Diseases Caused by Bacteria and Phytoplasmas

First Report of a Subgroup 16SrII-D Phytoplasma Associated with *Opuntia cylindrica* Fasciated Disease in Oman

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Cacti are evergreen perennial succulent plants that are used as ornamental and hedge plants. The fruits and leaves are also used as forage in some areas (Dewir 2016). Cactus species are susceptible to several pathogens, including phytoplasma. In March 2020, three cactus plants (*Opuntia cylindrica*) out of 10 (30% incidence) exhibited phytoplasma symptoms, including stunted growth, fasciation in stems and cladodes, color changes of the tips of cladodes to purple, and having clusters of highly proliferating cladodes. The plants were located in the Botanic Garden at Sultan Qaboos University, Muscat, Oman (N 23°59'14"; E 58°16'34"). Polymerase chain reaction (PCR) assays were carried out on the DNA samples extracted from young cladodes of three each of symptomatic and asymptomatic plants using phytoplasma-universal 16S rRNA primers P1/P7 in direct PCR followed by R16F2n/R16R2, P4/P7 in the nested PCR. Distilled water (DW) and Alfalfa witches' broom phytoplasma were used as negative and positive controls in each assay,

respectively. In addition, amplification of the partial translocase protein A (*secA*) gene in the symptomatic cactus samples was done using SecA-II-F1/SecA-II-R1 (targeting 2,140 bp) followed by SecA-II-F1/SecAR4 (targeting 1,510 bp) (Al-Subhi et al. 2018). All the symptomatic plants and the positive control were positive for both genes (16S and *secA*), but no amplification was observed from the asymptomatic samples and DW. Sequence analysis and similarity searches against BLASTn revealed that the phytoplasma 16S rRNA (MT327813) shared 100% sequence identity with '*Candidatus* Phytoplasma aurantifolia' isolate CB04 (MT555412) from India. The *secA* gene sequence (MT331815) analysis showed 100% identity with *Cicer arietinum* phyllody (KX358585). The associated phytoplasma was designated as cactus fasciated phytoplasma (CFP). Phylogenetic trees based on CFP 16S rRNA, *secA* genes, and a combined phylogenetic tree showed clustering of the CFP with the 16SrII-D subgroup phytoplasmas. The association of the aster yellows and peanut witches' broom phytoplasma groups with other cactus species has already been reported from Lebanon, Mexico, China, Italy, and Egypt (Dewir 2016). The 16SrII phytoplasma in association with *O. cylindrica* showing fasciated stem has been reported from Egypt (Omar et al. 2014). A series of diverse plant species in association with 16SrII-D phytoplasma has been reported from Oman (Al-Subhi et al. 2018). However, this is the first report of a cactus phytoplasma disease in Oman belonging to the 16SrII-D subgroup phytoplasmas. Some fasciated cactus species are attractive and therefore cultivated as new ornamental plants and transported around the world, which may pose a new threat to other economically important crops.

References:

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