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**PhD Dissertation Defense**

Entitled

*CHEMICAL AND BIOLOGICAL CONTROL OF STEM CANKER DISEASE EFFECT DELONIX REGIA TREE*

by

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Date & Venue

12:30 pm

Tuesday, 29 June 2021

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Abstract

In the United Arab Emirates (UAE), *Delonix regia* (*D. regia*) trees suffer from stem canker disease which characterized by branch and leaf dryness, bark lesions, discoloration of xylem tissues, longitudinal wood necrosis and extensive gumming. The main objectives of this dissertation are: 1) Isolate and identified the pathogen associated with infected *D. regia*, 2) Evaluate the efficacy of fungicides, and the most promising antagonistic Actinomycetes isolates against the causal agent of stem canker in vitro and in vivo under greenhouse conditions. And 4) Develop and implement Integrated Disease Management (IDM) strategies. The fungus, *N. dimidiatum* (*N. dimidiatum*) DSM 109897, was consistently recovered from diseased *D. regia* tissues; this was confirmed by the molecular, structural and morphological studies. To manage the disease, the chemical fungicides, Protifert<sup>®</sup>, Cidely<sup>®</sup> Top and Amistar<sup>®</sup> Top, significantly inhibited mycelial growth and reduced conidial numbers of *N. dimidiatum* in laboratory and greenhouse experiments. The described "apple bioassay" is an innovative approach that can be useful when performing fungicide treatment studies. Under field conditions, Cidely<sup>®</sup> Top proved to be the most effective fungicide against *N. dimidiatum* among all tested treatments. 47 actinobacterial isolates were obtained from rhizosphere soils of royal poinciana in the UAE, among which streptomycete actinobacteria were the predominant isolates. Three isolates, *Streptomyces rochei* UAE2, *S. coelicoflavus* UAE1 and *S. antibioticus* UAE1, exhibited powerful *in vitro* antifungal activity against *Neoscytalidium dimidiatum*. The antifungal action of *S. rochei* and *S. coelicoflavus* was mainly correlated with antibiosis and cell-wall-degrading enzymes production, respectively. *S. antibioticus* was, however, associated with both *mode of actions*. Using the novel apple fruit bioassay, these isolates suppressed lesion development on fruits inoculated with *N. dimidiatum*. Under greenhouse conditions, each of the potential biocontrol agents (BCAs) showed greater efficacies against stem canker when applied before *N. dimidiatum* inoculation (preventive) than those when the same BCAs were applied after the pathogen (curative) or the pathogen alone (control). The curative effects of Cidely<sup>®</sup> Top (a chemical fungicide) and *S. antibioticus* on disease symptoms were comparable on royal poinciana. This study is the first to explore the potential to use both biocontrol and fungicides.

**Keywords:** Chemical fungicide, *Delonix regia*, Stem canker, UAE, Actinobacteria, *Neoscytalidium dimidiatum*.