BIOLOGICAL CONTROL OF FUSARIUM WILT ON CHILLI (*Capsicum annuum* L.) CAUSED BY *Fusarium oxysporum* F.SP.CAPSICI USING *Glomus mosseae* AND ACTINOMYCETES

By

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Chili (*Capsicum annuum*) is an important crop grown worldwide for its use as spices and vegetables. However, chili is highly susceptible to fungal and viral infection that cause considerable damage to the crop. Therefore,this study was initiated with the aim of assessing the effective Actinomyces and Arbuscular mycorrhizal fungi against the Fusarium wilt disease.

A total of twenty bacterial strains were isolated from the rhizosphere soil of healthy chili plants, collected from different locations in UPM, Serdang, Malaysia. Out of the 20 bacterial isolates, seven were selected based on their ability to inhibit the growth of *Fusarium oxysporum*. In dual culture test isolates At1,At5,At6,At8,At11,At17 and At18 showed 50.0,71.0,42.0,42.0,47.0,42.0 and 50.0% inhibitions, respectively. Selected isolates were showed that all these isolates were Gram positive and showed high growth on Yeast extract malt extract agar, Actinomycetes isolation medium and tryptone soya agar (TSA).

All seven isolates were identified as *Streptomyces spp.* based on the morphological and biochemical properties along with 16S rRNA sequence analysis that was compared with the related bacteria in the Gen-Bank. Isolate At5 (*Streptomycetes indiaensis*) was found to be the most effective actinomycetes against the pathogen, with an average percentage inhibition of 71%, Antimicrobial products extracted using ethyl acetate, was identified by Gas Chromatography-Mass Spectrometry, Seventy-seven compounds from this isolated were identified. Susceptibility testing by disc diffusion method showed that the fungus was sensitive to all compounds with high peak but varying in proportions. It was found to be 91.85% sensitive to Chloroxylenol and 88.7% to Pyrrolo {1,2-a} pyrazine-1,4 dione, hexahydro-3-(2methylpropyl) after 7 days of incubation. Tetradecane, 2,6,10-trimethyl also showed 50% sensitivity at seven days of incubation. The Dual treatments (*Streptomyces sp.* and AMF) was able to increase shoot length significantly (61%), shoot dry weight (47%) and flower number (59%) compared to the control plant at 8th

weeks of plant growth. The dual treatment alter root morphological characteristics such as root dry weight (50.5%), root tips (18.5%), root length (77%), root surface area (72%) and root volume (48%) compared with the control. The concentration of N(67%), P(35%), K(87%), Fe(80%), Ca(67%), Mg(82%) and Zn(53%) in chili shoots and roots were increased after the colonization of *Glomus*.

The extensive colonization by the dual treatments of Streptomycetes and AMF was the reason behind the high concentration of chlorophyll Ch (a) and (b), so in dual and AMF treated plants was significantly higher (2.57 and 2.18) mg/gm respectively compared to the control (1.80) mg/gm. The activities of defense enzymes reach a peak at ten days after inoculation with the pathogen. Analysis revealed the expression of additional isoforms of PPO and PO was observed in biocontrol agents treated seedlings due to induced systemic resistance (ISR) induction.The overall results concluded from these studies confirm that the use of microorganisms as biological control agents such as (AMF) and Actinomycetes, as rhizospheric microorganisms, play a significant role in promoting plant growth and protection against plant pathogen. These could participate direct or indirect in the enhancement of root colonization by developing their individual effects on plant growth promotion.