REFINING TREATMENT THRESHOLDS FOR STINK BUGS IN THE SOUTHEAST - 2007

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Abstract

Boll-feeding bugs (plant bugs and stink bugs) continue to be an important group of insects requiring control in cotton in the USA. In the southeastern region of the country, stink bugs are the predominant group of sucking pests important in cotton production. During 2007, research on treatment thresholds for stink bugs in the Southeast (NC, SC, and GA) using population indices (bolls injured internally by feeding bugs) resulted in data that provided limited insight into refinement of currently recommended thresholds due to low stink bug pressure. As observed in 2006, a dynamic action threshold, based on varying injury levels by week of bloom (8 weeks: 50, 30, 10, 10, 10, 30, 30, and 50%), demonstrated promising results in refinement of thresholds for sucking bugs in the Southeast by highlighting the importance of weeks 3-5 of bloom. Considering the relatively low populations of stink bugs observed during 2007 and 2006, continued research in 2008 will allow further improvement of recommendations for managing stink bugs in the southeastern USA, especially considering the potential for a belated resurgence of high populations in the near future.

Introduction

When cotton varieties with single-protein (i.e. Bollgard) protection from lepidopterans, afforded by genetic insertions from *Bacillus thuringiensis* (Bt) var. *kurstaki*, become unavailable in a couple of years and dual-protein

(i.e. Bollgard II, WideStrike, VipCot) transgenic Bt varieties become the only option, the bollworm, *Helicoverpa zea* (Boddie), will no longer be the most damaging insect pest of cotton in the USA. The true bugs (Miridae – plant bugs and Pentatomidae – stink bugs) will most likely take over the number one spot, depending on region of the country (Southeast, Mid-South, West). The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), will be the most important insect pest of cotton in the Mid-South, the western tarnished plant bug, *Lygus hesperus* Knight, will remain predominant in western areas, and species of stink bugs, such as the green stink bug, *Acrosternum hilare* (Say), the southern green stink bug, *Nezara viridula* (L.), and the brown stink bug, *Euschistus servus* (Say), will be the most important group of insect pests of cotton in the Southeast.
There are considerable costs related to control of and losses to yield and fiber quality incurred from perennial infestations of the sucking bug complex in US cotton (Barbour et al. 1990, Roberts and Bednarz 2005, Roberts et al. 2006). In the Southeast, economic thresholds for stink bugs have been researched (Greene and Herzog 1999; Greene et al. 2000; Greene et al. 2001a,b; Greene and Capps 2003; Greene et al. 2004, 2005, 2007; Bacheler and Mott 2005, Bacheler et al. 2006) and adopted but need to be verified and refined if possible. Further development and validation of thresholds for the sucking bug complex in cotton will provide information needed to maximize yields and preserve high fiber quality. In 2007, we investigated treatment thresholds and application timings for stink bugs in cotton in North Carolina, South Carolina, and Georgia.

Materials and Methods

Cotton (Bollgard 2 / Roundup Ready Flex) was planted during late April and May in North Carolina, South Carolina, and Georgia. Percent boll damage was determined by randomly selecting quarter-sized bolls (10 or 25) from each plot. Each boll was evaluated for internal feeding injury and lint stain damage. Foliar applications of lambda-cyhalothrin (Karate 2.08CS) or cyfluthrin (Baythroid 1 or 2EC) at 0.033 lb (AI)/acre plus dicrotophos (Bidrin 8E) at 0.25 lb (AI)/acre were made based on percent internal boll injury (static at 10, 20 or 30%; or dynamic at 50, 30, 10, 10, 10, 30, 30, and 50% for weeks 1-8 of bloom, respectively) or on schedule (weekly; 3rd, 5th, and 7th week of bloom). Samples of insect density were taken regularly with a drop cloth to determine abundance and species present I plots. Data were processed using Agriculture Research Manager (ARM) (Gylling Data Management, Inc., Brookings, SD), and means were separated using Least Significant Difference (LSD) procedures following significant F tests using Analysis of Variance (ANOVA).

Results and Discussion

Data gathered in Georgia during 1998-2001 (Figure 1) on preliminary development of boll-injury thresholds for stink bugs (Greene and Herzog 1999, Greene et al. 2000, Greene et al. 2001) demonstrated that the technique of using symptoms of feeding injury to bolls could be used as an indirect sample of stink bug density. It was established that signs of feeding damage in bolls could be used as a monitoring tool to trigger insecticide application for stink bugs in cotton. Static treatment thresholds were established in most cotton-growing states because of this previous research. During 2007, multiple tests in the southeastern USA were established to refine treatment thresholds and other timings of insecticide application for stink bugs in cotton. In general, populations of stink bugs were very low during 2007. In North Carolina (Figure 2), there was an economic disadvantage to insecticide applications for bugs at the sites used in 2007. This was identical to results observed in 2006 (Greene et al. 2007). In South Carolina, there were no significant differences in yield among the treatments tested at five of six trials in 2007. This also was consistent with 2006 results. In two of those six trials, season-long protection from early populations of plant bugs did not result in positive net returns, indicating that plant bugs were unimportant early in South Carolina during 2007. This was also consistent with results from 2006 concerning the importance of plant bugs in the Southeast at selected sites. At the one site with yield differences, the highest yields resulted when insecticide was applied during the 3rd, 5th, and 7th week of bloom or all weeks of bloom and squaring using scheduled applications; however, positive returns on insecticide investment were only realized when used at weeks 3, 5, and 7 of bloom or every week of bloom (6 wk). Combined data for South Carolina (Figure 3) indicated that the variable threshold treatment (‘Dynamic’) resulted in the highest yield and net return ($15.45 with 1.75 applications on average). In Georgia, there were no significant differences in yield among treatments tested at five of six trials during 2007. At the sixth site, yields and net returns were lower in plots receiving insecticide than in untreated plots. Combined data for four trials in Georgia (Figure 4) with common treatments indicated that the dynamic/variable threshold produced the highest net return, but comparisons of yields from three sites with treatments in common (Figure 5) demonstrated that the 20% static threshold was most appropriate when compared with plots treated weekly during bloom or those entirely untreated. Yield data from all 2007 tests with common treatments addressing thresholds based on populations indices (internal feeding injury to bolls) and automatic applications for stink bugs were pooled for analyses. On average, the net economic return of using a 20% vs. a dynamic threshold were nearly identical (+$2.50 vs. -$1.35, respectively) and were greater than plots treated weekly during bloom, using the 10% threshold, or those left untreated (Figure 6). Combined results from the previous year (Figure 7) indicated that insecticide applications applied during the 3rd, 4th, and 5th week of bloom were most effective in controlling populations of stink bugs and were consistent with those found by Bacheler and Mott 2005 and Bacheler et al. 2006. During 2005, in what can be characterized as heavy pressure from stink bugs, threshold research in South Carolina and Georgia (9 sites) provided comparisons of weekly insecticide application during blooming, 20% internal injury, and plots remaining untreated (Figure 8). Yields and returns from plots treated weekly and at the 20% threshold were comparable, but some yield was lost under heavy stink bug pressure, suggesting that increased protection (i.e. <20% threshold) at critical times of the bloom period might result in less yield loss.

Although entomologists in the southeastern states currently recommend somewhat different internal boll injury levels as treatment triggers, those static thresholds appear effective and useful as a guide for control of stink bugs in cotton in the near-term. However, the importance controlling bugs during certain portions of the blooming period (weeks 3-5) should be stressed to reflect the importance of crop phenology, population development of stink bugs, and timing of insecticide applications. In order to be more confident with recommendations regarding control of bugs in the Southeast, additional research on refining thresholds (particularly dynamic thresholds) for stink bugs in cotton is needed under higher pressure than that observed during the last two seasons.

Acknowledgments

We thank Cotton Incorporated and cotton producers in the cooperating southeastern states for support of this work.

Disclaimer

The mention of trade names in this report is for informational purposes only and does not imply an endorsement.

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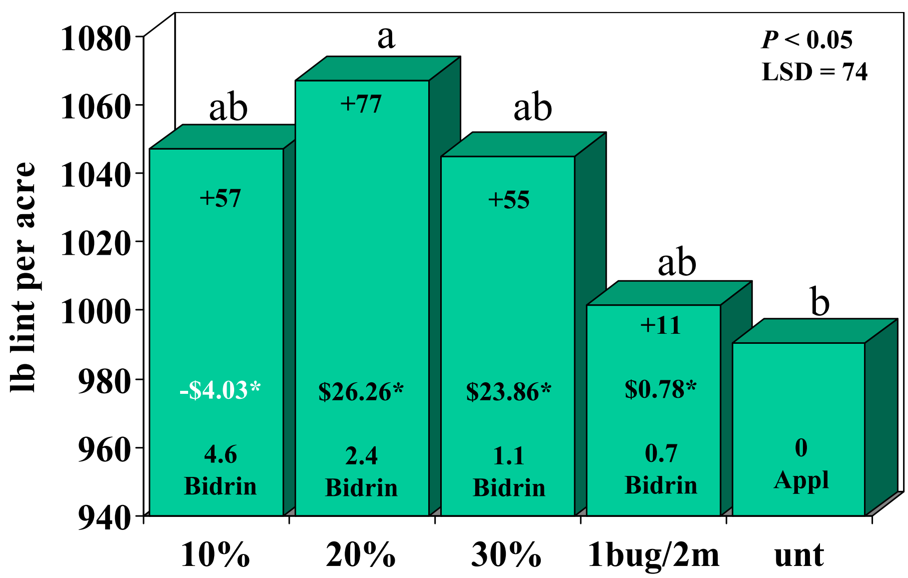

Figure 1. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in Georgia during 1999-2001. Insecticide application (organophosphate + application costs) was $8.31 per acre. Cotton was priced at $0.60/lb.

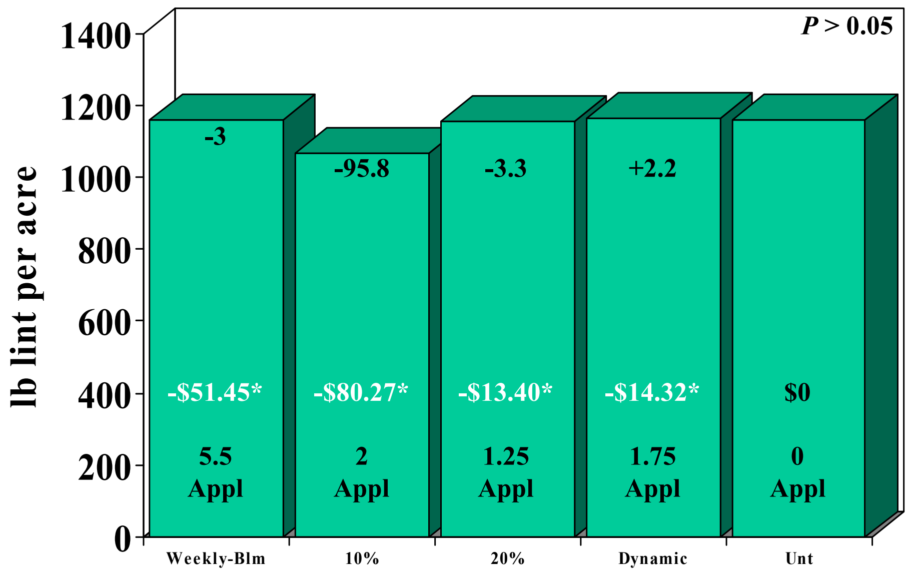

Figure 2. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in North Carolina during 2007. Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

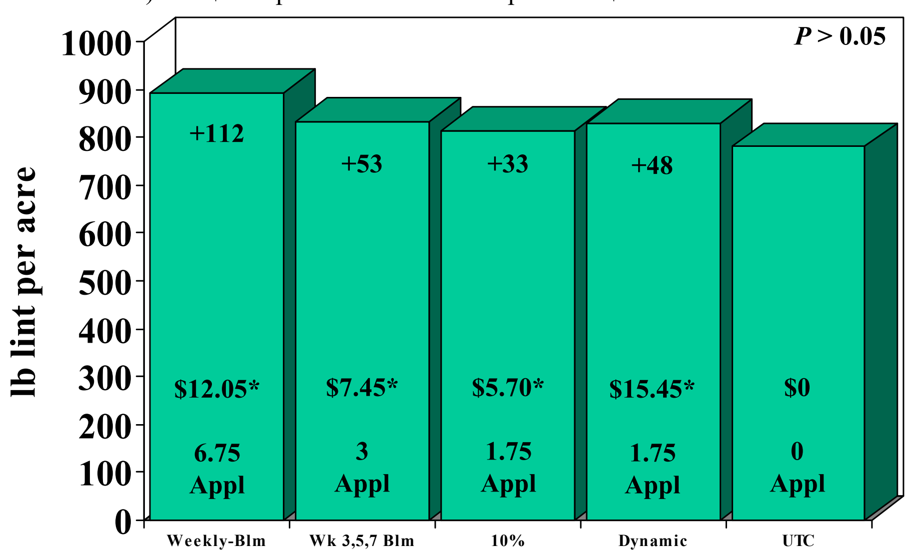

Figure 3. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in South Carolina during 2007. Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

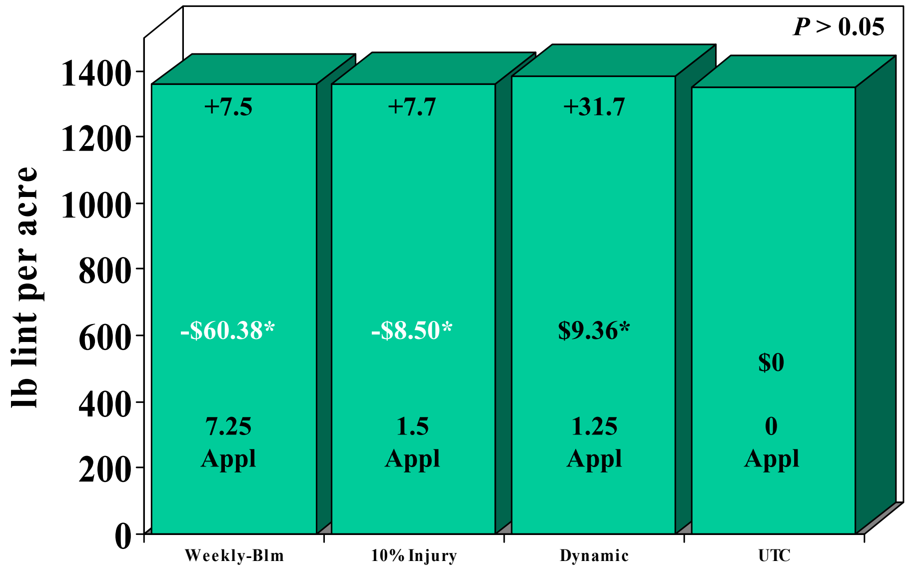

Figure 4. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in Georgia during 2007 (4 sites). Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

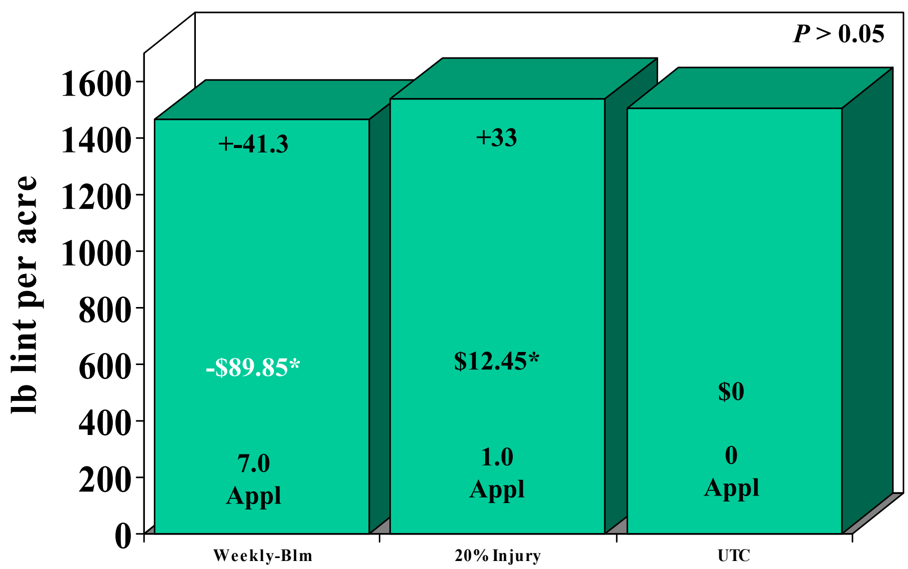

Figure 5. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in Georgia during 2007 (3 sites). Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

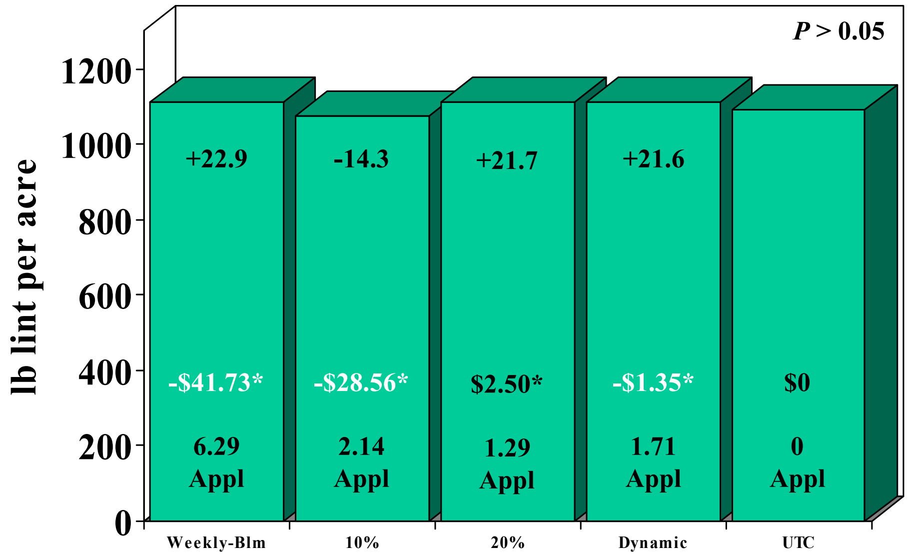

Figure 6. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in North Carolina, South Carolina, and Georgia during 2007 (7 sites with common treatments). Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

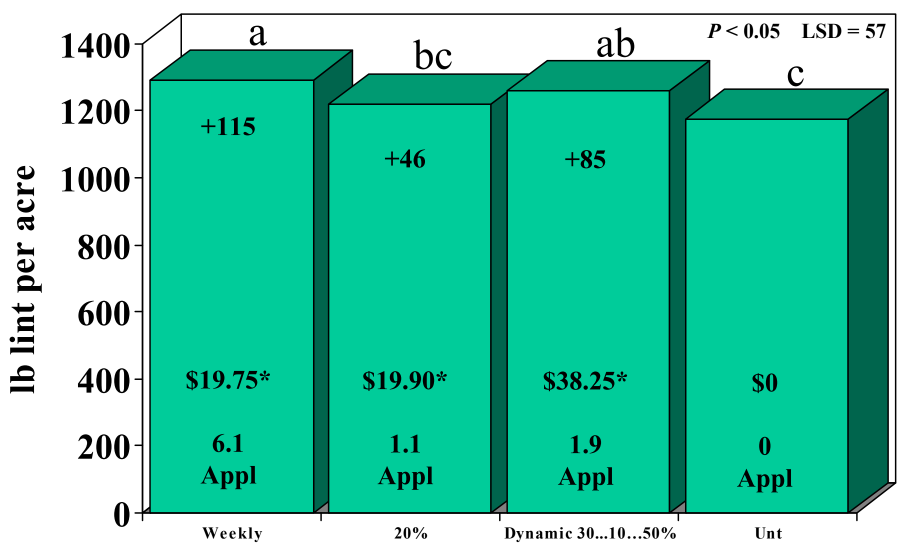

Figure 7. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in North Carolina, South Carolina, and Georgia during 2006 (9 sites with common treatments). Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.

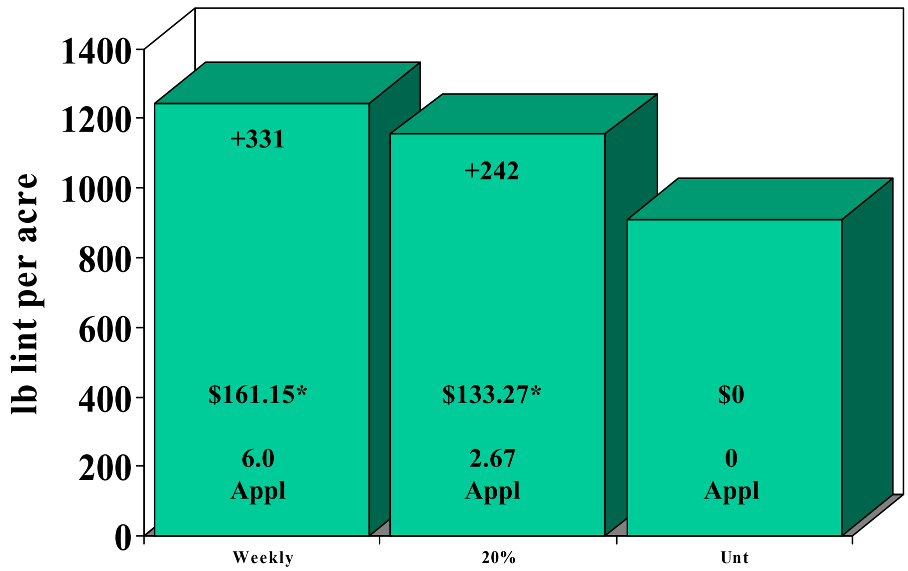

Figure 8. Yields, average number of insecticide applications, and net economic return following treatment regimens at various threshold levels for stink bugs in cotton in South Carolina and Georgia during 2005 (9 sites with common treatments). Insecticide application (pyrethroid + organophosphate + application costs) was $9.00 per acre. Cotton was priced at $0.65/lb.