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FIRST RECORD OF *TRICHIA PAPILLATA* ADAMONYTĖ (MYXOMYCETES) IN RUSSIA

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Abstract

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During the study on myxomycete species diversity in Bitsevsky Park (Moscow), a new to Russia species *Trichia papillata* Adamonytė was recorded. It is characterized by stipitate sporangia on well-defined striated stalks. Dehiscence by 6–8 well-defined small peridial plates. The main feature of the species is conspicuous dark warts on the peridium, composed of granular material. The warts are located in the centre of most peridium plates. The paper presents data on the ecological features and distribution of this species as well as iconography and illustrations of morphology, obtained using light and scanning electron microscopy.

Keywords: biodiversity, ecology, Moscow, Myxogastria, rare species, SEM.

INTRODUCTION

Myxomycetes are a relatively small group of soil protozoans belonging to Amoebozoa (Adl et al., 2019). It is believed that most morphospecies of myxomycetes are very widespread (Schnittler et al., 2017), but some of them are found only in certain climatic zones. In recent decades, quite a lot of new morphospecies have been described. Many of those have a wide heterogeneous yet disjunct distribution range. In addition, such species are not found anywhere abundantly. So far, local endemicity has not been reported for myxomycetes, and even surveys on remote islands have not revealed endemic taxa at the morphospecies level, but regional endemicity may occur in some species (Schnittler et al., 2017). We can suggest that these species are not found in other territories not only due to their biological features, but also as a result of insufficient studies of these areas. Thus, due to the lack of data on the distribution of certain species of myxomycetes, it is often impossible to conclude that they are endemic or cosmopolitan.

Another important aspect that should be considered during the study of rare species is difficulty in determining their ecological amplitude. Although many myxomycetes are able to exist under a very wide range of conditions, some belong to highly specialized ecological groups (Novozhilov et al., 2017b), for example, nivicolous (occurring along the margins of melting snowbanks) and coprophilous species (sporulating on the dung of herbivorous animals). Nivicolous myxomycetes are a very highly specialized group. However, there are some species among them that occur not only on the edge of melting snow, but also on other substrates throughout the year, e.g. *Didymium difforme* (Pers.) Gray (Poulain et al., 2011).

Coprophilous myxomycetes are a less specialized group. It has been shown that most of them can occur on other substrates in addition to the dung (for example, bark or leaf litter). Thus, there are probably no strictly obligate coprophilous species of myxomycetes (Eliasson, 2013).

Among more than 114 currently described coprophilous species of myxomycetes, only three (*Li-*

cea alexopouli M.Blackw., *Kelleromyxa fimicola* (Dearn. et Bisby) Eliasson and *Trichia brunnea* J.J.Cox) have been found exclusively on the dung of herbivorous animals. Remarkably, all these species are characterized by thick-walled spores, which probably is an adaptation for passage through the gastrointestinal tract of animals (Eliasson & Keller, 1999; Eliasson, 2013). For other myxomycetes described as coprophilous, colonization of dung is likely secondary (i.e. they do not pass through the digestive system of animals), as they can also be found on other types of substrates (Eliasson, 2013).

One of such species is *Trichia papillata* Adamonytė. This species was described in Lithuania in 2003 (Adamonytė, 2003). Fruiting bodies formed during cultivation in moist chambers on the hare (*Lepus* sp.) and roe deer (*Capreolus capreolus*) dung. Information about finding of *T. papillata* in Taiwan was published in 2007 (Liu et al., 2007). In that study, one specimen was collected in Wenshan Botanical Gardens of National Taiwan University, and two more were obtained in moist chamber cultures on the 43rd and 74th day of incubation. In both cases, fruiting bodies formed on leaf litter and small twigs (Liu et al., 2007).

MATERIALS AND METHODS

In 2017, we collected leaf litter in spruce forest with deciduous undergrowth in the Bitsevsky Forest Park (Moscow, Russia). The substrates were incubated during 90 days using the moist chamber technique according to the standard protocol (Wrigley de Basanta & Estrada-Torres, 2017). Scanning electron micrographs were obtained with a Camscan-S2 (Cambridge Instruments), using sputter-coating with gold-palladium.

Species and specimens

Trichia papillata Adamonytė

Specimen examined: Russia, Moscow, northern part of Bitsevsky Forest Park, near the horse training centre "Bitsa", 55°38.381′ N, 37°33.671′ E. The area is characterized by woody and shrubby vegetation of *Picea abies* (L.) H.Karst., *Sorbus aucuparia* L., *Corylus avellana* L. Material was collected on 4 May 2017. Specimen was developed in moist chamber culture on coniferous litter (MYX 10505).

Specimen description. Sporocarps: stalked sporangia, 0.8–1.3 mm high, obpyriform or almost spherical, scattered or in small loose groups, reddish-brown to black-brown; the diameter of the sporangium is 0.25–0.6 mm (Fig. 1). Peridium double: the inner layer is membranous, thin and yellowish in transmitted light; the outer layer is composed of deposits of dark granular material (Fig. 2B–D). Peridium dehisces in the upper part of the sporangium and splits into a large number of individual platelets, leaving a shallow cup at the base of sporangium (no more than 1/4 of the total height of fruiting body). Each peridial plate is translucent on the edges due to the absence of granular material, and is dark reddish-brown in the central part; the width of the colourless peridium fragment is about 10–15 μm. A distinctive dark papillary growth is formed in the central part of most large peridial plates; as a result, the whole sporangia resemble a mace in appearance. The hypothallus is inconspicuous, dark reddish-brown, forms a small ring around the base of the stalk. Stalk is up to 0.6 mm long, which is from 1/3 to 1/2 of the total sporocarp height, reddish-brown to almost black when mature; widened at the base and in the upper part, gradually turning into sporangia. In some cases, the stalks of two or three adjacent sporangia can merge with each other. Capillitium consists of

Fig. 1. Sporocarps of *Trichia papillata* (MYX 10505). Scale bar: 0.5 mm

yellow-brown tubular threads, 3.0–3.5 μm in diameter, ornamented with 3–5 spiral bands, with occasional bubbles up to 8–10 μm in diameter (Fig. 2A). Small warts are only visible on the surface of the spiral bands under SEM (Fig. 2F). Spores are light yellow in mass; brighter in transmitted light, globose

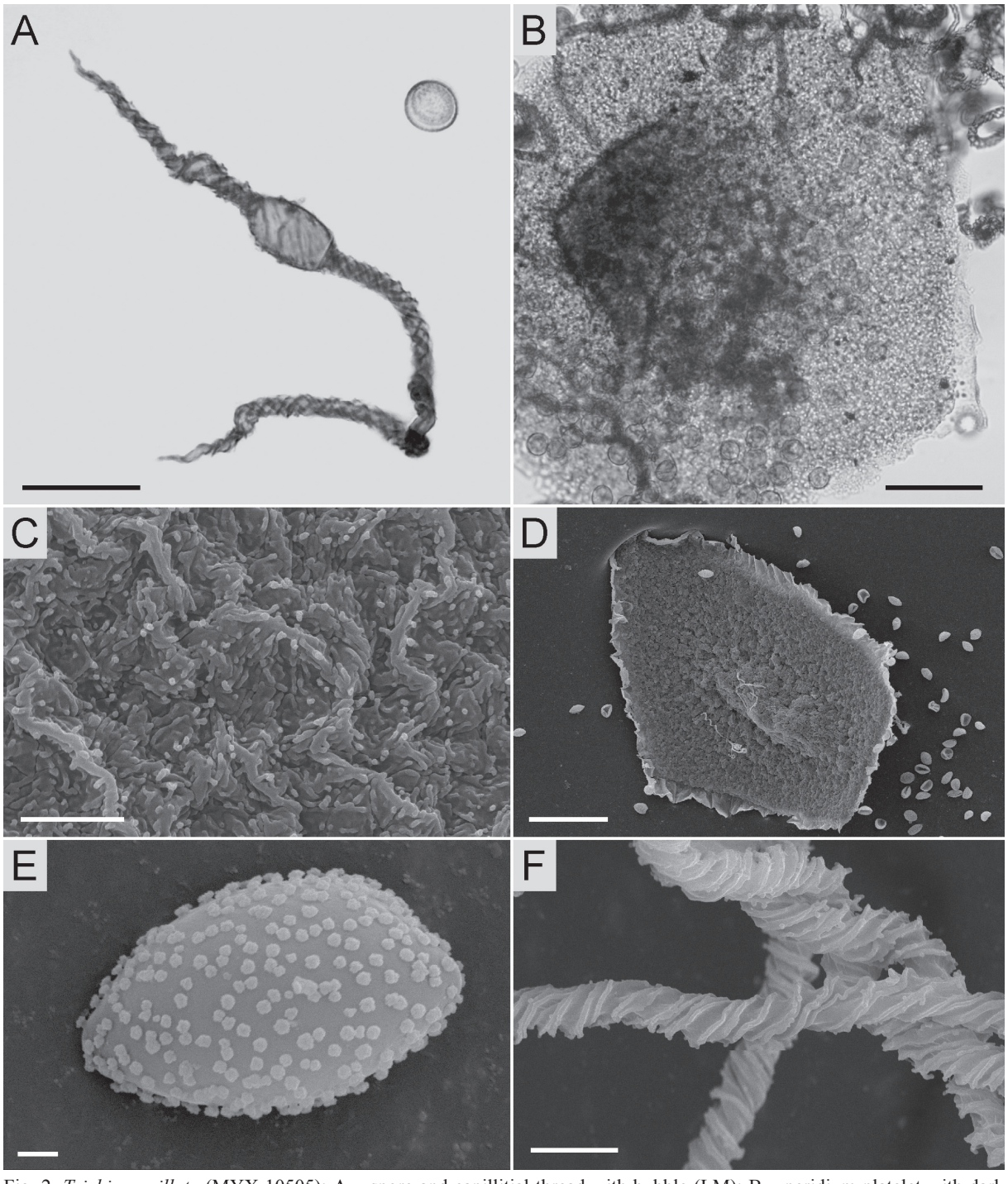

Fig. 2. *Trichia papillata* (MYX 10505): A – spore and capillitial thread with bubble (LM); B – peridium platelet with dark papillary growth (LM); C – details of the peridium inner surface (SEM); D – peridium outer surface (SEM); E – sapore (SEM); F – capillitium (SEM). Scale bars: A = 20 μm, B = 40 μm, C = 5 μm, D = 50 μm, E = 1 μm, F = 5 μm

or oval, 7.5–9.5 µm in diameter, ornamented with small warts (Fig. 2E). Under SEM, it is noticeable that the tops of the warts are significantly widened and sometimes merged with each other. Plasmodium is yellow.

Type locality: Lithuania, Dzūkija National Park, on roe deer dung, 54°07′ N, 24°19′ E (BILAS 23671).

Distribution. Lithuania (Adamonytė, 2003); Taiwan (Liu et al., 2007); Vietnam (Novozhilov et al., 2017a); Russia.

Illustrations. Adamonytė, 2003 (Fig. 1); Liu et al., 2007 (Fig. 3); Poulain et al., 2011 (Pl. 148).

Notes. Using light microscopy, our specimen appeared completely consistent with original description. However, using SEM, it was noticeable that the capillitial threads were ornamented with more loosely arranged warts compared to Fig. 1, D–G in the original work (Adamonytė, 2003). Nevertheless, we considered these differences to be insignificant.

This is the only species of the genus *Trichia* that is characterized by the dark papillary wart-like outgrowths on the surface of the sporangia. Another fairly close species, *Hemitrichia pardina* (Minakata) Ing, also has similar structures, but its peridium does not break up into separate plates, and the opening of the sporangium occurs as a result of the formation of gaps in the membranous layer, not straight slits. In addition, *H. pardina* as well as other species of the genus *Hemitrichia*, has a closed network of capillitium with almost no free endings. Moreover, the spiral bands of *H. pardina* are less conspicuous than in *T. papillata*, and spiny outgrowths are usually well visible on their surface. Also, the spores of *H. pardina* are slightly larger (9–11 µm versus 7.5–9 µm in *T. papillata*).

It is interesting that *Trichia papillata* has been originally described as a coprophilous species (Adamonytė, 2003), while in other collections, it has fruiting bodies on plant litter (Liu et al., 2007; Novozhilov et al., 2017a) and wood (Novozhilov et al., 2017a). Moreover, unlike obligate coprophiles (for example, *T. brunnea*), *T. papillata* has a thinner spore wall. Based on this, it can be assumed that *T. papillata* is not a truly coprophilous species and has wider ecological amplitude. Hence, dung is acceptable, but not the only suitable substrate for the species.

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PIRMA *TRICHIA PAPILLATA* ADAMONYTĖ (GLEIVŪNAI) RADAVIETĖ RUSIJOJE

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Santrauka

Tiriant gleivūnų įvairovę Bicevo parke (Maskva) buvo rasta nauja Rusijai rūšis *Trichia papillata* Adamonytė. Jai būdingos kotuotos sporangės su gerai išreikštais vagotais koteliais ir peridis, sutrūkinėjantis į 6–8 gerai išreikštas plokšteles. Svarbiausias rūšies požymis yra ryškios, tamsios peridžio karputės, sudarytos iš grūdėtos medžiagos. Karputės susiformuoja daugumos peridžio plokštelių centre. Straipsnyje pateikiami duomenys apie *T. papillata* ekologiją ir paplitimą, taip pat ir šviesiniu bei skenuojančiu elektroniniu mikroskopu gauta ikonografinė medžiaga, papildanti duomenis apie rūšies morfologiją.