Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Fomitopsis meliae* Causing Brown Wood Rot on Living Lemon Trees in Arizona and California

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Arizona is one of the largest producers of premium lemons for the fresh market in the world. In 2018, 54,000 metric tons of lemons were produced on more than 7,300 acres. In recent years, wood rot diseases have become increasingly important in desert citrus production, with an incidence rate of 70 to 100% in some lemon orchards in Yuma, and lower rates in lemon orchards in the California desert. In 2018 and 2019, A brown wood rot showing symptoms of leaf chlorosis, branch gummosis and wilt, and branch breakage was the most common disease in many lemon orchards. Where disease was observed, a white mycelial mass often covered split exposed internal wood, and basidiocarps were found on fallen decaying wood on orchard floors. The fungal colony, consistently isolated from decaying wood on malt extract agar or potato dextrose agar, was white, dense, and cottony-floccose. The 7-day-old culture had a distinct mushroom odor, and hyphae were hyaline, thin-walled, and clamped generative. Genomic DNA was extracted from the mycelia of three isolates using a DNeasy Plant Pro Kit (Qiagen, Valencia, CA) according to the manufacturer's instructions. The internal transcribed spacer (ITS) region of rDNA was amplified with primers ITS1/ITS4 (White et al. 1990). The resulting three nucleotide sequences were identical and deposited under accession number MW221272 in GenBank. A BLASTn search revealed 97.45 and 99.94% match with sequences HQ248221.1 and KT718002.1, respectively, which were isolates of *Fomitopsis meliae*, with a query coverage at 100%. To fulfill Koch's postulates, pathogenicity tests were conducted on 30-year-old 'Lisbon' (*Citrus × limon* [L.] Osbeck) lemon trees at the Yuma Agriculture

Center Mesa farm from February to July in 2019: 10 branches (6 to 10 cm in diameter) from 10 different trees were inoculated with each of three representative isolates. The inoculum was prepared by growing each isolate on wheat grains for 3 weeks at 23 to 25°C. Tree branches were inoculated by inserting five colonized wheat grains in 2-cm holes that were drilled into the branches and then covered with Parafilm. Five branches were inoculated with sterile grains and used as a control. Disease was assessed 4 months later by removing inoculated branches, splitting them in half through the inoculation point, and measuring the length of the wood area affected by wood rot. Brown discoloration of the wood extended an average of 3.9, 4.2, and 4.9 cm per isolate into wood tissues surrounding the inoculation hole, whereas control branches remained healthy. *F. meliae* was consistently reisolated from decayed wood based on morphology and ITS sequences. To our knowledge, this is the first report of brown wood rot caused by *F. meliae* in lemon in Arizona and California. *Fomitopsis* species often attack conifers, hardwoods, and fruit trees (Adaskaveg et al. 1993; Gilbertson and Ryvarden 1987). A species of *Fomitopsis* was detected in 40-year-old sweet orange trees and was highly pathogenic on lemons in southern Italy (Roccatelli et al. 2014). The ITS sequence of this *Fomitopsis* species (HM126455.1) shared 99% identity with those of *F. palustris* (KJ995920.1) or *F. ostreiformis* (KC595918.1) but only 93.2% identity with that of *F. meliae* isolates identified in this study. *F. meliae* can cause substantial premature mortality of lemon trees and represents a major threat to the survival and profitability of lemon production in Arizona.

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