THE EXPERIMENTAL USE PROGRAM FOR DETERMINING THE EFFICACY OF AFLA-GUARD® FOR BIOCONTROL OF AFLATOXIN IN CORN

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SUMMARY:

Although aflatoxin concentrations in corn were generally low in 2007, data collected showed that corn treated with the new biopesticide "Afla-guard" (it received special experimental use permit for use on corn at early silk to tassel stage), had a significant impact by reducing aflatoxin levels in corn.

OBJECTIVES:

Research conducted over several years has resulted in the development of a product for biological control of aflatoxin contamination. The biopesticide is now produced commercially under the trade name, Afla-guard®, and it is approved for use in commercial peanut production. Afla-guard is used to establish a dominant population of a nontoxigenic strain of *Aspergillus flavus* (NRRL 21882) in soil where the applied strain competitively excludes toxigenic strains in the colonization of peanuts during periods of late-season drought. Results of studies conducted in 2005 and 2006 showed that Afla-guard also has potential for controlling aflatoxin contamination in corn. Therefore, an experimental use permit (EUP) was sought from the US Environmental Protection Agency to allow large-scale testing to determine the efficacy of Afla-guard for biocontrol of aflatoxin in corn. The permit was granted in May 2007 allowing treatment of up to 3000 acres of corn in Texas to determine the efficacy of Afla-guard® for biocontrol of aflatoxin in corn.

MATERIALS and METHODS:

Southern Texas was chosen for the study because the potential for aflatoxin contamination there is historically high. To increase the likelihood of obtaining useful efficacy data, two different areas were included in the study. The first included about 1000 treated acres in Victoria, Calhoun, and Refugio counties along the southeastern Texas gulf coast, subsequently referred to as the Victoria area. The other included about 2000 treated

acres in Uvalde and Medina counties located west of San Antonio, subsequently referred to as the Uvalde area. Approximately half the acreage was treated with the peanut-approved rate of 20 lb/ac and the other half was treated at 10 lb/ac. Afla-guard was applied aerially between May 7 and May 18 when the majority of corn in the Victoria area was in early silk and the majority in the Uvalde area was beginning to tassel. Non-treated control fields were identified in relatively close proximity to treated fields.

As corn was harvested and delivered to buying points, approximate 10-12 pound samples were collected from both treated and untreated fields. Samples were shipped to the National Peanut Research Laboratory where they were ground in a Romer mill, and the entire ground sample was then combined with an equal weight of water and ground in a vertical cutter mixer to homogenize aflatoxins and *A. flavus* propagules. Separate subsamples were taken for aflatoxin analysis by HPLC and for dilution plating to determine the degree of *A. flavus* colonization of corn (results not complete at this time).

RESULTS and DISCUSSIONS:

Environmental conditions were characterized by abnormally high rainfall amounts and unusually cool temperatures that were not conducive for aflatoxin contamination. As a result, aflatoxin concentrations in corn were generally quite low, and often not detectable. Nevertheless, treatment with Afla-guard produced significant reductions in aflatoxin contamination.

In the Victoria area, the mean aflatoxin concentration in 93 samples from untreated fields was 5.4 ppb compared with means of 2.3 (n = 43) and 0.5 (n = 50) ppb from fields treated with 20 and 10 lb/ac, respectively. Kruskal-Wallis analysis of variance on ranks revealed significant ($P < 0.05$) reductions in aflatoxin were associated with both treatment rates. See Table 1. Both treatment rates also significantly reduced aflatoxin in the Uvalde area where means for control, 10 and 20 lb/ac treatments were 0.9, 0.3, and 0.1 ppb, respectively. There were no significant differences between the two treatment rates in either area. See Table 2.

Combining data from the two treatment rates and from both areas, aflatoxin in control peanuts averaged 3.4 ppb (n = 167) compared with 0.5 ppb (n = 283) in all treated peanuts, an 85% reduction. See Table 3. Chi-square analysis of the data showed that treatment with Afla-guard also produced a significant increase in the percentage of samples not contaminated with aflatoxin. Of samples from untreated, control fields, 33.5% did not contain any detectable aflatoxin compared with 78.1% negative samples from treated fields. Table 4 shows a comparison of aflatoxin reduction in peanuts and corn when treated with Afla-guard.

Although aflatoxin concentrations in corn were generally low, the data showed that treatment with Afla-guard had a significant impact by reducing aflatoxin levels in corn.

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DISCLAIMER CLAUSE:

Trade names of commercial products used in this report are included only for better understanding and clarity. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M University System is implied. Readers should realize that results from one experiment do not represent conclusive evidence that the same response would occur where conditions vary.

Table 1. Evaluation of Afla-guard on corn for Aflatoxin control. Victoria County, TX 2007

Farm # / Location	# Samples per Treatment	Control	10 lbs/ac	20 lbs/ac
1 Victoria area	20	2.4	0.3	n/a
2 Victoria area	10	2.0	0.1*	n/a
3 Victoria area	10	1.1	1.2	n/a
4 Victoria area	10	1.3	0.6	n/a
5 Victoria area	20	17.5	n/a	4.3***
6 Victoria area	23	2.7	n/a	0.5**
Summary for Victoria	93	5.4 a	0.5 b	2.3 b

Table 2. Uvalde Area Aflatoxin Results, Uvalde, TX, 2007

Rate	# Fields	# Samples	ppb
Control	7	74	0.9 a
10 lbs	6	55	0.3 b
20 lbs	7	135	0.1 b

Table 3. Overall Aflatoxin Summary, Victoria County and Uvalde County, TX areas, 2007

Rate	# Samples	Mean	Max	% Neg
Control	167	3.4	114.2	33.5
Treated	283	.05	25.5	78.1

Table 4. Comparisons of Aflatoxin Reductions in Peanuts and Corn, Victoria County and Uvalde County, TX areas, 2007

Rate	Peanuts 2004	Corn 2007
Control	78.9	3.4
Treated	11.7	0.5
% Reduced	85.2	85.3