Inhibition of lignin degrading enzymes of Ganoderma sp.: an alternative control of basal stem rot of oil palm

ABSTRACT

Basal stem rot (BSR) disease is one of the greatest threat to oil palm producing countries. The disease is caused by Ganoderma spp. Ganoderma is a white rot fungus that degrades the oil palm lignin completely. Lignin degradation is a rate limiting step in the infection procedure. Changing the lignin degrading activity of Ganoderma could be a possible approach to alleviate the spread of Ganoderma in future. Therefore, a study was carried out to regulate the production and inhibition of lignin degrading enzymes namely lignin peroxidase, manganese peroxidase and laccase by Ganoderma sp. in the presence of enzyme inhibitors such as thioglycolic acid, EDTA, 2-mercaptoethanol. Different Ganoderma sp. namely, (G. boninense (PER71), G. miniatocinctum, G. zonatum, G. tornatum) were cultured on plate amended with Remazol Brilliant Blue R (RBBR) to assess their lignolytic ability by decolorization of the dye. All the Ganoderma spp. had potential to degrade RBBR dye with diverse effectiveness. G. boninense (PER71) produce the highest percentage of RBBR decolorization at 90.21% followed by G. miniatocinctum (71.11%), G. zonatum (54.63%) and G. tornatum (38.51%). The quantification of the three lignolytic enzymes revealed that the isolate having least RBBR decolorizing efficiency, showed the presence of lignin peroxidase, manganese peroxidase and laccase activities in significantly lesser quantities. The maximum activities were perceived in G. boninense (PER71) with 0.069, 0.075, 0.606 U mL-1 protein for lignin peroxidase, manganese peroxidase and laccase activities, respectively. The effect of various enzymatic inhibitors was in following descending order EDTA > TGA > mercaptoethanol. The chemical compounds causing high inhibition of enzymatic production could be developed as chemical control strategy in integrated management of basal stem rot in field applications.

Keyword: AUDPC; β-Galactosidase; β-1, 4-Glucanase; Pectin lyase; Polygalacturonase