New Disease Reports

# First report of a '*Candidatus* Phytoplasma solani'-related strain (16SrXII-A subgroup) associated with pistachio leaf scorch disease in Turkey

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Pistachio (*Pistacia vera*) is a horticultural tree grown for its edible seeds. It is of great commercial importance for Turkey which is one of the main global producers. Pistachio trees are mostly cultivated in the Sanliurfa, Siirt, Gaziantep and Adiyaman provinces in Turkey. In recent years, symptoms regarding leaf scorch, chlorosis, and small leaves and significant yield loss have been observed in pistachio orchards.

Leaf samples were collected from symptom-bearing (Figs. 1-2) and symptomless pistachio trees in different pistachio orchards. Total nucleic acid was extracted using a CTAB-based method from each sample. Nucleic acids were tested with two-round PCR using P1/P7 primers in direct PCR followed by R16F2n/R2 primers in nested PCR to amplify the 16S rRNA gene (Duduk *et al*., 2013). Nested-PCR amplicons of approximately 1.2 kb were obtained from all symptom-bearing samples but not from symptomless ones. Amplicons were purified, cloned and sequenced directly in both directions and sequences assembled and compared to reference strains using MEGA7 software (www.megasoftware.net). One representative isolate (2H2EF9) sequence was deposited in GenBank with the accession number MH088869. The isolate showed 99% identity to 16SrXII group phytoplasmas according to BLAST analysis. A computer-simulated RFLP analysis using 17 restriction enzymes with *i*PhyClassifier (Zhao *et al*., 2009) and a phylogenetic tree generated by MEGA7 using the neighbour-joining method, confirmed the identification (Fig 3).

The association of phytoplasma (16SrI group) and pistachio was first reported by Marzachi *et al*. (1999) in Italy. There are also reports of phytoplasmas associated with distinct 16Sr groups infecting pistachio in Iran (Ghayeb Zamharir & Mirabolfathi, 2011), and Ghayeb Zamharir (2016; 2018) reported the presence of 16SrXII (associated with scorch disease) and 16SrIX groups of phytoplasma in Iran. Similarly, we detected and identified phytoplasmas in pistachio trees expressing leaf scorch symptoms in Sanliurfa, Turkey.

To the best of our knowledge, this is the first report of '*Ca*. P. solani'-related leaf scorch disease of pistachio in Turkey. Since the phytoplasmas belonging to subgroup 16SrXII-A have an extensive host range, mixed farming in the region may, therefore, have a potential threat to pistachio. The distribution, epidemiology and impact of the disease on pistachio yield are currently under investigation.

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Figure 1



Figure 2

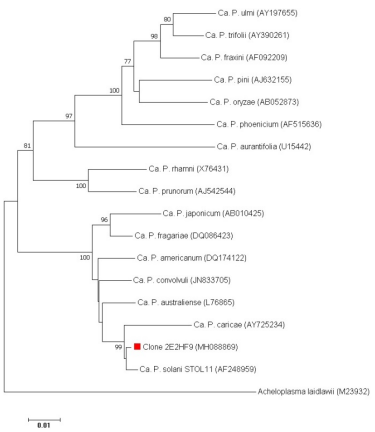



Figure 3

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