

A Taxonomic Note on *Viscum monoicum* Roxb. ex DC. (Santalaceae: Santalales) and New Hosts in West Bengal, India

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ABSTRACT

Viscum monoicum (Santalaceae), a rare mistletoe has been collected for the first time from Rarh region of West Bengal which is mainly composed of lateritic soil. Taxonomic description, phenology, distribution and ecological notes with an illustration of this species have been provided. *Viscum monoicum*, the poisonous hemiparasite reported previously from the hilly regions of Sikkim, Assam, Manipur, Tripura, Mizoram, Karnataka, Kerala, Madhya Pradesh, Andhra Pradesh, Tamil Nadu and Andaman & Nicobar Islands. The present paper deals with a new distributional record and new host range of the hemiparasitic taxon.

Key words: morphology

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Introduction

The genus *Viscum* is comprised of 75–100 plant species of mistletoes, inhabiting temperate - tropical portions of Europe, Africa, Asia and Australasia (Germishuizen, 2000). Previously, the genus was placed in the family Viscaceae (Cronquist, 1981), but recent investigations demonstrate that the family is nested within the sandalwood family, Santalaceae (Bremer et al., 2009; Chase et al., 2016).

Plants of this family Santalaceae are mostly hemiparasitic herbs, shrubs or small trees mostly hemiparasites on branches of trees or on roots e.g., *Santalum album* L. (Swet chandan) is a root hemiparasite, *Viscum album* is a stem hemiparasite (Kuijt, 1969; Bhandari & Mukerji, 1993). This family is characterized by flowers which are tetra- to pentamerous; three- to five- carpellate, unilocular ovary, single basal ovule with integument condensed to one and the seed lacking a seed-coat (Candolle, 1857; Der & Nickrent, 2008).

In India this genus is represented by 18 species. Here, we report on *V. monoicum* which is very similar to *V. orientale* from which it can be differentiated by its characteristic 5-nerved lanceolate leaves with usually sharp tips and oblong truncate fruits with totally smooth and shining outer surface (Figs. 2, 3, 4 & 5).

Distribution in Purulia district

The study was conducted in West Bengal, Purulia district, which lies between 23.3361°N, 80.4817°E to

23.1361°N, 86.2150°E. This hilly region is a division of the Dalma Hills and constitutes a piece of Eastern Ghats range (Fig. 1). *V. monoicum* was found in Ayodhya hills (elevation: 855 meters) and adjoining plains (elevation: 125-165 meters) in diverse locations: Baradi (23.6995°N, 90.6370°E), Gurrabira (23.3225°N, 86.0417°E), Nawagar (23.3113°N, 86.0272°E), Murguma (23.3196°N, 86.0593° E), Babnijara (23.2569°N, 86.0466°E), Susnidi (23.2566°N, 86.0338°E), Dungridi (23.2625°N, 86.0338°E), Upargugui (23.3156°N, 86.0784°E), Pitidiri (23.2658°N, 86.0617°E), Buridimur dam (23.3080°N, 86.1036°E). It is also found near Bamni falls. These areas of the forest mainly surrounded by *Butea monosperma* (Lam.) Taub., *Erythrina variegata* L., *Evodia roxburghiana* Benth., *Evodia fraxinifolia* (Hook.) Benth., *Evodia triphylla* (Lam.) DC. and *Evodia meliifolia* (Hance ex Walp.) Benth. Critical study of the specimens (deposited at Vidyasagar University Herbarium (VUH), Nos 01173, 01254) was done with the help of relevant literature (Hooker, 1890; Kirtikar & Basu, 1935; Prain, 1963; Watson, 2001) and consultation with an expert from Central National Herbarium, Shibpur, Howrah.

Taxonomic Notes

Viscum monoicum Roxb. ex DC., Prodr. 4: 278. 1830; Hook.f., Fl. Brit. India 5: 224. 1886. *V. benghalense* Roxb. ex Wight & Arn., Prodr. Fl. Ind. Orient. 1: 379. 1834.

Shrubs monoecious, evergreen, hemiparasitic, 28-70

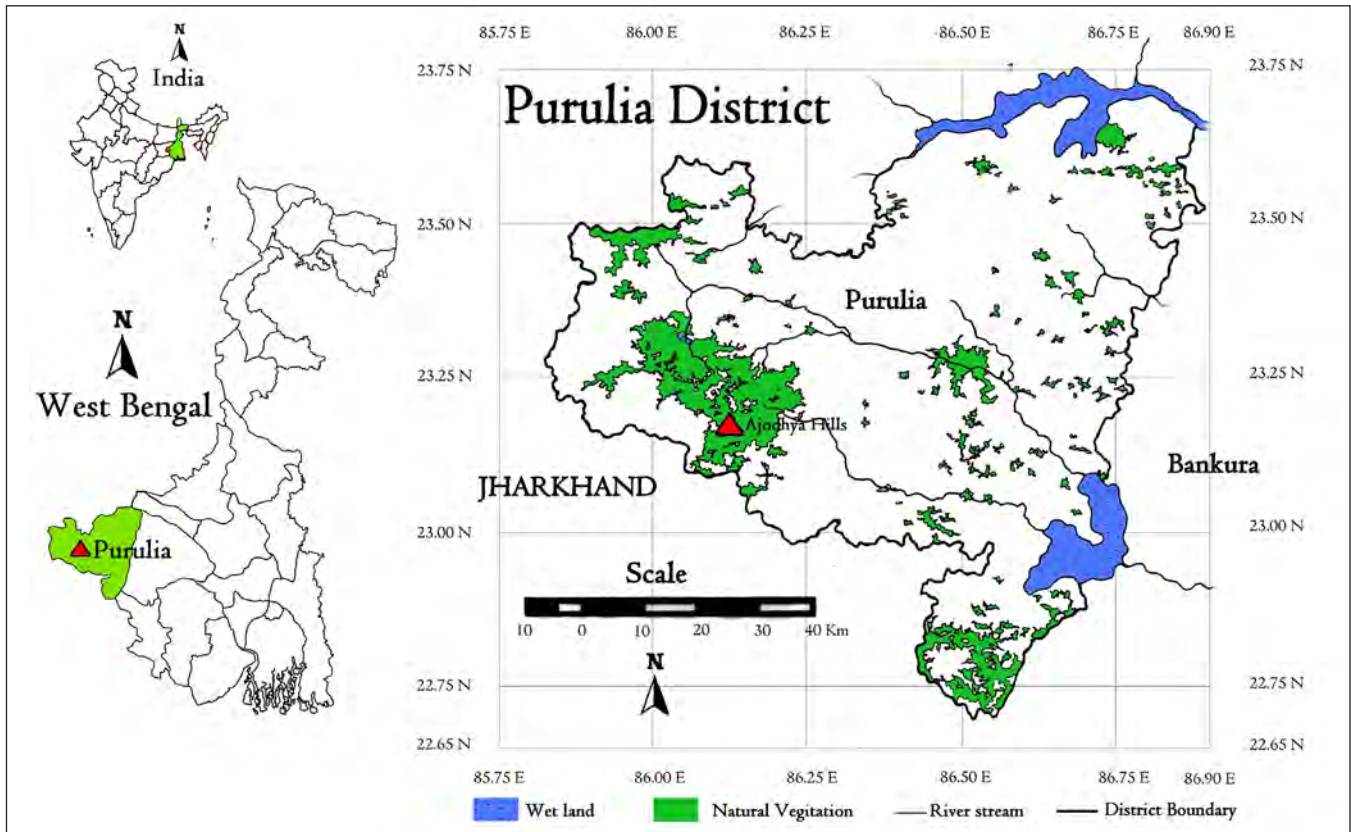


Figure 1. Map of Purulia district showing Ayodhya hills as well as adjoining areas [<http://www.purulia.gov.in>]



Figure 2. The hemi-parasitic plant on its host (*Dendrophoe fulcata*)



Figure 3. The hemi-parasitic plant on its host (*Vitex negundo*)

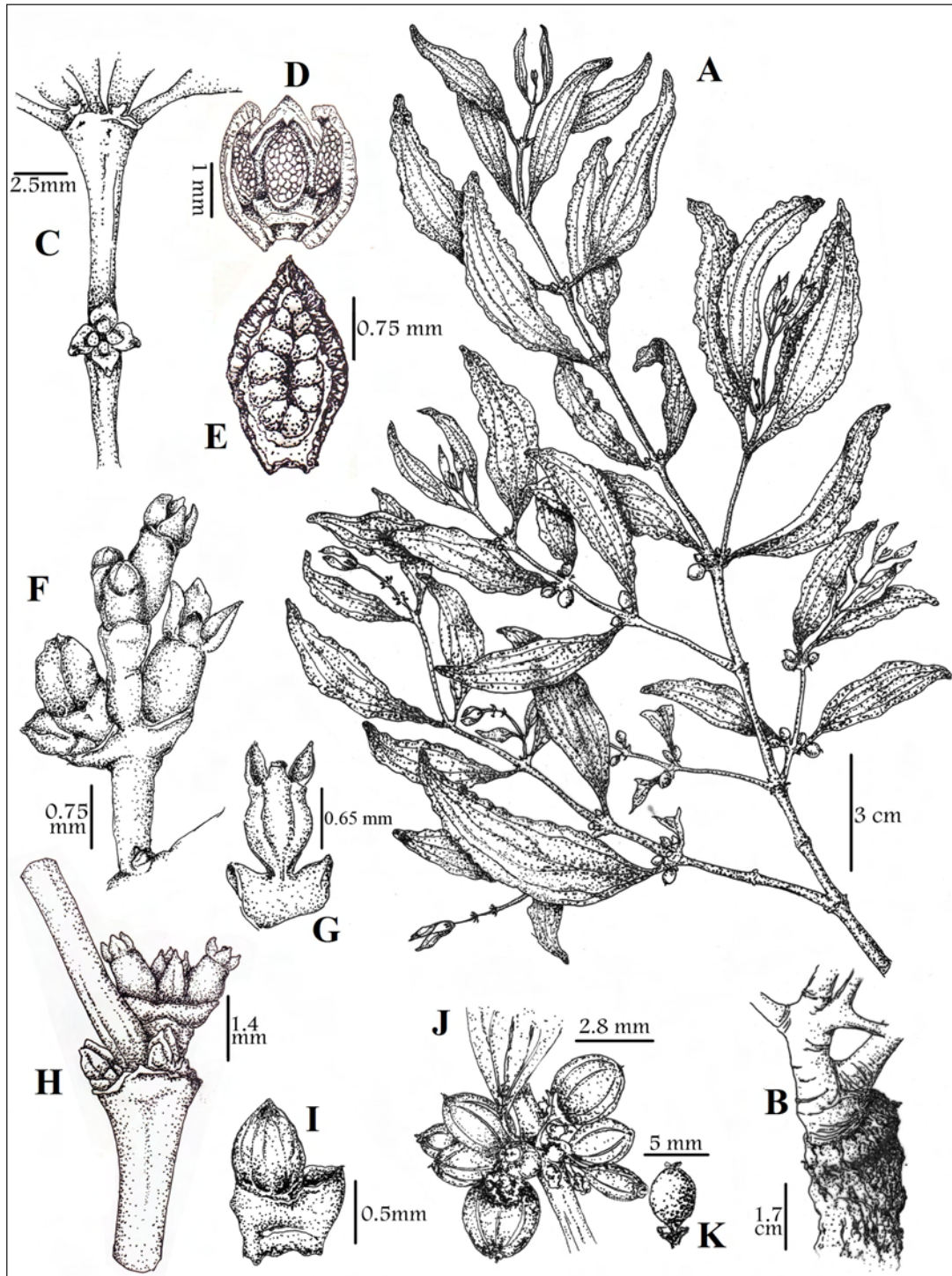


Figure 4. *Viscum monoicum* Roxb. ex DC. (A) A flowering twig of the hemi-parasitic plant, (B) Host parasite junction, (C) Inflorescence with male flower, (D, E) Dissected male flower showing anther attachment to perianth, (F) Inflorescence with female flower, (G) Dissected female flower, (H) Inflorescence with male and female flower, (I) Flower bud, (J, K) Fruit.

cm tall, Branches generally opposite; internodes 2.5-8 cm long. Leaves subsessile, petiole short; arrangement of leaves opposite, asymmetric; leaf blade lanceolate to elliptic, acute, sharp and acuminate at tip, entire or undulating along margins, slightly shiny, 5-8.5

× 1-4 cm, palmately (3-)5(-7)-veined at the base. Inflorescence axillary, cymose at the leaf axils, 1-7 together aggregated at each node; involucre navicular, base with boat shaped 1-3 pairs of connate acute scales with 1-3 mm length at its apex, (3-)5(-7) flowered,

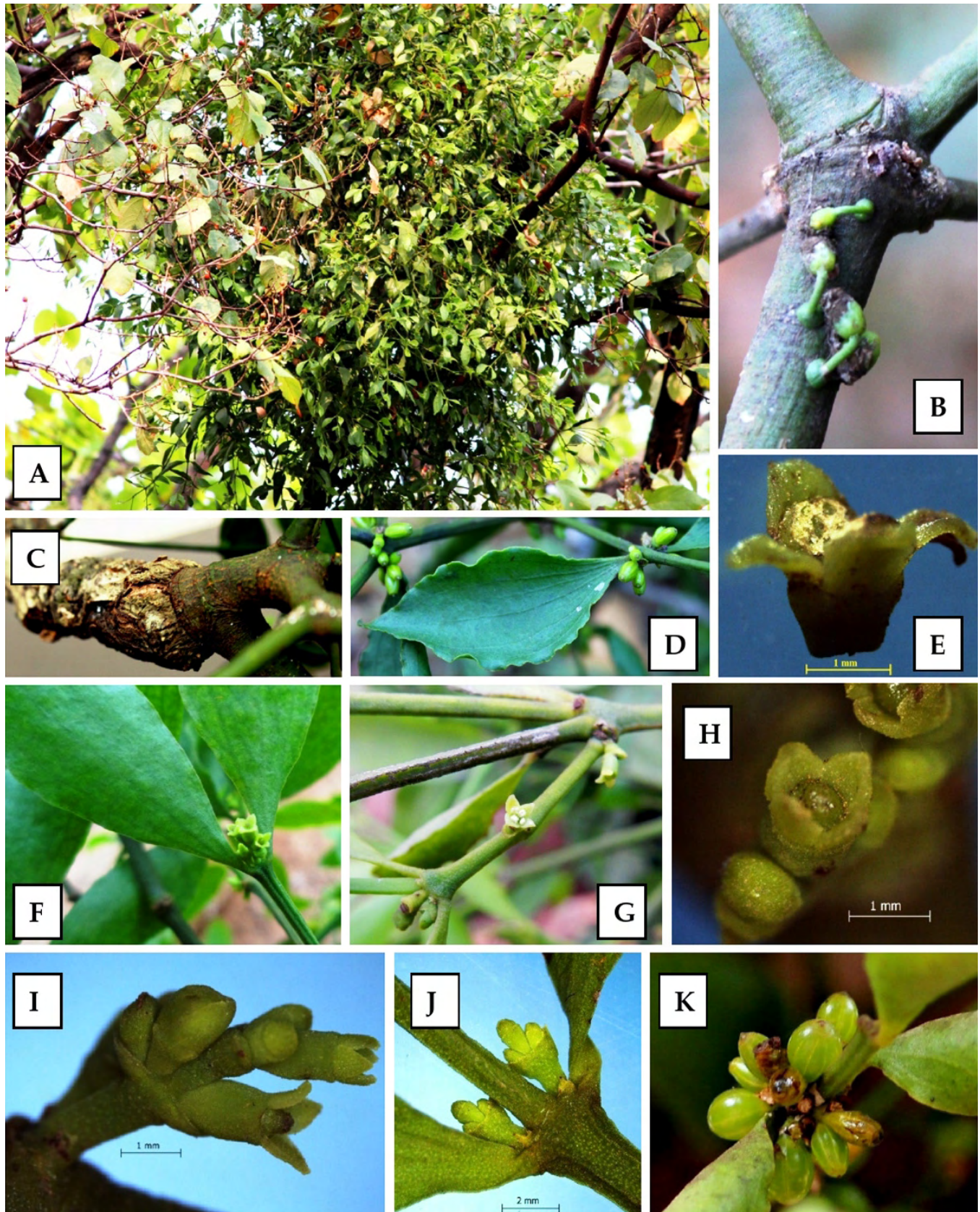


Figure 5. *Viscum monoicum* Roxb. ex DC. (A) Hemi-parasitic plant in its host plant (*Mallotus philippensis*), (B) Auto parasitism, (C) Host-parasite junction, (D) Leaf, (E, G) Male flower showing anther, (F, I, J) Inflorescence, (H) Female flower, (K) Fruit.

central 1-3 flower(s) being male, laterals female or all flowers female. Pedicel absent. Male flowers: elliptical shaped in bud, sessile, oblong, ca $2 \times 1(-1.5)$ mm; perianth lobes 4, subcordate or concave at the base, ca 1.3×1.1 mm, anthers positioned on the abaxial surface of perianths; stamens 4: anthers biloculed, each anther loosely attached to the inner side of each perianth lobes. Female flowers: obovoid or clavate in bud, ca. 2.5×1 mm; perianth lobes 4, lobes triangular, ca 0.5-1.2 mm. Stigma capitate, knob-shaped, style short, ovary inferior. Fruits: Berry, generally ellipsoid to oblong in shape, yellowish green to green, smooth, glossy, (5-8 \times 2-4) mm (Fig. 4 & 5).

Family: Santalaceae

Local name: Mohanika, Katavi (Sanskrit), Banda, Bhotvi (Bengali), Kuchlekamalang (Hindi), Alakjardi (Santali).

Flowering and Fruiting: November – March.

Distribution: The plant species distributed in Sri Lanka, Bhutan, Bangladesh, Myanmar, China, Vietnam, Thailand and in African countries (Brach & Song, 2006; Sanjai & Balakrishnan, 2012).

In India it is widely distributed, from the northeast, extending to the central India and further towards west and southwards; it occurs in Odisha, West Bengal, Sikkim, Bihar, Assam, Manipur, Tripura, Mizoram, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala and Andaman & Nicobar Islands (Sanjai and Balakrishnan, 2012).

Ecological Notes: Generally attack hosts growing on lateritic soil in moist and shady locations. When the plant parasitizes *Strychnos nux-vomica*, it mimics the host and looks strikingly like this phylogenetically unrelated host in vegetative morphology.

Host Range: Hemi-parasitic interaction depends on host range and host preference, which portray diverse spectacles of the host-parasite relationship. Host range refers to the whole number of diverse species that can be parasitized. In the present study the plants were found to be parasitic on *Diospyros melanoxylon* Roxb. (Ebenaceae), *Albizia amara* (Roxb.) B.Boivin, *Albizia odoratissima* (L.f.) Benth., *Pongamia pinnata* (L.) Pierre. (Fabaceae), *Zizyphus oenoplia* (L.) Mill. (Rhamnaceae), *Ficus benjamina* L. (Moraceae), *Shorea robusta* Gaertn. (Dipterocarpaceae), *Osmanthus fragrans* Lour. (Oleaceae), *Strychnos nux-vomica* L. (Loganiaceae), *Evodia fraxinifolia* (Hook.) Benth., *Evodia roxburghiana* Benth., *Evodia triphylla* (Lam.)

DC. (Rutaceae), *Madhuca longifolia* (J.Koenig ex L.) J.F.Macbr. (Sapotaceae) and *Punica granatum* L. (Lythraceae) in the study area. These have been reported previously (Hooker, 1890; Tubeuf, 1923; Duthie, 1960; Hara, 1982; Alam, 1985; Press et al., 2000; Wu et al., 2003; Devkota et al., 2005; Sanjai & Balakrishnan, 2012; Thriveni, 2013). In this study, three new host species from three new families were detected, which were *Dendrophthoe falcata* (Loranthaceae) (Fig. 2), *Vitex negundo* (Lamiaceae) (Fig. 3) and *Mallotus philippensis* (Euphorbiaceae) (Fig. 4A). Self-parasitism or auto parasitism was observed for the first time in *V. monoicum* (Fig. 5B). It was observed that the young plant grows on the mother plant and on other individuals of the same species.

Host Specificity: Host preference, referring to the selection of the most attractive host for most advantageous growth, typically is much narrower than the range seen. In the present study, they were found mainly on *Mallotus philippensis*, *Evodia roxburghiana* and *Diospyros melanoxylon*. Generally, hemiparasitic plant species have wide host ranges, and can be attached to a number of diverse hosts at once (Heide-Jørgensen, 2008).

Specimens examined: West Bengal, Purulia, Baradi (23.6995° N, 90.6370° E), 12.11.2016, Sayantan Tripathi & Amal Kumar Mondal 01173 (Vidyasagar University Herbarium); West Bengal, Purulia, Upargugui (23.3156° N, 86.0784° E), 12.03.2017, Sayantan Tripathi & Amal Kumar Mondal 01254 (Vidyasagar University Herbarium).

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