

2006

September

## Isolation and Characterisation of Microbial Endophytes from Oil Palm Roots: Implication as Biocontrol Agents against *Ganoderma*

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*Endophytic microorganisms enhance the natural complexity and diversity of the plant environment, providing greater biological balance and stability. They are internal colonisers, and therefore more able to compete within the vascular systems with potential to arrest the spread of Basal Stem Rot (BSR) disease in oil palm. Microbial endophytes were isolated from oil palm roots sampled from different soil types, age of palms and status of BSR infectivity. Bacterial endophytes were found to be dominant in all areas sampled followed by fungal and actinomycetes. Contrast comparisons between the frequency of bacterial and fungal isolates for different palm age showed high abundance in the mature, followed by middle-aged and young palms in all sampling areas. Based on soil types, endophytes abundance was not significantly different from all the sampled areas. Endophytic bacteria recovered from symptomless palms were higher in coastal and peat soils but lower in inland soils. However, inland soils recorded high abundance of isolates of Pseudomonas, Burkholderia and Serratia spp. that showed potential in controlling G. boninense in in vitro tests. Meanwhile, from palms infected with BSR, presence of bacterial endophytes was found to be high in inland and lower in coastal and peat soils with low frequency of isolation of the antagonistic genera. Gram-negative bacteria were found to be mainly confined to the epidermis, sclerenchyma cells and cortex, but were not detected in the phloem and xylem vessels. The abundance of antagonistic endophytic bacteria appeared to influence the incidence of BSR and may have limited the establishment of G. boninense in symptomless palms. A dendrogram of the UPMGA constructed by combining the results from primers OP5 and OPC 11 produced three main clusters (genera): Burkholderia, Pseudomonas and Serratia. Identification of endophytes with biocontrol potential against BSR was confirmed using Biolog System as Burkholderia cepacia (B3), Pseudomonas aeruginosa (P3) and Serratia marcescens (S3).*

**Keywords:** Endophytic microorganisms, basal stem rot, Ganoderma, biological control, oil palm.