Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Colletotrichum circinans* Causing Anthracnose in *Allium fistulosum* var. *giganteum* in Gansu Province, China

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In September 2018, severe symptoms and a high incidence (about 60%) of an onion anthracnose disease attributable to infection by *Colletotrichum* spp. was observed in production fields of Dingxi city, Gansu Province, China. Mature onion plants (*Allium fistulosum* L. var. *giganteum* Makino) that were nearing harvest and expressing necrotic symptoms had oval lesions with dark spots made up of stromatic masses that had formed beneath the cuticle of the plant base. Twenty symptomatic plants were sampled. Symptomatic tissues were surface sterilized with sodium hypochlorite, transferred aseptically to 20 ml of potato dextrose agar (PDA) in a Petri plate and incubated at 30 ± 2°C. After 7 days, cultures produced acervuli and setae, a characteristic sign of *Colletotrichum* spp. Acervuli were observed with a black, bulbous base and acicular setae, while conidia were elliptical (14 to 25 × 3 to 6 µm), unicellular, hyaline, and slightly falcate. DNA was extracted from a 7-day-old culture and the ITS region was amplified using primers D1 (5'-GCATATCAATAAGCGGAGGAAAAG-3') and D2 (5'-GGTCCGTGTTCAAGACGG-3') (Kurtzman and Robnett 1997). The resulting sequence (548 bp) was deposited in NCBI GenBank under accession number MW127281. The fungus was confirmed as *Colletotrichum circinans* after conducting a BLAST search with the ITS sequence that reported the highest homology (99% similarity) with MH81329.1 (*C. circinans*). The species was further confirmed by amplifying regions of the *TUB2*, *GAPDH*, and *ACT* genes using primers given in the supplementary materials, and sequences were also submitted to NCBI GenBank under accession numbers MZ456033, MZ456032, and MZ456031, respectively. The BLAST results for these three gene regions

were consistent with the results of the ITS region, and the fungus was identified as *C. circinans*. The isolated pathogen was tested for its pathogenicity on onion plants (*A. fistulosum* var. *giganteum*). A conidial suspension of 30 ml (5 × 10⁵ conidia/ml) was mixed with 1 kg of sterilized potted soil in 15-cm-diameter plastic pots. Uninoculated, sterilized soil was used as a control. Three green onion plants per pot were planted. The experiment was repeated three times with 15 replications in each experiment. Plants were maintained for 120 days under greenhouse conditions and were monitored for the development of anthracnose symptoms. Symptoms recorded previously on onion plants in the field (i.e., necrosis, sunken oval lesions, and dark spots) were observed after 30 days on plants grown in inoculated soil while control plants remained asymptomatic. Three samples from symptomatic tissues of each plant were used for reisolation of the pathogen on PDA, as described above. Cultures grown on PDA were confirmed both on a morphological and molecular basis as *C. circinans*. These morphological, molecular, and pathogenicity tests of the isolated fungus confirm that the anthracnose symptoms observed on onion in Gansu Province, Beijing, China, were caused by *C. circinans*. Six different *Colletotrichum* spp. have been reported to cause diseases on onion worldwide (Rodríguez-Salamanca et al. 2012). *C. circinans*, which causes smudge, is an occasional onion pathogen and was previously recorded as *C. dematium* (Pers.) Grove f. *circinans* Arx, which is specific to *Allium* spp. (von Arx 1970, 1981). However, Sutton (1992) described *C. circinans* as a distinct species from *C. dematium*. The fungus causes smudge or leaf spot of *Allium* spp. (Farr et al. 1989) and has been reported in Korea, Japan, Argentina, India, the United Kingdom, and most other regions of the world (Cho and Shin 2004; Kiehr et al. 2012). Smudge may be a disease of concern postharvest, as fungal growth compromises the onion scales and bulb (Walker 1921). In China, this is the first report of *C. circinans* causing anthracnose in *A. fistulosum* var. *giganteum* in Gansu Province.

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The author(s) declare no conflict of interest.

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