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Ophiorrhiza meenachilarensis, a new species of Rubiaceae from southern Western Ghats, India

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Abstract. A new species of *Ophiorriza* (Rubiaceae) from southern Western Ghats, India is here described and illustrated. *Ophiorriza meenachilarensis* is similar to *O. eriantha,* from which it differs in its herbaceous habit (vs. shrubby habit), densely villous-hirsute stem (vs. pubescent-glabrous stem), entire stipule (vs. bifid stipule), short-peduncled cymes (vs. comparatively long-peduncled cymes), unscented flowers (vs. scented flowers) and corolla tube with a ring of hairs at the middle of the tube (vs. corolla tube without a ring of hairs). A detailed description, illustrations, ecological observations, and geographic distribution are provided.

Keywords: Ophiorrhizeae, Camptothecin, Kerala, Rubioideae, Vagamon hills.

INTRODUCTION

Ophiorriza L. is a predominantly herbaceous genus that belongs to the tribe Ophiorrhizeae, subfamily Rubioideae, Rubiaceae (Bremer and Manen 2000). It is a species-rich genus consisting of 318 species, one subspecies and five varieties (WCSPF 2019) chiefly distributed in wet tropical forests of South-East Asia, extending to Australia, New Guinea and the Pacific Islands (Darwin 1976; Chen and Taylor 2011). The genus is taxonomically complicated and has been less-studied by taxonomists except Darwin (1976), Lo (1990), Halford (1991), Deb and Mondal (1997) and Tao and Taylor (2011). Deb and Mondal (1997) revised the genus in the Indian subcontinent, and recognized 47 species and 9 varieties from India. Since Deb and Mondal (1997), seven species have been added to the flora of India (Ramamurthy and Rajan 1985; Khan et al. 1998; Hareesh et al. 2015a,b, 2017a,b, 2018). Western Ghats is one of the diversity centres of *Ophiorrhiza* species followed by the north-eastern Himalayas. Nearly 21 taxa are distributed in the evergreen forest of the Western Ghats (Deb and Mondal 1997; Nayar et al. 2014).

Ophiorrhiza species are commercially important as source of Camptothecin (CPT), a potential anticancer drug. Rajan et al. (2016) screened 11 species and 3 varieties of *Ophiorrhiza* from the southern Western Ghats and

found that *O. mungos* L. (396.54 µg/g, dr. wt.) and *O. rugosa* Wall. var. *angustifolia* (373.19 µg/g, dr. wt.) are the two best known sources of CPT, while *O. rugosa* var. *decumbens* (18.55 µg/g, dr. wt.) and *O. hirsutula* (17.14 µg/g, dr. wt.) showed moderate contents of CPT.

While conducting floristic explorations in the Vagamon hills of southern Western Ghats, the authors came across a few populations of a densely hairy species of *Ophiorrhiza* growing in moist shady areas of an evergreen forest patch in Kottayam-Idukki districts border. After critical study and comparison with other species of *Ophiorrhiza* and scrutiny of literature, it turned out to be quite different taxa from known species hence described as new to science and illustrated here. Final author conducted systematic screening of CPT in the newly described species and found that the CPT level is zero.

Ophiorrhiza meenachilarensis Robi & Balan, **sp. nov**. (Figures 1 and 2)

Type: India, Kerala, Kottayam district, Vagamon Hills, ± 1000 m, 17 June 2018, *A.J. Robi & Anoop P. B. 16881* (holotype, MH!; isotypes, KFRI, MBGH!).

Diagnosis

Ophiorrhiza meenachilarensis shows similarities with the southern Western Ghats endemic species *O. eriantha* Wight, but differs by its herbaceous habit, villous-hirsute indumentum on stem, leaves and inflorescence, unlobed stipules, unscented flowers, glabrous hypanthium, lanceolate, bristly calyx lobes, corolla tube with a ring of hairs within, basally inserted stamens, ovate-orbicular style branches and areolate exotesta of the seeds with a number of tubercles.

Description

Erect herbs, 30–45 cm tall; stem unbranched or with a few branches, terete, densely villous-hirsute throughout; internodes 2–5 cm long. Stipules ovate, acuminate at apex, entire, 8–12 × 3–4 mm, bristly outside, caducous. Leaves in unequal pairs; petioles 1.2–3.5 cm long, densely hairy; leaf blades obovate-elliptic, 8–17.5 × 2.5–6 cm, attenuate at base, acuminate at apex, sometimes subfalcate, chartaceous, sparsely appressed pilose above, densely so beneath especially along the veins, margins hirsute, hairs up to 2.5 mm long; lateral veins 8–12 (–14) pairs, close, prominent beneath. Inflorescence axillary and terminal, a corymbose cyme, 1.5–2.5 cm across; peduncles 0.1–2 cm long at anthesis and 2–3 cm long at fruiting, stout, rusty villous. Flowers 1-1.2 cm long; bracts and bracteoles similar, linear-lanceolate, 6–8 × 0.7–1 mm, bristly along margins and outside, persistent. Pedicels 1–2 mm long. Hypanthium obovoid, 0.8–1 × 0.6 mm. Disc bilobed, 0.4–0.5 mm tall, glabrous. Calyx lobes lanceolate, 2–2.5 × 0.4–0.5 mm, bristly outside. Corolla infundibuliform, hispid outside; tube 7–8 mm long, patent-pubescent outside, appressed pubescent and with a ring of hairs at the middle of the tube inside; lobes ovate-lanceolate, 2.5–3 × 1.5–2 mm, acute-subacuminate, shortly keeled. Stamens included, inserted at the base of corolla tube; filaments 1–1.5 mm long; anthers linear-oblong, 1.5–1.6 × 0.4 mm. Style filiform, as long as corolla tube, glabrous, lobes 2, ovate-orbicular, 1 × 0.8 mm. Capsules obcordate in outline, 4–5 × 6–7 mm, laterally compressed, hispid, green. Seeds many, irregularly angled, *ca* 0.4 × 0.3 × 0.3, brown; exotesta areolate, wall of the areoles with a number of tubercles.

Etymology

The specific epithet refers to the type locality in Kottayam district of Kerala state, where the Meenachilar River originates.

Distribution and habitat

This species is currently known only from the type locality, Vagamon hills, Kerala, India. It is growing in moist shady areas of evergreen forest at an elevation of ± 1000 m altitude, in association with *Chassalia curviflora* Thwaites, *Clidemia hirta* (L.) D. Don, *Ophiorrhiza pectinata* Arn., *Ophiorrhiza jacobii* Hareesh, Salish, G. Joseph & M. Sabu, among other species.

Phenology

Flowering and fruiting during May to September.

Conservation status

Ophiorrhiza meenachilensis is so far known only from two collections at the type locality, Vagamon Hills of Western Ghats, with an extent of occurrence estimated to be less than 10 km^2. Extensive field surveys are needed to assign appropriate threatened category of IUCN (2012), therefore it is classified as Data Deficient (DD) according to IUCN standards.

Notes

Ophiorrhiza meenachilarensis is similar to *O. eriantha* in its broad, elliptic, acuminate leaves, short, congested, more or less hairy, corymbose cyme, long, linear and persistent bracts and bracteoles and broadly infundibuliform corolla with spreading lobes. In addition to the diagnostic characters, the new species differs from the latter by its

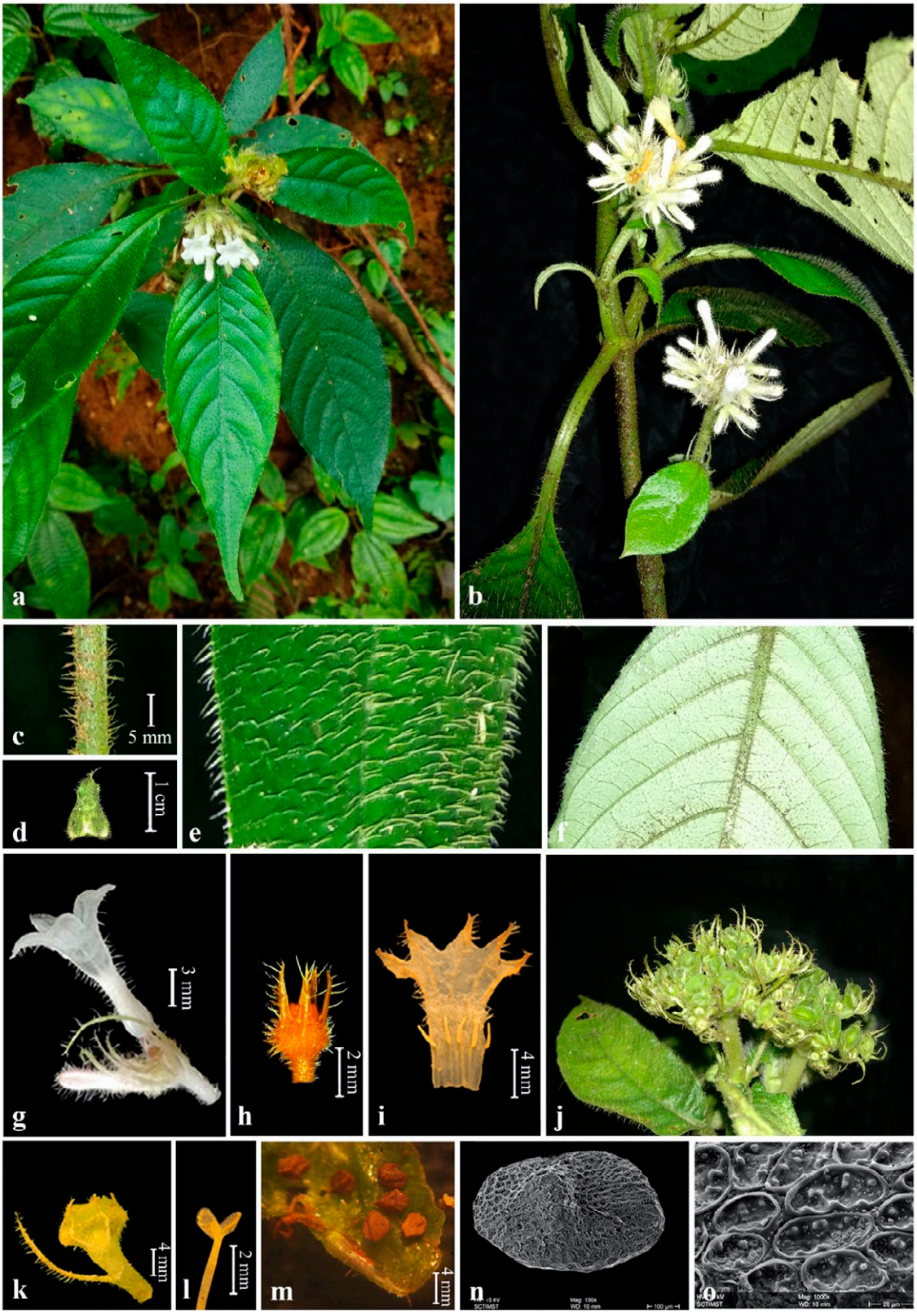

Figure 1. *Ophiorrhiza meenachilarensis* sp. nov. (a,b) Habit. (c) Stem. (d) Stipule. (e) Leaf: upper surface. (f) Leaf: Lower surface. (g) Flower. (h) Calyx. (i) Corolla split opened. (j) Infructescence. (k) Capsule. (l) Stigma. (m) Seeds. (n,o) SEM images of Seed.

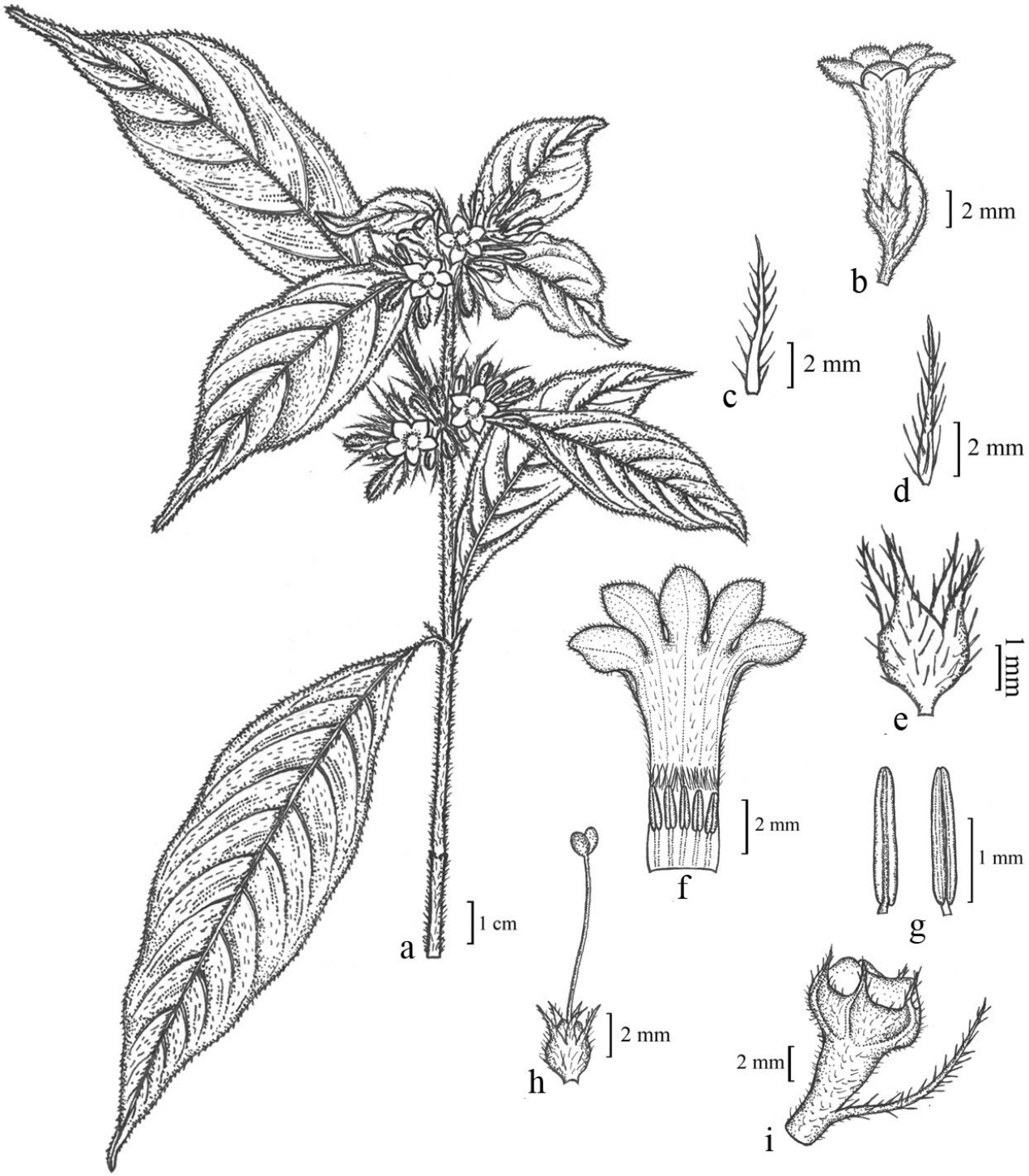

Figure 2. *Ophiorrhiza meenachilarensis*. sp. nov. (a) Habit. (b) Flower. (c) Bract. (d) Bracteole. (e) Calyx. (f) Split opened corolla. (g) Stamens. (h) Pistil. (i) Capsule. Drawn by Anoop P. Balan from *A.J. Robi & Anoop P. Balan 16881* (MBGH).

densely villous-hirsute stem (vs. pubescent-glabrous stem), ovate, acuminate, entire stipule (vs. lanceolate, bifid stipule), sparsely-densely pilose leaves with hirsute margins (vs. glabrous-puberulous leaves), up to 3 cm long peduncled cyme (vs. 4–5.5 cm long peduncled cyme), 1–1.2 cm long, unscented flowers (vs. 2.5–2.7 cm long, fragrant

Table 1. Morphological comparison of *Ophiorrhiza meenachilarensis*. with *O. eriantha.*

	O. meenachilarensis	*O. eriantha*
Habit	Herb, 30–45 cm tall	Subshrub, 45–90 cm tall
Stem	Densely villous-hirsute	Pubescent or glabrescent
Stipule	0.8–1.2 cm long, ovate, acuminate, entire at apex, bristly outside	0.5–1.5 cm, lanceolate, bifid at apex, puberulous-glabrous outside
Lamina	Obovate-elliptic, sparsely appressed pilose above, densely so beneath, margins hirsute	Elliptic-lanceolate, glabrous above, puberulous beneath
Peduncle	1.0–2 cm long at anthesis and 2–3 cm long at fruiting stage	0.3–4 cm long at anthesis and 4–5.5 cm long at fruiting stage
Flowers	1–1.2 cm long, unscented	2.5–2.7 cm long, fragrant
Bracts	0.6–0.8 cm long, bristly	10–17 mm long, pubescent
Bracteoles	0.6–0.8 cm long, bristly	6–10 mm long, pubescent
Hypanthium	Glabrous	Pubescent
Calyx lobes	Lanceolate, 2–2.5 mm long, bristly outside	Subulate, 1.5–2 mm long, pubescent outside
Corollas	White, hispid outside, appressed pubescent inside with a ring of hairs at the middle of the tube; tube 6–8 mm long	Pinkish-white, villous outside, glabrous inside without a ring of hairs; tube 16–22 mm long
Stamens	Inserted at the base of corolla tube; filaments 0.5–1.0 mm long; anthers 1.5–1.6 mm long	Inserted at the middle of the corolla tube; filaments 2–2.75 mm long; anthers 3–3.5 mm long
Style	As long as corolla tube	1/4th of the length of the corolla tube
Style branches	Ovate-orbicular, obtuse	Lanceolate, acute
Capsules	4–5 × 6–7 mm, hispid	2.5–3.25 × 7–8.5 mm, pubescent
Seeds	0.4 × 0.3 mm, irregularly angled; exotesta areolate and the wall of areole with tubercles	0.6 × 0.5 mm, 4–6 angled; exotesta areolate and the wall of the areole with branched projections

flowers), glabrous hypanthium (vs. pubescent hypanthium), lanceolate, bristly calyx lobes (vs. subulate, pubescent calyx lobes), ovate-orbicular stigmatic lobes (vs. lanceolate, acute lobes) and areoles of exotesta with tubercles (vs. areoles with branched projections). A morphological comparison of the two species is summarized in Table 1.

Additional specimens examined

INDIA, Kerala, Kottayam district, Vagamon Hills, ± 1000 m asl, 7 July 2018, *Anoop P. B. 16896* (MBGH!).

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