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Short communication

Mitteriella ziziphi (Ascomycota) on *Zizyphus nummularia* from the Himachal Pradesh and its distribution extension in India

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Mitteriella, an anamorphic fungus was proposed by Sydow & Mitter (1933). The genus is characterized by short, simple, macronematous, mononematous conidiophores with polyblastic, integrated terminal, sympodial, denticulate broad conidiogenous cells and solitary, simple, ellipsoidal to limoniform, black, 0–4-septate conidia (Ellis 1971).

During the exploration of foliicolous fungi of Himachal Pradesh, a black mildew infection was noticed on *Zizyphus nummularia* (Rhamnaceae). Critical microscopic examination of the fungus identified it as *Mitteriella ziziphi*. A detailed literature survey and comparative analyses revealed that this black mildew fungus has been recorded from Uttar Pradesh, Madhya Pradesh, Kerela and Andaman Islands previously. However, no reports were found from other part of the country. Therefore, we present here a new record from Himachal Pradesh which is new addition to the mycoflora of state and distribution extension in India. The detailed taxonomic descriptions of the fungi are presented in this study.

The plant leaves showing infection with black superficial fungal colonies were collected from Berthin (District Bilaspur) of Himachal Pradesh, India. Field notes were made regarding nature of colonies, nature of infection, locality and altitude, etc. These infected leaves along with a host twigs and reproductive parts were dried between sheets of blotting paper and preserve for further studies. Host plants were identified and confirmed by matching the collections with herbarium and by consulting botanists. The specimen was deposited at Faculty of Agriculture, Abhilashi University Mandi (AUMH), Himachal Pradesh, India for further reference.

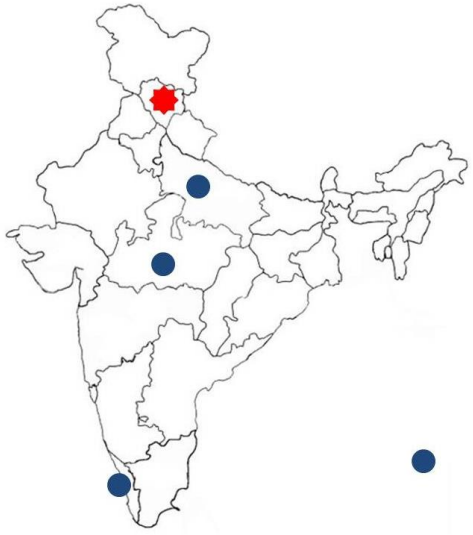

Figure 1. Map of India showing distribution of *M. ziziphina* in various states and its distribution extension. (*Blue colour denotes existing reports; red colour denotes new addition to the mycoflora of Himachal Pradesh and distribution extension in India*)

The morphological examination of colonies was carried out with the help of hand lenses for colour and texture. In the laboratory, the Nail polish technique was used to study the micro-morphological characters of the

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fungi. Black colonies were scraped directly from infected host, mounted in 5% KOH solution and then replaced by lactophenol to make the septa visible (Hosagoudar & Kapoor 1984). The microscopic observations were made under oil immersion by standard light microscopy to note down characters of appressoriate mycelium, conidiophores, conidia, thyriothecia, ascus and ascospores used to identify species. Camera Lucida drawings were also prepared to support the final confirmation of fungi.

The black mildew fungus was collected on aerial parts of infected plants during the course of mycological survey. The infection was found more during or after severe spell of cold and least on shady side as compare to sunny side of the bush. Description and illustrations of the fungi along with a discussion on its taxonomy is presented as here. Distribution of *M. ziziphina* in various states of India along with its distribution extension is also provided in figure 1.

Mitteriella ziziphina Sydow, Ann. Mycol. 31(1/2): 95, 1933. **(Figs. 2–3)**

Colonies black, amphigenous, mostly epiphyllous, without spots, at first minute, then more or less effuse, becoming confluent and occupying a major part of leaf or the entire leaf, stem and even fruits; if hyphophyllous thin, scattered, up to 2 mm in diameter, found on the margin or close to the veins. Hyphae straight to substraight, branching opposite to alternate at acute angles, loosely reticulate, cells 8–35 × 4–7 µm. Appressoria unicellular, globose, ovate, entire, alternate, unilateral, rarely arranged closely to form bicellular, 7–11 × 7.7–11 µm. Conidiophores produced lateral to the hyphae, micronematous, mononematous, 14.5–82 × 6–8 µm, 2–3 septate; conidia ellipsoidal, ovateellipsoidal, gradually but distinctly narrowing towards both ends, at first continuous, 2–4 septate by dividing the spore into unequal cells, dark to opaque brown, smooth, thick walled, 23–35 × 15–19 µm.

Material examined: India, Himachal Pradesh, Berthin (Distt. Bilaspur), 673 meters (2,208 ft), on leaves of *Ziziphus nummularia* (Rhamnaceae), October - December 2015, coll. Ajay K. Gautam.

Figure 2. Black mildew infection on leaves of *Ziziphus nummularia*.

Mitteriella is a hyphomyceteous fungi of family Dothideomycetes. It is among one of the four hyphomycetous asexual states of *Schiffnerula* (Hosagoudar 2003). It is widely distributed worldwide including; India, Pakistan, Sudan, Uganda, Zanbia (Ellis, 1971). In India, *Mitteriella* was reported only on different *Ziziphus* species. It was reported as both anamorphic and telomorphic forms. *Mitteriella ziziphina* is the

anamorphic state of *Schiffnerula ziziphi*. Previously, this fungus has been found on *Ziziphus jujuba*, *Z. anoplia*, Z. *latifolia*, *Z. nummularia*, *Z. xylopyrus*, from various localities of Uttar Pradesh, Madhya Pradesh, Kerela and Andaman Islands (Tandon 1935, Sahni 1966, Hosagoudar 2011, Hosagoudar *et al.* 2011). A detailed distribution of the *M. ziziphina* is depicted in figure 3. Some species of *Schiffnerula* produced *Questieriella* or *Mitteriella* alone, or no asexual morphs (Hughes 1983).

Himachal Pradesh is a north Indian hilly state with variable environmental conditions. We observed that the state shows extreme winters with dense fog which may be most favorable weather for growth and development of *Mitteriella ziziphina*. However, this black mildew has been reported from various parts of India; but no report is available from Himachal Pradesh. Therefore, we present here a new record from Himachal Pradesh which is new addition to mycoflora of state and distribution extension in India.

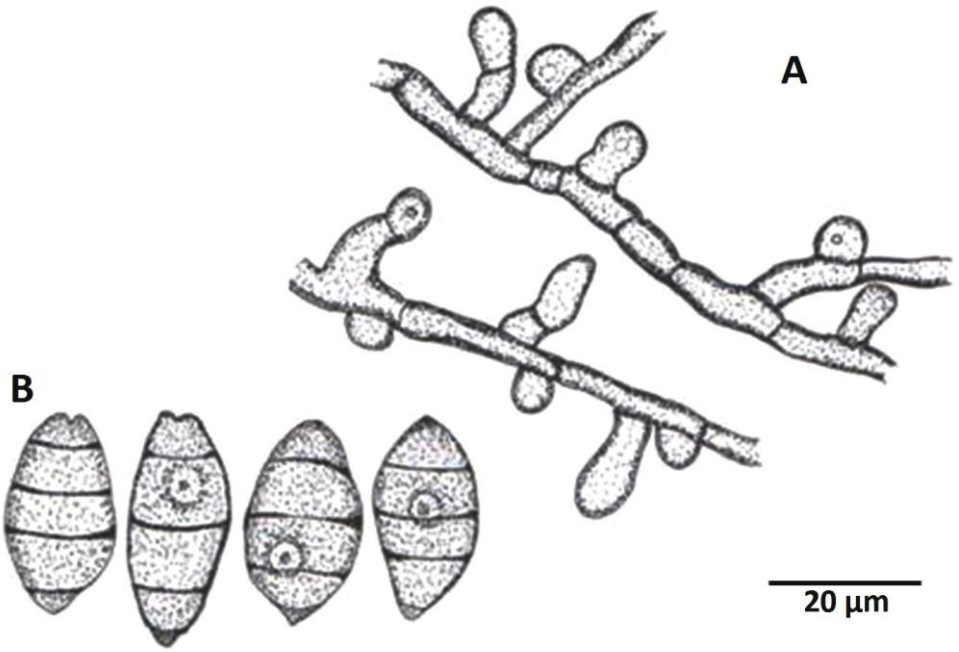

Figure 3. *Mitteriella ziziphina*: A, Branched appressoriate mycelium; **B,** conidia.

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