

## DISEASE NOTE

## PREVALENCE AND DISTRIBUTION OF PEACH YELLOW LEAF ROLL IN NORTH OF IRAN

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In the growing season of 2012, a phytoplasma-like disease was observed on peach and nectarine plants (*Prunus persica*) in several locations in the Iranian provinces of Mazandaran and Golestan. Affected trees were stunted, had upward curled and thickened leaves with purple-colored margins of their adaxial surface, and showed also a weak shoot growth. Vegetating shoots were collected from 25 symptomatic and three symptomless trees from whose leaf midribs and petioles DNA was extracted following the procedure of Zhang *et al.* (1998). Fragments of the rRNA operon were amplified using the phytoplasma primer pair P1/P7 followed by R16F2n/R16R2 for nested PCR (Gundersen and Lee, 1996). A 1200 bp product was amplified from all symptomatic samples but not from any of the symptomless trees. PCR products of four isolates were sequenced and deposited in GenBank with accession Nos. KC751538, KF739407, KF739408 and KF923872. Blast comparison of these sequences revealed the highest identity of all four isolates (99%) with those of members of the 16SrXII group 'Candidatus Phytoplasma solani' (Quaglino *et al.*, 2013). This phytoplasma has previously been reported, along with 'Ca. P. aurantifolia' and 'Ca. P. trifolii', as the agent associated with yellow leaf roll-diseased peach in the central provinces of Iran (Zirak *et al.*, 2010). The distribution of 'Ca. P. solani' is now extended to the three major northern Iranian provinces, where it appears to be the prevailing phytoplasma species,

Gundersen D., Lee I., 1996. Ultrasensitive detection of phytoplasmas by nested-PCR assays using two universal primer pairs. *Phytopathologia Mediterranea* **35**: 144-151.

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## DISEASE NOTE

## FIRST REPORT OF A 16SR IV GROUP PHYTOPLASMA ASSOCIATED WITH LETHAL YELLOWING IN AGAVE TEQUILANA

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Mexico, which is considered the origin and the biodiversity center of the family Agavaceae, hosts 117 of the 155 known species. *Agave tequilana* Weber cv. Azul is a national icon and the most widely cultivated species for the production of tequila, a widely known alcoholic beverage. In spring 2013, a disease of *A. tequilana* was observed in Tala, (Jalisco, Mexico) which greatly reduced its availability for tequila production. Affected plants showed extensive chlorosis, followed by yellowing and necrosis of stem and leaf tissues. As the disease progressed, leaves collapsed and hung downwards around the central head. To investigate the possibility of a phytoplasma infection, DNA was extracted according to Lee *et al.* (1993) from 25 symptomatic and 25 symptomless plants. A nested PCR was performed using two universal primer sets specific for the phytoplasma 16S rRNA gene, i.e. R16mF2/R16mR1 followed by R16F2n/R16R2 (Gundersen and Lee, 1996). The expected 1,200 bp product was obtained from 88% of the symptomatic plants. The PCR products were cleaned with a Wizard kit (Promega, USA) and cloned in *Escherichia coli* using a TOPO-TA cloning kit (Invitrogen, USA) in accordance with manufacturer's instructions. When nucleotide sequences of the amplified products (accession Nos KJ156364, KJ156365) were compared with those available in GenBank, it was found that the agave phytoplasma was most similar (99.98%) to the Texas phoenix palm phytoplasma (USA, JF791816) and Sabal mexicana decline phytoplasma (Mexico, GU473588). Phylogenetic and putative restriction site analysis of 16Sr DNA indicated that the phytoplasma associated with *A. tequilana* is closely related to the lethal yellows 16SrIV group. To our knowledge, this is the first report of a 16SrIV group phytoplasma associated with a disease of *A. tequilana*.

Gundersen, D.E., Lee, I.-M., 1996. Ultrasensitive detection of phytoplasmas by nested-PCR assays using two universal primer pairs. *Phytopathologia Mediterranea* **35**: 144-151.

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