

**UNIVERSITI TEKNOLOGI MARA**

**BIOCONTROL OF PLANT PATHOGEN  
*Phellinus noxius* BY SELECTED  
ACTINOMYCETES, BACTERIA AND  
FUNGI**

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Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of UniversitiTeknologi MARA. It is original and is the result of my own work, unless otherwise indicated or knowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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## ABSTRACT

*Phellinus noxius* which is a plant pathogen, causing brown root rot disease and thereby bringing harm to the plantation industry. In Malaysia, the disease can be found in teak plantations in Selangor, Perak, Kedah and Melaka. A study was conducted to evaluate the antagonistic activities of selected fungal and bacterial species, *P.aeruginosa*, *B.subtilis*, *Trichoderma* sp., TT1 actinomycete, TT2 actinomycete and TT3 actinomycete towards the plant pathogen. The molecular technique was done to identify the 16S rDNA of selected actinomycetes and 18S rDNA of *Trichoderma* spp.. The TT1 actinomycete known as *Streptomyces albulus*, TT2 as *Streptomyces acrimycini*, TT3 as *Streptomyces spiralis*, and *Trichoderma* sp. was identified as *Hypocrea jecorina* which was also known as *Trichoderma reesei*. All antagonists were found to have antagonistic activities towards the fungal pathogen when evaluated by the dual culture assay on PDA and ISP-2 at 30°C. *Trichoderma* sp. was the best antagonist shown by the highest percentage inhibition ranging from 14.28% to 100%. Three probable characteristics of antagonisms were identified and they were competitive inhibition, mycoparasitism and antibiosis. *Trichoderma* sp. showed the fastest growth among all antagonists which may indicate that it was able to compete for substrates, nutrients and space with the pathogen. Mycoparasitic interactions were investigated by using light and scanning electron microscopy. The microscopic observations showed that the hyphae of *Phellinus noxius* shrunk, swelled and became stunted. Activity of chitinolytic enzymes was detected when the antagonists formed clear zones on CYE agar but out of the three actinomycetes, only TT1 and TT3 produced a significant clear zone (> 0.5cm of diameter). Activity of cellulolytic enzymes was detected when the antagonists formed halos on CMC plate assay and the highest enzyme secreted was shown by TT2 actinomycete produced a halo diameter of 1.40cm. Antibiosis was evaluated using cell-free culture filtrate by agar well diffusion bioassay; all antagonists effectively inhibited the plant pathogen except for TT1 actinomycete. Among the three solvents used only methanolic extracts showed positive results. The methanolic extract of *P.aeruginosa* produced the widest zone of inhibition. Gas Chromatography analysis was done to find out the metabolites produced by these antagonists. All antagonists showed to release potential antifungal compounds and most of them produced at least four significant compounds.

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