EFFECTS OF TIMING OF INSECTICIDE APPLICATIONS FOR CONTROL OF PHYTOPHAGOUS STINK BUGS IN COTTON

John R. Ruberson, Phillip M. Roberts, Russell. J. Ottens and J. David Griffin
Department of Entomology, Univ. of Georgia, Tifton, GA

Introduction

In recent years, Georgia's cotton pest complex has undergone dramatic changes. Phytophagous stink bugs have become more abundant in and are increasingly damaging to cotton. Boll weevil eradication and increasing use of transgenic cotton varieties are generally viewed as contributing factors due to the reduced insecticide use following in the wake of the application of these technologies. Large and damaging stink bug populations have been observed in many areas of Georgia during the past few growing seasons, magnifying the need for specific threshold guidelines and effective management tools. Insecticidal measures are often used by growers to control stink bugs and this report presents the results of a field trial that attempts to characterize the phenological timing of damage to cotton by stink bugs. It was designed to examine the effects of various weekly Bidrin® spray regimens on damage caused by populations of phytophagous stink bugs (to help elucidate windows of susceptibility to stink bug attack), as well as the resulting yield of the cotton crop.

Methods

On 6 June 2005, DPL 424 Bollgard II/RR cotton was planted at the UGA Coastal Plain Experiment Station's Lang-Rigdon Farm. In one treatment, applications of 8 oz/acre of Bidrin® commenced at first bloom and were applied weekly until 15 Sept. Six additional Bidrin® treatments were included, with sprays initiated at 1, 2, 3, 4, 5, and 6 weeks post-bloom, and all continuing weekly until the last application on 15 Sept. An additional set of untreated plots provided a control, for a total of 8 treatments. There were four replications of each treatment arranged in a randomized, complete block design. Each plot was 8 rows wide by 75 feet long, and plots were longitudinally separated by 10-foot long alleyways. The plots were laterally separated by alternations of two rows of peanuts (Georgia Green), planted 25 May expressly for the purpose of attracting stink bugs to the cotton plants. With this layout, each plot was bordered by peanuts on at least one side. All insecticide applications were made using a John Deere 6000 Hi-Cycle sprayer applying 6.4 gallons per acre with TX-6 hollow-cone nozzles, at 60 psi. In addition to natural rainfall, all plots received 0.7" irrigation on 16 June, 0.9" on 26 July, 0.6" on 15 Aug., 1.0" on 22 Aug., 0.8" on 7 Sept., 0.9" on 13 Sept., and 0.7" on 20 Sept. 2005.

Stink bug damage was assessed at first open boll on 22 Sept. 2005. Approximately 25 bolls were harvested from each of the center four rows in each plot. The bolls were kept frozen until examined. Bolls with callous growths on the inner surface were counted as having internal stink bug damage. The number of bolls having lint obviously stained or rotten was also determined. On 21 Oct., the percentage of open bolls was sampled to assess any developmental delays among the treatments. Ten plants were randomly selected in each plot and the total number of open bolls and closed bolls per plant was recorded. The total of open bolls was divided by the total of all bolls to determine percent open bolls. Yield was taken by mechanically picking and weighing the middle 2 rows of each plot on 10 Nov. The experimental results (internal boll damage, stained/rotten bolls, percent open bolls, and yield) were analyzed using the general linear models procedure (GLM) with significant means separated using Duncan's New Multiple Range Test (SAS 1999).

Results and Discussion

Table 1 presents all of our experimental results. Bolls in plots receiving Bidrin® sprays beginning at bloom, as well as 1, 2 3, and 4 weeks post-bloom, displayed significant reductions in percent internal stink bug boll damage and percent stained/rotten bolls in comparison with the untreated control. Internal damage was also significantly reduced by sprays beginning at 5 weeks (2 applications) and 6 weeks post-bloom (1 application). These treatments were significantly less effective in reducing internal damage, however, than all other spray regimens. Numerically, the greatest percentage of open bolls on 21 Oct. occurred in the plots receiving 6 Bidrin® applications, beginning at 1 week post-bloom. Some of the other spray regimens produced numerically higher percentages of open bolls, though none were statistically significant, and no clear pattern emerged. From the data, it appears that the greatest risk to stink bug damage occurs from approximately the third week after initiation of blooming, and afterward.

From a yield perspective, 3-5 Bidrin® applications provided among the highest numerical benefits. However, the untreated plots performed equally well. It's possible that populations of beneficial insects were negatively impacted by too few sprays (1-2) or too many (6-7). Unless the fiber quality of the untreated plots was greatly reduced, it is unlikely that the cost of any insecticidal treatment in this particular study would have been justifiable. Each growing season will have numerous factors affecting the influence of phytophagous stink bugs on cotton yields. Scouting for stink bug numbers and damage is essential for assessing effective timing and numbers of insecticidal applications. As these insects become more of a problem for Georgia cotton growers, additional research is essential to know how to best combat them for the greatest economic gains.

Acknowledgments

We also appreciate the assistance of Mark Freeman and Javier Madrigal-Sanchez in collecting and processing data, as well as his help with the harvest.

References

SAS Institute. 1999. SAS/STAT User's guide, version 8.02. SAS Institute, Cary, NC.

Table 1. Phytophagous stink bug numbers (per shake sample) in relation to insecticide treatment. Tift Co., GA, 2004.

Bidrin® Treatment Initiated at:	22 Sept. % internal damage	22 Sept. % stained or rotten	21 Oct. % open bolls	10 Nov. Yield lb. seed cot./acre
untreated	39.7a	8.0a	64.9ab	3182ab
bloom (7 applications)	6.9c	3.2b	63.1b	3083ab
1 week post-bloom (6 applications)	4.5c	1.5b	78.2a	3124ab
2 week post-bloom (5 applications)	5.5c	2.0b	71.7ab	3490a
3 week post-bloom (4 applications)	8.2c	2.2b	63.0b	3219ab
4 week post-bloom (3 applications)	12.3c	2.0b	70.4ab	3187ab
5 week post-bloom (2 applications)	23.7b	4.4ab	72.1ab	2853ab
6 week post-bloom (1 application)	23.8b	5.8ab	65.0ab	2519b

Means in columns followed by the same letter are not significantly different ($P>0.05$).