Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Colletotrichum gloeosporioides* Causing Anthracnose on Pepper in Shaanxi Province, China

Yang Li,¹ Xiao Ma,¹ Wen-Xian Gai,¹ Luo-Dan Xiao,² and Zhen-Hui Gong^{1,†}

¹College of Horticulture, Northwest A&F University, Yangling 712100, Shaanxi, P.R. China

²Institute of Fruit, Vegetable, Tea and Flower, Yibin Academy of Agricultural Sciences, Yibin 644600, P.R. China

Funding: The authors highly appreciate the financial support of the funding from the National Natural Science Foundation of China (no. 31772309) and the National Key R&D Program of China (no. 2016YFD0101900). Plant Dis. 105:2242, 2021; published online as <https://doi.org/10.1094/PDIS-01-21-0123-PDN>. Accepted for publication 18 March 2021.

Pepper (*Capsicum annuum* L.) is an important solanaceous vegetable crop, with high nutritional and economic value. However, it is susceptible to *Colletotrichum* spp. infection during its growth and development, which seriously affects production yield and quality. Chili anthracnose, caused by *Colletotrichum* spp., is one of the most destructive diseases of pepper. In August 2020, chili anthracnose was observed with widespread distribution in the horticulture field of Northwest A&F University (34.16° N, 108.04° E) in Shaanxi Province, China. Approximately 60% of the pepper plants had disease symptoms typical of anthracnose. Lesions on pepper fruits were dark, circular, sunken, and necrotic, with the presence of orange to pink conidial masses. To perform fungal isolation, the tissue at the lesion margin was cut from eight symptomatic fruits, surface disinfested with 75% ethanol for 30 s followed by 2% NaClO for 1 min, rinsed three times with sterile distilled water, and dried on sterile filter paper. The tissues were placed on potato dextrose agar (PDA) and incubated at 28°C in the dark. After 3 days, hyphae growing from tissue of each lesion were recultured on PDA (Liu et al. 2016). A representative single-spore isolate (NWAUFU2) was used for morphological characterization, molecular analysis, phylogenetic analysis, and pathogenicity tests. NWAUFU2 colonies had gray-white aerial mycelium, and the reverse side of the colonies was dark gray to light yellow after 10 days of growth on PDA. Conidia were cylindrical, aseptate, with obtuse to slightly rounded ends, and measured 10.1 to 16.9 (length) × 4.7 to 7.0 (width) µm (*n* = 50). Based on morphological features, the isolate was consistent with the description of *Colletotrichum*

gloeosporioides species complex (Weir et al. 2012). For molecular identification, genomic DNA was extracted using a CTAB method, and the internal transcribed spacer (*ITS*) region, glyceraldehyde-3-phosphate dehydrogenase (*GAPDH*), and partial sequences of actin (*ACT*) genes were amplified and sequenced using primers ITS1F/ITS4, GDF1/GDR1, and ACT-512F/ACT-783R, respectively (Dowling et al. 2020). Using BLAST, *ITS*, *ACT*, and *GAPDH* gene sequences (GenBank accession nos. MW258690, MW258691, and MW258692, respectively) were 100, 100, and 98.19% identical to ZJL-4 of *C. gloeosporioides* (GenBank accession nos. MN075757, MN058142, and MN075666, respectively). Phylogenetic analysis was conducted using MEGA-X (version 10.0) based on the concatenated sequences of published *ITS*, *ACT*, and *GAPDH* for *Colletotrichum* species using the neighbor-joining algorithm. The identified isolate (NWAUFU2) was closely related to *C. gloeosporioides*. To confirm the pathogenicity, 10 healthy pepper fruits were surface sterilized, and 2 µl of conidial suspension (1×10^6 conidia/ml) was injected into the surface of pepper. Five fruits were inoculated with 2 µl of sterile distilled water as controls. After inoculation, the fruits were kept in a moist chamber at 28°C in the dark. The experiment was repeated three times. Anthracnose symptoms similar to those observed in the field were observed 7 days after inoculation, and control fruits remained healthy. A similarly inoculated detached leaf assay resulted in water-soaked lesions 3 days after inoculation. *C. gloeosporioides* was reisolated from the infected pepper fruits, fulfilling Koch's postulates. *C. gloeosporioides* has been reported to cause chili anthracnose in Sichuan Province, China (de Silva et al. 2019; Liu et al. 2016). However, Shaanxi is one of the main pepper-producing areas in China, and it is geographically distinct from Sichuan; its climate and environmental conditions are different from Sichuan. Knowledge that *C. gloeosporioides* causes chili anthracnose of pepper in Shaanxi province, China, may aid in the selection of appropriate management tactics for this disease.

References:

- de Silva, D. D., et al. 2019. IMA Fungus 10:8.
- Dowling, M., et al. 2020. Plant Dis. 104:2301.
- Liu, F. L., et al. 2016. Sci. Rep. 6:32761.
- Weir, B. S., et al. 2012. Stud. Mycol. 73:115.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: *Colletotrichum gloeosporioides*, pepper, anthracnose, Yangling Shaanxi

[†]Indicates the corresponding author.
Z.-H. Gong; zhong@nwsuaf.edu.cn