New Disease Reports

First report of *Fusarium incarnatum-equiseti* species complex causing ear rot of foxtail millet in Northwest regions of China

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Foxtail millet (*Setaria italica*) is one of the oldest grain crops. It is still widely cultivated in arid and semiarid regions worldwide, particularly in China and India (Bettinger *et al.,* 2010). In 2016, ears of foxtail millet with severe symptoms of Fusarium ear rot were collected from Yulin, Shanxi Province, with an incidence of up to 10%. Typical disease symptoms included ears with pink or salmon-coloured mould at the ear tip of affected plants (Fig. 1).

Diseased ears were surface-sterilised with 75% ethanol, washed three times in sterile distilled water, dried, and placed onto potato dextrose agar (PDA) medium for seven days at 23°C with a photoperiod of 12 hours. Colonies with abundant, loosely floccose, whitish aerial mycelium and beige pigmentation were obtained (Fig. 2). The pathogens isolated from PDA were transferred to carnation leaf agar medium to induce sporulation. After incubation for ten days at 23°C with a 12 hr photoperiod, conidia were collected for morphological observation. Macroconidia were falcate, usually four to seven septa, 31 to 53 µm in length. A pronounced dorsiventral curvature, tapered and elongated apical cell, and prominent foot shape were observed. The fungus was morphologically identified as *Fusarium equiseti* (Nelson, 1983; Leslie & Summerell, 2006) in the *Fusarium incarnatum-equiseti* species complex (FIESC). To confirm the identity, the partial translation elongation factor 1 alpha (TEF) gene, rDNA internal transcribed spacer (ITS) region and β-tubulin gene (TUB2) were amplified and sequenced (Vitale *et al.,* 2011). The sequences were deposited in Genbank (Accession Nos. MN150474, MN128581 and MN128582). BLASTn analysis against the TEF (KX663763), ITS (JF773657) and TUB2 sequences (GQ915441) revealed 93%, 99% and 98% identity respectively, with known sequences of these genes in the FIESC.

Pathogenicity studies were conducted on foxtail millet cv. Zhangza9. A conidial suspension (10^5 conidia/ml) was sprayed onto the millet ears of 15 plants at first flowering. Fifteen additional plants treated with sterile distilled water were used as controls. Inoculated ears were covered with a plastic bag for three days and maintained with a paper bag at 28°C for 20 days. The same symptoms of Fusarium ear rot as seen in the field were produced on the inoculated plants, while control plants did not develop symptoms. The fungus was reisolated from the inoculated plants and was morphologically identical to the original isolate, thus fulfilling Koch's postulates.

It was reported four decades ago that the FIESC could infect the seeds and roots of foxtail millet (Tai, 1979). However, this pathogen has not previously been reported to cause ear rot in China. We found that the infected plants did not produce any seeds when the disease was severe. Fusarium head blight and crown rot are two diseases of wheat caused by the same *Fusarium* pathogen, but different host genes are involved in conferring resistance (Li *et al*., 2010). The FIESC has been found in other regions of China and may become prevalent. This new disease could pose an imminent threat and cause severe economic losses. Further research is urgently needed to elucidate its epidemiology, symptomatology, vector transmission and crop losses in China as well as other regions where foxtail millet is widely cultivated.

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Figure 1

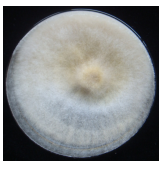

Figure 2

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