Diseases Caused by Oomycetes

Phytophthora cactorum Causing Bleeding Canker of *Acer × freemanii* in Southern Idaho

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Since 2018, bleeding cankers have been observed on maple trees in multiple home gardens in southwest Idaho. The cankers ooze a dark sap and are approximately 10 to 35 cm in diameter. Cankers typically occur on the main trunk but are also present on scaffold branches in severe infections. Symptoms of foliar chlorosis, branch dieback, and premature autumn senescence were also associated with the disease. *Phytophthora* DNA was detected in symptomatic material from five trees using real-time PCR (Miles et al. 2017). In July 2019, recovery of a causal agent from a symptomatic *Acer × freemanii* tree was attempted. Excisions were made from the interface of healthy and diseased tissue around the cankers using a chisel. The tissue was then placed in sealed plastic bags at 4°C for 7 days. Hyphae were then removed with forceps and placed onto potato dextrose agar (PDA) amended with penicillin G (0.2 g/liter) and streptomycin sulfate (0.8 g/liter). Colonies resembling *Phytophthora cactorum* were consistently observed after 5 days at 21°C. Tentative *P. cactorum* identification was based on the presence of abundant papillate and caducous sporangia on a short pedicel; sporangia were approximately 30 µm long and 26 µm wide (Bush et al. 2006; Hudler 2013). Individual hyphal tips were transferred to fresh PDA plates and sequencing of both the rDNA ITS region and Cytochrome *c* oxidase subunit I (COI) was completed for a representative isolate (D19-130). DNA extraction, PCR, and sequencing were as previously

described (Robideau et al. 2011; Woodhall et al. 2013). The resulting DNA sequences for rDNA ITS (MW315449) and COI (MW881040) were both 100% identical (723/723 bp and 728/728 bp) with sequences from cultures previously identified as *P. cactorum* (MH171627 and MH136858). To determine pathogenicity, 14-month-old maple (*A. × freemanii*) trees in individual containers with potting mix were wounded 15 mm above the soil line with a single 10-mm incision using a sterile razor blade and inoculated by placing a 10-mm² fully colonized PDA plug of isolate D19-130 on the wound. The inoculum and wound were then covered with a damp cotton ball that was secured loosely with Parafilm. Control plants consisted of uninoculated plants and wounded plants inoculated with a PDA agar plug. Each treatment was replicated five times and placed in a controlled environment chamber set at 24°C and 90% relative humidity. All treatments were sprayed with water daily to ensure the cotton balls remained damp. After 8 weeks, black lesions, up to approximately 25 mm above the soil line, were observed on the stem base of all *P. cactorum*-inoculated plants. No black lesions were observed on noninoculated plants or plants inoculated with a PDA agar plug. *P. cactorum* was isolated from lesions, as described above, except polystyrene foam boxes containing moist paper towels were used instead of bags. This report confirms *P. cactorum* as a causal agent of bleeding canker of maple in Idaho for the first time. It has been shown that several *Phytophthora* species can infect maple (Hudler 2013; Jung and Burgess 2009). *P. cactorum* has a wide host range, but certain strains have been associated with lethal bleeding stem cankers in maple and other deciduous trees worldwide (Hudler 2013). Knowledge of the causal agent of bleeding canker on maple will help determine appropriate disease management practices.

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