Effect of Harvest Date on Aflatoxin Contamination In the Yuma Valley

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ABSTRACT

Experiments were performed at the Yuma Valley Agricultural Center to determine how timely harvest of cotton may affect aflatoxin contamination of cottonseed. As the cotton was held in the field between the final irrigation and harvest, the quantity of aflatoxin in the crop increased. Significant reductions in aflatoxin contents of seed were realized by harvesting in early September.

INTRODUCTION

The fungus Aspergillus flavus contaminates cottonseed with aflatoxins during seed infection. Although this 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 (1,5,7) and we have demonstrated that the great majority of aflatoxin occurs in bolls that have been damaged by the pink bollworm (2). Therefore, proper management of pink bollworm damage is an important component of a sound aflatoxin management program. Shortening the period through which cotton is held in the field may also reduce aflatoxin contamination. It has been shown that aflatoxin contamination is reduced when late season irrigations are reduced. The current investigation was undertaken to determine if aflatoxin contamination increases as the cotton is held in the field after the final irrigation.

MATERIALS AND METHODS

Experiments were conducted in both 1987 and 1988 at the Yuma Valley Agricultural Center. Deltapine 90 was planted in mid-March on 40-inch centers in both years. Treatments (cotton harvested on different dates) were distributed in complete randomized blocks. Blocks were 4 to 8 rows of cotton about 200 feet long. Samples were taken from 25-foot, single row-segments randomly distributed within blocks. In 1987, two treatments were replicated six times. In 1988, three treatments were replicated eight times. Pink bollworm control was not initiated until a 15 percent to 20 percent infestation occurred in 1987 and a 25 percent to 30 percent infestation occurred in 1988. This was done because pink bollworm damage increases aflatoxin contamination.

In order to control the influence of boll age and position on toxin content of harvested seed, bolls forming early in the season were tagged while immature. Sixty 20- to 30-day-old bolls were tagged in each replicate in early July. Tagged bolls were harvested towards either the beginning (August 27 or September 15), middle (September 28), or end (October 25 or 27) of the usual commercial harvesting period in the Yuma Valley. The final irrigation was applied about 15 days before the first harvest. Aflatoxin content of harvested bolls was determined as previously described (3).

RESULTS

The aflatoxin content of the seed increased as the cotton was held in the field after the last irrigation in both years. In 1987 the toxin contents increased over sevenfold between September 15 and October 27. In 1988 the increase was threefold between August 23 and October 25.

Table 1. Quantity of aflatoxin B1 detected in cottonseed harvested in the Yuma Valley on several dates during 1987 and 1988

	Aflatoxin B1 content (ng/g)			
Year	August 23	September 15	September 28	October 25, 27
1987		96a		763 b
1988	2,555 x		7,316 y	8,162 y

Means followed by the same letter are not significantly different at the O.O5 probability level according to Fisher's LSD.

DISCUSSION

Cottonseed becomes associated with Aspergillus flavus in the field prior to harvest. The fungus remains associated with the seed until the seed is ultimately used. The fungus can continue to produce aflatoxins as the seed is held in the field, in modules or piles after ginning (4,6). The extent of this phase of the aflatoxin contamination is dependent upon what environmental conditions the seed is exposed to. Timely harvest and careful postharvest handling can improve management of aflatoxin contamination.

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