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Additions to the Meliolaceous Fungi (Black Mildews) of Maharashtra State, India

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Abstract

Meliolaceous fungi, also referred to as black mildews, are epiphytic parasitic fungus that can be found on a variety of angiosperm hosts. Five species of meliolaceous fungi were gathered and thoroughly investigated during systematic mycological surveys carried out in the Maharashtra districts of Ratnagiri and Sindhudurg. All of the identified taxa were verified as new distributional records for the state of Maharashtra based on thorough morphological observations and comparison with standard taxonomic literature. The species documented include *Asteridiella mallotica* (W. Yamam.) Hansf. on *Mallotus philippensis* (Lam.) Müll. Arg.; *Irenopsis thespesiae* Hansf. on *Thespesia lampas* (Cav.) Dalzell & A. Gibson; *Meliola carissae* Doidge on *Carissa carandas* var. *congesta* (Wight) Bedd.; and *Meliola cissampelicola* Hansf. & Thirum. on *Diploclisia glaucescens* (Blume) Diels. These new records add to the existing knowledge of meliolaceous fungal diversity in Maharashtra and highlight the need for further exploration of foliicolous fungi in the Konkan region.

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Introduction

Black mildews are a distinct group of foliicolous fungus that develop superficial, black to dark brown colonies as epiphytic parasites on the leaf surfaces of a variety of angiosperm hosts (Hansford, 1961; Hosagoudar, 2008). These fungi are members of the Meliolaceae (G.W. Martin ex Hansf.) family, which is distinguished by globose perithecia with asci with 2–8, usually 1-4 septate ascospores, and ectophytic, brownish, appressoriate mycelium bearing phialides and setae. These features are crucial diagnostic traits in species delimitation (Hansford, 1961). The majority of meliolaceous fungi are found in tropical and subtropical areas, where their growth is encouraged by warm, humid weather.

India has a wide variety of these fungi, especially in the Western Ghats, which are known to be hotspots for global biodiversity. It is anticipated that the Konkan region of Maharashtra, which forms the northern extension of the Western Ghats and is distinguished by heavy monsoonal

rainfall, high humidity, and diverse vegetation, will support significant meliolaceous diversity; however, little is known about the fungal flora of this area. In light of this, the current study was conducted to publish new distributional data for the state and to document the existence and distribution of meliolaceous fungus in Maharashtra, with particular reference to the Konkan region.

Materials and Methods

Infected leaf specimens were collected during December 2021 from various localities of Ratnagiri district, Maharashtra. Observations on host plants, colony characters, pathogenicity, locality, altitude, and habitat were recorded in the field. Photographs of infected leaves were taken, and each collection was assigned a separate field number. Specimens were collected individually in pre-sterilized polythene bags and dried by pressing between blotting papers. After drying, the specimens were preserved in herbarium packets (22 × 27

cm) lined with butter paper. Host plants were identified using standard floras (Singh *et al.*, 2000).

Fungal colonies were mounted in lactophenol cotton blue and examined under a compound light microscope for microscopic analysis. The peeling approach was used to create semi-permanent slides for in-depth morphological investigations (Patil and Patil, 2017). By comparing morphological traits with descriptions found in standard taxonomic literature, fungal specimens were identified (Hansford, 1961; Bilgrami *et al.*, 1991; Hosagoudar, 1996; Jamaluddin *et al.*, 2004; Hosagoudar and Agarwal, 2008; Bhise, 2015). Voucher specimens with accession numbers were placed in the Institute of Mycological Herbarium, Western Ghats, along with microphotographs.

Results and Discussion:

Taxonomy

Asteridiella mallotica (Yamam.) Hansf., Sydowia 10: 49, 1957; Hosag. & Goos, Mycotaxon 42: 128, 1991; Hosag., Meliolales of India, p.96, 1996. *Irenina mallotica* Yamam., Trans. Nat. Hist. Soc. Formosa 30: 415, 1940.

Colonies epiphyllous, sub-dense, up to 4 mm in diameter, rarely confluent. Hyphae sub-straight to flexuous, branching mostly opposite at acute angles, closely to loosely reticulate, cells 14–30 × 6–9.5 µm. Appressoria alternate, antrorse, straight to curved, 21–28.5 × 9.5–12 µm; stalk cells cylindrical to cuneate, 7–9.5 × 6–7 µm; head cells globose, mostly irregularly sub-lobate, 13–18 × 9.5–12 µm. Phialides borne on separate mycelial branch, opposite to alternate, ampulliform, 15–22.5 × 5.5–8 µm. Perithecia scattered, globose, up to 130 µm in diameter; perithecial cells conoid to mammiform, up to 20 µm long; ascospores obovoidal, 4-septate, constricted at the septa, 36–42 × 15–18 µm.

Material Examined: On the living leaves of *Mallotus philippensis* (Lam.) Müll. Arg.; Family- Euphorbiaceae Juss.; Dhopeswar, Ratnagiri, Maharashtra; 16°38'57"N 73°29'59"E, elev.-106 m, 08/12/2023, PDN-5468; Rajapur, Ratnagiri, Maharashtra; 15°59'31"N 73°40'57"E, elev.-60 m, 08/12/2023, PDN-5703.

Distribution: India (Andhra Pradesh, Kerala, Maharashtra and Tamil Nadu)

Note: Hosagoudar and Agarwal (2008) described *Asteridiella malloti* (Hansf. & Thirum.) Hansf. on *Mallotus albus* (Roxb. ex Jack) Müll. Arg. (= *Mallotus paniculatus* var. *paniculatus*) from Andhra Pradesh and on *M. philippensis* from Kerala; *Asteridiella mallotica* on *Mallotus philippensis* from Kerala and Tamil Nadu. Hosagoudar (1996) described *Asteridiella resinosa* Hosag. on *Mallotus resinosa* (Blanco) Merr. from Tamil Nadu. The present collection matches with *A. mallotica*, therefore treated as the same and it differs in having epiphyllous colonies, mycelial branching mostly opposite, phialides not mixed with appressoria and sometimes borne on separate branches, perithecia and ascospores are smaller in size. The present collection is found to new record to state of Maharashtra.

Irenopsis thespesiae Hansf., Reinwardtia 3 (1): 91, 1954.

Colonies epiphyllous, thin to sub-dense up to 3 mm in diameter, confluent. Hyphae straight to flexuous, branching mostly opposite at acute to wide angles, loosely reticulate, cells 19–26.5 × 5.5–7.5 µm. Appressoria alternate, about 1% opposite, straight to curved, mostly antrorse, 13.5–17 × 5.5–9.5 µm; stalk cells cylindrical to cuneate 4–5 × 4.5–7 µm; head cells globose, entire to slightly angular, 9.5–11.5 × 5.5–9.5 µm. Phialides mixed with appressoria, alternate to

opposite, ampulliform, 15–23 × 5.5–6.5 µm. Perithecia few, scattered, up to 148 µm in diameter; perithecial setae 0–7, straight to flexuous, simple, acute to obtuse at the tip, up to 175 µm long; ascospores obovoidal, 4-septate, constricted at the septa, 32–36 × 11.5–12 µm, wall smooth.

Material Examined: On the living leaves of *Thespesia lampas* (Cav.) Dalzell & A. Gibson; Family- Malvaceae Juss.; Kankavali, Sindhudurg, Maharashtra; 16°15'39"N 73°41'59"E, elev.-75 m, 20/12/2023, PDN-5470.

Distribution: World (Java), India (Maharashtra and Tamil Nadu)

Note: Hansford (1961) described *Irenopsis thespesiae* Hansf. on *Thespesia lampas* (Cav.) Dalzell & A. Gibson from Java and Hosagoudar (1996) from Tamil Nadu. The present collection matches with this species therefore treated as the same but differs in having slightly larger perithecia; ascospores obovoidal in shape. This species is reported for the first time from Maharashtra.

Meliola carissae Doidge, Bothalia 1 (2): 72 (1922).

Colonies amphigenous, mostly epiphyllous, dense, covering all the upper surface of leaf, up to 7 mm in diameter. Hyphae straight to undulate, branching opposite to irregular at acute angles, closely reticulate, cells 13 – 28 × 6.5 – 8 µm. Appressoria alternate to 10% unilateral, straight to bent, antrorse, 17–28 × 8–12 µm; stalk cells cylindrical to cuneate, 6–11.5 × 5.5–7 µm; head cells ovate, irregularly lobate, 11–17.5 × 8–12 µm. Phialides mixed with appressoria, few, alternate, ampulliform, 15–21 × 6–8 µm. Mycelial setae scattered, simple, straight, acute at the tip up to 890 µm long. Perithecia scattered, verrucose, up to 215 µm in diam.; ascospores oblong to ellipsoidal, 4-septate, constricted at the septum, middle cell slightly large, 38–45 × 15–20 µm.

Material Examined: On the foliage of *Carissa carandas* var. *congesta* (Wight) Bedd. (= *Carissa spinarum* L.); Family- Apocynaceae Juss.; Banda, Sindhudurg, Maharashtra; 15°49'01"N 73°52'52"E, elev.-93 m, 22/12/2019, PDN-5011; Amboli, Sindhudurg, Maharashtra; 15°57'26"N 73°59'43"E, elev.-757 m, 17/12/2022, PDN-5154; Hatkhamba, Ratnagiri, Maharashtra; 17°01'13"N 73°24'56"E, elev.-189 m, 17/05/2023, PDN-5533.

Distribution: World (Gold Coast, Sierra Leone, South Africa & Uganda)

India (Karnataka, Maharashtra and Uttar Pradesh)

Note: There were five taxa described (Hansford, 1961; Hosagoudar, 1996; Hosagoudar & Sabeena, 2008) on different hosts of *Carissa* and *Parsonia* sp. from Burma, Gold Coast, India, Sierra Leone, South Africa and Uganda. The present collection matches with *Meliola carissae* Doidge (Hansford, 1961) on *Carissa* sp., from India; Hosagoudar (1996) described on *C. congesta* Wight (= *Carissa spinarum* L.) from Uttar Pradesh; on *C. arduina* Lam. from South Africa; on *C. grandiflora* (E. Mey.) A. DC., from Gold Coast and on *C. edulis* (Forssk.) Vahl from Uganda. The present collection differs only in having larger setae and slightly larger perithecia. The present collection is found to be new to Maharashtra state.

Meliola cissampelicola Hansf. & Thirum., Farlowia 3: 291, 1948; Hansf., Sydowia Beih. 2: 64, 1961; Hosag., Meliolales of India I: 166; 1996.

Colonies epiphyllous, sub-dense to thin, confluent, up to 3 mm in diameter. Hyphae straight to flexuous branching opposite at acute to wide angles, loosely to closely reticulate, cells 18–34 × 5.5–7.5 µm. Appressoria alternate, antrorse,

straight to curved, distinctly placed, $21-30 \times 8-15.5 \mu\text{m}$; stalk cells cylindrical to cuneate, $7.5-11.5 \times 6.5-7.5 \mu\text{m}$; head cells entire, ovate to oblong, globose, slightly pointed at apex, $13-19 \times 8-11.5 \mu\text{m}$. Phialides borne on separate mycelial branch, mostly opposite, only about 1% alternate, ampulliform, $16-23 \times 6-7.5 \mu\text{m}$. Mycelial setae numerous, densely scattered, slightly curved, simple, acute to obtuse at the tip up to $375 \mu\text{m}$ long. Perithecia scattered, globose, verrucose up to $185 \mu\text{m}$ in diameter; ascospores oblong, constricted at the septa, 4-septate, $34-40 \times 13-17 \mu\text{m}$.

Material Examined: On the foliage of *Diploclisia glaucescens* (Blume) Diels; Family– Menispermaceae Juss.; Jaitapur, Ratnagiri, Maharashtra; $16^{\circ}37'24''\text{N } 73^{\circ}22'17''\text{E}$, elev.–37 m, 09/12/2023, PDN–5047.

Distribution: India (Karnataka, Maharashtra)

Note: Hansford (1961) and Hosagoudar (1996) described *Meliola cissampelicola* Hansf. & Thirum., on *Cissampelos convolvulacea* Willd. From Karnataka. The present collection matches with this species therefore assigned to it and for the first time reported on new (present) host and found to be new to Maharashtra state.

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