# Evaluation of bioformulation of Enterobacter sp. UPMSSB7 and mycorrhizae with silicon for white root rot disease suppression and growth promotion of rubber seedlings inoculated with Rigidoporus microporus


## ABSTRACT

White root rot (WRR) disease, caused by Rigidoporus microporus, is one of the major constraints causing the economic loss to rubber plantation worldwide including in Malaysia. This glasshouse study was conducted to evaluate the efficacy of a peat-based bioformulation of Enterobacter sp. UPMSSB7 and an arbuscular mycorrhizal fungus (AMF, Glomus mosseae) with silicon (Si) for WRR suppression and plant growth promotion of rubber seedlings. Results revealed that the tested bioformulation significantly ($P < 0.0001$) reduced the disease compared to positive control while, was not significantly different than the propiconazole, a triazole fungicide. The lower values of disease incidence, disease severity of foliar and root rot symptoms, area under disease progress curve, pathogen colonization and higher value of disease reduction were recorded in both bioformulation and the triazole fungicide treated seedlings than positive control treatment 24 weeks after inoculation with R. microporus. Results indicated that pathogen-inoculated seedlings treated with bioformulation had significantly ($P < 0.0001$) increased stem height, girth size, chlorophyll content, leaf area, shoot and root dry weight, total root length, root volume and root surface area (103.8 cm, 8.08 mm, 56.62 SPAD value, 3534.8 cm2, 37.04 g and 36.76 g, 1617.7 cm, 24.15 cm3 and 402.97 cm2, respectively) as compared to fungicide and control treatments. The tested bioformulation also significantly ($P < 0.0001$) increased silicon content in root and shoot (18.56 g kg−1 and 27.61 g kg−1, respectively) as well as leaf nutrient (N, P, K and Ca) contents (3.89%, 0.19%, 1.06% and 0.57%, respectively) as compared to the triazole fungicide and control treatments. The population of Enterobacter sp. ($1.1 \times 108$ cfu g−1 soil) recorded in pathogen-inoculated seedlings treated with bioformulation was not significantly different than non-inoculated seedlings treated with bioformulation. AMF spore density and root colonization were recorded higher in bioformulation treated seedlings with or without pathogen inoculation than the triazole fungicide and control treatments. From this study, it was concluded that the peat-based bioformulation of Enterobacter sp. and an AMF (Glomus mosseae) with Si could be a potential approach to suppress WRR and improve growth of rubber seedlings.



**Keyword:** Hevea brasiliensis; Disease reduction; Biological control; Propiconazole; Growth improvement