Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Fusarium culmorum* Causing Maize Stalk Rot in China

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Maize stalk rot has become one of the most important diseases in maize production in China. From 2017 to 2019, a survey was conducted to determine the population diversity of *Fusarium* species associated with maize diseases in 18 cities across Henan Province. Maize stalk rot with an incidence of more than 20% that caused yield losses up to 30% was observed on maize variety Zhengdan958, which was grown in two continuous maize fields in Zhumadian City, Henan Province. Stem tissues from the boundary between diseased and healthy pith were chopped into small pieces (3 × 8 mm), disinfected (70% ethanol for 1 min), and placed onto potato dextrose agar (PDA) amended with L-(+)-lactic acid (1 g/liter) and incubated at 25°C for 4 days. Colonies on PDA produced fluffy, light yellow aerial mycelium and purple to deep brick red pigment at 25°C. On carnation leaf agar (CLA), macroconidia in orange sporodochia formed abundantly, but microconidia were absent. Macroconidia were short and thick-walled and had three to five septa, a poorly developed foot cell and rounded apical cell. These characteristics matched the description of *Fusarium culmorum* (Leslie and Summerell 2006), and isolates

DMA268-1-2 and HNZMD-12-7 were selected for further identity confirmation. Species identification was confirmed by partial sequences of three phylogenetic loci (*EF1-α*, *RPB1*, and *RPB2*) using the primer pairs EF1/EF2, CULR1F/CULR1R, and CULR2F/CULR2R, respectively (O'Donnell et al. 1998). The consensus sequences from the two isolates were deposited in GenBank (MZ265416 and MZ265417 for *TEF*, respectively; MZ265412 and MZ265414 for *RPB1*, respectively; MZ265413 and MZ265415 for *RPB2*, respectively). BLASTn searches indicated that the nucleotide sequences of the three loci of the two isolates revealed 99 to 100% similarity to those of *F. culmorum* strains deposited in the GenBank, *Fusarium*-ID, and MLST databases. A pathogenicity test was conducted at the flowering stage using Zhengdan958 and Xundan20 plants according to previously described methods (Cao et al. 2021; Zhang et al. 2021; Zhang et al. 2016). The second or third internodes of 30 flowering plants were drilled to make a wound approximately 8 mm in diameter using an electric drill. Approximately 0.5 ml of inoculum (made from 125 ml of colonized PDA homogenized with 75 ml of sterilized distilled water) was injected into the wound and sealed with Vaseline and Parafilm to maintain moisture and avoid contamination. Sterile PDA slurry was used as a control. Thirty days after inoculation, dark-brown soft rot of pith tissues above and below the injection sites was observed, and some plants were severely rotten and lodged. These symptoms were similar to those observed in the field. No symptoms were observed on control plants. The same pathogen was reisolated from the inoculated stalk lesions but not from the control, thereby fulfilling Koch's postulates. To our knowledge, this is the first report of *F. culmorum* as the causal agent of stalk rot on maize plants in China. Also, this fungus has been reported to cause maize ear rot in China (Duan et al. 2016) and produce mycotoxins such as trichothecenes, nivalenol, and zearalenone that cause toxicosis in animals (Leslie and Summerell 2006). The occurrence of maize stalk rot and ear rot caused by *F. culmorum* should be monitored because of the potential risk for crop loss and mycotoxin contamination.

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