

Biocontrol and plant-growth-promoting traits of *Talaromyces apiculatus* and *Clonostachys rosea* consortium against *Ganoderma* Basal Stem Rot disease of oil palm

ABSTRACT

Basal stem rot (BSR) disease caused by *Ganoderma boninense* basidiomycetous fungus is the most economically important disease in oil palms in South East Asia. Unfortunately, there is no single most effective control measure available. Tremendous efforts have been directed in incorporation of environmentally friendly biocontrol approaches in minimizing BSR disease. This study investigated the performance of two potential biocontrol agents (BCAs), AAT0115 and AAB0114 strains recovered from oil palm on suppression of BSR in planta, and also assessed their plant-growth-promoting (PGP) performance. ITS rRNA-sequence phylogeny discriminated the two ascomycetous *Talaromyces apiculatus* (Ta) AT0115 and *Clonostachys rosea* (Cr) AAB0114 biocontrol species with PGP characteristics. In vitro studies have demonstrated both Ta and Cr are capable of reducing linear mycelial growth of *G. boninense*. Inoculation of individual Cr and Ta-as well as Cr+Ta consortium-induced a significant increment in leaf area and bole girth of oil-palm seedlings five months post-inoculation (MPI) under nursery conditions. At five months post-inoculation, shoot and root biomass, and nutrient contents (nitrogen, phosphorus, potassium, calcium, magnesium and boron) were significantly higher in Ta-inoculated seedlings compared to control treated with non-Ta-inoculated maize. Chlorophyll and carotenoids contents in rapidly growing oil-palm seedlings challenged with Cr, Ta or a combination of both were not negatively affected. Cr, Ta and Cr+Ta consortium treated seedlings had 4.9-60% BSR disease reduction compared to the untreated control. Co-inoculation of Cr and Ta resulted in increased BSR control efficiencies by 18-26% (compared with Cr only) and 48-55% (compared with Ta only). Collectively, Cr and Ta, either individually or in consortium showed potential as BSR biocontrol agents while also possess PGP traits in oil palm.

Keyword: Antagonistic fungus; Ascomycete; Biologic control; Mycoparasite; *Ganoderma boninense*; Plant growth