Diseases Caused by Oomycetes

First Report of Stem and Foliage Blight of Chrysanthemum Caused by *Phytophthora drechsleri* in the United States

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Chrysanthemum (*Chrysanthemum × morifolium*) plants exhibiting stem and foliage blight were observed in a commercial nursery in eastern Oklahoma in June 2019. Disease symptoms were observed on ~10% of plants during a period of frequent rain and high temperatures (26 to 36°C). Dark brown lesions girdled the stems of symptomatic plants, and leaves were wilted and necrotic. The crown and roots were asymptomatic and not discolored. A species of *Phytophthora* was consistently isolated from the stems of diseased plants on selective V8 agar (Lamour and Hausbeck 2000). The *Phytophthora* sp. produced ellipsoid to obpyriform sporangia that were nonpapillate and persistent on V8 agar plugs submerged in distilled water for 8 h. Sporangia formed on long sporangiophores and measured 50.5 (45 to 60) × 29.8 (25 to 35) µm. Oospores and chlamydospores were not formed by individual isolates. Mycelium growth was present at 35°C. Isolates were tentatively identified as *Phytophthora drechsleri* using morphological characteristics and growth at 35°C (Erwin and Ribeiro 1996). DNA was extracted from mycelium of four isolates, and the internal transcribed spacer (ITS) region was amplified using universal primers ITS 4 and ITS 6. The PCR product was sequenced, and a BLASTn search showed 100% sequence similarity to *P. drechsleri* (GenBank accession nos. KJ755118 and GU111625), a common species of *Phytophthora* that has been observed on ornamental and vegetable crops in the United States (Erwin and Ribeiro 1996). The gene sequences for each isolate were deposited in GenBank (accession nos. MW315961, MW315962, MW315963, and MW315964). These four isolates were paired with known A1 and A2 isolates on super clarified V8 agar (Jeffers 2015), and all four were mating type A1. They also were sensitive to

the fungicide mefenoxam at 100 ppm (Olson et al. 2013). To confirm pathogenicity, 4-week-old 'Brandi Burgundy' chrysanthemum plants were grown in 10-cm pots containing a peat potting medium. Plants ($n = 7$) were atomized with 1 ml of zoospore suspension containing 5×10^3 zoospores of each isolate. Control plants received sterile water. Plants were maintained at 100% relative humidity for 24 h and then placed in a protected shade structure, where temperatures ranged from 19 to 32°C. All plants displayed symptoms of stem and foliage blight in 2 to 3 days. Symptoms that developed on infected plants were similar to those observed in the nursery. Several inoculated plants died, but stem blight, dieback, and foliar wilt were primarily observed. Disease severity averaged 50 to 60% on inoculated plants 15 days after inoculation. Control plants did not develop symptoms. The pathogen was consistently isolated from stems of symptomatic plants and verified as *P. drechsleri* based on morphology. The pathogenicity test was repeated with similar results. *P. drechsleri* has a broad host range (Erwin and Ribeiro 1996; Farr and Rossman 2021), including green beans (*Phaseolus vulgaris*), which are susceptible to seedling blight and pod rot in eastern Oklahoma. Previously, *P. drechsleri* has been reported on chrysanthemums in Argentina (Frezzi 1950), Pennsylvania (Molnar et al. 2020), and South Carolina (Camacho 2009). Chrysanthemums are widely grown in nurseries in the Midwest and other regions of the United States for local and national markets. This is the first report of *P. drechsleri* causing stem and foliage blight on chrysanthemum species in the United States. Identifying sources of primary inoculum may be necessary to limit economic loss from *P. drechsleri*.

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