Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Stem Canker of Almond Trees Caused by *Fusarium solani* in Greece

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Almond (*Prunus dulcis*) is an important crop for Greece grown on 15,130 ha in 2019 (FAO 2019). In September 2019, a severe stem canker disease was observed in 6-year-old trees of cultivar Marta grafted on the rootstock 'F675C14', in a new almond grove of cultivars Marta, Soleta, Antonela, Belona, and Laurete, in Vlachiana, Heraklion, Crete, Greece. Only cultivar Marta trees were affected. Diseased trees exhibited cankers on trunks and branches with pale yellow to red-colored gum excreting from cankers, leaves turning yellow and falling off, twig and branch dieback, and bark and wood tissue discoloration. Severely affected trees were killed. A *Fusarium*-like fungus was consistently isolated from symptomatic wood tissue previously surface disinfested with 95% ethanol, on acidified potato dextrose agar (PDA). Emerging colonies were transferred to new PDA, and their growth rate (colony diameter) was 7.86 mm/day at 24°C in the dark. The abundant aerial mycelium was initially white, turning to pale orange in the center after 7 days of growth on PDA. Microscopic observations revealed hyaline conidiphores measuring 26.74 ± 20.44 µm in length, developing microconidia 5.00 to 9.50×2.50 to 4.75 µm (average 6.64×3.50 µm) and macroconidia 10.00 to 23.25×3.75 to 5.50 µm (average 16.42×4.50 µm) in size. DNA from one representative single-spore isolate (code KOUB.AM.VR1) was extracted, and the internal transcribed spacer region (ITS) of ribosomal DNA and translation elongation factor 1- α (EF 1- α) genes were amplified using the primer pairs ITS1/ITS4 (White et al. 1990) and EF1-F/EF2-R (O'Donnell et al.

1998), respectively. The PCR products were sequenced and deposited in GenBank (accession nos. MW547397 and MW554492). Based on morphological characteristics (Leslie and Summerell 2006) and a BLAST search with 100.00 and 99.38% identity to published *Fusarium solani* ITS and EF 1- α sequences in GenBank (KX034335.1, DQ247636.1), the fungus was identified as *F. solani*. Eight 3-year-old almond trees of cultivar Marta were artificially inoculated in March 2020 by making a 6.0-mm-diameter hole in the trunk, inserting a 6-mm-diameter mycelial disc taken from a 10-day-old PDA culture, sealing the hole with cellophane membrane, and covering with adhesive paper tape. Another eight trees of the same cultivar were mock inoculated with sterilized PDA discs and served as controls. Potted trees were kept under ambient conditions. One month postinoculation, yellow gum was evident excreting around the inoculation point in *F. solani*-treated trees. Seven months postinoculation, longitudinal and transverse sections of inoculated trunks revealed internal and external symptoms similar to those observed under natural infection conditions, and *F. solani* was consistently reisolated from symptomatic wood tissue and identified by colony morphology. Neither symptoms nor positive isolations were observed in control trunks. Pathogenicity tests were repeated twice. *F. solani* has been reported as the causal agent of stem canker or wood decay diseases in several woody hosts including bitternut hickory, black walnut, mulberry, and pistachio trees (Crespo et al. 2019; Markakis et al. 2017; Park and Juzwik 2012; Tisserat 1987). To our knowledge, this is the first report worldwide of stem canker caused by *F. solani* on almond tree. This disease could potentially be an increasing problem in almond growing areas and result in severe crop losses. Hence, effective management practices should be investigated and applied.

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