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SHORT COMMUNICATION in PLANT PATHOLOGY

The Third Report of *Colletotrichum japonicum* Worldwide

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Abstract

This paper reports the first finding of *Colletotrichum japonicum* (Hemmi) Bedlan on *Berberis aquifolium* Pursh [= *Mahonia aquifolium* (Pursh) Nutt.] in Poland. The fungus was collected in the Botanical Garden of Maria Curie-Skłodowska University (UMCS) in Lublin. This is the second locality of the species in Europe and the third worldwide. In this paper, morphological characteristics, microphotographs, and distribution comments are provided.

Keywords

anthracnose; coelomycetous anamorphs; distribution; microfungi; Oregon grape

1. Introduction

Colletotrichum is traditionally recognized as an asexual genus of fungi, with a number of species linked to sexual morphs assigned to the *Glomerella* genus (Sordariomycetes, Glomerellaceae, Ascomycota). Over the years, *Colletotrichum* species were considered to be host specific, which led to the description of a large number of taxa (Cannon et al., 2012; Sharma & Shenoy, 2016). Species from this genus are economically one of the most important fungi, and cause anthracnose and other diseases in a wide range of plant species (Cai et al., 2009; Hyde et al., 2009; Sutton, 1980).

The comprehensive monographic study conducted by von Arx (1957) based on morphological characteristics with little emphasis placed on pathological features led to drastic reduction from approximately 750 to 11 species. Molecular studies of *Colletotrichum* species, which have become an integrated element in taxonomic research, have been developing intensively since the end of the twentieth century. The first applications of DNA sequence data to distinguish between species within this genus used the internal transcribed spacer (ITS1) region of nrDNA. Later, multilocus analyses became a common approach based on the use of ITS2 and large ribosomal subunit (LSU) as well as partial sequences of genes encoding, e.g., histone H3 (HIS), translation elongation factor 1 alpha (TEF-1 α), tubulin beta chain (TUB), and actin (ACT) (Cannon et al., 2012). Scientists working on *Colletotrichum* do not agree on the taxonomic approach and characters that should be employed to identify and describe a new *Colletotrichum* species. Hence, a reliable secondary barcode marker is indispensable for the accurate identification of *Colletotrichum* species (Sharma & Shenoy, 2016).

Identification of *Colletotrichum* species based on morphology has always been problematic; therefore, the current progress in molecular phylogenetic methods facilitates identification of stable and well-separated clades within *Colletotrichum*. However, the taxonomy of this genus is still unsatisfactory and there is a need for a polyphasic approach for identification, which reflects the natural classification of species and subspecific taxa within the genus (Cai et al., 2009).

Berberis aquifolium (Berberidaceae) is a plant native to western North America. This species was introduced to Europe as an ornamental plant in the 1820s.

Table 1 Features of *Colletotrichum* species reported to be associated with *Berberis aquifolium* leaves.

	<i>C. fiorinae</i> (Marcelino & Gouli) Pennycook	<i>C. japonicum</i> (Hemmi) Bedlan	<i>C. mahoniae</i> Fabric.	<i>C. nymphaeae</i> (Pass.) Aa
Leaf spots	Up to 10 mm Irregularly circular Brown, with a margin, surrounded by a chloric halo	1–5 mm Mostly irregularly shaped First greyish-brown, finally grey	1–1.5 mm Rounded Grey	0.5–5 mm Roundish Pale brownish, greyish-brown with a dark reddish-brown to purplish-brown margin, later dark brown to black
Conidia	9.9–14 × 3–4.3 μm*	10.65–16.83 × 5.08–7.51 μm Mostly ellipsoidal, short cylindrical or ovoid Ends rounded	12–12.5 × 4.5–5 μm Cylindrical Hyaline, two-punctated or granulated	11.8–23 × 4.2–5.6 μm Ellipsoidal or cylindrical Rounded at the apex, attenuated, occasionally truncate at the base
Setae	No data	Very few	If present then occur abundantly, with swelled basis	Not formed
References	Garibaldi et al., 2020	Bedlan, 2012	Fabricatore, 1950	van der Aa, 1978

* Measurements based on in vitro cultures.

At present, it grows in many parts of Europe (Sorokopudov et al., 2017). It was introduced in Poland in 1839, and the status of this species has changed from a crop plant to a locally established and invasive species (Tokarska-Guzik et al., 2012).

According to *A preliminary checklist of micromycetes in Poland*, 23 *Colletotrichum* species were reported in Poland up until 2008 (Mułenko et al., 2008), while 26 species are currently known (Farr & Rossman, 2020; Jayawardena et al., 2016; Okorski et al., 2018; Pszczółkowska et al., 2016, 2017). The present paper provides information about a new *Colletotrichum* species for Polish flora (*C. japonicum* on *B. aquifolium*); it also reports the second locality of the fungus in Europe and third worldwide.

2. Material and Methods

The infected leaves of *B. aquifolium* were collected in the Botanical Garden of Maria Curie-Skłodowska University (UMCS) in Lublin in 2018. The material sample was stained with cotton blue in lactic acid and gently heated. Observations were made using an Olympus SZX10 stereoscopic microscope and an Olympus CX31 light microscope. Photographic documentation was taken with an Olympus XC50 microscope camera. Measurements were made at ×600 and/or ×300 magnifications. Structure size ranges were specified based on 10 measurements of acervuli, 15 setae, and 30 conidia. The publications mentioned in Table 1 were used for identification of the fungus. The name of the host plant and its synonym is accepted following The Plant List (<http://www.theplantlist.org/>). The examined specimen is deposited in the herbarium of Maria Curie-Skłodowska University in Lublin (LBL).

3. Results

Colletotrichum japonicum (Hemmi) Bedlan, J. Kulturpfl. 64(12): 478–481. 2012 (Figure 1)

Leaf spots mostly elliptical, roundish, or irregular, 2–6 mm in diameter, greyish-brown to greyish with blackish-brown margin. Acervuli within the spots, epiphyllous, 112–300 × 90–180 μm, often with setae. Setae short, black-brown, straight or slightly curved, 40–55 × 3–3.5 μm. Conidia one-celled, hyaline, elliptical or ovoid, straight or slightly curved, rounded at the ends, 12.5–17 × 4.5–6.5 μm.

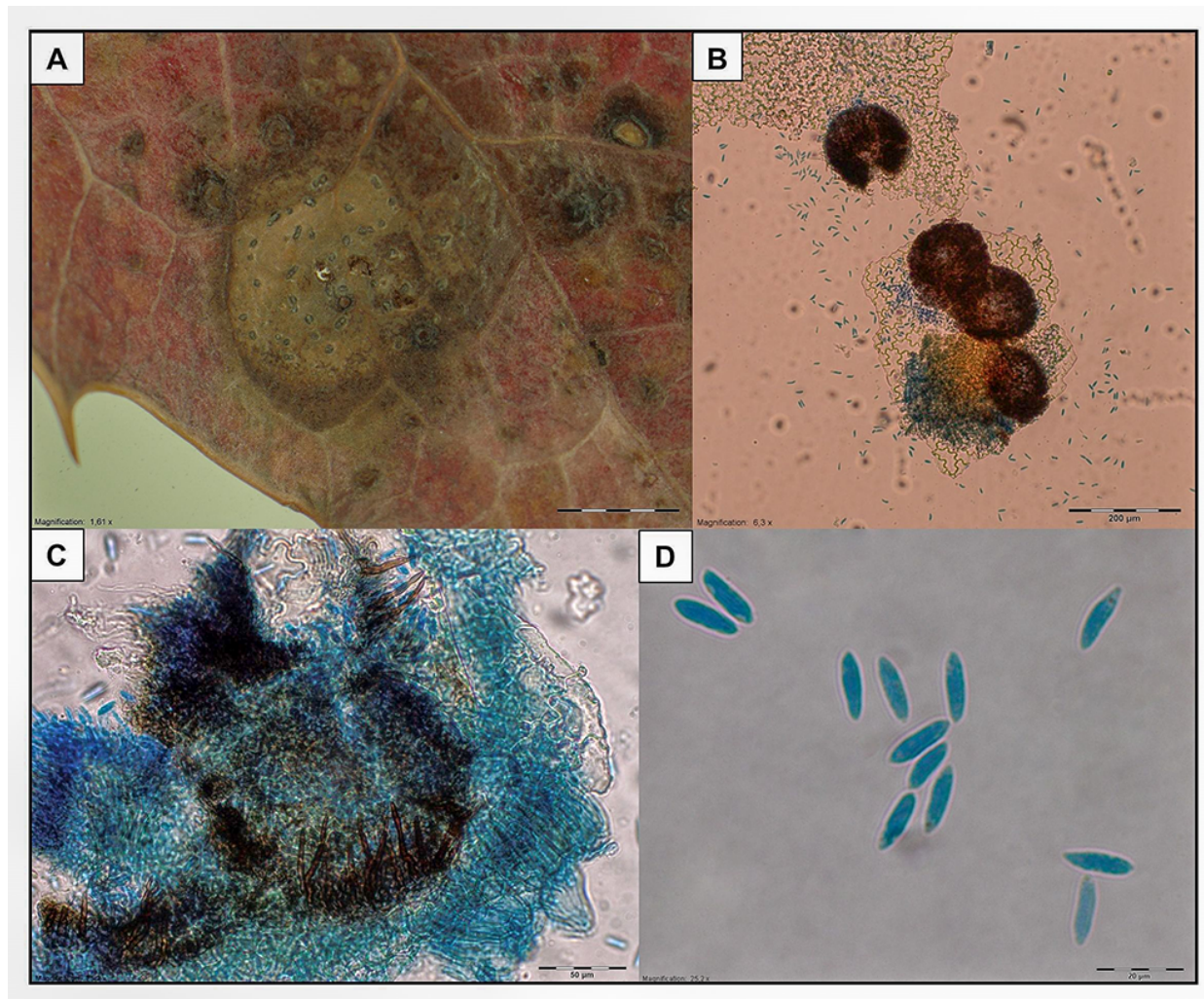


Figure 1 *Colletotrichum japonicum* on *Berberis aquifolium* (LBL M–32789). (A) Leaf spots with visible acervuli. (B) Acervuli. (C) Acervulus with setae. (D) Conidia. Scale bars: (A) 15 mm; (B) 200 μ m; (C,D) 50 μ m. Structures in a microscopic preparation stained with cotton blue in lactic acid. Photographs: U. Świdarska-Burek.

Specimen examined: On *Berberis aquifolium* Pursh (Berberidaceae). Poland: Lublin – Botanical Garden of the Maria Curie-Skłodowska University, September 25, 2018, leg. U. Świdarska-Burek (LBL M–32789).

4. Comments

The analyzed Polish sample exhibits the features of *C. japonicum* provided in the literature from Austria (Table 1), i.e., the only locality worldwide where the fungus has been noted on the same host (*B. aquifolium*) (Bedlan, 2012).

On *B. aquifolium*, three other *Colletotrichum* species have been reported to date. All of them, *C. nymphaeae* (Damm et al., 2012), *C. mahoniae* (Fabricatore, 1950), and *C. fioriniae* (Garibaldi et al., 2020), were reported from Italy. Additionally, two species were recorded on another host species from the *Mahonia* genus (currently assigned to the *Berberis* genus), i.e., *M. bealei* (Fortune) Pynaert: *C. mahoniae* from Georgia and *C. gloeosporioides* Penz. (probable host *M. bealei* incorrectly reported as *M. healei*) from China (Bedlan, 2012; Farr & Rossman, 2020).

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