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HELIOTHINE BOLL DAMAGE SURVEY IN ARKANSAS, 2002

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Abstract

With almost 70% of the state conducting a Boll Weevil Eradication program the amount of Bt cotton has risen to comprise 60% of the acreage in Arkansas. The 2002 growing season was unique in that budworm pressure was greater in many parts of the northeast part of the state, compared to the southeast, which traditionally experiences more budworm pressure. A field survey was conducted in late August to compare the performance of Bt and non-Bt varieties. Across the state Bt varieties had significantly less boll damage than non-Bt varieties and required significantly less insecticide applications for control of heliothines. When varieties were compared, although sample numbers were insufficient to make a conclusive statement, it appeared that some varieties experienced more boll damage than others.

Introduction

Approximately 94% of the one million acres of cotton planted in Arkansas in 2002 were planted to transgenic varieties. Bt-transgenic varieties composed 60% of the planted acreage in Arkansas (USDA, 2002). Almost 70% of the state is currently active in the Boll Weevil Eradication Program being conducted in the state. With the potential threat of secondary pests associated with the eradication program growers have been encouraged to increase their usage of Bt-transgenic varieties particularly in the second year of the eradication program.

The 2002 growing season, in regard to heliothine populations was extremely different than what we have experienced in previous years in Arkansas. Tobacco budworm, *Heliothis virescens*, was not as big a problem in the south compared to the northeast. The southeast is traditionally the more active area for heliothines. Many growers in northeast Arkansas, although the BWEP was in the first full year, did not plant Bt cotton and found themselves treating multiple times for tobacco budworm. Tracer, Steward, Curacron, Larvin and Double Threat were used for control, depending on what was available. A section 18 for Denim was also in place and many growers used this material as well. Tobacco budworm outbreaks occurred first along the St. Francis River in early July and had spread across the entire northeast area by mid-August. Meanwhile cotton bollworms were reported and observed in higher-than-normal numbers in Bt cotton throughout the state. In many cases multiple applications were necessary to control bollworms in Bt cotton. In past years the need for supplemental foliar sprays applied to Bt for bollworm control has been considerably less throughout the mid-south, Layton, et. al. (2002) reported a range of 0.33 to 1.2 supplemental applications made on Bt cotton from 1996 through 2001, while across the cotton belt supplemental applications have ranged from 0.29 in 1999 to 0.4 in 2001. The purpose of this survey was to document the alleged higher than normal boll damage observed and the subsequent increase in supplemental applications needed for control of the cotton bollworm.

Methods

In late-August of 2002 and ending by the first week of September, a survey was conducted to determine the amount of caterpillar damage to bolls and to document the number of applications used to control caterpillar pests in Bt- and conventional cotton. All fields had reached NAWF=5 or "cutout" (Bourland, et al., 1992)

Fields were selected with the assistance of private consultants and county agents. A total of 121 observations were included in the survey, 78 were Bt cotton with 43 non-Bt. Because of differing population levels in the two regions, observations were further differentiated by being designated as northeast or southeast. Fields in the northeast were located north of a line drawn due east and west through the middle of the state with most observations recorded in the uppermost 3 tiers of counties in northeast Arkansas including Mississippi, Craighead, Crittenden, and Lee counties. The southeast counties included Ashley, Chicot, Desha, Drew, and Lincoln Counties.

Percent boll damage was determined in most observations by taking four 3.5 ft samples in random locations within the field and the total number of bolls was recorded. Some observations were taken by sampling 300 bolls per field; these were taken as 100 consecutive bolls from each of three randlomly selected sites per field. Bolls were categorized as undamaged (no visible signs of feeding damage) or damaged (as a visible hole in the carpel wall). No attempt was made to differentiate between damage caused by heliothines and other caterpillar pests.

Interviewing the producer, referencing field treatment records and determining the primary target of all insecticide applications determined treatment history. Almost all treatments made during July and August were targeted for caterpillar pests particularly Heliothines although Fall Armyworm may have been present in some fields. Applications of ULV Malathion as part of the BWEP were not counted as oversprays.

Data was analyzed as a simple t-test with the P level set at 0.1.

Results and Discussion

A total of 121 observations were included in the survey. Seventy-eight locations were planted to Bt varieties while 43 were planted to non-Bt varieties (Table 1). The most commonly planted Bt varieties planted were Deltapine DPL 451 B/RR (20), SureGrow SG 215 B/RR (19), and Stoneville STV 4892 B/RR (15). A total of nine different varieties were included in the survey. Forty-three locations were planted to non-Bt varieties and 12 different varieties were included. Phytogen 355, planted at 7 locations, was the most common variety planted. Other varieties included Stoneville varieties STV 4793 RR and STV BXN 47; Deltapine varieties DPL 491 RR, DPL 436 RR, and DPL 5415; SureGrow Varieties SG 521RR and SG 747; Fibermax varieties FM 956 and FM 958, and Paymaster varieties PM 1218, and PM 1199 RR.

Tobacco budworm populations were very high in the northeast part of the state and moderate in the southeast part of the state in 2002. There were no reports of Tobacco Budworm applications needed on Bt cotton. Bollworm populations were moderately high throughout the state and all fields in the survey except one received at least one application of insecticide for worm control. Statewide, Bt cotton had 3.65% damaged bolls compared to 4.9% for non-Bt with Bt cotton receiving, on the average, just over 2 applications of insecticides for worm control while non-Bt cotton received almost 5 applications (Table 1). This compares to a high of 2.7% in 1996reported by Layton et. al (2001) in a 6 year summary. Coincidentally, the 4.9% boll damage in non-Bt observed in this survey matches that seen by Layton et. al (2001) which also occurred in 1996.

In the southeast, where Budworm was not as prevalent, the percent boll damage was 4.8% and 5.6% for Bt and non-Bt, respectively (Table 2). The average number of insecticide applications for Bt averaged 2.8 and for non-Bt was significantly higher at 6.0. This indicates the value of Bollgard cotton in years with moderate to heavy worm infestations. In the northeast part of the state, results were extremely variable depending on location and may not accurately reflect the worm pressure in the area. No significant differences were observed in percent boll damage and number of insecticide applications used for worm control.

When varieties were compared it appeared that some varieties had a higher percentage boll damage than other varieties (Table 5). These data indicate possible differences but due to the low number of samples taken, no conclusions can be made. Adamczyk et. al (2000) reported differences in toxin levels of some varieties in various plant parts and further information may lead to identifying varieties that express the toxin better than others.

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References

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Table 1. Percent boll damage and number of insecticide applications for Bt-cotton and non-Bt cotton, Arkansas, 2002.

Avg. No.	% Boll Damage	Applications	N
Bt	3.65*	2.01*	78
Non-Bt	4.90*	4.90*	43

*Pairs of means followed by * indicate significant difference by t-test (P=0.1).

Table 2. Comparison of percent boll damage and number of insecticide applications for Bt- and non-Bt cotton in southeast Arkansas, 2002.

Avg. No. of	% Boll Damage	Applications	N
Bt Cotton	4.8	2.8*	57
Non-Bt Cotton	5.6	6.0*	31

*Pairs of means followed by * indicate significant difference by t-test (P=0.1).

Table 3. Comparison of percent boll damage and number of insecticide applications for Bt- and non-Bt cotton in northeast Arkansas, 2002.

Avg. No. of	% Boll Damage	Applications	N
Bt Cotton	2.4	1.6	21
Non-Bt Cotton	3.2	1.5	12

*Pairs of means followed by * indicate significant difference by t-test (P=0.1).

Table 4. Comparison of percent boll damage and number of insecticide applications for Bt-cotton varieties, Arkansas, 2002.

Avg. No. of Variety	%Boll Damage	Applications	N
STV BXN 49 B	5.86	2.0	4
STV4691 B/RR	5.50	2.0	4
STV 4892 B/RR	4.71	2.3	15
PM 1218 B/RR	4.20	1.6	7
DPL 451 B/ RR	3.33	2.3	20
SG 215 B/RR	2.82	1.9	19
DPL 33B	2.20	1.0	1
FM 989 B/RR	2.20	1.0	4
SG 501 B/ RR	1.60	2.0	4
Average of Bt Varieties	3.65	2.0	