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A PUTATIVE DERMATOPHYTE-LIKE MACROCONIDIUM ON *ACERENTOMON ITALICUM* (HEXAPODA: PROTURA)

MIRCA ZOTTI[1], BRENDON E. BOUDINOT[2], LORIS GALLI[1]

[1] Department of Earth Environment and Life Sciences (DISTAV), University of Genova, Genova, Italy
[2] Senckenberg Forschungsinstitut & Naturmuseum Frankfurt, Germany

*Correspondence: loris.galli@unige.it

ABSTRACT

A putative dermatophyte-like macroconidium was observed adhering to the prothoracic tarsus of a female *Acerentomon italicum* specimen extracted from a soil sample collected in Alessandria Province (Piedmont, northwestern Italy). The morphology and position of the propagule are described, and the finding is discussed in relation to the known association of Protura with soil fungi. Because the specimen was detected on a permanent slide and no culture or molecular identification was possible, its attribution to a dermatophyte must be regarded as provisional. The observation nevertheless raises the hypothesis that Protura may occasionally carry fungal propagules on their cuticle.

KEY-WORDS: chitinous cuticle, fungal propagules, mechanical transport, Acerentomidae, keratinophilic fungi, Northwestern Italy.

SHORT NOTE

Dermatophytes are keratinophilic filamentous fungi belonging to the Arthrodermataceae (Onygenales). They are traditionally grouped according to their principal ecological niche as anthropophilic, zoophilic or geophilic. The geophilic species occur primarily in soil, where they develop as saprotrophs on keratin-rich animal remains and may occasionally infect humans or other animals after contact with contaminated substrates (Guerra et al., 2012; de Hoog et al., 2017). Recent evolutionary and genomic studies indicate that these ecological categories are not entirely discrete, but reflect different degrees of adaptation from soil-associated saprotrophy to the colonization of keratinized tissues in animal and human hosts; comparative genomic data are also providing new characters for resolving the still-complex taxonomy and species boundaries of dermatophytes (Kabtani & Ranque, 2023; Tang et al., 2024). *Nannizzia gypsea* (Nann.) Stockdale is among the best-known geophilic dermatophytes, but several other dermatophytes and non-dermatophytic keratinophilic fungi may occur in soils. Macroconidial morphology is an important diagnostic character; however, reliable identification normally requires observation of a fungal culture and, increasingly, molecular data. Because morphological characters alone may not permit reliable species-level identification, dermatophyte taxonomy increasingly relies on multilocus and genomic approaches (de Hoog et al., 2017; Kabtani & Ranque, 2023). Consequently, an isolated conidium observed on an arthropod cannot be assigned confidently to a genus or species solely from its appearance (de Hoog et al., 2017).

Soil microarthropods interact closely with fungi through grazing, ingestion and contact with hyphae and propagules (Wardle, 2002; Friberg et al., 2005; Culliney, 2013; Vašutová, 2019). Some species of heterostigmatid mites (e.g. Tarsonemidae and Siteroptidae) are endowed with sporothecae. These are highly specialized pockets used to gather, protect, and transport spores of the fungi on which they depend for their survival as they are obligate fungivores (Lindquist, 1985; Jagersbacher-Baumann & Ebermann, 2012). Studies on Collembola have shown that diverse fungi may occur on the body surface and in the gut and that these arthropods can contribute to the redistribution of fungal propagules in soil (Seres et al., 2007; Anslan et al., 2018; Innocenti & Sabatini, 2018). Comparable evidence is not currently available for Protura.

Protura are minute soil-dwelling hexapods whose ecology remains incompletely understood. Available evidence indicates that at least some species feed selectively on fungal hyphae, including ectomycorrhizal fungi, by sucking the hyphal cytoplasm (Galli et al., 2019a,b; Bluhm et al., 2019). This trophic relationship makes occasional contact between their cuticle and fungal propagules biologically plausible. During the examination of more than one hundred proturans extracted with Berlese-Tullgren funnels from soil samples collected in Piedmont (northwestern Italy) and mounted on permanent slides, a multiseptate, fusiform conidium was observed adhering to the prothoracic tarsus of one specimen (Figure 1). The proturan carrying the conidium was a female of *Acerentomon italicum* Nosek, 1969, a common and widespread Italian species that has previously been investigated in detail (Galli et al., 2016, 2021). The specimen originated from the surroundings of San Cristoforo, in the Lemme riverbed, Alessandria Province (175 m a.s.l.; 2nd April 2025; S. Zoia leg.).

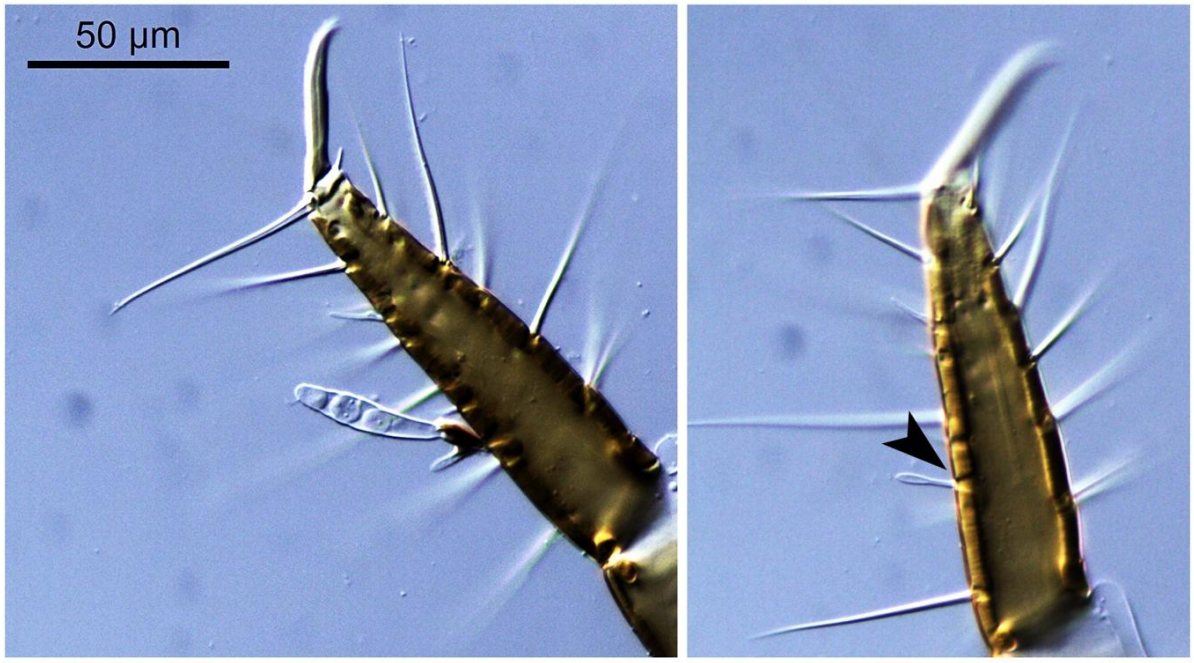

Figure 1. Putative dermatophyte-like macroconidium adhering to the prothoracic tarsus of a female *Acerentomon italicum* (left). The arrow indicates the corresponding position at the base of sensillum t1 on the opposite foretarsus of the same individual (right). Scale bar = 50 µm.

To our knowledge, this is the first published observation of a dermatophyte-like macroconidium attached to a proturan, and no comparable structure has been noticed among the several thousand specimens examined by the second author. Nevertheless, the interpretation must remain cautious. The conidium was observed only after slide preparation, so accidental contamination during sampling, extraction or mounting cannot be excluded. Furthermore, since it was not possible to cultivate and identify the fungus through DNA analysis, it cannot be confirmed that it is a dermatophyte. The finding therefore does not demonstrate that Protura are vectors of dermatophytes. It provides, instead, a preliminary record consistent with the possibility that these soil hexapods may occasionally act as passive carriers of fungal propagules over very short distances. However, given that this type of phenomenon is undescribed in Protura literature, and considering the limited knowledge of their ecology, this observation is nevertheless noteworthy and deserves further investigation. Targeted studies using freshly collected individuals, surface washing, cultivation, microscopy and metabarcoding would be required to test the frequency, taxonomic identity and ecological significance of such associations.

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