Melanustilospora ari (Cooke) Denchev (Fungi, Urocystidales), a rare species new to Belgium

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Abstract. *Melanustilospora ari* (Cooke) Denchev, a parasitic fungus growing on *Arum maculatum*, has been observed in Belgium for the first time. Macro- and microscopic characters of the collection are described and illustrated. Various comments on the species are given.

Key words. *Melanustilospora ari*, *Arum maculatum*, Urocystidales, smut fungi, Belgium.

1. Introduction

In April 2022, during a field prospection she made in Kelmis (= La Calamine, Eastern Belgium) together with Eddie Lavreys, in the valley of the river Göhl (= Gueule), one of us (CVS) collected a parasitic fungus on leaves and petioles of *Arum maculatum* L. She identified the fungus as *Melanustilospora ari* (Cooke) Denchev (Urocystidales, smut fungi). The species is not included in the check-list published by Vanderweyen & Fraiture (2014) and appeared to be new for the Belgian mycoflora. The collection is described and illustrated hereafter and some comments are made on this interesting species.

2. Material and methods

Infected plants are not easy to spot in the field. An additional difficulty is that the leaves of healthy plants often show black spots, sunken or not, whose presence is a natural character of the species. Such spots are sometimes mistaken for the development of *M. ari* (Klenke & Scholler 2015). In 2019 the first author contacted Julia Kruse to obtain additional information on how to recognize the infection. Kruse shared with us her findings of the symptoms of infected plants, based on her observations of the species in Germany. This helped us to finally discover, after 5 years of research, a small group of infected plants growing on a slope near the river Gueule. The infection was inconspicuous, with the leaf surface slightly deformed and violet to yellowish leafspots visible on the upper side. The presence of black spore masses in the leaf tissue was observed holding the leaf against the light.

Spore morphology was studied using a Bresser Science TFM-301 light microscope and a Leitz Ortholux. Pieces of the sori, spore masses embedded in the leaf tissue, were mounted in distilled water.

We followed the website of Plants of the World online for the nomenclature and synonymy of the host-plants. Scientific names of plants and fungi are complying with the ICBN rules (Turland et al. 2018). A herbarium specimen of the species has been deposited at BR (Meise Botanic Garden, Belgium). Photographic illustrations were taken with a Canon Ixus 160 (photos in situ) and a Canon Ixus 175 camera by Carina Van Steenwinkel.

3. Results

3.1. Studied collection

Belgium, prov. Liège, Kelmis (= La Calamine), valley of the river Göhl (= Gueule), IFBL F8.13.13, on leaves and petioles of *Arum maculatum* growing on a slope next to the river, April 17th 2022, leg. and det. C. Van Steenwinkel, herb. CVS/2022/03 (BR5020224868731V).

3.2. Description of the collection

Sori present on the leaves and petioles of *Arum maculatum* (Fig. 1). Surface of infected leaves flat to slightly bulged. Leafspots on the upper side violet to yellowish, turning dull beige in advanced stage, light grey to lead grey at the lower side, relatively extensive, often in elongated rows. Spore masses visible in transparency as black spots, embedded in the leaf tissue and covered with epidermis (Fig. 2). Teliospores (Fig. 3) globose, ovoid to angular, 14.0-16.7-21.7 x 12.0-14.5-16.5 µm (n=40), yellow brown to olive brown, with a very thick and two layered wall, the inner layer (endospore) 1.0-1.5 µm thick, the outer layer (exospore) light colored and of unequal thickness, 0.5-3.5 µm. The wall of many spores shows one or more perforations, originating from the endospore. They can be considered as germ pores even if no germination was observed on our sample.

4. Comments on the species and discussion

Melanustilospora ari (Cooke) Denchev, *Mycotaxon* 87: 476 (2003)

Basionym: *Protomyces ari* Cooke, *Grevillea* 1 (1): 7 (1872).

Synonyms:

≡ *Melanotaenium ari* (Cooke) Lagerh., *Bull. Soc. mycol. Fr.* 15: 98 (1899).

? = *Melanustilospora arisari* (Peglion) Denchev, *Mycotaxon* 87: 476 (2003); *Melanotaenium arisari* (Peglion) Cif., *Bull. Soc. bot. ital.* 1924 (2): 57 (1924); *Melanotaenium plumbeum* f. *arisari* Peglion, *Malpighia* 8: 425 (1894).

Anamorph: ? *Entylomella aricola* (Zambett.) U. Braun, Monogr. Cercosporella, Ramularia and allied genera (Phytopath. Hyphom. 1): 250 (1995); *Ovularia aricola* Zambett. [as *'ariicola'*], *Revue Mycol., Paris* 21 (2/3): 180 (1956).

The position of the species in the taxonomy has varied considerably over time. It has been first described under the name *Protomyces ari* (Ascomycetes) by Cooke (1872) and subsequently transferred to *Melanotaenium* (Basidiomycetes, Ustilaginales) by Lagerheim (1899). More recently, it turned out that, due to morphological and ultrastructural differences especially in the septal pore, *Melanotaenium ari* was not a true *Melanotaenium* (Ustilaginales) but rather belonged to the Urocystaceae (Urocystales) (Zwetko & Blanz 2004). Since they could not be placed in any of the genera of this latter family, Denchev (2003) created the genus *Melanustilospora* to accommodate *M. ari* and *M. arisari*.

One can note incidentally that the names Urocystidales and Urocystidaceae are often used despite the fact that they have been published as Urocystales (Bauer et al. 1997: 1311) and Urocystaceae (Begerow et al. 1998: 2052) and that this original spelling is in accordance with the rules of ICBN Art. 18.1 (Turland et al. 2018).

Two decades after Cooke's description, Peglion (1894) described a similar parasite, on *Arisarum proboscideum* (L.) Savi, under the name *Melanotaenium plumbeum* f. *arisari*. The correct name of the taxon is now *Melanustilospora arisari*. The species is known only from the type locality (Avellino, Italy). As Vanky (2012) pointed out, a critical study of the type specimen is needed. The taxon could be a synonym of *M. ari* but a doubt is remaining due to some differences, mainly in teliospore size (*M. ari*: 12-20 µm long ; *M. arisari*: 20-26 µm long), and it is provisionally kept as a separate species by several authors.

The description of *Protomyces ari* by Cooke (1872) only mentions the globose teliospores. More than 80 years later Zambettakis (1956) described, on leaves of *Arum maculatum* and *A. italicum* in France, what seems at first sight a completely different species, producing elongated "spores" (conidia?) (9.0-11.5 x 3.0-3.5 µm). Zambettakis names it *Ovularia aricola* (Mycosphaerellales, Ascomycota).

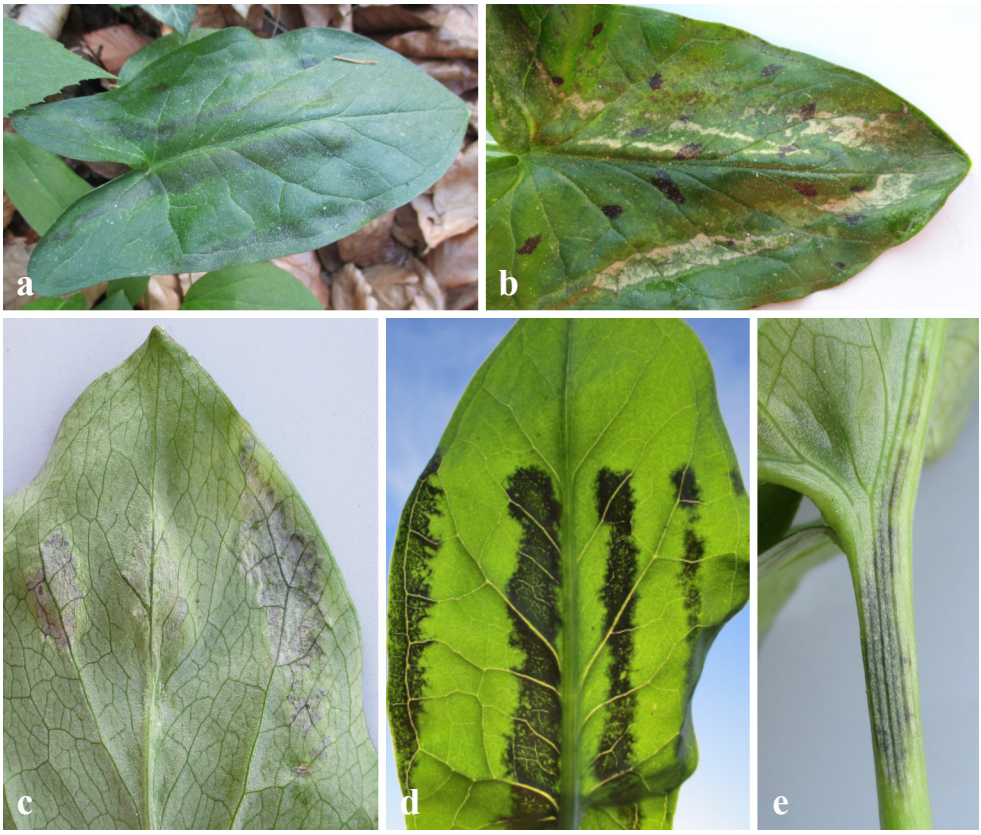


Fig. 1. *Melanustilospora ari* on *Arum maculatum* leaves, a: leafspots on the upper side of the leaf; b: advanced stage (the small black spots are part of the natural coloration of the leaf), c. lower side of a leaf, d. spore masses visible by transparency, e. spore masses in a petiole.



Fig. 2. *Melanustilospora ari*, spore masses embedded in the underside of the leaf (the epidermis covering them has been removed).



Fig. 3. *Melanustilospora ari*, teliospores (scale bar = 10 µm). The arrow points to the spore which has been enlarged to show the germ pores.

He describes the development of the infection, which forms circular oil yellow spots on the *Arum* leaves. He also observes that bacteria always grow in the spots but only after the fungus has developed. Later on, Braun (1995) revised the species and transferred it to *Entylomella* (*E. aricola*, Exobasidiomycetes). He considers it to be the anamorph of *Melanustilospora*, and he specifies that "the connection between *E. aricola* and *Melanotaenium ari* has not experimentally been proven, but there is little doubt" (Braun 1995: 250).

Phenology: The species appears in spring (April-May).

Host-plants: *Melanustilospora ari* has been observed on various species of Araceae, almost always belonging to the genus *Arum*: *Arum besserianum* Schott, *A. cylindraceum* Gasp. (syn. *A. alpinum* Schott & Kotschy and *A. orientale* subsp. *danicum* (Prime) Prime), *A. italicum* Mill., *A. jacquemontii* Blume, *A. maculatum* L., *A. orientale* M. Bieb. (syn. *A. elongatum* Steven). A very small number of mentions on *Biarum tenuifolium* (L.) Schott.

Distribution: Almost all records of the species are from Europe: Austria, Belgium (this note), Czech Republic, Denmark, France, Germany, Hungary, Italy, Netherlands (still to be confirmed fide Aad Termorshuizen, pers. comm.), Poland, Romania, Russia (North Ossetia), Spain, Switzerland, United Kingdom, and Ukraine. There are also rare mentions from Israel (Savchenko et al. 2015) and from Pakistan (Dima 2021: 273).

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