EVALUATION OF ECONOMIC THRESHOLDS FOR BOLL FEEDING BUGS IN COTTON

Blake Young[1], Stephen Biles[2], Greta Schuster[1], and Shad Nelson[1],
[1]Texas A&M University – Kingsville, Kingsville, TX, and
[2]Texas A&M AgriLife Extension Service Port Lavaca, TX

Objectives

The objective of this project is to evaluate the economic threshold for boll feeding bugs in cotton, determining if the current threshold is adequate for more insects, than just stink bugs.

Abstract

Boll feeding damage caused by various insect species in the order Hemiptera continue to emerge as an economic pest of cotton. With advancements in cotton such as Bacillus thuringiensis (Bt) in selected varieties and practices of boll weevil eradication, new emerging insect pests are becoming problematic. These insect pests include the stink bugs (Pentatomidae) and plant bugs (Miridae). A study was initiated in 2012 at Port Lavaca, Texas to evaluate the economic threshold (ET) of boll feeding insects in cotton. The trial consisted of four treatments 1) an untreated check, 2) weekly automatic insecticidal application, 3) insecticide applications based on the ET level of 20% bolls with feeding damage and 4) an application at 50% boll feeding damage. Dicrotophos (Bidrin®) was the insecticide used for all applications. Boll damage was evaluated by randomly selecting twenty, 1-inch bolls from each plot on a weekly basis starting 10 days after first bloom. Each boll was visually assessed for external feeding damage and then further evaluated on internal feeding damage. The weekly automatic treatment received a total of three insecticidal sprays and the 20% internal feeding treatment received two applications. In the final week of sampling, statistical differences in boll feeding were observed between the untreated check and the two insecticidal treatments, but not observed between the two insecticidal treatments. No differences in yield or fiber quality were found between treatments. Further studies should be conducted to better evaluate the threshold for different regions.

Materials and Methods

This study was conducted in Port Lavaca during 2012 with the cotton variety Deltapine 1044 B2RF. Plots were planted on March 1, 2012 on 40-inch row spacing, with four replications. Each plot had 12 rows at a length of 50 feet with a total of 16 plots. The four treatments used in this study were 1) untreated check, 2) weekly automatic insecticidal application, 3) insecticide applications based on the ET level of 20% bolls with feeding damage and 4) applications at 50% boll feeding damage. Bidrin® was applied at the label rate of 8 oz/A for each treatment application. A Spider Trac sprayer was calibrated to deliver 5.8 gpa through TXVS-04 nozzles while traveling at 3.5 mph during application. A CO2 pressurized cylinder was used to apply pressure to the spray boom.

Boll feeding was evaluated by randomly selecting 20 bolls of 1-inch diameter from each plot, weekly, after the first insecticide application,. Bolls were picked from row two the first time, row three the second time, and row four the final time. Bolls were examined for external lesions and categorized into bolls with lesions and bolls without lesions. Under each category, bolls were assessed for internal damage for boll wall warts, stained seed, and/or stained lint. When incidence of boll feeding damage was above the action threshold, an insecticidal treatment was applied.

The weekly automatic insecticide application was first applied on June 14, 2012 at about eight NAWF. The first examinations of bolls were examined on June 22nd. The second application was on June 25th, where the weekly spray and 20% feeding were treated. Bolls were then examined for a second time on June 28th. The third application was on July 2nd, on the weekly spray and 20% feeding treatments. The final examinations of bolls were examined July 6th. We were unable to spray any of the plots because of rain. It should also be noted that insect observations were made when picking bolls but also on days of application by beat sheets or sweeps.

Harvest was done on row nine on August 27, 2012. Fiber lint quality and yield were examined.

Statistical Analysis was done using ARM 8.4.2 using the LSD statistical method with p > 0.05.

Results

Table 1. Insect species observed during bloom in cotton treated at various thresholds.

Insects	Friday, June 22, 2012	Monday, June 25, 2012	Friday, June 29, 2012	Monday, July 02, 2012	Monday, July 09, 2012
Euschistus servus AD	7	3	7	4	0
Creontiades signatus AD	0	2	7	13	11
Creontiades signatus N	2	13	10	6	25

Table 2. Percent evidence of internal boll feeding on cotton with insecticidal treatments based on different thresholds for insecticide application.

Treatment	Rate	Application	6/22/2012	6/28/2012	7/6/2012
1) Untreated			20.0%a	42.5% a	73.8%a
2) Automatic weekly	8 oz/A	A B C	10.0%a	17.5%a	18.8%b
3) 20% evidence boll feeding(ET)	8 oz/A	B C	28.8%a	36.25a	22.5%b
4) 50 % evidence boll feeding	8 oz/A		16.3%a	33.8%a	66.3%a
LSD (P=.05)			3.771	4.268	4.111
Standard Deviation			2.179	2.466	2.376
CV			58.12	37.95	26.22
P>f (0.05)			0.2057	0.1179	0.001

Table 3. Yield data

Treatment	Lint Yield
1) Untreated	1415.6 a
2) Automatic weekly	1488.3 a
3) 20% evidence boll feeding(ET)	1416.0 a
4) 50 % evidence boll feeding	1310.4 b
LSD (P=.05)	93.1
Standard Deviation	47.43
CV	3.37
P>f (0.05)	0.027

Figure 1. Displaying Boll Feeding Percentages

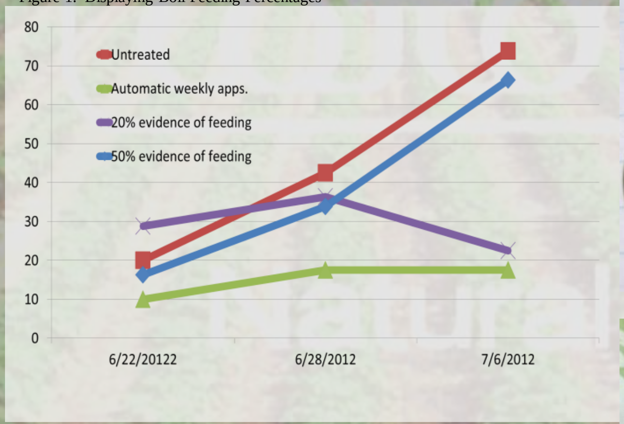
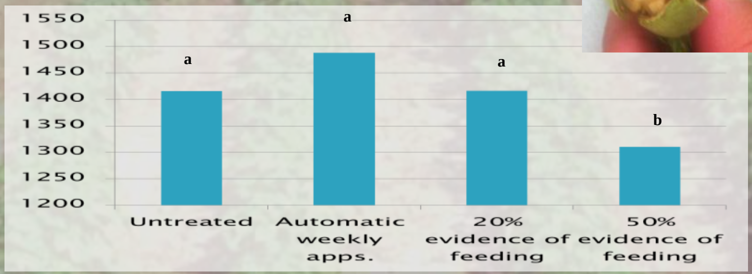


Figure 2. Displaying yield data



Results and Discussion

Insects found in the research plots include *Euschistus servus* adults and *Creontiades signatus* adults and nymphs. These species have all been found to cause similar internal evidence of feeding. Thus, the internal and external evidence of feeding cannot be attributed to only one of the insect species found. There was an increase in *Creontiades signatus* the final three dates; likely because of the harvest of neighboring corn and sorghum fields in the area or the change in sampling techniques from beat sheets to sweep nets (Table 1).

For the first two dates of boll sampling, no differences were found for evidence of internal boll feeding (Table 2 & Figure 1). On the third date, the automatic and 20% ET treatments both had lower internal feeding than the untreated control and 50% ET treatment.

No differences were examined on fiber quality between treatments. No differences were observed for lint yield between sprayed treatments and the untreated control. However, all treatments had more lint per acre than the 50% evidence of internal feeding treatment had no insecticidal applications. This demonstrates the difficulty of evaluating economic thresholds on highly mobile insects which have the ability to move easily between treated and untreated plots(Table 3 & Figure 2).

Summary

Boll feeding is and will continue to be an economic problem. The piercing/sucking mouthparts of the stink bugs (Pentatomidae) and plant bugs (Miridae) are the prime cause of boll feeding and boll rot in cotton; which has become more common in recent years. These two families are known as secondary pests in cotton. But with reduced insecticide applications due to the success of the boll weevil eradication and increased adoption of BT cotton, these secondary pests are now becoming a higher priority as boll feeding pests. This study was conducted to evaluate the ET of 20% feeding boll damage that is commonly used for the stink bugs, as an action threshold for both stink bugs and Creontiades signatus.

From this study we can see that the applications did have an effect on the boll feeding damage. What was interesting about this study was the yields of the untreated control and treated plots had no statistical difference, but this is likely because of the size of the plots. Had each plot been larger or more yield rows would have been taken, this could have changed the outcomes of the cotton yield. It is not feasible to draw conclusions on an economic threshold for all boll feeding insects on this study alone. Not only because of our rainy period affecting application timing, but also further and more expansive research needs to be done in different regions.

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