

COMPARISON OF DETOXIFICATION METHODS ON PHORBOL ESTERS IN DEOILED *JATROPHA CURCAS* MEAL FOR ANIMAL FEEDS

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Abstract :

The deoiled *Jatropha curcas* meal by hexane extraction was detoxified phorbol esters by two different methods. These two methods were alkali in methanol and only ethanol washing. After both treatments, the phorbol esters (PEs) were decrease by 100%. The crude protein in detoxified meal of alkali in methanol washing was less amount than only ethanol washing. The result showed that treatment by only ethanol washing was a promising way to detoxify deoiled *Jatropha curcas* meal for animal feeds in industrial scale.

Introduction:

Jatropha curcas Linn is a drought-resistant plant which belong to the Euphorbiaceae family. Its seeds contained a high amount of oil content approximately 50-60% which is a good source of biodiesel fuel. After of oil extraction, the *Jatropha curcas* seedcake is rich in protein between 50-64%. However, the *Jatropha curcas* seed cake was found to be toxic to mice, rats, calves, sheep, goats, human and chickens, which greatly restricts its use. Some antinutritional components, such as saponin, phytate, trypsin inhibitors, glucosinolates, amylase inhibitors, flavonoids, vitexine, isovitexine and cyanogenic glucosides. Toxic irritant compounds, such as curcumin, β -D-glucosides of sitosterol and 12-deoxy-16-hydroxy phorbol that were reported in *Jatropha curcas* seed cake. Apart from these, phorbol esters (PEs) present at high levels in the seed cake had been identified as the main toxic agent responsible for toxicity. The term PEs are the esters of triglucan diterpenes (Fig.1 (1)) and chemical structure of PEs has six chemical structure 2-7 as shown in Fig.1. The PEs chromatogram showed in Fig.2.

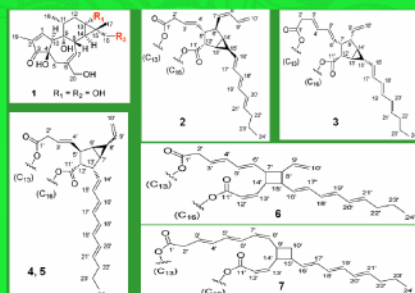


Fig.1 Six chemical structures of phorbol esters

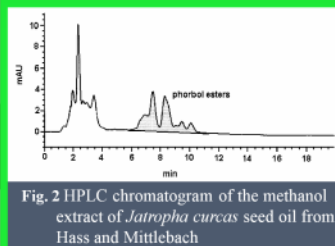


Fig. 2 HPLC chromatogram of the methanol extract of *Jatropha curcas* seed oil from Hass and Mittelbach

the objective of this research is to compare two methods especially alkali in methanol and only ethanol washing, to obtain a method that cannot only effectively remove phorbol esters compound but also maintain the crude protein content of detoxified meal.

Methodology

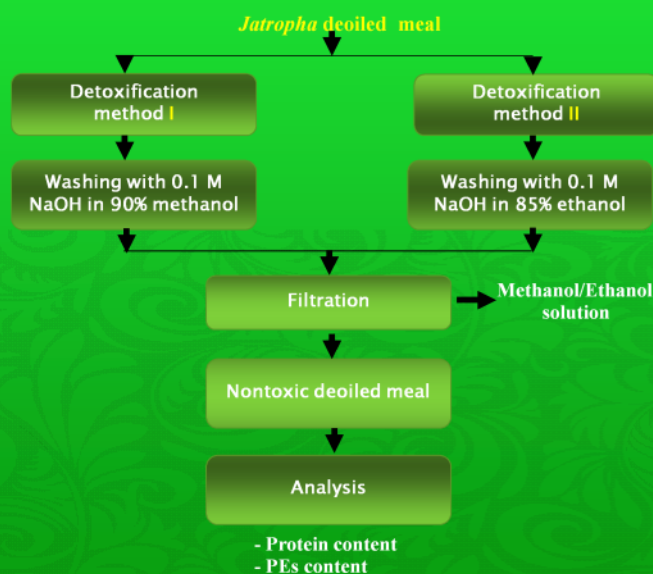


Diagram of phorbol esters detoxification from *Jatropha* deoiled meal with base solution washing

Results and Discussion :

The phorbol esters content in *Jatropha curcas* meal before hexane extraction (Fig.3(a)) and deoiled after hexane extraction (Fig.3(b)) were 2.9259 mg/g and 0.5482 mg/g. The results of phorbol esters detoxification by alkali in 90% methanol and 85% ethanol were shown in Fig.3(c) and Fig.3(d), respectively. The non toxified deoiled meals showed in figure 4(a) and 4(b).

Both chromatograms had not appeared four peaks of phorbol esers between 8-12 min. This mean all phorbol esters content could be remove by both in 90% methanol and 85% ethanol for washing. This result indicated that 85% ethanol washing had the same efficiency in phorbol esters removing as alkali in 90% methanol washing. But the advantage of ethanol is nontoxic solvent when it is compared with methanol. Additional, the condition of ethanol washing is lower temperature (40°C) than alkali in 90% methanol washing, too. The detoxified deoiled meals were further analyzed for crude protein. The result showed deoiled meal after alkali in 90% methanol and 85% ethanol for washing contained were 61.47% and 65.41% of crude protein, respectively.

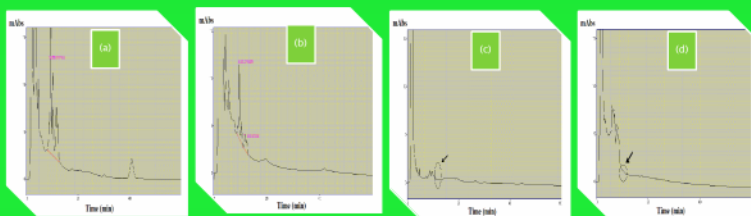


Fig. 3 Chromatogram of phorbol esters in experiment analyzed with chromatography technique, (a) *Jatropha curcas* meal before hexane extraction, (b) *Jatropha curcas* deoiled meal after hexane extraction, (c) deoiled meal of detoxification by alkali in 90% methanol washing and (d) deoiled meal of detoxification by 85% ethanol washing

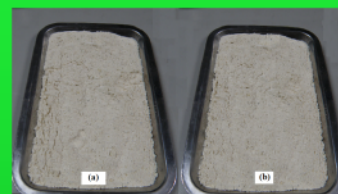


Fig. 4 Nontoxified deoiled meal after washing with alkali solution (a) alkali in 90% methanol (b) 85% ethanol

Conclusions :

On the basis of the results of this research, it can be concluded that the 85% ethanol washing is more economic and effective method to maintain crude protein content than alkali in 90% methanol washing. It can be concluded that this method was a promising way to detoxify *Jatropha curcas* deoiled meal after solvent extraction for animal feed.

Acknowledgement :

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