

Notes on Taxonomic Identity, Distribution and Ecological Status of the Genus *Ceropegia* L. in Western Ghats of Coimbatore District, Tamil Nadu, India

¹B. Subbaiyan, ¹S. Jagatheskumar, ¹A. Venkatachalapathi,
²V. Aravindhan, ³P. Samyurai and ¹V. Thangapandian

¹Department of Botany, Kongunadu Arts and Science College [Autonomous],
Coimbatore, Tamil Nadu, India

²Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu, India

³Institute of Forest Genetic and Tree Breeding, Coimbatore, Tamil Nadu, India

Abstract: The present study was made to assess the morphological identification, distribution, ecological status of the genus *Ceropegia* in Western Ghats of Coimbatore district Tamil Nadu, India. A taxonomic survey was conducted during 2012-2014 and a total of 8 species of *Ceropegia* (*Ceropegia bulbosa*, *C. bulbosa* var. *lushii*, *C. juncea*, *C. candelabrum*, *C. pusilla*, *C. intermedia*, *C. omissa* and *C. elegans*) were collected. Their taxonomic identification was confirmed on critical appraisal and authentication of herbarium specimens. The present paper deals with their correct taxonomic identity, distribution and ecological status.

Key words: *Ceropegia* • Western Ghats • India • Threat status • Conservation

INTRODUCTION

The genus *Ceropegia* L. belongs to the plant family Asclepiadaceae, is an old world tropical genus and is one of the largest genus in the tribe Ceropegieae. The genus consists of about 200 species and is widespread along the margin of the Indian Ocean [1]. It has always been a fascination to the botanists because of various reasons like their distinct diversity in reference to habit, habitat, flower structure and ecological adaptations. Attractive flytrap flowers [2], flower design, corolla size, shape and coloring pattern etc are some special characters of this genus.

The maximum diversity of *Ceropegia* L. occurs in South Africa followed by Kenya and Madagascar. Its species diversity eastwards diminishes in Arabia where only 10 species were recorded and only one species in Pakistan. However, most of the species of *Ceropegia* have a restricted distribution only in certain regions. Ansari [3] reported 44 species of Indian *Ceropegia* of which 28 are said to be endemic. Karthikeyan *et al.* [4] reported about 56 species, two subspecies and three varieties for India.

Presently the genus is represented by 50 species of which about 38 species were recorded in Western Ghats. Out of these 38 species of *Ceropegia* in Western Ghats about 15 are narrow endemic and all of them are highly threatened [5, 6]. The level of endemism suggests the Western Ghats as one of the centers for evolution and diversification of *Ceropegia* L. Several species of *Ceropegia* L. are facing different threats and are narrow endemics while 16 species are recorded under different categories in Red Data Book [7].

The species of *Ceropegia* as a whole are under threat, owing to either destructive collection or habitat degradation. They are not only genetically depleted but also are scarcely available. The genus *Ceropegia* is included under the Plants and the Indian Wildlife [Protection] Act 1972. The Director General of Foreign Trade prohibits the export of *Ceropegia* species under 'Negative List of Exports and Import Policy, 1997-2002 [8]. They occur in a wide range of habitats from equatorial forest to semi-desert, but are not found in true deserts.

The rootstock is often a cluster of fleshy [fusiform] roots, a discoid tuber, occasionally an elongated tuber or rhizome, or only has fibrous roots. The stems range from

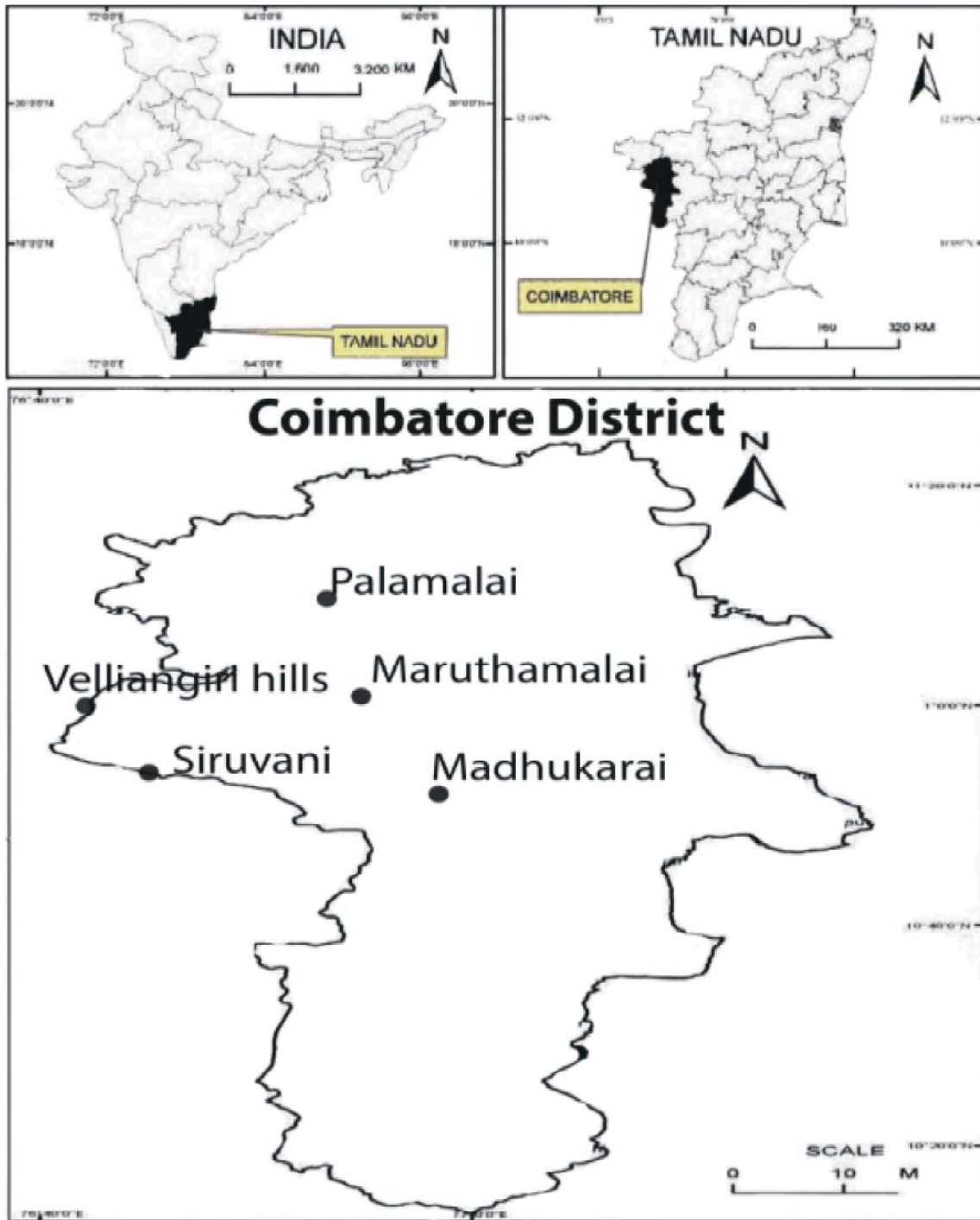


Fig. 1: Study area

herbaceous to extremely succulent. The root tubers contain starch, sugar, gum, albuminoids, fats and crude fiber and are valuable constituents in many traditional medicinal systems in India [9]. Active principle of tuberous root contains an alkaloid Ceropagine which is

active against diarrhoea and dysentery [10]. The present paper not only gives the taxonomic description but also describe the unusual morphological differences showed by different species collected in the study region.

Study Area: The various tribal inhabits in Coimbatore district is a part of Southern Western Ghats. The following areas of Coimbatore district were selected for study area: Madhukarai, Palamalai, Maruthamalai, Velliangiri hills and Siruvani hills (Fig. 1).

MATERIALS AND METHODS

Frequent field surveys were carried out in around Coimbatore hilly regions during various seasons in 2012 to 2014. The ethnobotanical data and local name, habitat, flowering, ecological status and medicinal uses were observed. The collected specimens were identified taxonomically using “*The Flora of Presidency of Madras*” [11]; *The Flora of Tamil Nadu and Carnatic* [12] and the following reference authors [13, 14]. The enumerated plants were documented by Botanical name, Local name, habitat, family, ecological status and medicinal uses (Table 1). Voucher specimens have been deposited in the Herbarium, Department of Botany, Kongunadu Arts and Science College [Autonomous], Coimbatore, Tamil Nadu, India.

Enumeration:

1. *Ceropegia bulbosa* Roxb. Pl. Cor. 1: 11.t.7. 1795 & Fl. Ind. 2: 28. 1824; FBI 4: 67. 1883; Gamble 2: 857[602]. 1923.

A fleshy, twiner, with a round depressed tuber. Stems very slender, glabrous. Leaves fleshy, variable, lower orbicular, upper ones elliptic-oblong or obovate, 2.5-4.5 x 1.5-2.6 cm, chartaceous when dry, glabrous, base obtuse, subacute or subcordate, margin entire, apex acutely apiculate. Flowers small, greenish in lateral, pedunculate umbellate, 3-7-flowered cymes. Peduncles 1-2.5 cm long, arising from between the petioles. Calyx 5-partite, with 5 glandular scales within, divided to the base; sepals lanceolate, acute. Corolla lobes valvate in bud, connate at their apices, purplish within. Corolla tube with base inflated, lobes shorter than tube. Corona double, arising from the staminal column. Pollen masses erect, attached to the pollen carriers by very short caudicles. Follicles cylindrical, glabrous, tapering towards an acute apex.

Habitat: Very rare, in dry deciduous forests.

Flowering & Fruiting: September - October.

Specimen examined: Tamil Nadu: Madukkarai hills, B. Subbaiyan BS: 015 (25-5-2012). S. Jagathes Kumar SJ: 0159 (12.6.2013).

Distribution: It is confined to Indian

Subcontinent [India and Pakistan]:

Maharashtra: Pune, Raigad, Satara, Thane

Karnataka: Belgaum, Hassan, S. Kanara

Tamil Nadu: Cuddalore, Kancheepuram,

Madurai, Tiruvannamalai, Viluppuram and

Coimbatore. Andhra Pradesh [Cuddapah,

Khammam, Visakhapatnam], Rajasthan,

Gujarat, Punjab, Orissa [Angul] and West

Bengal.

Uses: Raw tubers eaten for enhancing ladies fertility and vitality, decoction taken to get rid of urinary bladder stone, paste applied on the inflammation of skin.

2. *Ceropegia bulbosa* Roxb. var. *lushii* (Graham) Hook. f., Fl. Brit. India 4: 68. 1883; Gamble, Fl. Pres. Madras 857(602). 1923. A fleshy, twiner, Leaves 6-8 x 7-1.3 cm, linear-lanceolate, apex acuminate, base acute; petiole to 1 cm. Cymes axillary, umbellate; peduncle to 1.5 cm; bracts 3 mm, linear; pedicel 5 mm; calyx 5-lobed, to 5 mm, beaked, dark purple, tube yellow with dark blotches; pollinia 3, obovoid-circular, caudicle minute, receptacle small; outer corolla ca 1mm, cupular, membranous, inner corona 5, ca 2 mm, spathulate, connivent.

Flowering & Fruiting: July-October

Habitat: Occasional in moist deciduous forests.

Specimen examined: Madukkarai hills, B.

Subbaiyan BS: 017 [12-8-2012]. S. Jagathes

Kumar SJ: 0163 [5.5.2013].

Distribution: Karnataka: N. Kanara; Kerala:

Palakkad; Tamil Nadu: Cuddalore,

Dharmapuri, Kancheepuram, Madurai,

Salem, Thiruvallur, Tiruvannamalai,

Viluppuram and Coimbatore.

Uses: Tubers are used to treat the urinary disorder and stomach pain.

3. *Ceropegia candelabrum* L. Sp. PI 211

1753; FBI 4: 70. 1883; FPM 857. 1923;

FTC 3(2); 935. 1983; Huber in Dassan. &

Fosb., Handp. Fl. Ceylon 4: 120. 1983;

M.Y. Ansari, Fasc. Fl. India 16: 12. 1984;

FTN 2: 82. 1987; Nicols. et al., Interp. Hort.

Malab. 61. 1988. *C. ellitii* Hook.f., Fl. Brit.

India 4: 70. 1883.

Twining climber. Leaves 2.5-4.5 by

0.6-0.8 cm, elliptic-ovate, acuminate at apex, acute at base, entire at margins, glabrous, membranous, Flowers in axillary racemose cyme. Calyx-lobes 5, 0.5 cm long, narrow. Corolla-tube c 2.5 cm long; lobes 5, c 0.5 cm long, hairy within. Corona double; outer lobes 5, hairy; inner lobes 5, spathulate, c 0.2 cm long. Follicles 7-8 cm long, narrowly attenuate.

Table 1: Distribution, ecological Status and medicinal uses of *Ceropegia* species in Coimbatore district, Tamil Nadu, India

S.No.	Botanical Name	Ecological Status	Common/ Tamil name	Distribution	Parts used	Medicinal uses	Source
1	<i>Ceropegia bulbosa</i> Roxb	VU/EN	Chatimuti Kizangu	Madhukarai hills, Maruthamalai and Palamalal	Leaves and tuber	Leaves and tubers were used for urinary disorder and anti- diabetic activity.	IUCN 1997.
2	<i>Ceropegia juncea</i> Roxb.	R	Pulichankodi	Maruthamalai, Palamalal and Madhukarai hills	Aerial parts	Aerial parts are used for anti- diabetic activity and control gastrointestinal disorders.	Karuppusamy <i>et al.</i> , 2010.
3	<i>Ceropegia candelabrum</i> L.	R	Perunkodi	Madhukarai hills, Siruvani, Velliangiri	Leaves and Tuberous root	Paste of leaves is applied on forehead to cure the headache and Promote fertility.	Been <i>et al.</i> , 2003.
4	<i>Ceropegia intermedia</i> Wight.	E	-	Velliangiri, Siruvani	Leaves and Tuberous root	Leaves were used as Skin Diseases and edible.	Murthy <i>et al.</i> , 2012.
5	<i>Ceropegia omissa</i> H.Huber.	E/Possibly extinct	-	Velliangiri	Tuberous root	-	IUCN, 1997; Murthy <i>et al.</i> , 2012.
6	<i>Ceropegia elegans</i> Wall.	E	Perungilangu	Siruvani	Root	The roots were chewed at the time of the snake bite	Krishna Reddy and Pullaiah, 2012.
7	<i>Ceropegia pusilla</i> Wight & Arn.	EN/E	-	Velliangiri	Leaves and Tuber	Tubers were used as a Snake bite and edible purpose.	Murugaesan, 2005; Suresh and Paulsamy, 2010.
8	<i>Ceropegia bulbosa</i> Roxb. var. <i>lushii</i> Hook.f. R	R	Chitlankodi	Madhukarai hills	Leaves and tuber	Tubers are used to treat urinary disorder and stomach pain	Henry <i>et al.</i> , 1987.

Flowering & Fruiting: September-November

Habitat: Moist deciduous forests and scrub jungles.

Specimen examined: Tamil Nadu: Ramanathapuram, V. Balasubramaniam VB: 2199 [1991]. Velliangiri hills, B. Subbaiyan BS: 016 [15-6-213]. Velliangiri hills, S. Jagathes Kumar SJ: 0184 [12.8.2013].

Distribution: Kerala: Palakkad, Kasaragode, Kollam, Idukki, Pathanamthitta, Malappuram, Thiruvananthapuram, Kozhikkode, Thrissur; Tamilnadu: Coimbatore, Nilgiris

Uses: Paste of leaves is applied on forehead to cure the headache and promote fertility.

4. *Ceropegia juncea* Roxb., Pl. Cor. t. 10. 1795; Wight, ic. t. 1260, 1848; FBI 4: 68.

1883; FPM 856. 1923; FTO (3)2: 937. 1983; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 4: 115. 1983; M.Y. Ansari, Fasc. Fl. India 16: 18. 1984; FTN 2: 83. 1987.

Twinner, leafless, sap watery, stem striated. Cymes axillary; peduncles 1 cm; pedicels 1 cm long. calyx 5-lobed, 5 x 1 mm, lanceolate; corolla basally inflated, curved, tube 2.5 cm long, widened at mouth, lobes 5, 3 cm long, fused at apex, inside with brown hairs; outer corona 5, with 2-fid lobes, 3 mm; inner of 5 subulate lobes; pollinia erect, pellucid along margins; ovaries 2 mm, stigma truncate.

Follicles paired, 20 x 1 cm, linear-lanceolate, hooked at apex.

Flowering & fruiting: October-January

Habitat: Rare in dry deciduous forests and scrub jungles.

Specimen examined: Ramanathapuram, V. Balasubramaniam VB: 2244 [1991]. Madukkarai hills, B. Subbaiyan BS: 020 [12-5-2013]. Maruthamalai, S. Jagathes Kumar SJ: 0170 [7.8.2013].

Distribution: Maharashtra: Satara; Karnataka: Chikmagalur, Dharwar, Hassan, Mysore, N. Kanara; Kerala: Idukki; Tamil Nadu: Coimbatore, Cuddalore, Dharmapuri, Kancheepuram, Puddukkottai, Ramanathapuram, Thiruvallur, Tiruchchirappalli, Tirunelveli, Tiruvannamalai and Viluppuram.

Uses: In folk medicine the extract of the plant is used for treatment of for the treatment of liver disorders and also in hypotension, ulcerative condition, fever, topically used as anesthetic agent [Jagatap and Singh, 1999].

5. *Ceropegia pusilla* Wight & Arn. in Wight, Contrib. 31. 1834; Hook. f., Fl. Brit. India 4: 66. 1883; Gamble, Fl. Pres. Madras 856 [601]. 1923.

Erect tuberous herbs, to 15 cm tall; tuber 3-5 cm across, depressed globose. Leaves to 8 x 0.4 cm, linear, acute, base narrowed into a short petiole. Peduncle 8-10 mm long. Flowers greenish, 3-5 together, 3.5 cm long; sepals 4 x 1 mm, subulate, puberulus; corolla tube 1.6 cm long, dialated below; lobes 1.5 x 0.4 cm, oblong, obtuse, base revolute, auricled; outer corona 2 mm across, divided, lobes obtuse; inner corona 4.5 mm long, oblong, obtuse, connate.

Flowering & Fruiting: September - December

Habitat: Very rare in open grassland.

Specimen examined: Velliangiri hills, M.

Murugesan MM: 594 [2005]. B. Subbaiyan BS: 019 [13-9-2014]. S. Jagathes Kumar SJ: 0217 [2.11.2014].

Distribution: Karnataka: Mysore Kerala: Idukki Tamil Nadu: Coimbatore, Nilgiri, Theni. Endemic to Southern Western Ghats.

Uses: Tubers were used as a Snake bite and edible purpose.

6. *Ceropegia intermedia* Wight, Ic. t. 1263. 1848 emend. Huber, Mem. Soc. Bro. 12: 61. t. 2. f. 26. 1957; Hook. f., Fl. Brit. India 4: 71. 1883; Gamble, Fl. Pres. Madras 858 [603]. 1923.

Glabrous twiners. Leaves to 10 x 2 cm, lanceolate, acute to acuminate, base rounded or acute; nerves 3 or 4 pairs; petiole 1-1.7 cm long. Flowers purple, to 3 x 1 cm, few to many together, in axillary racemes; pedicels 15 mm long; sepals 4 x 0.6 mm, linear; corolla tube 2 cm long, prominently dialated at base, narrow above; lobes 10 x 3 mm, ovate, pubescent inside; gynostegium 4 x 0.9 mm; outer corona shallowly lobed, lobes blunt; inner corona lobes spatulate, connate above.

Flowering & Fruiting: June-December

Habitat: Rare in semi-evergreen forests and scrub jungles.

Specimen examined: Velliangiri hills, B.

Subbaiyan BS: 021 [8-6-2013]. S. Jagathes Kumar SJ: 0110 [13.8.2013].

Distribution: Karnataka: Coorg, Mysore, Shimoga Kerala: Idukki, Palakkad Tamil Nadu: Coimbatore, Dindigul, Kanniyakumari, Namakkal, Nilgiri, Theni, Tirunelveli. Endemic to Peninsular India.

Uses: Leaves were used as skin diseases and also edible.

7. *Ceropegia omissa* H. Huber, Mem. Soc. Brot. 12: 67. 1957; M.Y. Ansari, Fasc. Fl. Ind. 16: 27. 1984.

Twiners. Leaves 8-11 x 2 cm, lanceolate, apex acute, base obtuse, membranous; petiole 1.3 cm. Cymes axillary; peduncles 1.5 cm; pedicels 1.5 cm; flowers purplish; calyx 5-lobed, 3.5 mm, linear lanceolate; corolla curved, base bulbous, tube 2.3 cm, lobes fused at apex, lobes 8 mm, ciliate; outer corona cupular, 5-lobed, 1 mm, inner 2 mm, spatulate.

Flowering & Fruiting: September-December

Habitat: Rare in scrub jungles and evergreen forests.

Specimen examined: Velliangiri hills, B.

Subbaiyan BS: 022 [3-7-2013]. S. Jagathes Kumar SJ: 0101 [7.8.2014].

Distribution: Kerala: Idukki, Palakkad Tamil Nadu: Dindigul, Tirunelveli and Coimbatore. Endemic to Western Ghats.

8. *Ceropegia elegans* Wall. in Curtis, Bot.

Mag. 57: t. 3015. 1830; Hook. f., Fl. Brit.

India 4: 68. 1883; Gamble, Fl. Pres. Madras 857[602]. 1923.

Twiners. Leaves to 4 x 3 cm, ovate, lanceolate, apex acute, base slightly cordate, membranous; petiole 1.5 cm. Cymes axillary; peduncles 1.5 cm; pedicels 1 cm; calyx 2 mm. Linear; corolla base bulbous, mouth broadly widened, tube, 1.8 cm long, curved, lobes 5, 1 x 0.6 cm, triangular, ovate, obtusely apiculate; outer corona lobes 5, deeply 2-fid, 2 mm; inner lobes 5, 2 mm, linear.

Flowering & Fruiting: June-December.

Habitat: Occasional in evergreen and semi-evergreen forests.

Specimen examined: Siruvani hills, B.

Subbaiyan BS: 023 [13-5-2014]. S. Jagathes Kumar SJ: 0110 [25.10.2014].

Distribution: Karnataka: Chikmagalur, Hassan, Mysore, Shimoga Kerala: Idukki, Kannur, Kollam, Kozhikode, Palakkad, Thiruvananthapuram Tamil Nadu: Coimbatore, Dindigul, Nilgiri, Theni, Tirunelveli, Tiruvannamalai.

Uses: The roots were chewed at the time of the snake bite.

RESULTS AND DISCUSSION

The results of the study revealed that a total of 8 species *Ceropegia* L. belonging to the family Asclepiadiaceae were distributed in the different places of Coimbatore District. The overall study focused on the collection and identification of *Ceropegia* species, the



Fig. 2: Habit and Flower of *Ceropegia* species in Coimbatore district
A. Habit of *Ceropegia bulbosa*, B. Flower of *C. bulbosa*, C. Habit of *C. juncea*,
D. Flower of *C. juncea*, E. Habit of *C. intermedia*, F. Flower of *C. intermedia*

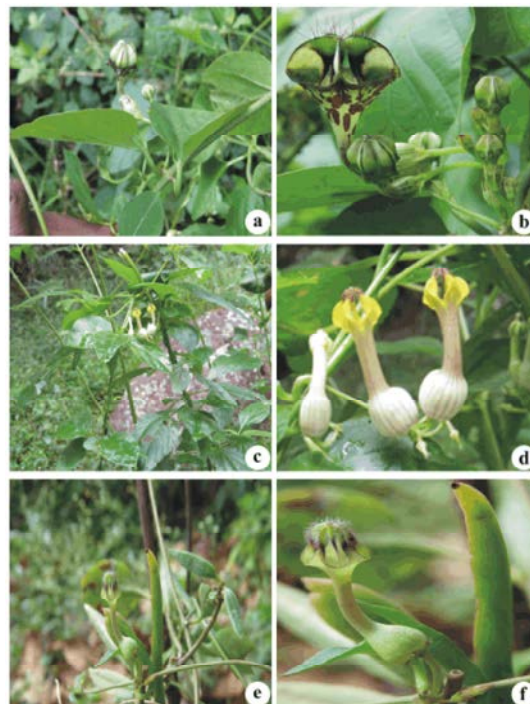


Fig. 3: Habit and Flower of *Ceropegia* species in Coimbatore district.
A. Habit of *Ceropegia elegans*, B. Flower of *C. elegans*, C. Habit of *C. candelabrum*, D. Flower of *C. candelabrum*, E.
Habit of *C. bulbosa* var. *lushii*, F. Flower of *C. bulbosa* var. *lushii*

maximum numbers of plants were observed in Madhukarai hills [*C. juncea*, *C. bulbosa*, *C. bulbosa* var. *lushii*] and followed Velliangiri [*C. candelabrum*, *C. intermedia*, *C. omissa* and *C. pusilla*] Marudhamalai [*C. juncea*, *C. bulbosa*], Siruvani [*C. candelabrum*, *C. intermedia*, *C. elegans*]. In Palamalai region, two species were collected such as *C. juncea* and *C. bulbosa* (Fig. 2 & 3).

The present investigation also observed the population of *Ceropegia* L. species in Coimbatore district; it's very low in various study area, because of their habitat, bad environmental condition, irregular collection of plant parts like, leaves, tuberous root and bulb, low seed formation, poor seed germination, animal disturbance, mode of preparation and consumption by local people. The distribution of this species is very much restricted and the existing population is under threat, species such as *C. bulbosa*, *C. pusilla* and *C. elegans* collected during the study belong to the category 'possibly extinct' so we treat to conserve the through different type of propagation methods.

In recent years, many research articles mentioned about the *Ceropegia* species went to RET category due to their over exploitation from their natural habitat, *C. juncea* [15], *C. elegans* [16] and *C. intermedia* [17] were endemic to Southern India. *C. candelabrum*, [18] was Rare in different parts India. *C. bulbosa* [19] and *C. pusilla* [20-22] were endangered and endemic in India. The tuberous roots of many *Ceropegia* species are edible [23], whereas those of *C. bulbosa* and *C. candelabrum* have medicinal properties [24].

CONCLUSION

The study observed that all the collected species was known from only a single location in the study region, which is under high biotic pressure such as cattle grazing, tourism and trampling, land use changes, etc. In view of this, detailed field studies were conducted for gaining more information regarding its status and trends in the wild. The CITES Authorities of India have indicated that habitat destruction and collecting of tubers for local consumption are the major threats. It is noticed that most of the species reported in the was already included in the IUCN Ret list categories and therefore, *In-vitro* conservation studies should be taken up to overcome the extinction rate of such species.

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