Short Communication

Aflatoxin Distribution in Fines and Meats from Decorticated Cottonseed

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ABSTRACT

Nine samples of fuzzy cottonseed potentially high in aflatoxin were separated into hulls, fines and meats. Assays for aflatoxin on triplicate 50-g portions from fines (small, dry particles of kernels) and meats from each of the nine samples indicated a marked concentration of toxin in the fines. On average, there was a 17-fold difference between the aflatoxin content of the fines and that of the meats; the average toxin level in fines was 4024 μg/kg and that in the meat samples was 232 μg/kg. These results indicate a potential for marked reduction in aflatoxin content of processed cottonseed meal by physical removal of fines from meats after dehulling and before processing of meats into oil and meal.

Before processing of fuzzy cottonseed into oil and meal, seed must be decorticated. When the kernels or meats are separated from the hulls, fines (very small dry particles of kernels) are produced by the friction involved in the decortication process. At this point in the processing procedure, hulls and fines could be kept separate from meats.

Our research needs dictated the preparation of a sample of cottonseed meal containing high levels of aflatoxin. During decortication of fuzzy seed we noticed a large amount of fines associated with the hulls. Since microscopic examination of *Aspergillus flavus* infected cottonseed (Fig. 1) revealed a concentration of mycelia and spores just beneath the seed coat (hull), it follows that secondary metabolites such as aflatoxin would be elaborated near the site of fungal infection. Variation in toxin would then exist within a kernel and toxins might be concentrated in material close to the hull. In anticipation of a higher yield of toxin in the fines. we kept the fractions (hulls, meats and fines) separate following decortication.

Nine sacks of fuzzy cottonseed, ca. 10 kg each, were obtained from the valley region of Arizona. Decortication was done on a huller-shaker (Carver Cotton Gin Co., Eastbridgewater, MA). Hulls were removed by density difference and fines were separated from meats on a 30-mesh shaker screen. Whitten (1) reported the absence of toxins in cottonseed hulls, therefore hulls were discarded without analysis. Meats and fines were analyzed separately for aflatoxin by the Pons procedure (2). Assays were in triplicate using 50-g grab-samples (samples taken without riffling) each of meats and fines. Results reported in Table 1 were subjected to an analysis of variance in a randomized block design with samples as blocks and with meats and fines as the two treatments. The analysis revealed a significant difference between samples ($p<.01$). Even though there was significant variation in the aflatoxin content between 50-g portions of meats and fines, in no instance was the variation among samples as great as that between meats and fines within samples.

Aflatoxins were definitely concentrated in the fines. The analyses of variance revealed a significant difference between meats (mean = 232.1 μg/kg) and fines (mean = 4023.9 μg/kg) at the 0.001 level of probability. In only one sample, sample 5, was the aflatoxin content of the meats above 1000 μg/kg. This sample also had the greatest variation in toxin content between grab-samples (none detected to 2560 μg/kg). On average, the fines contained 17 times the amount of toxin contained in meats. The meats of sample 1 contained no detectable toxins (<1 μg/kg), whereas the fines had from 1340 to 2500 μg/kg. In all other cases, some toxins were detected in the meats. When a portion of the meats from samples 5 and 8 were further treated, toxins were greatly reduced in the remaining meats. Portions of the meats from samples 5 and 8 were treated by placing the meats (ca. 1 kg) in a thin layer on a 20-mesh screen and air-washing. The small quantity of very fine material removed by the air contained essentially all of the toxins, while the "washed" meats were virtually toxin-free. Fines from sample 5 contained 3600 μg/kg and those of sample 8 had 800 μg/kg; the corresponding meats contained 20 and 30 μg/kg, respectively.

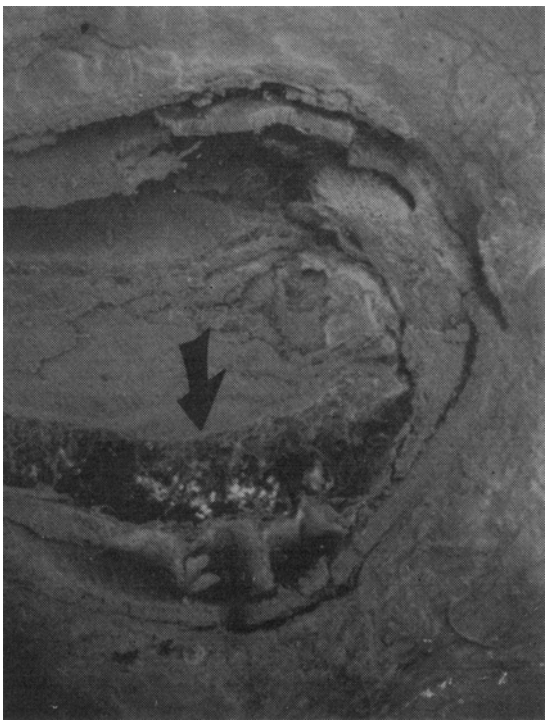

FIG. 1. Scanning electron micrograph of an *Aspergillus flavus* inoculated cottonseed. Magification 20X. Arrow indicates location of fungus.

TABLE I

Aflatoxin Content of Meats and Fines Separated From 9 Samples of Cottonseed Following Decortication

Meats[a]	Fines[a]	Meats	Fines	Meats	Fines
Sample 1		Sample 2		Sample 3	
ND[b]	2500	120	300	240	8600
ND	1340	510	740	410	5630
ND	1420	60	1040	20	5050
Sample 4		Sample 5		Sample 6	
20	7680	2560	4110	50	9620
30	3660	140	4840	50	4650
ND	2790	ND	1050	420	5680
Sample 7		Sample 8		Sample 9	
930	8560	110	3360	20	6670
5	3330	40	1880	65	5220
280	6420	3	900	180	1600

[a]Analyses were done on three 50-g grab-samples of meats and fines after separation of ca. 10-kg samples of whole seed.
[b]ND: none detected, <1 μg/kg.

Our results show a definite concentration of aflatoxin in the fines of decorticated cottonseed. It follows that removal of such fines by a physical separation such as extensive air-washing could be used to reduce the toxin level of aflatoxin-contaminated cottonseed. Meal produced from such seed could more readily find a market as animal feed.

ACKNOWLEDGMENT

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REFERENCES

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