

## 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 chlamyosporum* JQ350882.1, *F. chlamyosporum* JQ517492.1 and *F. chlamyosporum* 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. chlamyosporum* 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