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Entitled

BIOLOGICAL CONTROL OF SUDDEN DECLINE DISEASE OF DATE PALM (PHOENIX DACTYLIFERA L.) IN THE UNITED ARAB EMIRATES

by

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Abstract

Date palm orchards suffer from serious diseases, including sudden decline syndrome (SDS). The fungal pathogen *F. solani* was associated with SDS on date palm in the United Arab Emirates (UAE). Application of Cidely® Top (difenoconazole and cyflufenamid) significantly inhibited the fungal mycelial growth *in vitro* and reduced SDS development on date palm seedlings pre-inoculated with *F. solani* under greenhouse conditions. This is the first report confirming that the chemical fungicide Cidely® Top is strongly effective against SDS on date palm.

Fungal pathogens not only inhibit plant growth directly, but also induce the plant to synthesize stress ethylene. Much of the damage sustained by plants infected with fungal phytopathogens occurs as a result of the response of the plant to the increased in *planta* levels of ethylene. The aim of the present study was to compare the effectiveness of antagonistic actinobacteria capable of producing 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase, with those incapable of producing ACC deaminase, on suppression and severity of SDS on date palm. To achieve this, actinobacteria-producing ACC deaminase isolated from the rhizosphere of date palm in the UAE were evaluated for their potential to produce antifungal metabolites and cell-wall degrading enzymes that can inhibit the pathogens growth *in vitro*. The most inhibitory isolates produced chitinase, diffusible antifungal metabolites, siderophores, and were able to lyse the hyphae of the three pathogens *in vitro*. Under greenhouse conditions, the ACC deaminase-producing isolate were significantly more effective in reducing the incidence and severity of SDS compared to ACC deaminase-non-producing isolate. This study demonstrated for the first time the superiority of antagonistic rhizosphere actinobacteria to enhance their effectiveness as biocontrol agents by their abilities to produce ACC deaminase in addition to their abilities to produce antifungal metabolites and cell-wall degrading enzymes. The results clearly showed the potential to enhance most if not all the biocontrol agents performance by including the ACC deaminase ability into the strains.

Keywords: date palm; sudden decline syndrome; *Fusarium solani*; actinobacteria; ACC deaminase; UAE.