Diseases Caused by Fungi and Fungus-Like Organisms

Occurrence of *Sclerotinia sclerotiorum* Causing Sclerotinia Root Rot on American Ginseng in Northeastern China

Yi Ming Guan,^{1,†} Ying Ying Ma,¹ Lin Lin Zhang,¹ Xiao Xi Pan,¹ Ning Liu,¹ and Ya Yu Zhang^{1,2,†}

¹Institute of Special Wild Economic Animal and Plant Science, Chinese Academy of Agricultural Sciences, Changchun, Jilin, China

²College of Pharmacy and Biological Engineering, Chengdu University, Chengdu, Sichuan, China

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American ginseng (*Panax quinquefolium*) is a valuable medicinal plant that is commercially cultivated in China. In May 2020, Sclerotinia root rot of American ginseng was observed on 4-year-old plants in Fusong County in northeastern China, which is the most important part of the country for American ginseng cultivation. The pathogen only infected the tuberous and fibrous roots, with sclerotia tightly attached to the root surface. Infected roots, which were brownish and had a watery soft rotted appearance, eventually became hollow and filled with sclerotia. There were no significant changes to the aboveground plant parts during the initial infection stage, but as the disease progressed, the foliage became discolored and wilted because of the damaged roots. More than 31% of the plants in a 30-ha field were infected. Symptomatic roots were collected and sclerotia were removed from the diseased tissue, immersed in 1% NaClO for 1 min, rinsed three times with sterile water, and placed on acidified potato dextrose agar (PDA) in Petri dishes. After an incubation in darkness at 20°C for 2 to 3 days, 21 suspected *Sclerotinia* isolates were obtained. Isolates JH1 and JH2 were randomly selected for identification. On PDA, colonies produced sparse, white, and cottony aerial mycelia (i.e., wool-like appearance), with septate, branched, and hyaline hyphae. Within 4 days of incubation, the PDA surface was covered with white hyphae. Small white sclerotial primordia formed 3 days later and were irregularly distributed

in the middle and along the edge of the Petri dish. After maturing, the hardened black sclerotia had an irregular shape and size, ranging from 1.4 × 1.5 to 4.1 × 7.5 mm ($n = 50$). Most of the sclerotia developed separately, with approximately 15 to 25 per plate. On the basis of their morphology, the isolates were initially identified as *Sclerotinia* sp. (Kohn 1979; Mordue and Holliday 1976). Using the JH1 and JH2 rDNA internal transcribed spacer (ITS) region (GenBank accession nos. MZ031405 and MZ031406) and the aspartyl protease gene specific to *S. sclerotiorum* (MZ292709 and MZ292710) in GenBank as queries, BLAST searches revealed that the sequences were, respectively, 99 to 100% similar to *S. sclerotiorum* sequences KF859933 and AF271387. The primer pairs for amplifying the ITS region and the aspartyl protease gene were, respectively, ITS4/ITS5 (White et al. 1990) and SSaspr F/SSaspr R (Abd-Elmagid et al. 2013). The pathogenicity of JH1 and JH2 was evaluated using healthy plants. The roots of 4-year-old ginseng plants were washed, wiped with 75% alcohol, and transferred to flower pots containing sterile sand and sorghum grain (10:1 v/v) infested with 10-day-old isolates. For both isolates, 12 plants were inoculated, with four plants per pot. Control plants were transferred to flower pots containing sorghum grain lacking fungus. The inoculated samples were incubated in a greenhouse (12 h photoperiod and 25°C) for 25 days before they were examined. The test was repeated twice. The inoculated roots exhibited the same symptoms as those observed in the field, whereas the controls remained symptomless. The same fungus was reisolated from all infected roots and resequencing results confirmed its identity. To the best of our knowledge, this is the first report of *S. sclerotiorum* causing Sclerotinia root rot on American ginseng in China. Because this disease is detrimental to the production of the plant, effective management strategies will need to be developed.

References:

- Abd-Elmagid, A., et al. 2013. J. Microbiol. Methods 92:293.
- Kohn, L. M. 1979. Phytopathology 69:881.
- Mordue, J. E. M., and Holliday, P. 1976. Descriptions of Pathogenic Fungi and Bacteria. No. 513. CMI, Kew, U.K.
- White, T. J., et al. 1990. PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.

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[†]Indicates the corresponding authors.

Y. M. Guan; gymcau@126.com, and Y. Y. Zhang; zyy1966999@yeah.net