Diseases Caused by Oomycetes

First Report of *Pythium aphanidermatum* Causing Root Rot of Head Lettuce in China

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Head lettuce (*Lactuca sativa* L.) is an important crop for fresh consumption in China. In Shandong Province, head lettuce is planted in spring and in autumn each year. Because of on-and-off rain for 3 weeks, 20% of head lettuce plants planted directly into the field in Jiyang City in July 2017 rapidly showed symptoms of rotting, water-soaked lesions on roots and stem bases, and then death. The diseased plants first appeared in low-lying areas prone to water accumulation. One-millimeter pieces were excised from water-soaked roots and stem bases, dipped in a 0.2% calcium hypochlorite solution for 10 min, then placed on V8 medium, and incubated in the dark at 28°C for 5 days. Two *Pythium*-like strains were isolated from the roots and stems. The isolates transferred to CMA and grown for 7 days, and the morphological characteristics of the two isolates on corn meal agar (CMA) were white with dense, cottony, aerial, and well-branched mycelia. The two isolates produced sporangia, oogonia, antheridia, and oospores. Most of the sporangia were lobate. The oogonia were smooth, nearly globose, and terminal. Oospores were globose, smooth, and aplerotic. The average dimensions of 50 oogonia and oospores, respectively, ranged from 19.5 to 25.2 (avg. 23.1) µm and 17.8 to 22.3 (avg. 19.9) µm. The antheridia were broadly sac-shaped. The isolates' morphological characteristics were consistent with

P. aphanidermatum (van der Plaats-Niterink 1981). The COI gene and ITS region of the rDNA were amplified and sequenced using primers FM55/FM52R (Long et al. 2012) and ITS1/ITS4 (White et al. 1990), respectively. The two aligned COI sequences were identical for both isolates, as were the two ITS sequences. BLASTn analysis of the 1,133-bp COI sequence (accession no. MT952703) resulted in a 100% identity with accession number AY129164 from *L. sativa*, which belongs to *P. aphanidermatum*, and the 808-bp ITS sequence (accession no. MT921597) showed a 99% identity with GenBank accession number HQ643442 belonging to *P. aphanidermatum*. Koch's postulates were conducted by first soaking corn kernels in water for 24 h, and then autoclaving for 2 h at 121°C. Isolate SDHL-1 was grown on CMA for 10 days, after which agar plugs were transferred to the sterilized corn kernels and incubated at 28°C for approximately 15 days, until the corn kernels were covered in white hyphae. Ten healthy head lettuce plants were transplanted into a sterilized loam potting soil artificially infested with the corn inoculum (3 g inoculum per 100 g loam mixture). Inoculated plants and noninoculated controls were maintained in a greenhouse at 28°C and 100% relative humidity with a 12-h photoperiod; the experiment was repeated once. Within 1 week, all 20 inoculated plants exhibited symptoms similar to those observed. *P. aphanidermatum* was recovered only from the water-soaked roots and stem bases of inoculated plants and the reisolated cultures again identified based on morphological characteristics and sequencing of the ITS and COI genes. No symptoms were observed on the control plants. *Sclerotinia sclerotiorum* is reported to cause stem base rot of *L. sativa* in China (Zhou et al. 2011). To our knowledge, however, this is the first report of root rot of head lettuce caused by *P. aphanidermatum*. Identification of the pathogen will assist in devising strategies to reduce yield loss.

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