

# DISEASES

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## Aflatoxin Contamination of Cottonseed From Pink Bollworm Damaged Bolls

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### ABSTRACT

*Aflatoxin contamination of cottonseed from bolls damaged by the pink bollworm was compared with contamination of cottonseed from undamaged bolls. Cottonseed produced in pink bollworm damaged bolls was the predominant source of aflatoxin contaminated cottonseed.*

### INTRODUCTION

The fungus *Aspergillus flavus* contaminates cottonseed with aflatoxins during seed infection. Although the fungus can infect bolls via natural openings, such as sutures and nectaries, aflatoxin contamination of cottonseed has been associated with insect damage in the field. A study was carried out to determine the precise relationship between pink bollworm damage and aflatoxin contamination of cottonseed.

### METHODS AND MATERIALS

Cotton bolls were collected from two cotton fields in the Yuma Valley in Arizona. At randomly-selected locations in each field, fully mature bolls in the lower third of the plants were examined for pink bollworm exit holes in the carpel walls. Each boll with an exit hole was collected along with an apparently undamaged boll at a similar position on the same plant. Twenty-five pairs of bolls were collected from one field on 16 September 1987, and from two fields on 28 October 1987.

The aflatoxin content of seed from the following sources was determined on a boll-by-boll basis: (a) PBW damaged locks; (b) undamaged locks of PBW damaged bolls; (c) non-damaged bolls.

For statistical analysis, samples from each treatment were randomly sorted into 5 replicates. Mean replicate values were transformed ( $\log(X+1)$ ) and evaluated by analysis of variance (3 treatments, 5 replicates); tests containing significant differences were subjected to Fischer's least significant difference test.

### RESULTS AND DISCUSSION

Pink bollworm (PBW) damaged bolls contained over 99% of the aflatoxin detected in this study and over 50% of PBW-damaged bolls produced aflatoxin contaminated seed in each harvest. Conversely, only 0 to 8% of non-damaged bolls contained contaminated seed in the 3 harvests (Table 1). Toxin levels in seed from PBW-damaged locks averaged 14,400 ng aflatoxin per gram cottonseed over the three harvests, whereas toxin levels

in seed from non-damaged bolls averaged only 1.80 ng aflatoxin per gram of cottonseed. Aflatoxin concentrations over 10,000 ng per gram were detected in cottonseed from 16 to 32% of PBW-damaged locks, whereas the highest toxin level detected in cottonseed from a boll not damaged by PBW was 93 ng/g.

In the 3 investigated harvests, aflatoxin contamination occurred primarily in cotton bolls damaged by the PBW. Occurrence of low aflatoxin levels in non-damaged bolls, however, indicated that infections not associated with PBW damage did occur.

Our results confirmed conclusions of previous researchers that control of PBW populations should reduce aflatoxin levels. Aflatoxin control strategies should include techniques to either reduce contamination of pink bollworm damaged bolls by Aspergillus flavus or to reduce pink bollworm damage during periods when the fungus is most active.

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Table 1. Aflatoxin B<sub>1</sub> content of cottonseed from: pink bollworm damaged locks (DL), non-damaged locks (NL) of damaged bolls, and bolls not damaged (NB) \*

Field	Harvest date	Seed type	Percent contaminated	Percent over 10,000 ng/g	Aflatoxin B <sub>1</sub> (ng/g):		
					Maximum	Minimum	Average **
1	Sept. 16	DL	52	32	152,000	0	16,790 a
		NL	8	0	27	0	2 b
		NB	8	0	93	0	5 b
1	Oct. 28	DL	68	16	146,000	0	17,470 a
		NL	16	4	32,000	0	1,280 b
		NB	8	0	12	0	0.4 b
2	Oct. 28	DL	54	16	160,000	0	8,890 a
		NL	8	4	10,300	0	420 b
		NB	0	0	0	0	0 b

\* Each value represents data from 25 analyses of individual bolls.

\*\* Average of 5 replicates; each replicate is the mean of 5 analyses. Values within a harvest annotated with different letters are significantly different (P=0.05) by Fischer's least significant difference test.