



Euphorbia duerrii (Euphorbiaceae), a new species from the Dhule District of Maharashtra, India

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(Manuscript received 16 September 2024; Accepted 10 November 2024; Online published 12 November 2024)

ABSTRACT: A new succulent species *Euphorbia duerrii* is described and illustrated from the Dhule District of Maharashtra state in India. This new species is allied to *Euphorbia sahyadrica* but differs in shape of the podaria, short obovate leaves, 2–4 times branched peduncles, fimbriate bracts in male flowers and colliculate capsules. *Euphorbia duerrii* sp. nov. belongs to *Euphorbia* section *Euphorbia* based on the presence of succulent stems, spine shields, ecarunculate seeds, and glands of the cyathium lacking appendages.

KEY WORDS: *Euphorbia duerrii*, *Euphorbia nivulia*, *Euphorbia sahyadrica*, subgenus *Euphorbia*, Maharashtra, India.

INTRODUCTION

Genus *Euphorbia* L., (Euphorbiaceae) is one of the largest and most diversified among the angiosperms (Govarts *et al.*, 2000; Frodin, 2004). Life forms in this genus include herbs, shrubs, trees and geophytes, all of which exhibit a great diversity in xerophytic morphological features such as stipules modified into spines, succulent stems and persistence or early caducous leaves (Horn *et al.*, 2012). This genus has occupied and adapted to all types of habitats (Pritchard, 2003; Bruyns *et al.*, 2006; Yang *et al.*, 2012; Ozbilgin and Citoglu, 2012). The genus has more than 2052 species distributed worldwide (POWO, 2024). All species in the genus share a unique inflorescence, the cyathium, which mimics a flower and reduced male and female flowers are within a cup-shaped involucre that is formed by the fusion of involucre bracts (Prenner and Rudall, 2007; Prenner *et al.*, 2008; Hoppe and Uhlarz, 1982). Wheeler (1943) subdivided the genus *Euphorbia*, based on morphology, into 8 subgenera viz. *Chamaesyce*, *Agaloma*, *Poinsettia*, *Eremophyton*, *Lyciopsis*, *Tithymalus*, *Rhizanthium* and *Esula*. However, the current classification of the genus, based on a robust phylogenetic framework and also morphology, consists of four subgenera further subdivided by sections (Yang *et al.*, 2012; Dorsey *et al.*, 2013; Peirson *et al.*, 2013; Riina *et al.*, 2013). In this classification the succulent, cactiform *Euphorbia* of Africa and Asia are placed in *Euphorbia* section (Dorsey *et al.*, 2013). The Indian succulent species sampled by Dorsey *et al.* (2013) were clustered as one clade that includes *Euphorbia nivulia*, *E. neriifolia*, *E. caducifolia*, *E. antiquorum*, *E. lactea* and *E. vajravelui*.

In India, the genus *Euphorbia* comprises 84 species, with the majority reported from Peninsular India, followed by regions in Western India, Central India, and the Western Himalayas (Binojkumar and Balakrishnan, 2010). The subgenus *Euphorbia* has 17 species of

succulents including six recently described species: *Euphorbia gokakensis* S.R.Yadav, Malpure & Chandore (Malpure *et al.*, 2016), *E. venkatarajui* Sarojin. (Sarojinidevi, 2017), *E. belgaviensis* Sarojin. & Raja Kullayisw. (Sarojini Devi and Raja Kullayiswamy, 2018), *E. lakshmiinarasimhanii* Sardesai & Malpure (Malpure *et al.*, 2021a), *E. sahyadrica* Sardesai & Malpure (Malpure *et al.*, 2021b), and *E. ravii* A.Naray. & K.Prasad (Swamy and Prasad, 2022). Additionally, two varieties have also been described in the country: *E. vajravelui* var. *thenensis* B.De Jong & R.W.Stewart (De Jong and Stewart, 2019) and *E. antiquorum* var. *longa* Sarojin. (Sarojinidevi, 2024).

Subgenus *Euphorbia* typically has various spine forms with a spine-shield often of stipular origin (White *et al.*, 1941; Carter, 1994; Dorsey *et al.*, 2013) and succulent stems. Growth forms in this subgenus vary widely and include geophytes, pencil-stemmed shrubs and trees, leafy shrubs and trees, spiny xerophytic shrubs, and various stem succulents that vary in size from dwarf shrubs to large candelabriform trees with winged, angled, terete or tubercle stems (Bruyns *et al.*, 2006). Involucral glands are large and without a petaloid limb and the seeds are usually carunculate or ecarunculate (Dorsey *et al.*, 2013). Most species of the subgenus *Euphorbia* are confined to tropical, sub-tropical and warm temperate regions.

During a floristic analysis of Peninsular India conducted by the Dharmavana Nature Ark (DNA) in 2007, an interesting and hitherto unknown species was collected and kept under conservation in their gardens along with other succulent *Euphorbia* collected from across India. The authors identified and described the same as a new species.

MATERIALS AND METHODS

Plant cuttings were collected from scrub forest nearby the Sindkhed Village in the Dhule District of Maharashtra, India, and cultivated in the Dharmavana Nature Ark



gardens. Twigs were collected from these same grown plants, dried and specimens were prepared by standard protocol (Davies *et al.*, 2023). Cyathia were used for microscopic observations and imaging, few of them were preserved in 70% ethanol for future reference. Microscopic characters were studied under an Olympus SZ61 with a Magnus (Magcam DC 5) camera attached.

Online databases, protologues, and specimens from various herbaria, both virtual and physical, including Kew, JSTOR, GBIF, POWO, and Botanical Survey of India Deccan Regional Centre, Hyderabad (BSID) were scrutinized during the identification of the species, along with recently published taxa.

TAXONOMIC TREATMENT

Euphorbia duerrii Sarojin. & Raja Kullayisw. *sp. nov.*

Figs. 1–3

Type: INDIA. Telangana State, Yadadri-Bhongir District, Dharmavana Nature Ark, 17.526426N, 78.889749E, 450 m, 23 May 2024, *Sarojini Devi and Raja Kullayiswamy DNA-603* (*ex-situ* plants cultivated from stem cuttings collected from the Dhule District of Maharashtra, the documented original distribution of the species) Holotype (BSID), Isotypes (MH & SKU).

Diagnosis: The new taxon is allied to *Euphorbia sahyadrica* in habit, the presence of terete branches, involucre glands transversely oblong, male flowers in 5 fascicles and ovary trigonous, but it differs in many characters viz. ellipsoid shape of spine shields, (verses a circular); sessile, obovate, obtuse and margin wavy leaves (verses petiolate, elliptic-obovate, attenuate at base, margin entire leaves); four times dichotomously branched peduncle (verses two time branched peduncle); glands transversely oblong glands (verses transversely elliptic glands).

Description: Perennial **shrubs**, up to 2 m height; **stems** terete; branches glaucous green to grey-green, terete, 2–3 times branched, latex milky. **Stipules** modified into spines, arranged spirally; tubercle of spine shield up to 10 mm long, obconic, **spine** shield brown, ellipsoid 4–6 mm across; spines two, divaricate, 3–5 mm long. **Leaves** axillary, only on newly growing branch, caducous, sessile, obovate, 2.5–3.5 × 1–1.5 cm, succulent, glabrous, pale green at abaxial, dark green at adaxial, midvein prominent, laterals obscure, base obtuse, margin wavy at young, entire at mature, apex acute-apiculate. **Cyathia** axillary cymose, peduncles 2–4 times dichotomously branched, terete, glabrous; primary peduncle 6–8 mm long, secondary peduncle 4–6 mm long, tertiary peduncle 5–6 mm long, cyathial peduncle 8–10 mm long. **Bracts** on primary peduncle 2, laterally arranged, obovate, 1.8 × 1.5 mm, margin slightly incised on secondary peduncles, obovate 2.5 × 2.4 mm, transparent towards margin and lacinate; on tertiary peduncle, oblong, 2.4 × 1.8 mm, apex broadly ciliate; on

cyathial peduncle 2, oblong, 2.5 × 1.7 mm. **Cyathium** 10–12 mm long, dark red; involucre turbinate, 4–6 mm across, involucre bracts 4–5, broadly obovate, 1 × 1.5 mm, apex ciliate, reddish, involucre glands 5(–6), dark red, transversely oblong, 2.5–3 × 0.8–1 mm, pitted outer margin concave, inner margin entire; **male flowers** in 5 fascicles, each contains 5–6 flowers, male flower 3–3.3 mm long, bracteoles fimbriate up to 1.6 mm long; anthers dithecous, elliptical, transversely dehiscent; **female flowers** laterally pendulous, pedicel, 8.5 mm long, ovary 3-locular, trigonous, glabrous, styles three, fused up to the middle, each bifid at apex papillose. **Capsules** trigonous, 6–8 mm across, surface colliculate, cocci obtusely keeled. **Seeds** ellipsoid, 1.5–2.0 × 1–1.5 mm, pale brown.

Distribution and habitat: The present taxon is distributed nearby the Sindkheda village, Dhule District of Maharashtra, situated at the foot hills of the Satpuda hill of the Sahyadri mountain range. The taxon also is found in the Dhar District of Madhya Pradesh in the Malwa plateau of western Madhya Pradesh.

Phenology: Flowering in February and fruiting (capsules) during March to April.

Etymology: The species epithet ‘duerrii’ honors William Frederick Dürri who has enjoyed the flora of the Deccan Plateau since moving with his family to Hyderabad, Telangana State, India in the year 2000.

DISCUSSION

The Indian succulent Euphorbias contain mainly three types of stems/branches: angular (winged), sub-terete and terete. Most of them have small caducous leaves except *Euphorbia nivulia*, *E. neritifolia*, *E. royleana* and *E. sahyadrica*. Of note out of the 17 *Euphorbia* species in India, *E. sahyadrica*, *E. caducifolia* and *E. venkatarajui* comprise terete stems, the rest of the species have winged or sub-terete stems. Among the terete stem species, *Euphorbia sahyadrica* and *E. nivulia* have 6–15 cm long leaves, crowded at the shoot apex and drop in the flowering season (Table 1).

Euphorbia caducifolia is a shrub with terete stems, small caducous leaves and small spine-shields. *E. venkatarajui* is a small shrub that has compact and terete branches with small caducous leaves, small sharp spines and spine-shields.

The new taxon described here has comparatively unique characteristics to the above species since it grows up to 2 m height, with thick cylindrical branches containing 3–4 cm long obovate, caducous leaves. The inflorescence is branched 2–4 times, each peduncle contains a different type of bracts, the involucre glands are dark red and largely pitted, and the capsule surface shows colliculate structures.

Euphorbia subgenus *Euphorbia* is primarily divided into three clades viz. Old World, New World, and Pacific (Dorsey *et al.*, 2013). The Old World clade consists of

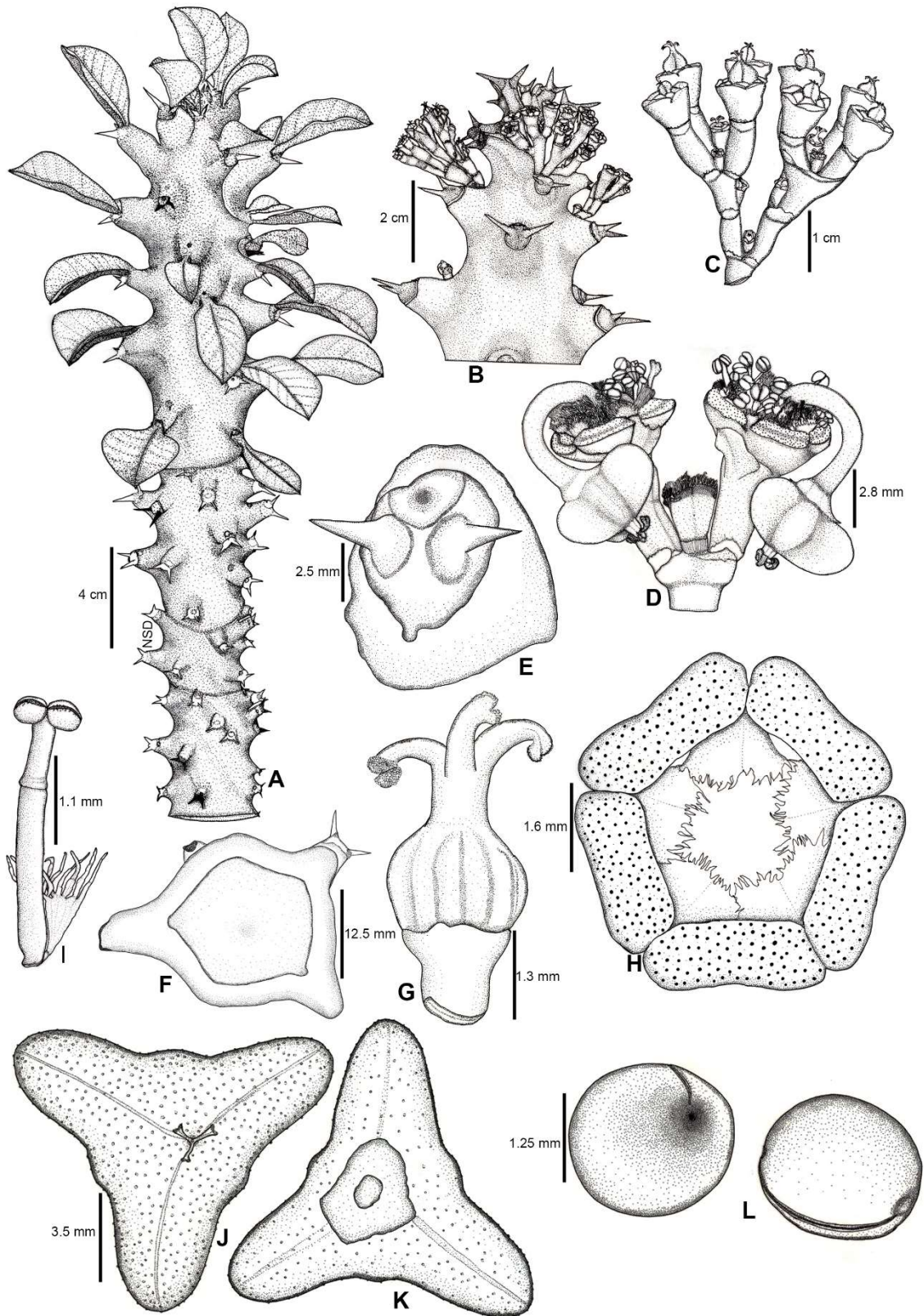


Fig. 1. *Euphorbia duerrii* Sarojin. & Raja Kullayisw. **A.** Twig with leaves; **B.** Inflorescence at shoot apex; **C.** Cyathia on branching peduncles; **D.** Cyathial cyme; **E.** Spine shield; **F.** T.S of stem; **G.** Young female flowers with papillose stigmas; **H.** Involucre with glands and involucral bracts; **I.** Male flowers with bracteole; **J.** Capsule top view; **K.** Capsule bottom view; **L.** Seeds. (Drawn by Naidu Sarojini Devi)



Fig. 2. *Euphorbia duerrii* Sarojin. & Raja Kullayisw. **A.** Habit with leaves; **B.** Habit with inflorescence; **C.** Inflorescence; **D.** Branch with leaves; **E.** Branch with early stage of inflorescence; **F.** Leaf; **G.** T.S of stem; **H.** Spine shield side view.



Fig. 3. *Euphorbia duerrii* Sarojin. & Raja Kullayisw. **A.** Branching peduncles of cyathia; **B.** Pair of cyathia; **C.** Male flower; **D.** Involucre; **E.** Involucre with glands and involucral bracts; **F.** Bract on primary peduncle; **G.** Bract of secondary peduncle; **H.** Bract of tertiary peduncle; **I.** Bract of quaternary peduncle; **J.** Capsule; **K.** Seeds.



Table 1. Comparison of cylindrical stem species *Euphorbia duerrii*, *E. sahyadrica*, and *E. nivulia*.

Character	<i>Euphorbia duerrii</i> sp. nov.	<i>E. sahyadrica</i>	<i>E. nivulia</i>
Habit	Shrubs up to 2 m high	Trees up to 5 m height	Trees up to 10 m height
Tubercle of spine shield	10 mm long, ellipsoid	5 mm long, circular	10 mm long, circular
Spines	3–5 mm long	2–5 mm long	5–8 mm long
Leaves	Sessile, obovate, 2.5–3 × 1–1.5 cm, base obtuse-rounded, apex acute-apiculate, midvein prominent, lateral veins obscure, early caducous	Petiolate, elliptic-obovate, 12–18 × 5–8 cm, base attenuate, apex obtuse-mucronulate, midvein and lateral veins prominent, fall off in dry season	Sub-sessile, obovate-oblong, 6–15 × 2–8 cm, base cunate, margin entire, midvein and lateral veins prominent, falling in dry season
Inflorescence	Peduncles 4 times dichotomously branched, peduncle 4–10 mm long	Peduncles 2 times dichotomously branched, peduncle 8–12 mm long	Peduncles once dichotomously branched, peduncle 25 mm long
Involucre	Turbinate, bracts broadly obovate, apex ciliate, glands pitted	Broadly cupular, bracts broadly ovate, apex fimbriate, glands slightly pitted	Cupular, bracts broadly orbicular, apex lacinate, glands pitted
Male flower bracteoles	Fimbriate	Lacinate	Lacinate
Ovary	Trigonal	Trigonal	Sub-globose
Capsule	6–8 mm across, surface colliculate, cocci obtusely keeled, not recurved	8–10 mm across, surface smooth, cocci obscurely keeled, recurved	9–10 mm across, surface smooth, cocci keeled, recurved
Seeds	Broadly ellipsoid, 1.5–2.5 × 1–1.5 mm white to pale brown, caruncle absent	Sub-globose, 4.5–4.7 mm, blackish grey, caruncle absent	Ovoid or sub-quadrangular, 6 mm, smooth, black, caruncle small

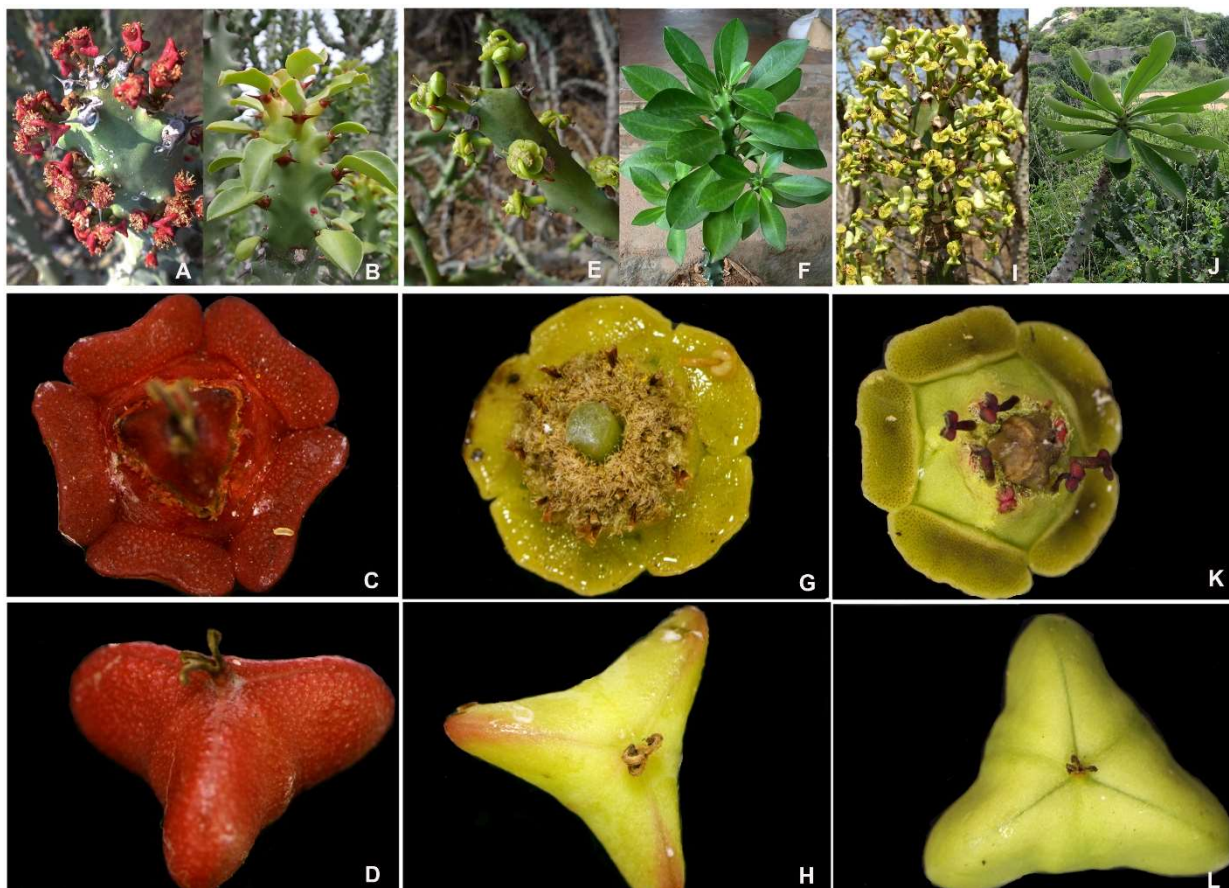


Fig. 4. Comparison between *Euphorbia duerrii* and its allied species: A, B, C, D - *E. duerrii* Sarojin. & Raja Kullayisw. **A.** Inflorescence at shoot apex; **B.** Stem new growth with leaves; **C.** Involucre; **D.** Capsule; E, F, G, H - *E. sahyadrica* Sardesai & Malpure **E.** Shoot apex with inflorescence; **F.** Stem new growth with leaves; **G.** Involucre; **H.** Capsule; I, J, K, L - *E. nivulia* Buch.-Ham. **I.** Inflorescence at shoot apex; **J.** Stem new growth with leaves; **K.** Involucre; **L.** Capsule.



nine sections across clades I and II. The newly described species, *Euphorbia duerrii*, likely nests within Old World Clade II, alongside *Euphorbia nivulia*, *E. neriifolia*, and *E. caducifolia*, which share morphological traits such as cylindrical or angular stems with spine shields and caducous leaves. Most of these species are distributed in South Asia. Given all of these characteristics, the authors concluded that this taxon is new to science.

ACKNOWLEDGMENTS

The authors are grateful to the Dharmavana Nature Ark (DNA) for the facilities and resources to enable periodical field visits for gathering data. Much thanks to the DNA jungle team for their support. The authors thank anonymous reviewers for their valuable suggestions and comments, which have helped to improve the quality of the manuscript.

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