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Four endemic Euphorbiaceae taxa additions to Telangana state, India

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ABSTRACT

An endangered and endemic taxon *Phyllanthus narayanswamii* Gamble is reported from Nallamalais of Telangana region. Thus it forms a new distributional record for the state of Telangana. Endemic taxa *Euphorbia deccanensis* V.S. Raju, *Euphorbia deccanensis* var. *nallamalayana* (J.L. Ellis) V.S. Raju and *Euphorbia senguptae* N.P. Balakr. & Subr. are reported here as new records for the Flora of Telangana State.

Keywords: Endangered, Endemic, Extended distribution, Eastern Ghats, Grasslands and Palni Hills.

1. INTRODUCTION

Euphorbia s.l. the largest genus in the family Euphorbiaceae s.l. and sixth largest genus among the flowering plants, consisting of about 2000 species (Malpure *et al.*, 2021) and occurring throughout the world chiefly seen in tropical, subtropical and warm temperate regions. The genus comprises more than 80 species in India with highest number of endemics (Binoj Kumar & Balakrishnan 2010; Sarojinidevi, 2017; Malpure, 2021). Cyathium is the general character of the Tribe Euphorbieae. The cyathium is actinomorphic bearing a ring of broken glands at the rim of the involucre cup, a solitary exserted or included naked pistillate floret in the central position of the cup bearing a single 3-loculed ovary with one ovule in each locule. Several aggregated fascicles of staminate florets surround the pistillate floret; each consisting of a pedicel and a ring of filiform bracteoles or solitary bracteole at the junction of pedicel and filament. This type of inflorescence is unique and found only in this group.

Phyllanthaceae is one of the five segregated families of Euphorbiaceae s.l. recognized by Angiosperm Phylogenetic Group (Hoffmann *et al.*, 2006), which contains around 2099 species belonging to 58 genera (POWO, 2021). The genus *Phyllanthus* L. is one of the largest genera of the family Phyllanthaceae with around 880 species (Bouman *et al.*, 2018) distributed throughout the tropics mainly in dry deciduous forests (Gautam & Adhikari, 2021; Naik *et al.*, 2020). In India, the genus *Phyllanthus* is represented with more than 50 species (Mathew, 2021) among them, 17 species were recorded in Telangana state

(Pullaiah, 2015; Reddy & Reddy, 2016). In this present work, we treated the genus *Phyllanthus* under the family Euphorbiaceae s.l., as this work confined to conservation aspect.



Figure 1: A–D. *Phyllanthus narayanswamii*; E–I. *Euphorbia senguptae*

During the enumeration of flora of Amrabad Tiger Reserve (Nallamalais) of Telangana the authors have collected a decumbent undershrub *Phyllanthus* from different localities. After thorough examination, it was identified as *Phyllanthus narayanswamii* Gamble (Figure 1). Furthermore, from Nallamala Forest of Telangana region namely, Tirumalaiah Gutta, Wanaparthy District and Farhabad, Nagar Kurnool District, three more Euphorbiaceae taxa were collected and identified them as *Euphorbia deccanensis* V.S. Raju var. *deccanensis*, *E. deccanensis* V.S. Raju var. *nallamalayana* (J.L. Ellis) V.S. Raju (Figure 2) and *Euphorbia senguptae* N.P. Balakr. & Subr. (Figure 1) respectively. Inventory on endemic and narrowly distributed taxa is prerequisite to conserve them in their specific habitats (Reddy *et al.*, 2006).



Figure 2: A. *Euphorbia deccanensis* var. *deccanensis*; B–C. *Euphorbia deccanensis* var. *nallamalayana*

Euphorbia deccanensis V.S. Raju, in Taxon 34(3): 519. 1985.

Decumbent herb, ca. 35 cm tall, glabrous; stem unbranched or rarely dichotomously branched; nodes thickened; internodes terete, ca. 1.5 cm long. Leaves linear-lanceolate, 1.5–4.5 cm × 0.5–0.8 cm, mid vein prominent, base oblique, distinctly serrate, acute-mucronate, glabrous; petioles ca. 1 mm long; stipules ovate, fimbriate at apex. Cyathia terminal, solitary or in pairs; involucre turbinate, 1–2 mm; lobes 5, triangular, red; glands-4, transversely oblong or cupular, 0.2–0.3 × 0.1–0.2 mm, red. limbs patent, obovate-orbicular, margin wavy, 1–1.2 × 1–1.8 mm, white or pink. Male florets: pedicles 1–1.5 mm; anthers sub-globose; bracteole filiform, ca. 1.8–2.5 mm, peripheral bracteoles lacinate. Female floret: gynophore ca. 2.5–3 mm long, ovary sub-globose, ca. 2 mm; styles 0.6–0.8 mm long, connate at base, bifid above; stigma capitate. Fruits sub-globose, ca. 2–2.5 × 2–3 mm, smooth, glabrous; seeds 1–1.5 mm long, smooth or sparsely dotted, pale brown.

Key to the varieties

1a. Rootstock slender. Stems rarely branched, internodes 3–6 mm long, cyathia solitary, glands flat and transversely oblong-----
-----var. **deccanensis**

1b. Rootstock stout, stems shortly branched at apex or unbranched; internodes 5–20 mm long, cyathia 3–5, glands cupular and rounded-----var. **nallamalayana**

var. **deccanensis**; N.P. Balkr. & Chakrab., Fam. Euphorbiaceae in India 253. 2007; Binojk. & N.P. Balakr., Genus *Euphorbia* in India 181. 2010; Binojk. & N.P. Balakr., in N.P. Balakr. *et al.* Fl. India 23: 284. 2012. *E. linearifolia* Roth, Nov. Pl. Sp. 224. 1821, *non* Willd. 1799; Hook. f., Fl. Brit. India 5: 249. 1887. *Chamaesyce linearifolia* (Roth) Sojak in Cas. Nar. Mus., Odd. Prir. 140: 169. 1972.

Flowering & Fruiting: April–September.

Habitat: Scarce in hill slopes of dry deciduous forests.

Specimen examined: Tirumalaiah Gutta, Wanaparthy District, 11 October 2013, M. Sharath Goud & B. Sadasivaiah 1246.

var. **nallamalayana** (J.L. Ellis) V.S. Raju in Taxon 34(3): 520. 1985; N.P. Balkr. & Chakrab., Fam. Euphorbiaceae in India 254. 2007; Binojk. & N.P. Balakr., Genus *Euphorbia* in India 184. 2010; Binojk. & N.P. Balakr., in N.P. Balakr. *et al.* Fl. India 23: 284. 2012.

Decumbent herb, ca. 25 cm tall, with thick stout rootstock: unbranched or rarely branched at apex; internodes 0.7–2 cm long. Leaves linear-oblong, 1–4.5 × 0.2–0.5 cm, base obliquely sub cordate, minutely serrulate, apiculate, glabrous; petioles ca. 0.5 mm long; stipules broadly oblong, lacinate 0.1–1.5 mm. Cyathia terminal, solitary or 2–3; involucre turbinate, 2–3 mm; glands-4, rounded, cupular, ca. 0.2 mm across, pink; limbs of glands obovate, orbicular, margin wavy 0.1–1.8 mm. Male florets: many, bracteolate, bract lacinate. Female floret: gynophore ca. 4 mm long, recurved, ovary sub-globose, ca. 2 mm; styles 0.6–0.8 mm long, connate at base, bifid above; stigma capitates. Fruits sub-globose, ca 2–2.5 × 2–3 mm, smooth, glabrous; seeds 1–2 mm long, smooth, brown.

Flowering & Fruiting: May–November.

Habitat: Rare in hill slopes of dry deciduous forests.

Specimen examined: Vatuvralapally to Domalapenta, Amrabad Tiger Reserve, Nagar Kurnool District, 14 July 2015, K. Prasad & B. Sadasivaiah 1992.

Euphorbia senguptae N.P. Balakr. & Subr. in Bull. Bot. Surv. India 2:175. 1960; Binojk. & N.P. Balakr., Genus *Euphorbia* in India 199. 2010; Binojk. & N.P. Balakr., in N.P. Balakr. *et al.* Fl. India 23: 298. 2012. *Chamaesyce senguptae* (N.P. Balakr. & Subr.) V.S. Raju & P.N. Rao in Phytologia 37:454.1977.

Herbs, erect, ca. 30 cm tall, glabrous; stems woody at base, terete, pseudo dichotomously branched; branches slender, thickened at nodes; internodes 1.5–4 cm long. Leaves oblong-elliptic, 0.7–2.5 × 0.4–0.8 cm, base oblique, margin serrulate, apex acute, glabrous; lateral nerves obscure; petioles ca. 2 mm; stipules scaly, lacinate. Cyathia terminal, solitary; peduncle ca. 2 mm; involucre turbinate, ca. 2 × 2.5 mm; lobes 5, triangular; glands 4, oblong, shortly stalked; limbs sub-ovate, entire, minutely sinuate, hyaline, pale pink or white. Male florets: pedicels ca. 1mm; anthers sub-globose; bracteoles filiform, ca. 2 mm. Female florets: gynophores ca. 2 mm; ovary oblong-ovoid, ca. 1.5 × 1 mm; styles ca. 2 mm, free, simple, stigma minute, capitate. Fruits sub-ovoid, deeply keeled, ca. 3 × 3 mm, glabrous; seeds oblong, tetragonous, ca. 2 × 1 mm, reddish brown.

Flowering & Fruiting: August–December.

Habitat: Occasional in hill slopes of dry deciduous and scrub forests near rock boulders.

Specimen examined: Tirumalaiah Gutta, Wanaparthy District, 26 July 2012, M. Sharath Goud & B. Sadasivaiah 1008; 14 August 2012, M. Sharath Goud & B. Sadasivaiah 1271.

Phyllanthus narayanswamii Gamble, in Bull. Misc inform. Kew 1925: 329. 1925 & Fl. Madras 1289. 1925; Subba Rao & Kumari in Red Data Book of Indian Plants 1:145.1987; Binojk. & N.P. Balakr., in N.P. Balakr. *et al.* Fl. India 23: 470. 2012.

Under shrubs, ca. 60 cm tall; root system stout and slightly woody at base; stem angular, wiry branched, solid, glabrous, green, branches scabrous with stipular scars. Leaves alternate, elliptic or oblong, 5–10 × 0.2–0.7 mm, base cordate, entire thickened, recurved, apex obtuse or acute, veins clearly visible on both sides, coriaceous, lateral nerves 4–6 pairs; petiole ca. 0.5 mm; stipule peltate, denticulate along margins. Inflorescence axillary, male cymules at proximal axils; female cymules towards distal; bracts deltoid to acuminate, ca. 1 mm in length; **Staminate flowers:** Pedicel sub-sessile; sepals 6, in two whorls, free, oblong to ovate, sinuate along margins, 1.5–2 × 1.0–1.4 mm, white or lilac or brick red; stamens 3, filaments free, ca. 0.8 mm, anthers sub-globose, basifixed, extrose dehiscent transversely, disc of 6 glands, ca. 0.8 mm, round shaped, alternating the perianth lobes. **Pistillate flowers:** pedicels 1.5–3 mm, pulvinate at apex; sepals 6, in two whorls, ovate to lanceolate, 0.8–1 × ca. 0.5 mm, scarious, red along margins; ovary tricarpeal syncarpous, superior, trilocular with two ovules in each locule, axile placentation, sub-globose, ca. 0.8 mm, glandular, verrucose, style 3, ca. 0.5 mm, stigma bifid, disc present. Capsule dry dehiscent, ca. 3 mm, seeds trigonous, golden brown, covered with red glands.

Distribution: Scarce in semi evergreen and dry deciduous forests as under growth. Commonly associate with grasses (*Apluda mutica*, *Digitaria ciliaris*, *Chrysopogon fulvus*, *Heteropogon contortus*), herbaceous flora and often with *Phoenix loureiroi*.

Flowering & Fruiting: April–October.

Representative Specimens: Lingala Range, Amrabad Tiger Reserve, Nagar Kurnool District, Telangana, 02 September 2018, A. Ramakrishna & B. Sadasivaiah 2214; Near Shikar Ghar, Mannanur Range, Amrabad Tiger Reserve, Nagar Kurnool District, Telangana, 15 September 2018, A. Ramakrishna & B. Sadasivaiah 2239.

The past literature in regard to the taxon occurrence in Telangana and Andhra Pradesh revealed that it was first described by Gamble based on a single collection of V. Narayana Swamy on October, 1920 from Dummukonda, Rampachodavarm hills of East Godavari (Lakshmi Narasimhudu & Venkata Raju, 2012; Pullaiah, 2018). The recent records indicated that the distribution of the species is restricted to few areas in East Godavari and Visakhapatnam districts of Andhra Pradesh, Idduki District of Kerala, Agasthyamalais, Nilgiris and Palni Hills, Tamil Nadu (Sasidharan, 2004; Satish & Prakash Rao, 2019; Arigela *et al.*, 2021). In the present study it was collected from the hill top of Penchalakona (Potti Sreeramulu Nellore District); Talakona and Tirumala (Chittoor District); Chelama (Kurnool District) at one place in each locality with countable number of individuals ranging from 10 to 20 from Andhra Pradesh and also Lingala Forest Range and Mannanur Forest Range of Amrabad Tiger Reserve (Nallamala), Telangana state Hence, the distribution is extended to the Southern Andhra Pradesh and Telangana.

The Taxon is rightly categorized as endangered species by Nayar & Sastry (1987), Walter & Gillett (1998) and Rao *et al.* (2003), but the details of the reasons for its inclusion are not provided. Later Satish and Prakash Rao (2019) have documented that, frequent fires, grazing, rapid invasion by various invasive species, tourism, mining, and expansion of shifting cultivation are the major causes of habitat destruction on the hilltops of East Godavari and Visakhapatnam of Andhra Pradesh state leading to the decrease in the taxon population. The same drivers of habitat destruction were also observed in Southern Andhra Pradesh by the authors. While, the field observations in Nallamalais of Telangana state indicate that status of the populations of *P. narayanswamii* are reasonably better and the occurrence of seasonal forest fires in Telangana, habitat loss due to invasion of species of *Acacia* and *Eucalyptus* the grasslands at Palni Hills (Arigela, 2019) can be considered as the major threat in the habitat.

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Ethical approval

The ethical guidelines are followed in the study for observation of four endemic Euphorbiaceae taxa from Nallamalais of Telangana region, India. The field survey was carried-out by the approval of Director, BSI, Kolkata & officials of Forest Department of Telangana. Information on habitats is shared by Prof. R.R. Venkat Raju and Dr. N. Sarojini Devi, Sri Krishnadevaraya University, Ananthapuramu, Andhra Pradesh and Dr. D. Veeranjanyulu, Environment Protection Training & Research Institute, Hyderabad.

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Conflicts of interests: The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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