Detoxification of toxic phorbol esters from Malaysian Jatropha curcas Linn. kernel by Trichoderma spp. and endophytic fungi

ABSTRACT

The presence of phorbol esters (PEs) with toxic properties limits the use of Jatropha curcas kernel in the animal feed industry. Therefore, suitable methods to detoxify PEs have to be developed to render the material safe as a feed ingredient. In the present study, the biological treatment of the extracted PEs-rich fraction with non-pathogenic fungi (Trichoderma harzianum JQ350879.1, T. harzianum JQ517493.1, Paecilomyces sinensis JQ350881.1, Cladosporium cladosporioides JQ517491.1, Fusarium chlamydosporum JQ350882.1, F. chlamydosporum JQ517492.1 and F. chlamydosporum JQ350880.1) was conducted by fermentation in broth cultures. The PEs were detected by liquid chromatography-diode array detector-electrospray ionization mass spectrometry (LC-DAD-ESIMS) and quantitatively monitored by HPLC using phorbol-12-myristate 13-acetate as the standard. At day 30 of incubation, two T. harzianum spp., P. sinensis and C. cladosporioides significantly ($p < 0.05$) removed PEs with percentage losses of 96.9%–99.7%, while F. chlamydosporum strains showed percentage losses of 88.9%–92.2%. All fungal strains could utilize the PEs-rich fraction for growth. In the cytotoxicity assay, cell viabilities of Chang liver and NIH 3T3 fibroblast cell lines were less than 1% with the untreated PEs-rich fraction, but 84.3%–96.5% with the fungal treated PEs-rich fraction. There was no inhibition on cell viability for normal fungal growth supernatants. To conclude, Trichoderma spp., Paecilomyces sp. and Cladosporium sp. are potential microbes for the detoxification of PEs.

Keyword: Phorbol esters detoxification; Phorbol esters-rich fraction utilization; Fungal treatment; Mycelial dry weight; Cytotoxicity; Cell lines