Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Mucor* spp. Causing Root Rot of *Radix pseudostellariae* in Guizhou Province of China

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Radix pseudostellariae L. is one of the most common and highly prized Chinese medicinal plants with various pharmacological effects, and it is mainly produced in acid soils in the Guizhou and Fujian provinces of southwestern and southeastern China, respectively (Wu et al. 2020). However, consecutive monoculture of *R. pseudostellariae* results in severe root rot and decline in biomass and quality of underground tubers. Root tubers of *R. pseudostellariae* are typically planted in December and harvested the next June. Root rot commonly starts developing in May. The disease incidence of root rot ranged from 37 to 46% in root portions and basal stem of *R. pseudostellariae* under the consecutive monoculture fields in Shibing County, Guizhou Province, China (108°12'E, 27°03'N) (Li et al. 2017). Severe root rot was observed in Shibing County in May 2018. Infected plants displayed curly, withered, and yellow leaves, blight, retarded growth, root rot, and yield losses. Abundant whitish mycelia were observed on roots and surrounding soil. Two fungal isolates, designated GZ20190123 and GZ20190124, were obtained from symptomatic roots cultured on potato dextrose agar. The optimum temperature range for growth of the two isolates was 25 to 30°C. The optimum pH range for the growth of GZ20190123 was 5 to 5.5, whereas GZ20190124 grew better

between pH 5 and 8.5. The mean mycelial growth rates of GZ20190123 and GZ20190124 at 30°C were 2.1 and 1.5 cm/day, respectively. Conidia of the two isolates were ovoid or obclavate and were produced in single or branched chains. The internal transcribed spacer (ITS) region was amplified with primers ITS1 and ITS4 (White et al. 1990). The sequences were deposited in GenBank as accession numbers MN726736 for GZ20190123 and MN726738 for GZ20190124. Sequence comparison revealed 99% (GZ20190123) and 97% (GZ20190124) identity with previously reported isolate xsd08071 of *Mucor racemosus* Bull. (accession no. FJ582639.1) and isolate BM3 of *Mucor fragilis* Bainier (accession no. MK910058.1), respectively, which was confirmed by phylogenetic analysis. The two isolates were tested for pathogenicity on *R. pseudostellariae*. Six roots of *R. pseudostellariae* were surface sterilized with 75% ethanol and stab inoculated with mycelia using a sterile toothpick for each isolate. Sterile distilled water was stab inoculated to 12 roots to serve as the control. Treated roots were incubated in a greenhouse with 16-h day length (light intensity 146.5 µmol/[m²·s]) and day/night temperature 26°C/18°C. The inoculated roots showed the expected symptoms on roots and sprouts 7 days after inoculation, whereas the control roots with sprouts did not show any symptom. The fungi were reisolated from the diseased roots and confirmed as expected *M. racemosus* or *M. fragilis* based on the ITS sequences, which satisfied Koch's postulates. Thus, isolate GZ20190123 was identified as *M. racemosus* and GZ20190124 as *M. fragilis*. Previously, *M. racemosus* and *M. fragilis* have been reported as pathogens on tomato (Kwon and Hong 2005) and grape (Ghuffar et al. 2018), respectively. To our knowledge, this is the first report of *M. racemosus* and *M. fragilis* causing root rot of *R. pseudostellariae* in southwestern China, where the disease could cause a significant loss to production of this important medicinal plant.

References:

- Ghuffar, S., et al. 2018. Plant Dis. 102:1858.
- Kwon, J., and Hong, S. 2005. Mycobiology 33:240.
- Li, A., et al. 2017. Jiangsu Agric. Sci. 45:123.
- White, T. J., et al. 1990. Page 315 in: PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.
- Wu, H., et al. 2020. Front. Microbiol. 11:1142.

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