Lilium polyphyllum

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Notes on *Discospermum sphaerocarpum* Dalzell ex Hook.f., a rare species of Rubiaceae (Ixoroideae: Coffeae) from southern India

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**Abstract:** *Discospermum sphaerocarpum* is a rare species in the tribe Coffeae of the family Rubiaceae and its occurrence on the Madayippara lateritic plateau of the Kannur district of Kerala, southern India is discussed. This plant is endemic to southern India and Sri Lanka. In Kerala, this species was previously recorded from the low-altitude evergreen forests of Thiruvananthapuram district. The present study gives a detailed description, distribution and figures & images illustrating the diagnostic characters of *D. sphaerocarpum* for easy identification and conservation.

**Keywords:** Conservation, endemism, laterite ecosystems, Madayippara, sacred groves.
INTRODUCTION

The genus *Discospermum* Dalzell ex Hook.f. comprises 13 species, mainly shrubs or trees, growing primarily in wet tropical biomes with native ranges from India to the Philippines (POWO 2023). In India, *Discospermum* is represented by three species, *D. sphaerocarpum* Dalzell ex Hook.f., *D. apiocarpum* Dalzell ex Hook.f., and *D. abnorme* (Korth.) S.J. Ali & Robbr. The former two species were reported in southern India and the latter one from Assam. *D. sphaerocarpum* is a medium-sized tree which grows in dry and wet tropical biomes and it is native to southern India and Sri Lanka (POWO 2023).

The genus was originally described by Dalzell in 1850 from Sri Lanka. Later, Hooker (1880) reduced the genus *Discospermum* to a section of *Diplospora*. This synonymy was widely accepted until Ali & Robbrecht (1991) revived *Discospermum*. To resolve the issue of the generic position of Asian species classified as *Tricalysia* or *Diplospora*, Ali & Robbrecht (1991) reviewed traits of *Diplospora/Tricalysia* species, and proved that the Asian species cannot be accommodated within the African genus *Tricalysia*; and *Discospermum*, which was included in the synonymy of *Diplospora* for over a century, was reinstated at generic rank. They found that the two genera differ in placentation, fruit size and fruit wall texture, the number of seeds per locale, seed shape, and exotestal cell anatomy. Using molecular techniques, Arriola et al. (2018) have shown that *Diplospora* and *Discospermum* represent separate lineages in the tribe *Coffeeae*. Molecular investigations by Tosh et al. (2009) further supported the decision to keep *Diplospora* and *Discospermum* as two distinct genera.

Another much-debated topic was the taxonomic placement of this genus. Initially, *Discospermum* was placed in the tribe *Gardeniaeae*. Robbrecht & Puff (1986) emended the circumscription of *Gardeniaeae* to include *Tricalysia* and *Diplospora*. Subsequently, Ali & Robbrecht (1991) attributed generic status to *Discospermum*, and included it in the *Gardeniaeae* subtribe *Diplosporinae*. They stated that *Discospermum* “links the Diplosporinae with the Gardeniinae and supports the rank (subtribe) given to these”. Results of the phylogenetic study by Andreasen & Bremer (2000) do not support such a relationship and they concluded that at least some genera of Diplosporinae belong to Coffeeae. In a recent study, Davis et al. (2007) expanded the circumscription of *Coffeeae* and confirmed the placement of *Discospermum* in this tribe based on plastid sequence data and morphological data set.

Previous reports of the species *Discospermum sphaerocarpum* in India were from the wet and dry evergreen forests from the coast to high altitudes (50–1,000 m) of the Western Ghats regions of Kerala, Tamil Nadu, Karnataka, Goa, and Maharashtra (Singh et al. 2015). Gamble (1921) reported the species from Courtallam of Tirunelveli (Tirunelveli) district of Tamil Nadu; later distribution record extended to Cuddalore and Villupuram districts and Coromandel coast (Narayanasami & Natesan 2020). In Kerala, *D. sphaerocarpum* was earlier reported from the low-elevation evergreen forests of Thiruvanthapuram district (Sasidharan 2004). This species now has been recorded from a totally different habitat close to seashore, the sacred groves of a Lateritic hill of Madayippara at an altitude of less than 50 m in the Kannur district (Pramod & Pradeep 2020, 2021).

During a botanical exploration of the Madayippara lateritic plateau of southern India in 2008, the authors encountered a rare Rubiaceae member in vegetative condition in two patches of vegetation associated with sacred groves. The identity of the species remained a mystery as no flowering was seen in the two populations until early January 2014, when the plant produced a few flower buds which did not open. However, after a gap of five months, following the first summer shower in May, the flowers opened. After critical studies of the specimens, they were referred to Dr. S.E. Dawson, Rubiaceae systematics, Herbarium Royal Botanic Gardens, Kew, and confirmed the identity as *Discospermum sphaerocarpum*, and commented “it is very interesting that it comes from such a different habitat” (Sally Dawson pers. comm. 13.vi.2014). The aforementioned pattern of flowering was repeated in the year 2023 as well. The present paper aims to provide a detailed taxonomy, distribution and conservation status, illustration and photographic images of *D. sphaerocarpum*, for future reference and conservation.

MATERIALS AND METHODS

The present account of the species *Discospermum sphaerocarpum* is based on two populations; one growing in a sacred grove associated with Madayikkavu Thiruvarkattu Bhagavathi temple and another one in an undisturbed patch of vegetation in a private land near Sree Chalilkkavu Bhagavathi temple (Image 1A,B). The current location is in the northernmost of Kerala, in Madayippara lateritic plateau in the Kannur district, which has a completely different habitat not far separated from the sea coast. Madayippara is one of
the most remarkable midland lateritic plateaus in Kerala (Pramod & Pradeep 2020) located in Madayi Panchayath, near Payangadi town, Kannur district, between 12.017–12.050 N and 75.233–75.267 E, at an altitude of about 50 m and extending an area of 3.65 km² on the top (Pramod & Pradeep 2021).

Madayikkavu sacred grove covers an area of about 0.4 ha (Image 1A) with a number of rare and endemic species. A population of Discospermum sphaerocarpum of seven trees with heights ranging from 5 m–15 m, and 37 saplings was recorded in this location, covering an area of about 0.0014 km² between 12.033358–12.033374 N and 75.25018–75.250185 E. The second population is about 200 m away from Madayikkavu sacred grove, in an undisturbed patch of vegetation in a private-owned land close to Chalilkavu Bhagavathi temple (Image 1B). The population consists of 11 trees ranging in height from 4–20 m, and 15 saplings, covering an area of about 0.0011 km², between 12.033386–12.03339 N and 75.250229–75.250238 E.

Plant materials were collected from the two populations available at Madayippara lateritic plateau for laboratory studies and preparation of voucher specimens. The specimens collected for laboratory studies were worked out using LEICA M80, ZEISS Stemi DV4 and LABOMED CSM2 microscopes. Photographs of the plant specimens and habitats were taken using Nikon Coolpix L110 and Olympus C-7070 cameras. The voucher specimens were prepared following wet method (Fosberg & Sachet 1965) and are deposited at the Calicut University Herbarium (CALI). The distribution status was determined from ‘Plants of the World Online’ (POWO), pertinent floras and literature; and the distribution map was created using QGIS ver. 3.28.2 (QGIS 2022).

RESULTS AND DISCUSSION

Taxonomic Treatment

Discospermum sphaerocarpum Dalzell ex Hook.f. in
**Distribution and Ecology:** The species is endemic to the Western Ghats and Sri Lanka. However, its recent reports from the Philippines (Biag & Alejandro 2021) and Bangladesh (Uddin et al. 2023) are doubtful, as its description or voucher specimens were not available for confirmation. In southern India, the species was recorded from the low altitude to high range (50–1,000 m) evergreen forests of the southern Western Ghats (Figure 1) (Gamble 1921; Singh et al. 2015). In Sri Lanka, populations were reported from the dry zone at low altitudes in secondary and rocky areas (Dassanayake 1998). The trees of the population of Discospermum sphaerocarpum present in the Madayikkavu sacred grove were seen growing associated with other species such as Aglaia elaeagnoides (A.Juss.) Bentham., Vitex altissima L.f., Canthium coromandelicum (Burm.f.) Alston, Falcocera insignis Royle, Hugonia mystax L., Tinospora sinensis (Lour.) Merr., Cissus latifolia Lam., Tabernaemontana alternifolia L., Schleichera oleosa (Lour.) Oken, Benkara malabarica (Lam.) Tirveng., Gnetonia floribunda Roxb., Glycosmis mauritiana (Lam.) Tanaka, Sapindus trifoliatus L., Diospyros candolleana Wight, Memecylon randieranum S.M.Alemda & M.R.Alemda, Strychnos nux-vomica L., Dalbergia hordia (Dennst.) Mabb. var. horrida, Alstonia scholaris (L.) R.Br., Croton caudatus Geiseler, Grewia nervosa (Lour.) Panighri and Bredelia stipularis (L.) Blume.

**Economic importance:** The berries are known as wild coffee; the drink made from the roasted and powdered seeds has a coffee flavour. In addition to
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© A,B,F–K—Pramod C.; D–E—Drisya V.V.
Figure 2. Discospermum sphaerocarpum Dalzell ex Hook.f.: A—habit | B—a node showing stipule | C—domatia on the abaxial surface of leaf | D—bract | E—bracteole | F—flower bud | G—flower | H—calyx | I—corolla split opened with attached stamens | J—anther (ventral view) | K—anther (dorsal view) | L—pistil | M—fruit | N–O—fruit with pericarp removed showing seed arrangement | P–Q—lateral section of the fruit | R—seed. Drawn by Drisya V.V., A–L from C. Pramod 138287 | M–Q from C. Pramod 138293.
this, many alkaloids, astringent, aromatic bodies, fat, sugars and mineral matter are found in seeds (Nadkarni 1976). Being a reservoir of phytochemical components, this plant is used as a potential drug for the treatment of a variety of human illnesses such as depression and diabetes, and also effective as a good antioxidant. Wood is used for making comb.

Conservation: An assessment of tropical dry evergreen forests of Tamil Nadu, recorded that *Discospermum sphaerocarpum* occupies an area of about 10 km², has around 500 mature individuals, and is declining at a rate of more than 50% due to the widespread usage of the wood for making comb. No regular flowering and seed set was observed in this species in the current location. There is a serious risk of losing the population in the second location mentioned, the habitat is on a private-owned land, and will be cleared off for construction purposes (Image 18). *Discospermum* appears to be at a lower level of evolution than *Diplospora* and *Tricalysia* due to its large, dry fruits, frequent well-developed placental extension around the seeds, and radial exotestal cell-thickenings (Ali & Robbrecht 1991). These factors necessitate urgent measures for the conservation of the species and their habitats. In vitro propagation will be useful for the conservation and sustainable utilization of this species.

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