RHEEDEA
Journal of the Indian Association for Angiosperm Taxonomy

RESEARCH ARTICLE

Vol. 35(1): 13–18 (2025)
ISSN: 0971-2313 (Print edition)
ISSN: 2582-2438 (Online edition)
https://dx.doi.org/10.22244/rheedea.2025.35.01.03

Crotalaria luteopurpurea (Fabaceae), a new elegant rattlepod from drylands of Karnataka, India

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Abstract: *Crotalaria luteopurpurea* Dalavi *et al.* is described with photo-plate here as a new species from Bagalkot district of Karnataka, India. It is an annual, procumbent, sparingly branched herb with dimorphic leaves, usually solitary flowers, bicolored corolla (standard petals bright yellow on both surfaces, wing petals purple with yellow nectar guides), densely hirsute blotched pods and polished seeds with mottled testa. The newly proposed species grows sympatrically with *C. bifaria* L.f. and maintains consistent differences without any intermediate form. The blooming time of flowers also differs in both species (*C. bifaria* flowers open in the early day hours and close in the evening whereas *C. luteopurpurea* flowers bloom in the late afternoon or evening hours and remain open whole night). Due to this reproductive isolation, we could not collect any intermediate forms between these species. The new species is described with informative photo plates, identification keys and ecological notes.

Keywords: Badami, Karnataka, *Crotalaria,* Fabaceae, Rattlepod

Introduction

Fabaceae Lindl. (Leguminoseae Juss.) is the third-largest family of angiosperms comprising 765 genera and 19,500 species worldwide (LPWG, 2017). In India, it is represented by 179 genera and 1297 taxa (Sanjappa, 2010). Tribe *Crotalarieae* Hutch. consists of about 16 genera and 1547 taxa worldwide and *Crotalaria* L. is a highly diverse and widely distributed genus in the tropics and subtropics, especially in the southern hemisphere, and adapted to almost all types of habitats. It is represented by 713 species worldwide (POWO, 2022) and by 121 taxa in India (Ansari, 2008; Rokade, *et al.*, 2019 & 2020; Ansari & Chauhan, 2020). As a part of floristic study of Bagalkot district by Dalavi *et al.* (2021) and subsequent surveys by other authors revealed that one bicolored corolla-bearing population of *Crotalaria* growing sympatrically with *C. bifaria,* and is consistently different from it by following characters standard petal blue on ventral surface and broader than longer (*vs.* standard bright yellow on both surfaces), bluish wing petals with no or faint white nectar guides (*vs.* wings purple with yellow nectar guides), keel petals usually white or rarely with blue shades faintly veined (*vs.* keel petals variegated with white and purple distinctly veined), pods blotched, more than 3 cm long (*vs.* pods less than 3 cm long) and brown to black rarely mottled seeds (*vs.* pale yellowish brown, usually mottled). After a critical study they are described here as a new species with detailed taxonomy, photo plates, and identification keys.

Received: 21.04.2023; *Revised & Accepted*: 10.02.2025
Published Online: 31.03.2025

Material and Methods

Plant specimens collected during September to December from 2016–2022 were processed using standard herbarium techniques. The necessary ecological data regarding field associates, habitat, habit, morphological variations, phenology, and geographic coordinates of the type locality during the field visits were also recorded. The photographs of the comparative morphological characters were taken using D6000 camera (Nikon, Japan) and some photomicrographs under CMZ-6 stereomicroscope (Labomed, Japan). The specimens collected from the type locality are deposited in CAL!, BSI! UASB! and SUK!. The novelty of the specimen was confirmed after a thorough and critical survey of the literature (Ansari, 2008; Ansari & Chauhan, 2020) and comparing with specimens available at BLAT!, BSI!, CAL!, CALI!, E!, MH!, K! (Thiers, 2024 continuously updated) and images of specimens available in the virtual database of JSTOR (2020), BM, E, K and P.

Taxonomic treatment

Crotalaria luteopurpurea Dalavi, Ramesh, Basavaraj, Sanjappa & S.R.Yadav, **sp. nov.** **Fig. 1**

It is allied to *C. bifaria* L.f. (Fig. 2) but differs in its habit (much branched *vs.* procumbent sparingly branched), leaves (lower leaves ovate to orbicular and upper ovate to oblong, less than 1.5 times longer than lower leaves *vs.* lower leaves orbicular to ovate and upper leaves elliptic-lanceolate to oblong-lanceolate, 1.5–3 times longer than lower ones), peduncle (diffused, weak and creeping *vs.* erect to sub-erect) corolla (entirely blue on ventral surface side while standard yellow with brown veination on backside *vs.* bicolored ventral surface while standard bright yellow on both the surfaces and wings purple colored), standard (as long as or broader than long, blue inside *vs.* longer than broader and bright yellow inside), wings (blue with white shade near claw *vs.* purple with bright yellow near claw), and seeds (usually brown to black shiny rarely slightly blotched or mottled *vs.* faint brown, always distinctly blotched or mottled).

Type: INDIA, **Karnataka,** Bagalkot District, Badami, N 15° 55' 42.7872", E 75° 41' 35.2716", Badami Hills, 767 m, 31.12.2021, *J.V. Dalavi, R. Pujar & B. Saliyavar* BCV-001 (holo CAL!, iso BSI!, CAL!, SUK!).

Annual diffuse herbs, 10–25 cm long. Stems slender, sparingly branched, thinly strigose to pubescent throughout. Leaves simple, dimorphic, lower leaves 0.5–2.5 × 0.4–2.5 cm, rounded, orbicular to broadly-ovate, obscurely wavy along margin, thinly hairy on both the surfaces, rounded at base, acute to rounded at apex, upper leaves 1–3 × 0.5–2 cm, ovate-oblong to elliptic-lanceolate to linear-oblong, sparsely hairy on both the surfaces, rounded at base, acute to obtuse at apex; petiole less than 5 mm long; stipules 4–8 × 2–5 mm, ovate, acute at apex, pubescent, slightly reflexed. Flowers terminal or axillary, solitary, rarely in pairs. Peduncle 2–5 cm, usually sub-erect to erect, finely pubescent. Flowers 2–3.5 cm long, bicolored inside; bracts 2, 3-5 mm, usually paired, cordate at base, acute at apex, pubescent; bracteoles minute; pedicel, 3–8 mm; calyx 1.0–1.3 × 1.0–1.8 cm across, 5-lobed; lobes 0.8–1.3 × 0.1–0.3 cm, linear-lanceolate, acute at apex, thinly strigose, slightly black blotched along the margins; standard petals ovate 1.2–2.0 × 1–1.6 cm, bright yellow on the inner surface, bright yellow with brown veination and finely hairy on dorsal surface; wing petals 8–12 × 4–7 mm, ovate, distinctly clawed, glabrous, dark purple with bright yellow nectar guides; keel petals 7–15 × 4–9 mm, boat-shaped, clawed, twisted at apex, white to variegated purple, with dark purple veins, pubescent along margins; stamens 10, pin-headed ones=to or slightly longer than arrow headed in mature flower; while arrow headed stamens are longer than pin headed in buds; carpel 4 – 9 mm, ovary elongated, 2–3 × 1–2 mm, hairy; style 4–6 mm long, 'L' shaped, feathery; stigma minute. Pods 1.5–2 × 0.6–1 cm, oblong, finely strigose, black to brown blotched; ovules 6–12; seeds 4–10, 1.5–2.2 × 1.0–2 mm, orbicular to kidney-shaped, usually faintly brown with black blotches or mottled, rarely black shiny with white strophiole.

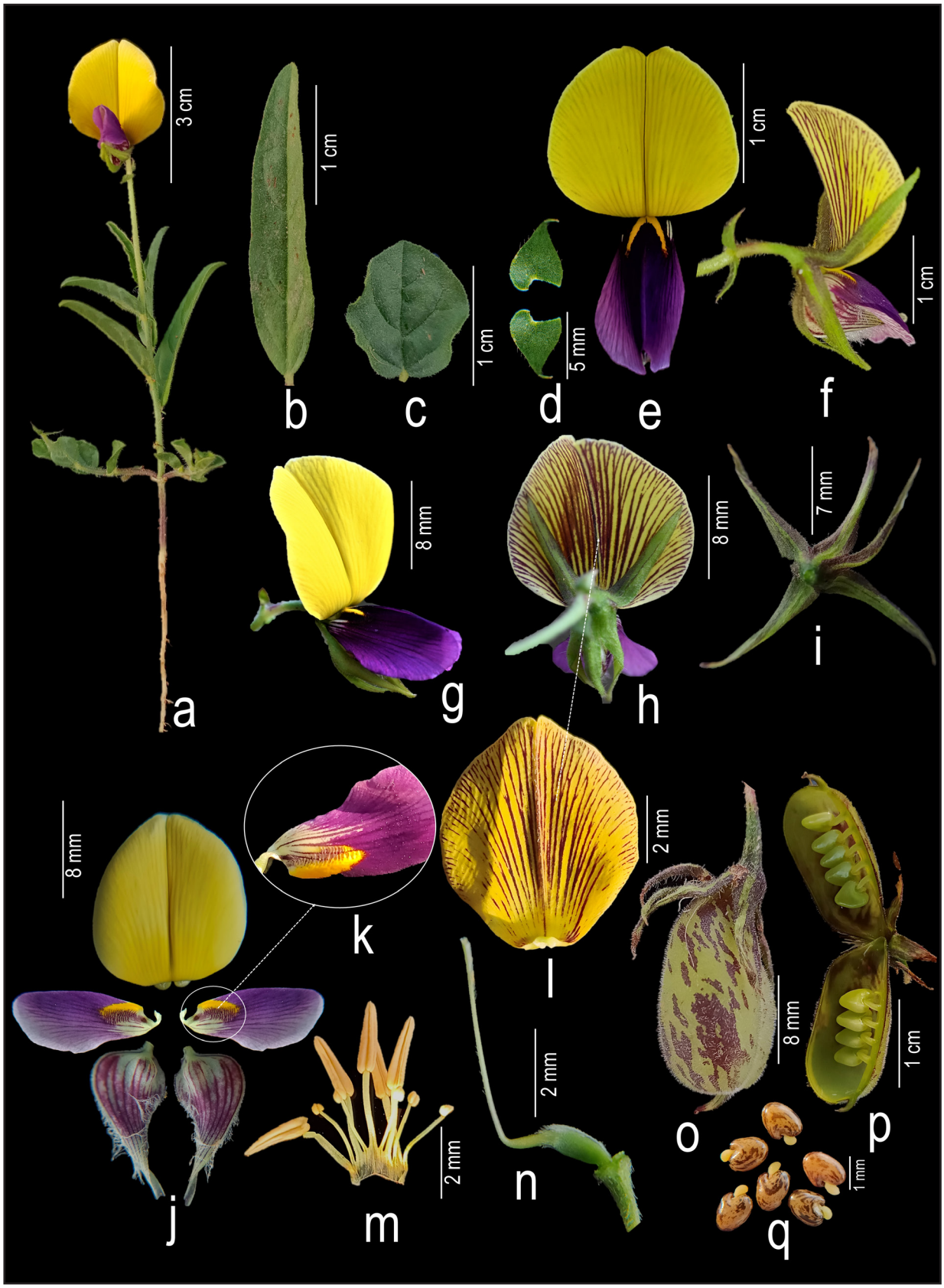

Fig. 1. *Crotalaria luteopurpurea* Dalavi, Ramesh, Basavaraj, Sanjappa & S.R.Yadav: **a.** Habit; **b** & **c** Dimorphic leaves; **d.** Bracts; **e.** Flower–front view; **f.** & **g.** Flower–lateral view; **h.** Flower–dorsal view; **i.** Calyx; **j.** Dissected corolla; **k.** Enlarged portion of wing; **l.** Standard petal–dorsal view; **m.** Androecium; **n.** Gynoecium; **o** & **p.** Pods; **q.** Seeds (from *J.V. Dalavi, R. Pujar & B. Saliyavar* BCV-001; photos by Jagdish Dalavi).

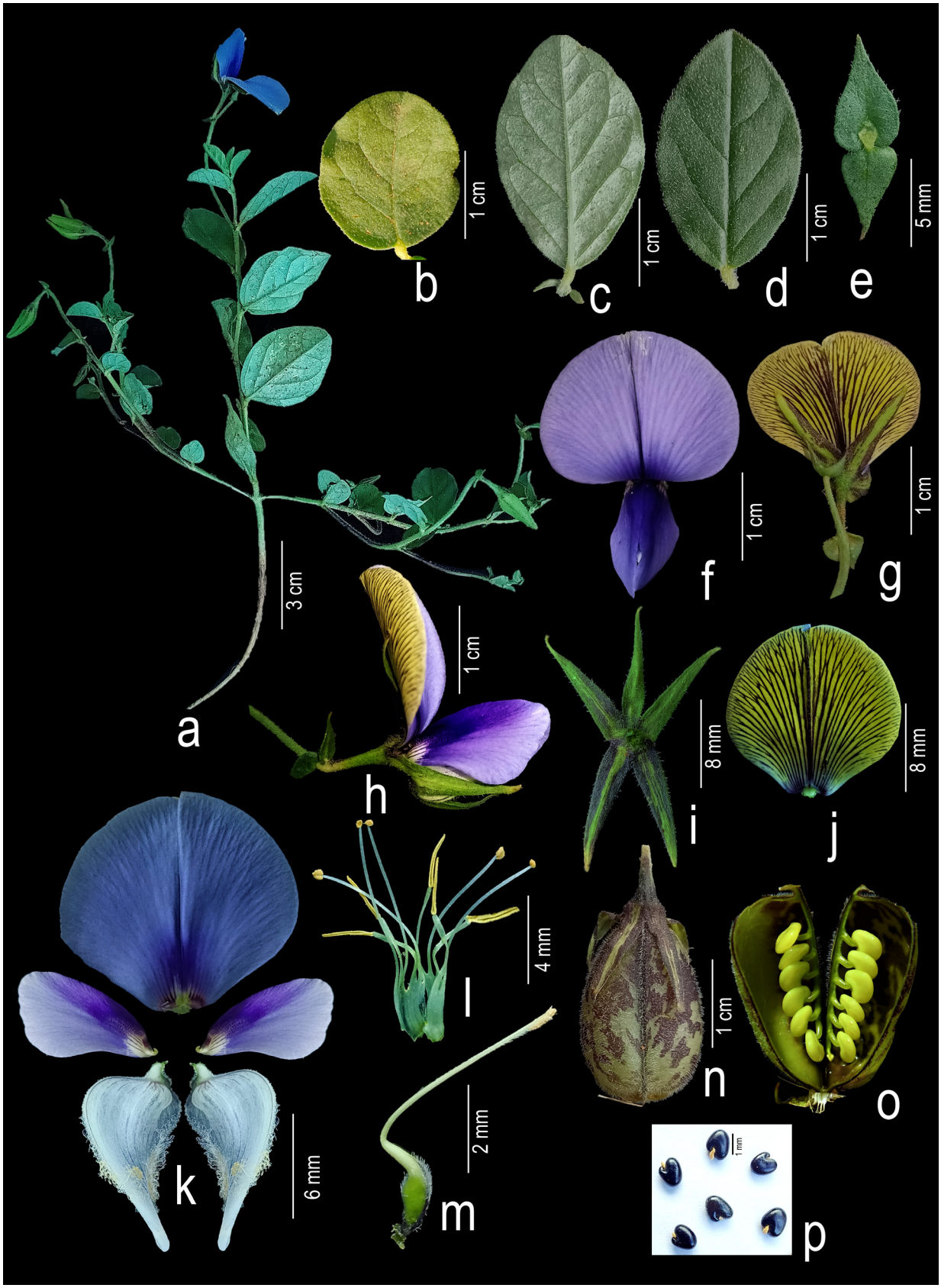

Fig.2. *Crotalaria bifaria* L.f.: **a**. Habit; **b–d**. Dimorphic leaves; **e**. Bracts; **f**. Flower– front view; **g**. Flower–dorsal view; **h**. Flower–lateral view; **i**. Calyx; **j**. Standard petal–dorsal view; **k**. Dissected corolla; **l**. Androecium; **m**. Gynoecium; **n** & **o**. pods; **p**. Seeds (from *J.V. Dalavi & S.P. Bramhadande* JVD-878; photos by Jagdish Dalavi).

Flowering and fruiting: Flowering from October to January; fruiting from December to February.

Habitat: Grows on loose sandy soils in and around cultivated fields on hill tops (plateaus) in association with *Crotalaria bifaria* L.f., *Eleiotis rottleri* Wight & Arn., *E. sororia* (L.)DC., *Indigofera arnottii* (Kuntze) Peter G.Wilson, *Rothia indica* (L.) Druce, (All Fabaceae) *Trachys muricata* (L.) Pers. ex Trin. (Poaceae).

Etymology: The specific epithet '*luteopurpurea*' is derived from color of the corolla, standard bright yellow (latin *luteo* = yellow) and purple wing and keel petals (latin *purpurea* = purple).

Distribution: India, Karnataka, (Bagalkot District-Badami; Gadag-Bommasagara).

Conservation status: Presently it is known from small hillocks of Northern Karnataka, in Badami hills (Bagalkot District) and Bommasagara (Gadag District). Extensive field surveys are needed to evaluate the status of populations and individuals, hence assessed here as Data Deficient (DD).

Additional specimens examined: Bagalkot District, Badami plateau, 15^0 55' 45.97" N, 75^0 42' 20.37" E, 651 m, 30.12.2021, *M.Sanjappa, A.N.Sringeswara & Mahadeva Murthy* 105 (UASB!)

Notes: This species grows on open sandy soils in and around cultivated fields of plateaus where more than 40 species of legumes were collected (Dalavi *et al.*, 2021). Many of them are habitat-specific. It is highly likely that *C. luteopurpurea* occurs in similar habitats of Deccan plateau. Cooke (1903) also collected the same plant from Badami which he identified as *C. bifaria*. In the protologue of *C. bifaria* L.f. (Linnaeus, 1781), it is clearly mentioned that the 'corolla caerulescentes', with upper leaves ovate and lower orbicular, unlike the species described here, which has a bright yellow standard and purple wings with basal yellow pollinator guides. However, there are chances of confusion on the identity of all the allied species when flowers are closed they have similar patterns on the back of standard this but, when flowers bloom, this new species can be easily distinguished with the combination of characters given in the key below.

Key to the allied species

1. Flowers 2–10, in terminal racemes; corolla yellow on both surfaces..... *C. multiflora*

1. Flowers solitary, rarely paired; corolla not as above 2

2. Corolla blue on ventral; seeds 8-16; upper leaves 1.5 times longer or less, than lower ones; peduncle diffused, weak or creeping; wing petals without yellow nectar guides; seeds usually black shine ..... *C. bifaria*

2. Corolla bicolored (standard yellow and wing & keel petals purple) ventral; seeds 4-10; upper leaves 1.5 times or more longer than lower ones; peduncle erect to suberect; wing petals with yellow nectar guide; seeds usually pale brown with black mottling..... *C. luteopurpurea*

Acknowledgments

Authors are thankful to the Head, Department of Botany, Shivaji University Kolhapur & Karnatak University, Dharwad, for the facilities and also thankful to the Principal Balwant College, Vita, Basaveshwar A.C.S. College, Bagalkot. SRY and MS are thankful to the Indian National Science Academy for financial assistance and all authors are thankful to Miss. S.P. Bramhadande & Dr. Krishnat Rokade (Shivaji University, Kolhapur) and Dr. Sharad Kambale (MVP Samaja's A.C.S College, Tryambakeshwar) for his useful suggestions and help. JVD is thankful to Dr. A.A. Mao, (the Director, Botanical Survey of India), Dr. A. Benniamin (Scientist 'F' & Head of the Office, Botanical Survey of India, Western Regional Centre, Pune) for encouragements; the Ministry of Environment, Forest and Climate Change, Govt. of India, and the Botanical Survey of India (BSI) for financial aid (No. BSI-292/2/RA-Rect./022-Tech./724 dated 09.08.2023).

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