Sequence analysis and gene expression of putative oil palm chitinase and chitinase-like proteins in response to colonization of Ganoderma boninense and Trichoderma harzianum

ABSTRACT

Chitinases are glycosyl hydrolases that cleave the ϐ-1,4-glycosidic linkages between N-acetylglucosamine residues in chitin which is a major component of fungal cell wall. Plant chitinases hydrolyze fungal chitin to chitin oligosaccharides that serve as elicitors of plant defense system against fungal pathogens. However, plants synthesize many chitinase isozymes and some of them are not pathogenesis-related. In this study, three full-length cDNA sequences encoding a putative chitinase (EgChit3-1) and two chitinase-like proteins (EgChit1-1 and EgChit5-1) have been cloned from oil palm (Elaeis guineensis) by polymerase chain reaction (PCR). The abundance of these transcripts in the roots and leaves of oil palm seedlings treated with Ganoderma boninense (a fungal pathogen) or Trichoderma harzianum (an avirulent symbiont), and a combination of both fungi at 3, 6 and 12 weeks post infection were profiled by real time quantitative reverse-transcription (qRT)-PCR. Our findings showed that the gene expression of EgChit3-1 increased significantly in the roots of oil palm seedlings treated with either G. boninense or T. harzianum and a combination of both; whereas the gene expression of EgChit1-1 in the treated roots of oil palm seedlings was not significantly higher compared to those of the untreated oil palm roots. The gene expression of EgChit5-1 was only higher in the roots of oil palm seedlings treated with T. harzianum compared to those of the untreated oil palm roots. In addition, the gene expression of EgChit1-1 and EgChit3-1 showed a significantly higher gene expression in the leaf samples of oil palm seedlings treated with either G. boninense or T. harzianum.

Keyword: Basal stem rot; Chitinases; Ganoderma; Gene expression; Oil palm; Trichoderma