Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Root Rot Caused by *Fusarium armeniacum* on Soybean in Korea

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Fusarium wilt samples were collected in 2017 and 2019 from two soybean (*Glycine max*) fields, Yesan (36.73°N, 126.81°E) and Gimje (35.76°N, 126.80°E), in Korea. The disease incidence rate in each field was approximately 1%. For fungal isolation, root lesion fragments were surface sterilized in 1% sodium hypochlorite for 2 min, rinsed thrice with sterile distilled water, then incubated on water agar (WA) plates at 28°C in an incubator for 5 days. Two isolates (YS37231 and GJ3050) were obtained using the hyphal tip method. Colonies of the isolates on potato dextrose agar (PDA) produced white aerial mycelia, which later turned pinkish yellow. The isolates on PDA formed abundant chlamydospores and macroconidia but microconidia were absent. Macroconidia were 3 to 5 septate and prominently curved, measuring 12.4 to 41.2 by 3.3 to 4.3 µm (Leslie and Summerell 2006). For the identification of the isolates, translation elongation factor 1α (EF-1α) and RNA polymerase second largest subunit (RPB2) regions were amplified and sequenced using EF1/EF2 and RPB2-5f2/RPB2-7cr primer pairs, respectively (O'Donnell et al. 2010). EF-1α sequences of YS37231 (MT445439) and GJ3050 (MT445440) showed 99.01 and 99.67% identity, respectively, with *Fusarium armeniacum* (FD_01843 and FD_01305; FUSARIUM-ID database). The RPB sequences of YS37231 (MT445442) and GJ3050 (MT445441) showed 100 and 98.48% identity, respectively, with that of *F. armeniacum* (FD_01869; FUSARIUM-ID database). The sequences MT445439, MT445440, MT445441, and MT445442 were deposited in NCBI GenBank. The pathogenicity of the two isolates on the soybean cultivar Daewonkong was determined using two inoculation

methods. In the first method, a pathogenicity assay was performed on seedlings using WA plates (Cruz Jimenez et al. 2018). Eight surface-sterilized seeds were transferred to WA plates, with or without actively growing cultures, for 3 days, then incubated at 25°C in a growth chamber (12-h photoperiod) for 7 days. After 7 days, brown lesions were observed on the roots in inoculated plates; however, no symptoms were observed in the control. In the second method, 10-day-old soybean seedlings were inoculated by cutting and soaking the roots in the spore suspension (1×10^6 conidia/ml) for 2 h. The inoculum was prepared by incubating isolates on PDA for 10 days, then adding sterile distilled water, scraping the growth medium, and filtering the suspension. The seedlings were then transplanted into 18-cm plastic pots (20 cm in height) and grown under greenhouse conditions ($26 \pm 3^\circ\text{C}$, 13-h photoperiod) for 2 weeks. After 7 days, the inoculated plants showed wilting symptoms, developed brown lesions in the roots, and eventually died within 2 weeks after inoculation. No such symptoms were observed in the control (inoculated with sterile distilled water). The isolates were reisolated from the inoculated seedlings for confirmation. Although the fungus and associated mycotoxins have been reported in the rice produced in Korea (Hong et al. 2015), to the best of our knowledge, this is the first report of *F. armeniacum* causing Fusarium wilt on soybean in Korea. In the United States, it was first reported by Ellis et al. (2012). Fusarium wilt is a soilborne disease of growing concern in soybean cultivation worldwide. Our findings will help increase awareness about the global spread of this disease.

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