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Transcriptomic Response of Calmodulin Encoding Gene (CaM) in Pesticide Utilizing Talaromyces Fungal Strains

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Abstract : Calmodulin is one of the intracellular calcium proteins that regulates large spectrum of enzymes and cellular functions including metabolism of cyclic nucleotides and glycogen. The potentials of calmodulin gene in fungi necessitates their genetic response and their strong cassette of enzyme secretions for pesticide degradation. Therefore, this study was carried out to investigate the 'Transcriptomic' response of calmodulin encoding genes in Talaromyces fungi in response to 2, 2-dichlorovinyl dimethyl phosphate (DDVP or Dichlorvos) an organophosphate pesticide and γ-Hexachlorocyclohexane (Lindane) an organochlorine pesticide. Fungi strains isolated from rhizosphere from grasses rhizosphere in pesticide polluted sites were subjected to percentage incidence test. Two most frequent fungi were further characterized using ITS gene amplification (ITS1 and ITS4 combinations), they were thereafter subjected to In-vitro DDVP and lindane tolerance tests at different concentrations. They were also screened for presence and expression of calmodulin gene (caM) using RT-PCR technique. The two Talaromyces strains had the highest incidence of 50-72% in pesticide polluted site, they were both identified as Talaromyces astroroseus asemoG and Talaromyces purpurogenum asemoN submitted in NCBI gene-bank with accession numbers KY488464 and KY488468 respectively. T. astroroseus KY488464 tolerated DDVP (1.23±0.023 cm) and lindane (1.11±0.018 cm) at 25 % concentration while T. purpurogenum KY488468 tolerated DDVP (1.33±0.061 cm) and lindane (1.54±0.077 cm) at this concentration. Calmodulin gene was detected in both strains, but RT-PCR expression of caM gene revealed at 900-1000 bp showed an under-expression of caM in T. astrorosues KY488464 but overexpressed in T. purpurogenum KY488464. Thus, the calmodulin gene response of these fungal strains to both pesticides could be considered in monitoring the potentials of fungal strains to pesticide tolerance and bioremediation of pesticide in polluted soil.

Keywords : Calmodulin gene, pesticide, RT-PCR, talaromyces, tolerance
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