Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Chili Pepper Fruit Rot Caused by *Fusarium incarnatum* in China

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Pepper (*Capsicum annuum* L.), with annual production over 1 million metric tons, is ranked the first vegetable crop in Hainan Province, China. In December 2018, fruit rot of chili pepper, with yield loss of up to 15%, was found in 10 fields (12 hm²) in Yacheng (18°N, 109°E), Hainan Province, China. Water-soaked and soft lesions developed on fruit, with white to light gray fungal mycelium present inside. The diseased fruit turned soft and decayed at the later stages. Diseased tissue was cut into 12 pieces of 0.5 × 0.5 cm, surface disinfected with 2% sodium hypochlorite for 2 min followed by 70% ethanol for 30 s, rinsed with sterile distilled water five times, and plated onto potato dextrose agar (PDA). After growing on PDA for 2 to 3 days at 28°C in an incubator without light, 10 pure culture isolates were obtained. All isolates had abundant dense white aerial mycelia that became beige with age. The macroconidia were slightly curved with four to seven septa, 29.51 to 42.15 × 4.29 to 6.22 µm. Spindle-shaped mesoconidia with three to four septa were abundantly produced, 20.34 to 24.54 × 4.58 to 4.79 µm. Microconidia were pyriform to obovate with no septa, 7.32 to 11.70 × 2.35 to 3.20 µm. Chlamydospores were absent. Based on the morphological

characteristics, the fungus was tentatively identified as *Fusarium incarnatum* (Leslie and Summerell 2006). An isolate (SQHP-01) was chosen for molecular identification and pathogenicity testing. Two DNA fragments of the isolate, the internal transcribed spacer (ITS) and translation elongation factor genes (EF-1α), were amplified for sequencing. BLAST analysis showed that sequences of ITS (GenBank accession no. MN317371) and EF-1α (accession no. MN928788) had 99.61 to 100% identity with those of known *F. incarnatum* (MN480497 and KF993969). Phylogenetic analysis was conducted using the neighbor-joining algorithm based on ITS and EF-1α genes separately, and the isolate was well clustered with *F. incarnatum*, both with 100% bootstrap support. Pathogenicity testing of the isolate was carried out twice on five healthy chili pepper fruit. After surface disinfection, fruit were wounded at three different points, and 20 µl of conidial suspension (10⁶ conidia/ml) was deposited on each wound. Unwounded inoculation was conducted by spreading 100 µl of the suspension on each fruit surface including the pedicel and calyx. Fruit spread with sterile distilled water represented the negative control. All fruit treatments were placed on moist sterile cotton in moist chambers at 25°C with 16-h light and 8-h darkness. After 4 to 6 days, water-soaked necrotic lesions appeared on the wounded fruit, symptoms identical to those observed in the field. Water-soaked necrotic lesions developed on the pedicel and calyx of unwounded fruit. No symptoms were observed on the control fruit. The morphology and sequences of reisolated fungal isolates from the tested peppers were the same as the original isolate. To our knowledge, this is the first report of *F. incarnatum* (synonym of *F. semitectum*) causing fruit rot on chili pepper in China. *F. incarnatum* has been reported to cause root rot of greenhouse pepper in China (Li et al. 2018) and fruit rot of bell pepper in Trinidad (Ramdial et al. 2016) and Pakistan (Tariq et al. 2018). Effective control strategies need to be developed to prevent the economic losses caused by the disease in chili pepper.

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