Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Root and Stem Rot Caused by *Pythium aphanidermatum* on *Sedum sarmentosum* in Korea

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Sedum sarmentosum Bunge, stringy stonecrop, is a perennial herb native to Eastern Asia and is widely grown as an ornamental plant. Its sprouts are a common salad ingredient in Korea. The total area for *S. sarmentosum* cultivation in Korea is 30.84 ha in 2018, of which 23.51 ha (76%) is located in Gyeonggi Province. During 2014 to 2019, the production was on average about 760 metric tons per year, and it has been selling in the wholesale market between \$10 and \$2 per 4 kg. In late July to early September 2019, root and stem rot symptoms were observed in a commercial greenhouse located in Namyangju, Gyeonggi Province. Initial water-soaked lesions on the stem near the ground gradually enlarged and caused necrosis. These symptoms developed rapidly when greenhouse temperatures reached 35 to 40°C. Five weeks after the initial symptom appearance, *S. sarmentosum* plants had been completely destroyed. After placing diseased stem tissues on potato dextrose agar (PDA) following surface sterilization with 70% ethanol for 30 s and rinsing three times in sterilized water, inoculated plates were incubated at 25°C in the dark. Three isolates purified via single-hyphal isolation (NYJ-1, NYJ-2, and NYJ-3) were identified morphologically. Colonies on PDA were white with cottony aerial mycelium, and the width of aseptate hyphae ranged from 3.8 to 9.6 µm (average 6.2 µm). Oospores (14.3 to 26.3 µm in diameter; average 21.7 µm) were globose and aplerotic.

Antheridia (5.6 to 13.4 µm; average 9.4 µm) were terminal, intercalary, and sac-shaped. These morphological characteristics are consistent with those of *Pythium aphanidermatum* (van der Plaats-Niterink 1981; Watanabe 2002). The optimum for mycelial growth was 31 to 32°C with a radial growth rate of 40 mm/day at 32°C. Molecular identification was performed by amplifying and sequencing the internal transcribed spacer (ITS) regions of rDNA using the primer pair ITS5 and ITS4 (White et al. 1990) and the cytochrome oxidase subunit 2 (COXII) region using the primers FM66 and FM58 (Martin 2000). The ITS (MT093455 to 57) and COXII (MT107525 to 27) sequences of NYJ-1, NYJ-2, and NYJ-3 were identical to those of *P. aphanidermatum* strains P36-3 (100%; AB095052.1) and UZ051 (100%; AB468890.1). A maximum likelihood phylogenetic analysis based on the concatenated ITS and COXII sequences, which was performed using the MEGA X program (Kumar et al. 2018), placed the three isolates within a clade comprising *P. aphanidermatum*. Healthy plants were inoculated with rye grains colonized by NYJ-1, NYJ-2, and NYJ-3 for 2 weeks. Control plants were treated with uninoculated grains. After keeping inoculated plants in a plastic bag for 16 h, they were moved to a growth chamber with a 16-h photoperiod and 75% humidity. Two temperatures (28 and 38°C) were used to monitor disease development. At 38°C, water-soaked lesions were observed on the stem of inoculated plants at 2 days postinoculation. Three days later, inoculated plants were completely dead. No symptoms were observed on inoculated plants incubated at 28°C after 14 days. Pathogenicity assays were repeated three times with similar results. The pathogen was successfully reisolated, and the identity was confirmed using the methods described above. To our knowledge, this is the first report of *P. aphanidermatum* causing root and stem rot on *S. sarmentosum* in Korea.

References:

- Kumar, S., et al. 2018. Mol. Biol. Evol. 35:1547.
- Martin, F. N. 2000. Mycologia 92:711.
- van der Plaats-Niterink, A. J. 1981. Stud. Mycol. 21:1.
- Watanabe, T. 2002. Pictorial Atlas of Soil and Seed Fungi. CRC Press, Boca Raton, FL.
- White, T. J., et al. 1990. Page 315 in: PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.

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