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A Note on *Mitrastemon yamamotoi* (*Mitrastemonaceae*): a Root Parasite of Rare Occurrence in North East India

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Summary: *Mitrastemon yamamotoi* Makino (*Mitrastemonaceae*) is the only species of the genus found in the state of Meghalaya, North East India. The present study is a recollection of the species for the second time after a gap of about 45 years. In addition to its detailed taxonomic description, habitat characterization, threats operating on the species and related conservation implications are also discussed.

The genus *Mitrastemon* is represented by two species, i.e., *Mitrastemon matudae* Yamam. and *M. yamamotoi* Makino. The former is found in Central America, and the latter in tropical and subtropical Asia. The genus belongs to the family *Mitrastemonaceae*, grows as herbs and lives as parasites on roots of some trees. In India, the genus is represented by only one species i.e., *Mitrastemon yamamotoi*, and it is found only in Khasi Hills of Meghalaya (Meijer and Veldkamp 1993).

Mitrastemon yamamotoi is a unique root parasite and is considered a good example of transpacific distribution. It was first reported by Makino in 1909 from Japan as *Mitrastemma yamamotoi* (Makino 1909), and was later corrected as *Mitrastemon yamamotoi* (Makino 1911). In India, this species was first collected in 1969 by Rao and Balakrishnan from Mawsmat forest in East Khasi Hills of Meghalaya (Rao and Balakrishnan 1972). Since then the species has not been collected from the state (Nayar and Sastry 1990). The species was listed as 'Rare' by Walter and Gillett (1998) and is classified as 'Endangered' in the Red Data Book of Indian

Plants (Nayar and Sastry 1990). Even in Japan the species is considered 'Rare' (Makino 1911). In the present study, a detailed distribution, plant description, habitat characterization, threat operating on the species and conservation measures that need to be adopted are discussed, so as to prevent the species from extinction in India.

During a recent floristic exploration carried out in Cherrapunjee and adjoining areas in East Khasi Hills district of Meghalaya, we came across this interesting species. After a critical examination, comparison with the original description and available literature (Makino 1909, 1911, 1928, Hayata 1913, Matuda 1947, Rao and Balakrishnan 1972, Huang and Gilbert 2003) as well as comparison with the herbarium specimens of Botanical Survey of India, Eastern Circle, Shillong, its identity was confirmed as *Mitrastemon yamamotoi*. The vegetation of the area, where the species was collected falls under subtropical broadleaved wet-hill forests (Champion and Seth 1968). The dominant canopy trees of the forests include *Castanopsis tribuloides* (Sm.) DC., *Castanopsis kurzii* (Hance) Biswas, *Echinocarpus murex* Benth., *Elaeocarpus* spp., *Lithocarpus dealbatus* Rehder, *L. elegans* (Blume) Hatus. ex Soepadmo, *Quercus glauca* Thunb., *Syzygium* spp. and *Schima khasiana* Dyer. Whereas, the sub-canopy layer is dominated by *Casearia glomerata* Roxb., *Coffea khasiana* Hook. f., *Eurya* spp., *Macropanax dispermus* (Blume) Kuntze, *Microtropis discolor* (Wall.) Meisn.,



Fig. 1. *Mitrastemon yamamotoi* during different growth stages. A. Budding stage. B. Blooming stage. C. Mature individuals showing intimate attachment with roots. D. Dehiscent stage. E. Dead individuals. F. Remaining marks on plant roots. All taken from Mawmluh, Cherapunjee, Megalaya, India. A. 3 Dec. 2014. B, C. 5 Feb. 2015. D. 10 Mar. 2015. E. 26 Mar. 2015. F. 7 Apr. 2015.

Table 1. Site characteristic of forest patches with *Mitrastemon yamamotoi* in Khasi Hills, Meghalaya, India

Site	Area (ha)	Latitude (N)	Longitude (E)	Elevation (m)	Disturbances	Population size
Law Spurba, Mawmluh	948	25°14.903'	91°41.968'	1115	low	large
Law Saiawmih, Mawsmmai	86	25°14.354'	91°43.841'	1074	moderate	small
Law Arliang, Laitryngew	4.05	25°19.921'	91°44.159'	1603	high	small
Law Pjah, Laitryngew	3.02	25°19.748'	91°44.069'	1582	high	small

Psychotria spp., *Schefflera hypoleuca* (Kurz) Harms, *Schefflera venulosa* (Wight & Arn.) Harms, *Symplocos spicata* Roxb., *Sarcococca pruniformis* Lindl. and *Vernonia volkameriifolia* DC.

Taxonomic description

Mitrastemon yamamotoi Makino in Bot. Mag. (Tokyo) **23**: (326), t. (1909), ut '*Mitrastemma*', & in Bot. Mag. (Tokyo) **25**: 255, t. 7 (1911); Rao & Balakrishnan in Indian Forester **98**(4): 234 (1972).

Cylindrical body, 3–7 cm tall, stem erect with tuberous base. All parts off-white when young and dark brown when dry. Volva 1.5–2.5 × 0.5–2 cm. Scales 12, decussately opposite, imbricate, in three tiers of four each, sub-erect ascending, ovate, ovate-oblong, or lanceolate, 1–2.7 × 0.5–2 cm. Perianth fleshy white when young and brown when old, cupular, 0.5 × 1–1.9 cm, mouth entire or undulate. Staminal tubule, 14–20 mm long, anther many celled, honey-combed in a 2–6 mm broad ring. Ovary globose to ellipsoid, superior, sessile ca. 12 × 9 mm, unilocular; placentae parietal with sinuately intruding lamellae masking the single locule. Ovules many on slender stalks, anatropous. Style stumpy, conical, stout, 3–4 mm long. Stigma subglobose, 4–5 mm long, 5–7 mm thick. Fruits subglobose-ovoid, 20–25 mm in diameter, dark brown, enclosed in dark brown scales. Seeds many, 3 mm long, brown (Figs. 1, 2).

Flowering and fruiting period: The plant is seen only during the winter season and it completes the whole life cycle from November to April.

Specimens examined: **INDIA**. MEGHALAYA: East Khasi Hills: Laitryngew near Cherrapunjee, 5 February

2015, A. H. Mir 87863 (ASSAM); Mawmluh, 5 February 2015, A. H. Mir 87864 (ASSAM). Khasi and Jaintia Hills: 1966, A. S. Rao 37958 (ASSAM); 1971, A. S. Rao 38222–38224, 38285 (ASSAM); 1969, Balakrishnan 34188 (ASSAM).

The plant is reported from India (Meghalaya), Thailand, Cambodia, Vietnam China (Fujian, Guangdong, Guangxi, Taiwan, Yunnan), Japan (Shikoku, Kyushu, Ryukyu Islands), Sumatra, Borneo and New Guinea. In Meghalaya, the species was thought to be restricted only to the Mawsmmai area (Rao and Balakrishnan 1972), but during the current study, in addition to the previous site, it could be collected from three fragmented forest patches located in Mawmluh and Laitryngew (Table 1).

Mitrastemon yamamotoi is a root parasite on many tree species and grows in thick, moist virgin forests (Rao and Balakrishnan 1972). The species grows so closely with the host that it seems to be a part of the host plant. The species grows mainly in moist and shady areas of the forests. Earlier it was reported to grow mainly on roots of *Engelhardia spicata* Blume, *Castanopsis tribuloides*, *Vernonia volkameriifolia* and *Elaeocarpus lancifolius* Roxb. (Rao and Balakrishnan 1972). But during our survey, in addition to above species it was found to grow on roots of *Lithocarpus elegans*, *Psychotria adenophylla* Wall., *Calophyllum polyanthum* Choisy and *Elaeocarpus floribundus* Blume as well. The majority of the individuals were found to grow on the roots of *Lithocarpus elegans* and *Psychotria adenophylla*. The habitat of the species is characterized by low light intensity (6–30 $\mu\text{mol m}^{-2} \text{s}^{-1}$), low air temperature (10–19 °C), high relative humidity (80–97%) and high rainfall (11,000 mm per year). However, there

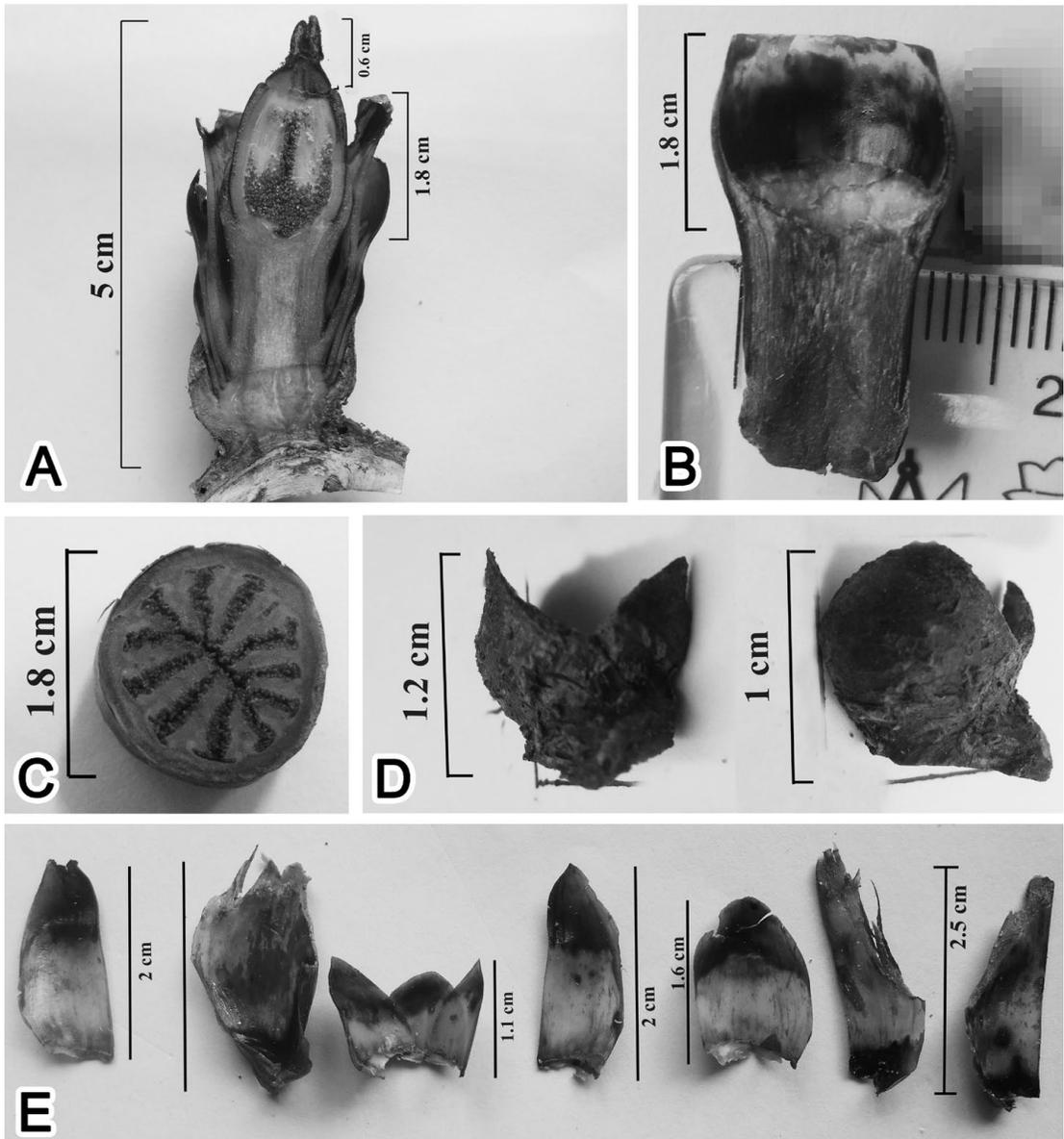


Fig. 2. *Mitrastemon yamamotoi*. A. Longitudinal section of a plant. B. Volva. C. Transverse section of the ovary. D. Scales. E. Bracts. All from Mawmluh, Cherapunjee, Meghalaya, India.

is low or no rainfall during the winter months (December–February). Except rainfall, these environmental parameters are more or less similar to those of other parts of the world where this species is growing (Matuda 1947). It has also been observed that the plant exudates a honey like fluid in order to attract birds and

insects, which aid the plant in pollination (Fig. 1D).

The population size of the species in the studied sites was very small and is in the danger of extinction. The major threats operating in the area of its occurrence are fragmentation and habitat destruction due to shifting cultivation,

deforestation for small timber and fuel wood collection, medicinal plant collection for commercial purposes, forest fires and mining of coal, limestones and sand (Upadhaya et al. 2013). The ever increasing forest fragmentation is changing the microclimatic conditions of the forests, hence making the environment unfavorable for the growth of this species. Moreover, because of its parasitic nature, cultivation of this species seems to be very difficult (Nayar and Sastry 1990). So far no conservation measures have been taken for the species in India. In order to conserve the species from extinction from the country, these forest patches in which the species occurs needs strict protection. In addition, regular monitoring of the population is needed.

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A. H. Mir^a, K. Upadhaya^b, C. G. Khonglah^a: 北東インド稀産の寄生植物—ヤッコソウ (ヤッコソウ科)

ヤッコソウ *Mitrastemon yamamotoi* Makino (ヤッコソウ科) はインドでは北東部のメガラヤ州 Khasi Hills でのみ知られていたが、最近になって同所で 45 年ぶりに採集された。これが二度目の報告となる。本稿では、新しく得られた材料にもとづいて、ヤッコソウの詳細い

記載、生育地の特性、種の現況と保全への方策を示した。

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