COMPARISON OF CONTROL OF HELIOTHINES IN CONVENTIONAL AND DUAL GENE COTTON

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Abstract

The bollworm is a major pest of cotton in Arkansas. In most cases dual gene Bt. transgenics provide adequate control of this pest, however when bollworm populations are high the control may not be adequate to prevent damage. This study was conducted to determine the impact and efficacy of a foliar overspray of Prevathon (chlorantaniliprole) on dual gene Bt cotton cultivars and a conventional cotton to determine the efficacy of an overspray and the value for conventional and dual gene cotton. Our results indicated that a conventional cultivar sprayed with prevathon can yield similarly to current Bt cultivars and some cultivars of Bt cotton can benefit from an insecticide application in years when bollworm pressure is high.

Introduction

Each year, the bollworm (*Helicoverpa zea,* Bodie*),* infests 100% of cotton planted in Arkansas. It remains a major pest of post-bloom cotton in the Mid-South despite widespread use of transgenic varieties. Dual gene Bt cotton does not always provide adequate protection from lepidopteran pests to maintain potential yield. In years when bollworm populations are high, foliar insecticides are commonly used to supplement control of cotton bollworm. In 2015, 98% of the cotton acreage in Arkansas was planted with dual gene Bt cultivars (Williams, et. al., 2016). A recent analysis of data since 2007 indicates that there has been an increase in damage to squares which might indicate there may be some tolerance developing to dual gene technologies (personal communication, G. Lorenz). Economic loss to the grower based on cost of treatment and reduction in yield due to this pest totaled more than $1.7 million or $9.41 per acre. The objective of this study was to evaluate the impact and efficacy of foliar oversprays on conventional and dual-gene cottons, specifically Bollgard II and WideStrike for control of cotton bollworm and to determine a threshold level based on percent damage.

Materials and Methods

A trial was conducted on a grower field in Jefferson County, Arkansas 2016. Plot size was 12.5 ft. (4rows) by 40 ft., in a randomized complete split-block with 4 replications. Varieties included a conventional, cultivar DP1441 RF, WideStrike, cultivar PHY499WRF; and Bollgard II, cultivar ST4946B2RF, and a sprayed and unsprayed treatment. For sprayed plots, a foliar application of Prevathon at 20 oz/ acre was made on July 19. Application was made using a Mudmaster high clearance sprayer fitted with 80-02 dual flat fan nozzles at 19.5 inch spacing with a spray volume of 10 gal/a, at 40 psi. Damage ratings were taken pre-application, and 3, 8, 15 and 27 days after application by sampling 25 squares, blooms, and bolls per plot. Plots were harvested using a John Deere two row plot picker. The data was processed using Agriculture Research Manager V.9 (Gylling Data Management, Inc., Brookings, S.D.) and Duncan's New Multiple Range Test (P=0.10) to separate means.

Results and Discussion

Prior to the application of Prevathon, percent fruit damage in the conventional cultivar was high, 15%, compared to WideStrike at 4% and Bollgard II with 0.3% damage (Fig. 1).

At 3 days after application, conventional sprayed, WideStrike sprayed and unsprayed, and Bollgard II sprayed and unsprayed had less damage than the conventional unsprayed (Fig. 2). Bollgard II had less damaged fruit than WideStrike; however, no differences were observed for either of the transgenic varieties when comparing sprayed and unsprayed.

At 8 days after application, all treatments had less damaged fruit than the unsprayed conventional treatment (Fig. 3). Bollgard II, sprayed and unsprayed, and WideStrike sprayed had less damage than WideStrike unsprayed and the conventional sprayed treatment.

At 15 days after application, all treatments had less fruit damage than conventional unsprayed (Fig. 4). All other treatments had less fruit damage than WideStrike unsprayed.

Similar differences were observed 22 days after application (Fig. 5).

Yield indicated that conventional sprayed, WideStrike sprayed/unsprayed, and Bollgard II sprayed and unsprayed had higher yield than conventional unsprayed (Fig. 6). Conventional sprayed, WideStrike sprayed and Bollgard II had higher yield than WideStrike unsprayed. There is a clear indication that there was not enough damage in the BGII to affect yield.

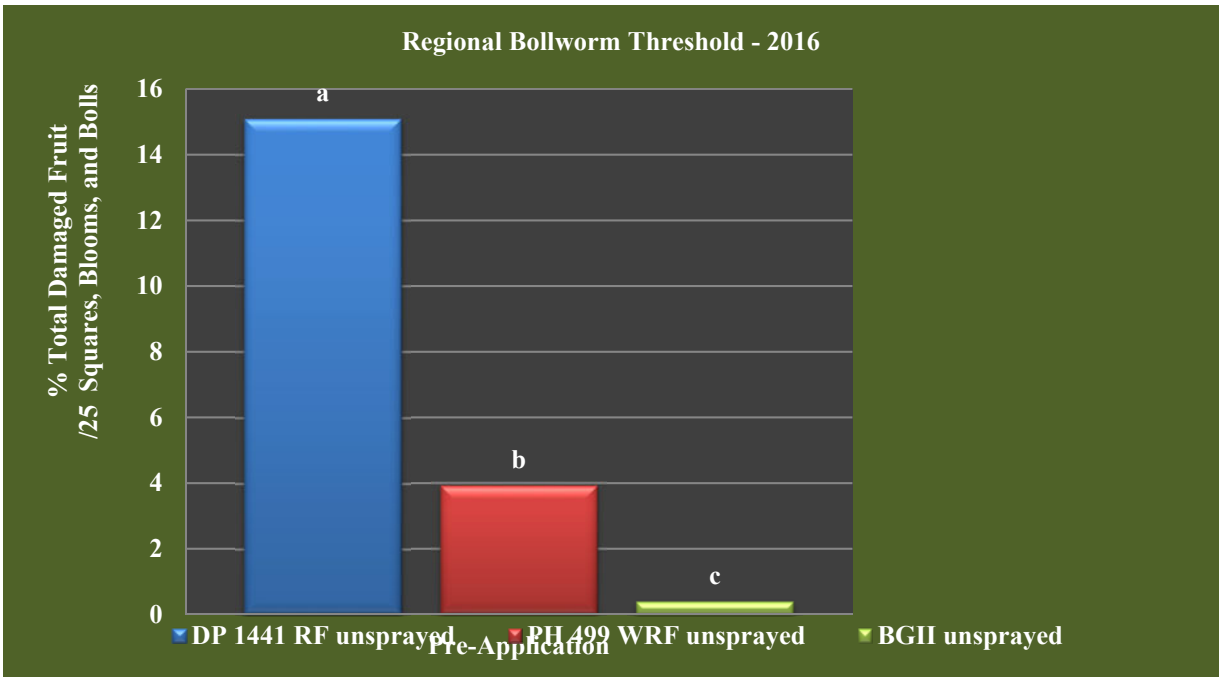

Figure 1. Percent total damage of trial before application to determine infestation levels.

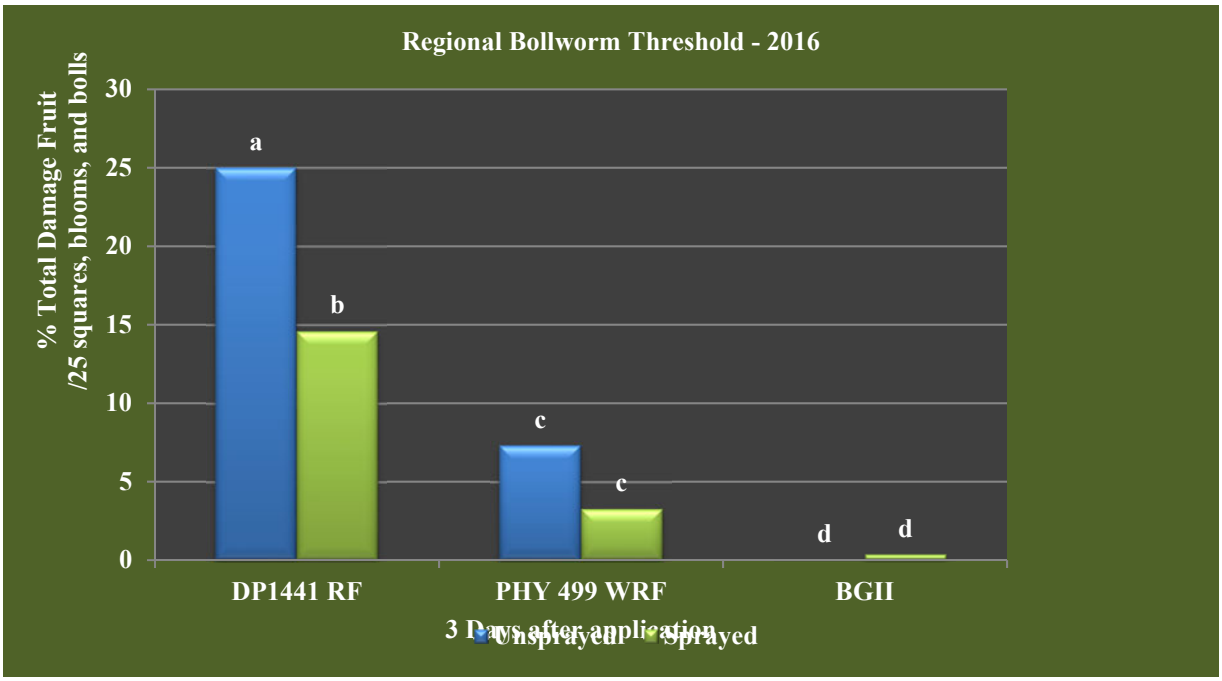

Figure 2. Percent total damage of fruit 3 days after application.

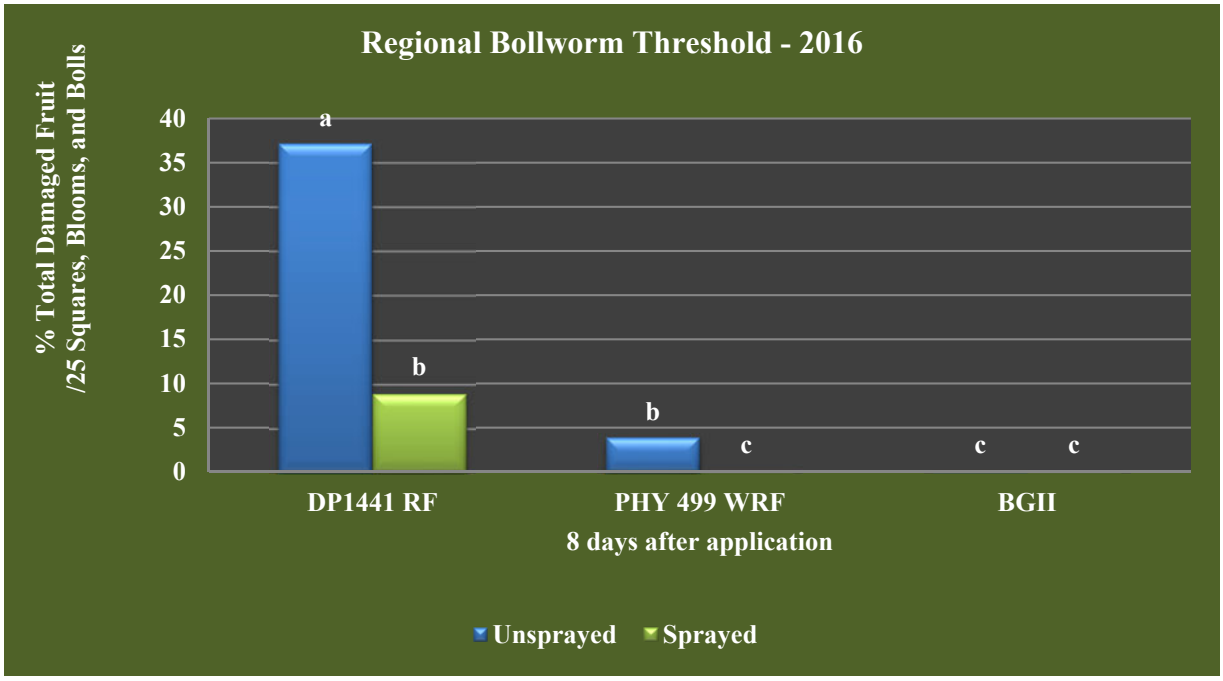

Figure 3. Percent total damage of fruit 8 days after application

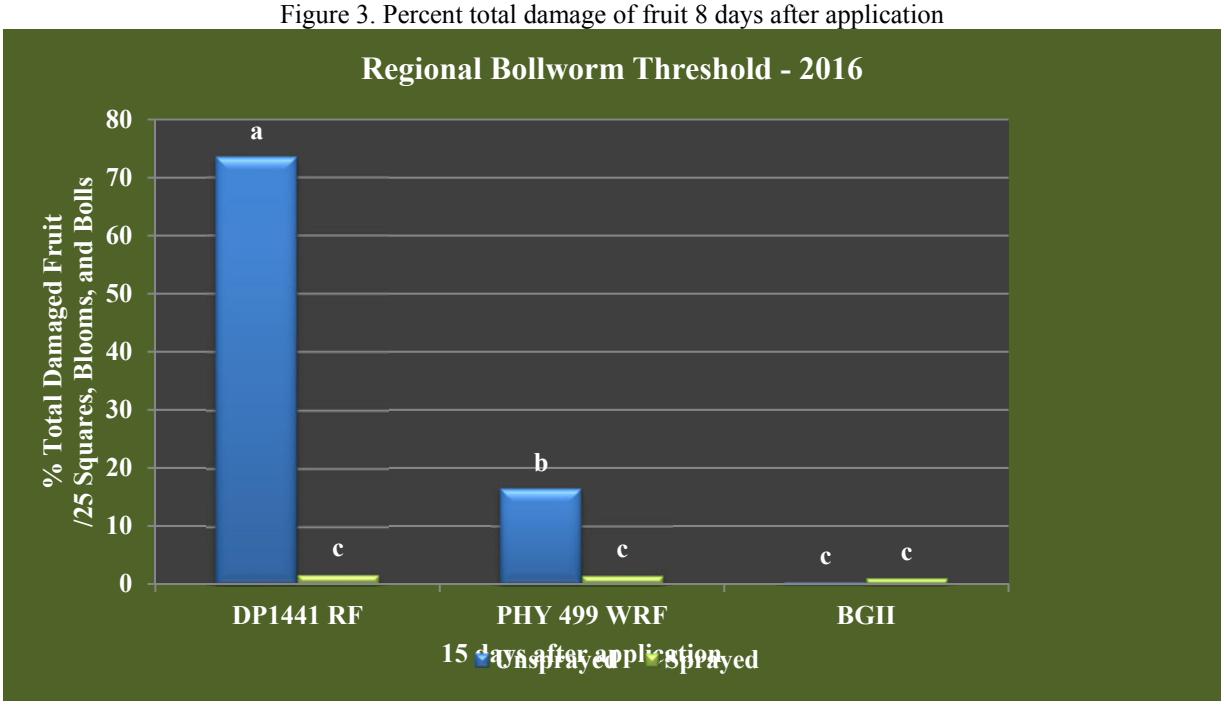

Figure 4: Percent total damage of fruit 15 days after application.

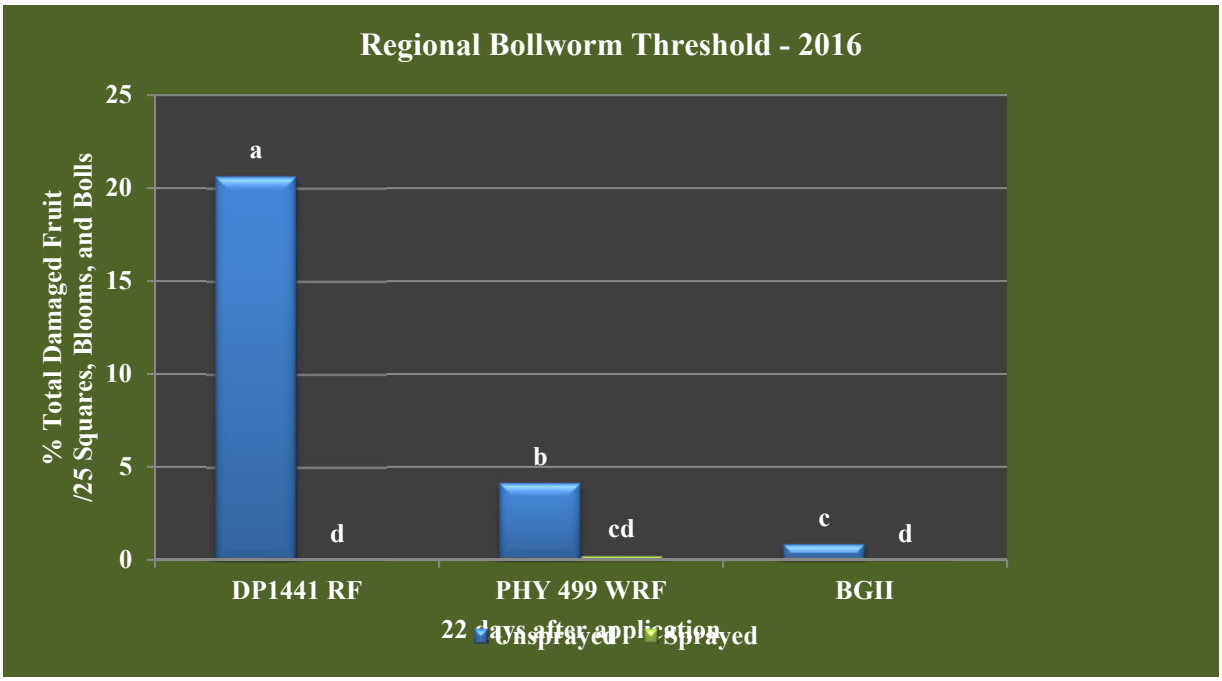

Figure 5. Percent total damage of fruit 22 days after application.

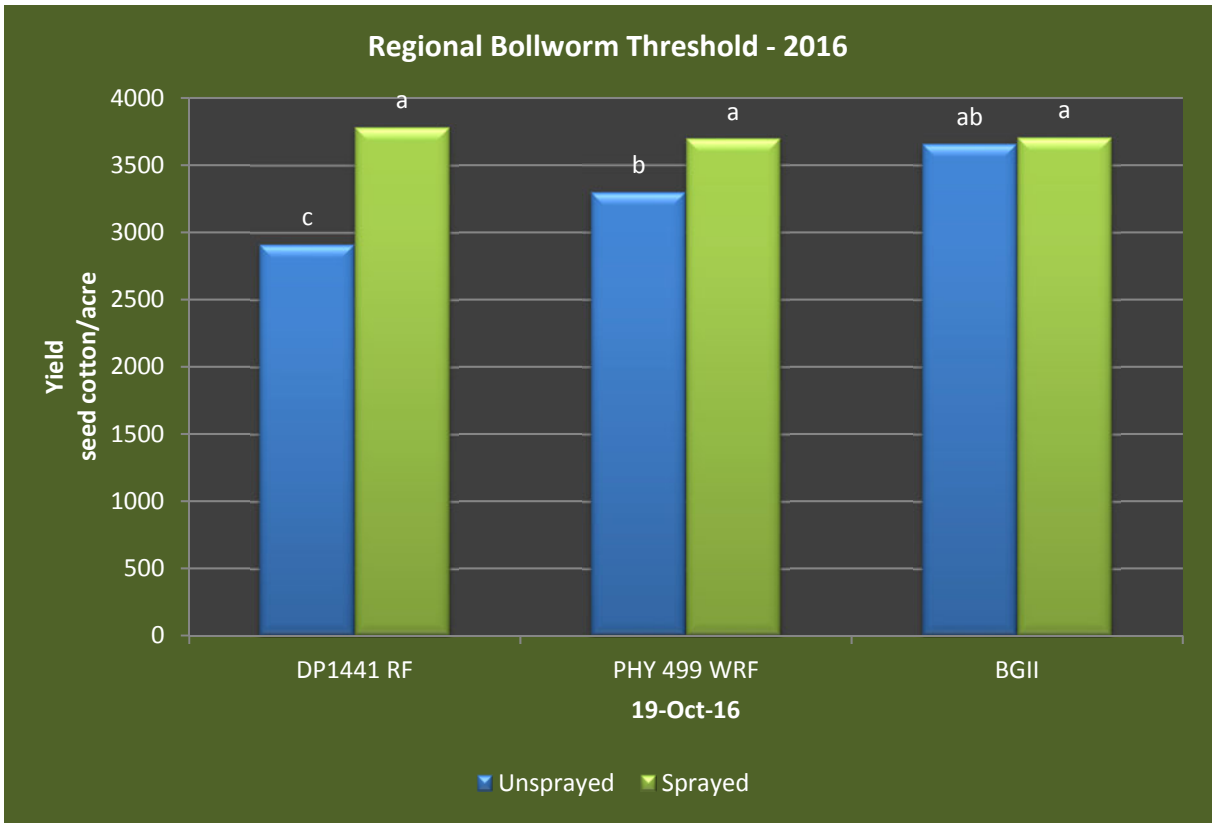

Figure 6: Yield

In 2016, we observed extremely high levels of fruit damage indicating control without foliar applications could result in severe yield loss with WideStrike; however, the BG II variety maintained control without foliar application of insecticide. Yield results from previous studies, (Lorenz, et al., 2012; Taillon, et al., 2013; Orellana, et al., 2014),

show the impact of foliar applications on transgenic cultivars varies from year to year. In 2012, foliar applications increased yield in Bollgard II and WideStrike but in 2013 and 2014 yields did not increase with foliar applications.

Summary

These studies suggest that in some years when a Conventional cultivar is sprayed with insecticides it can yield similarly to current Bt cultivars and some cultivars of Bt cotton can benefit from an insecticide application in years when cotton fields are under high bollworm pressure. Further studies will be conducted to determine the impact of supplemental foliar applications on second and third generation Bt cottons as well as to monitor for tolerance and determine a threshold level based on the percentage of damage to the fruit.

Acknowledgements

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