Disease Note

Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Gymnosporangium yamadae* Causing Japanese Apple Rust on Crabapple (*Malus* spp.) in Ohio

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Japanese apple rust, caused by the heteroecious and demicyclic rust fungus *Gymnosporangium yamadae* Miyabe ex G. Yamada, can affect juniper (*Juniperus* spp.), where the telial stage of this disease occurs, and apple or crabapple (*Malus* spp.), where the aecial stage occurs (Yun 2010). Leaf samples displaying symptoms and signs of rust disease were collected in August 2020 from 14 different crabapple cultivars ('Amerspirzam' [American Spirit], 'Amsalzam' [American Salute], 'Excizam' [Excalibur], 'Guinzam' [Guinevere], 'Hargozam' [Harvest Gold], 'Mary Potter', 'Orange Crush', 'Prairie Maid', 'Professor Sprenger', 'Pumpkin Pie', 'Rawhide', 'Select A' [Firebird], 'Shotizam' [Show Time], and 'Sinai Fire') in the crabapple research plot of Sequest Arboretum (Crablandia) in Wooster, OH. Samples displayed adaxial leaf lesions with brown necrotic centers surrounded by a red-yellow coloration, corresponding on the abaxial side to lesions containing brown-orange aecia, producing aeciospores, surrounded by a dark red-orange coloration. One to multiple lesions were present per symptomatic leaf. DNA was extracted from symptomatic leaf tissue containing fungal material on all 14 cultivars using the DNeasy Plant Mini Kit (Qiagen), and the D1/D2 region of the 28S rDNA was amplified using primers NL1 and NL4 (O'Donnell 1993) according to the method of Dagar et al. (2011). GenBank BLAST sequence analysis of all 14 sequences resulted in 99.83 to 100% sequence identity to *Gymnosporangium yamadae* with 99% query coverage (MN605735). Sequences from all samples were deposited in GenBank under accession

numbers MW131119.2 to 131125.2 and MW131127.2 to 131132.2. Morphological features were characterized for the three representative cultivars Amerspirzam, Orange Crush, and Pumpkin Pie. Aecia were hypophyllous, roestelioid, with cornute, yellow-brown peridia with lacerate sides. Peridial cells appeared yellow and were long-linear rhomboid, verrucose with long papillae, smooth outer walls and echinulate inner walls, measuring 45 to 78 × 16 to 27 µm (average 65 × 21 µm), 51 to 82 × 16 to 30 µm (average 66 × 23 µm), and 47 to 93 × 14 to 31 µm (average 64 × 24 µm), respectively ($n = 50$ per cultivar). Aeciospores were globose, 20 to 26 × 18 to 24 µm (average 23 × 20 µm), 21 to 28 × 19 to 24 µm (average 24 × 21 µm), and 21 to 27 × 18 to 23 µm (average 23 × 21 µm), respectively, with a slightly coronate surface and dark yellow walls 1.6 to 2.7 µm (average 2 µm), 1.4 to 2.4 µm (average 2 µm), and 1.3 to 2.5 µm (average 1.8 µm) thick, respectively ($n = 50$ per cultivar). The telia, known to occur on *Juniperus* spp., were not observed. Specimens from these three cultivars were deposited into the U.S. National Fungus Collections (BPI 923889, 923888, and 923887). Japanese apple rust has been officially reported in parts of Eastern Asia and the Eastern United States and is also known to be present in parts of Far East Russia and Ontario, Canada (CAB International 2008; Yun et al. 2009). This report constitutes the first confirmed instance of *G. yamadae* causing Japanese apple rust in Ohio. Because infected trees tend to be highly symptomatic, this disease poses a significant threat to the nursery and landscape industries because it can decrease the market value of ornamental varieties and affect yield and crop quality in varieties used for fruit production.

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