., channelled above, with sparse row of hairs, rarely glaucous. ***Inflorescences*** of extra-axillary umbellate cymes, 12–18-flowered, two flowers open at a time; peduncles extra-axillary, two per node, 1–2.5 cm long, 1.2–1.8 mm in diam., sparsely pubescent hairy, greenish-pinkish; pedicels 1–1.5 cm long, 1–1.2 mm in diam., greenish-pinkish; bracts 1 or 2 at base of pedicel, lanceolate, 1.5–2 mm long, greenish-pinkish, acute at apex, hairy at margins, caducous. ***Calyx*** 5-partite, greenish at base, pinkish towards apex; lobes 5–7 × 0.6–0.9 mm, linear-lanceolate, acute-acuminate at apex, greenish-

pinkish. ***Corolla*** 4–4.7 cm long, sparsely minutely hairy outside at base, dense towards apex, glabrous within; corolla tube 1.5–2 cm long, 2–4 mm in diam., purplish maroon streaked and blotched with pinkish white on outer surface, reddish maroon on inner surface except at the tip of corolla tube, pinkish white with red lines towards top; inflated base 5–7 × 5.5–8 mm, pinkish white, streaked and blotched purplish maroon at apex on outer surface; inner surface greenish white to pinkish white with reddish or purplish maroon blotch at middle and a ring of downwardly pointed hairs at the throat; lobes 5, 2–2.2 × 0.6–0.7 cm, lanceolate or ovate-lanceolate, folded, keeled, pinkish at base with clear reddish reticulate veins inside, pinkish white, streaked and blotched purplish maroon outside, apical part slender, pinkish reddish, coherent at apex, keeled, ciliate hairy within, glabrous without. ***Corona*** biseriate; outer with five bifid lobes, 1–1.2 mm long, each lobe very sparsely ciliate, hairs 1–1.5 mm long; inner lobes linear-lanceolate, 2–2.5 mm long, reddish-pinkish at base, translucent yellowish white towards apex, rounded or obtuse at apex, glabrous. ***Pollinia*** yellowish, ovoid, with pellucid margin, 0.25–0.4 × 0.2–0.35 mm, caudicles short, c. 0.25 mm long, corpusculum clavate, minute, 0.2–0.3 mm long, reddish to brownish. ***Ovary*** conical, c. 2 × 0.5 mm, glabrous. ***Follicular mericarps*** in unequal pairs, up to 10 cm long, straight or slightly curved above the middle, erect, tapering at both ends, blunt at tips, glabrous. ***Seeds*** up to 7 × 1 mm; brownish, comose; coma up to 2.5 cm long, silky white.

Distribution. So far known only from Sumer forest areas, Ri-Bhoi district of Meghalaya India.

Ecology. Occasional along forest margins at an altitudinal range between 900–950 m above sea level. A total of six mature individuals were located at the type locality. The species grows in association with *Arundinella nepalensis* Trin., *Ceropegia* sp., *Crotalaria assamica* Benth., *Eulophia pauciflora* Guillaumin and *Ischaemum* spp.

Phenology. Flowering: July-August. Fruiting: August-October.

Etymology. The new species is named after the type locality, Khasi hills, Meghalaya.

Provisional IUCN conservation assessment. The new species is currently known only from the type locality. During the field surveys we have located only six mature individuals within this forest which covers an area of 3 km^2. The species is assessed here using IUCN Red List Categories and Criteria version 3.1 (IUCN, 2017) as Critically Endangered CR B1ab(iii), B2ab(iii). Habitat destruction caused by wild fires, mining, collection of Minor Forest Produces (MFP) by local people, fire wood collection and cattle grazing were determined as the major threats during the study period. Extensive explorations to similar habitats and micro environments in the adjacent localities are required to assess its whether there are as-yet unknown populations in other parts of Northeast India.

Taxonomic notes. Ceropegia khasiana is a member of the *Ceropegia longifolia* complex.

This complex includes *Ceropegia longifolia*, *C. longifolia* subsp. *sinensis* H.Huber var. *sinensis* H.Huber, *C. macrantha*, *C. mizoramensis* and *C. murlensis* (Kumar et al., 2018). Species from this complex have fleshy swollen roots. The approximately equal length of the corolla lobes and tubes is a character shared by *Ceropegia khasiana* and *C. longifolia* subsp. *sinensis* var. *sinensis*. The corolla lobes in the latter are ovate and have long, pendulous white-coloured trichomes and in the former the lobes are linear-lanceolate and pilose-pubescent within.

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