Nanoparticle-enhanced electrochemical biosensor with DNA immobilization and hybridization of Trichoderma harzianum gene

Abstract

The genus *Trichoderma* is a soil-borne fungi which in numerous reports has been successfully used as a biological control agent against various plant pathogens. The identification of *Trichoderma* species worldwide is currently deduced from micro-morphological descriptions which are tedious and prone to error. Electrochemical approaches are currently being developed for the detection and analysis of DNA. In the present study, an electrochemical DNA biosensor was successfully developed based on ionic liquid (e.g., 1-ethyl-3-methylimidazolium trifluoromethanesulfonate ([EMIM][Otf])), ZnO nanoparticles and a chitosan (CHIT) nanocomposite membrane on a modified gold electrode (AuE). A single-stranded DNA probe was immobilized on this electrode. Methylene blue (MB) was used as the hybridization indicator to monitor the hybridization reaction of the target DNA. Under optimal conditions using differential pulse voltammetry (DPV), the target DNA sequences were detectable at concentration ranges of 1.0×10^{-18}–1.82×10^{-4} mol L^{-1}, and the detectable limit was 1.0×10^{-19} mol L^{-1}. The developed DNA biosensor enables the study of hybridization with crude DNA fragments and the results of this study confirm that this DNA biosensor provides a fast, sensitive and convenient way for the species level identification of *Trichoderma harzianum*.