IMPACT OF FOLIAR APPLICATIONS FOR CONTROL OF HELIOTHINES IN COTTON

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Abstract

When bollworm populations are high in cotton, dual gene Bacillus thuringiensis (Bt) cotton may not provide adequate protection to maintain potential yield. In those situations, supplemental foliar applications may be required to provide additional yield protection. Growers treated 65% of total acres for lepidopteran pest, 57% of which was for the bollworm, and lost over $4 million. The objective of this study was to evaluate the impact and efficacy of foliar oversprays on conventional, dual-gene and triple-gene cottons, specifically Bollgard II, WideStrike, WideStrike III and Twinlink, for control of cotton bollworm, Helicoverpa zea.

Introduction

While plant bugs are considered the number one pest in Arkansas cotton, caterpillar pests can be equally or even more devastating to the bottom line for our producers. In 2014, 97% of the cotton acreage in Arkansas was planted with dual gene B.t. cultivars and every acre was infested by the bollworm, Helicoverpa zea (Williams, et. al., 2015). Twinlink cotton and Widestrike 3 became available in 2014; third generation technologies will be commercially available within the next few years.

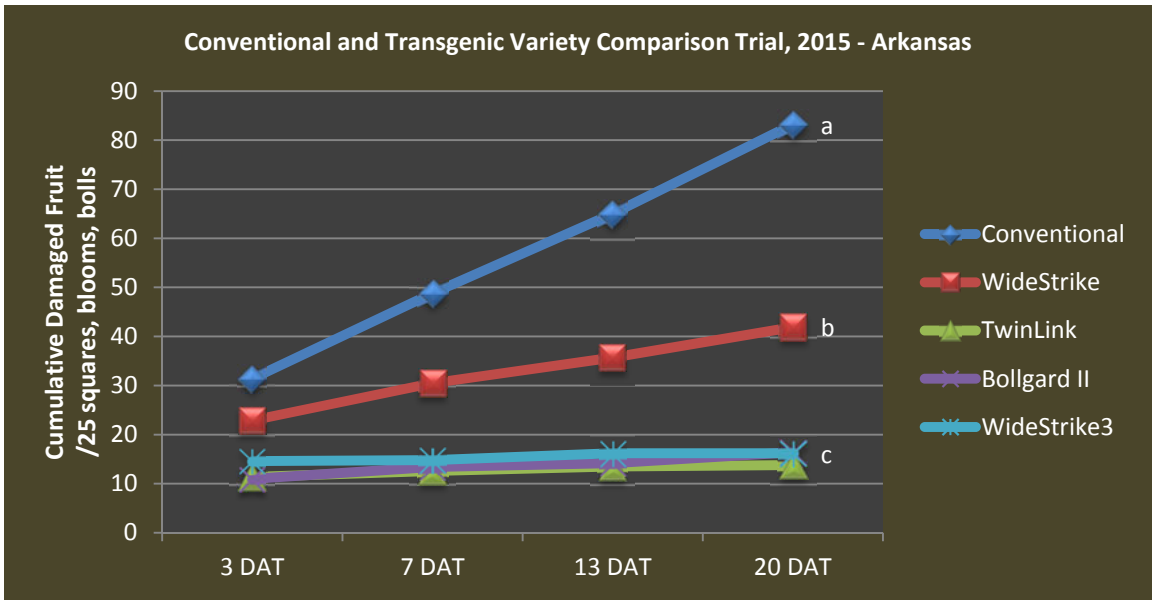
Materials and Methods

A trial was conducted on a grower field in Jefferson County, Arkansas 2015. Plot size was 12.5 ft. (4rows) by 40 ft., in a randomized complete block with 4 replications of sprayed and 4 replications of unsprayed plots. Treatments consisted of a conventional cultivar (PHY315RF); WideStrike cultivar (PHY499WRF); TwinLink cultivar (ST5289TL); Bollgard II cultivar (ST5288B2RF); and a WideStrike3 cultivar (PHY495W3RF). Sprayed plots were treated with a foliar application of Prevathon (20 oz) on July 21. Application was made using a Mudmaster 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 3, 7, 13 and 20 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

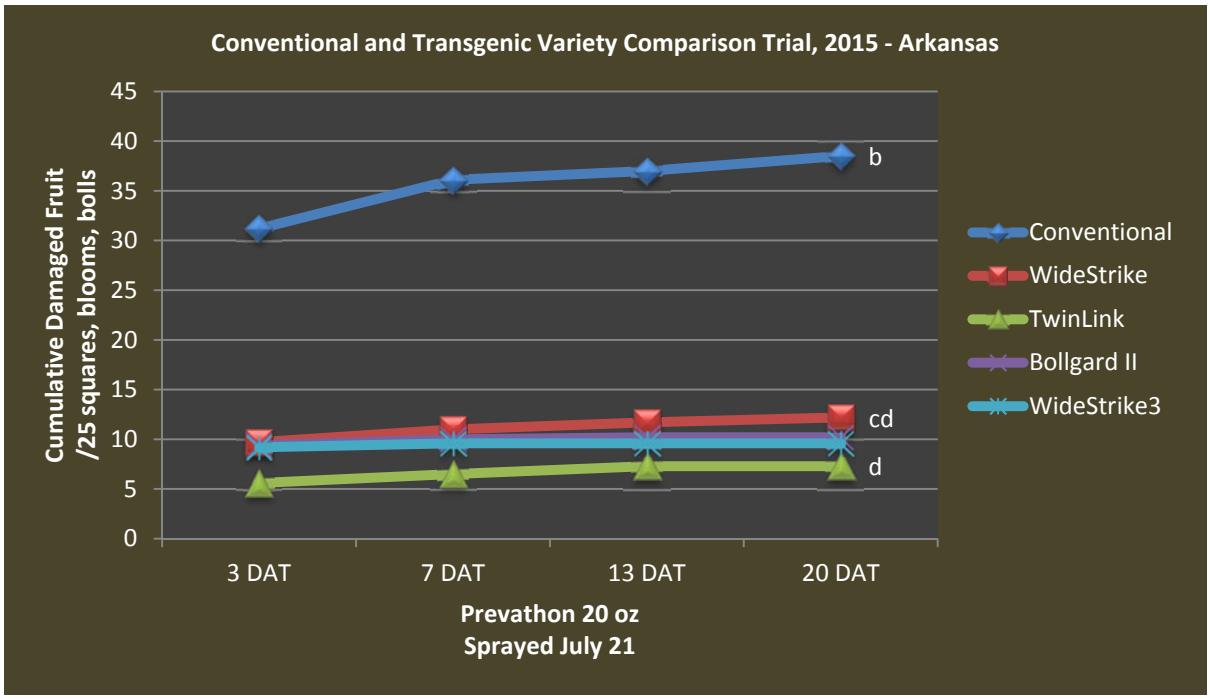
In the unsprayed portion of the test cumulative damage in the Conventional cultivar was high compared to the unsprayed transgenics (Fig. 1). WideStrike had more damage compared to all other unsprayed transgenics. In the sprayed portion of the test, cumulative damage was higher in the Conventional cultivar than the sprayed transgenic cultivars (Fig. 2). Foliar applications did not reduce cumulative damage fruit number for TwinLink and WideStrike III (Fig. 3). All other treatments had less damage when sprayed. Conventional unsprayed had more total damaged fruit than all other treatments. However, one application of Prevathon (20 oz/acre) reduced damage for the Conventional cultivar similar to the unsprayed trangenics. A reduction in damaged fruit was also observed in WideStrike and BG II when foliar applications were made. Yields indicated that the unsprayed Conventional cultivar had significantly lower yield than all other treatments (Fig. 4). When sprayed the Conventional cultivar had similar yield to all unsprayed transgenic cultivars as well as the sprayed TwinLink and BGII. Conventional, WideStrike, and WideStrike3 cultivars had higher yields when they were sprayed compared to unsprayed. There were no differences in sprayed verses unsprayed for TwinLink and BGII. WideStrike and WideStrike3 sprayed treatments had higher yield compared to all other sprayed and unsprayed treatments.

Figure 1: Season Totals Percent Total Damage in unsprayed portion of test.



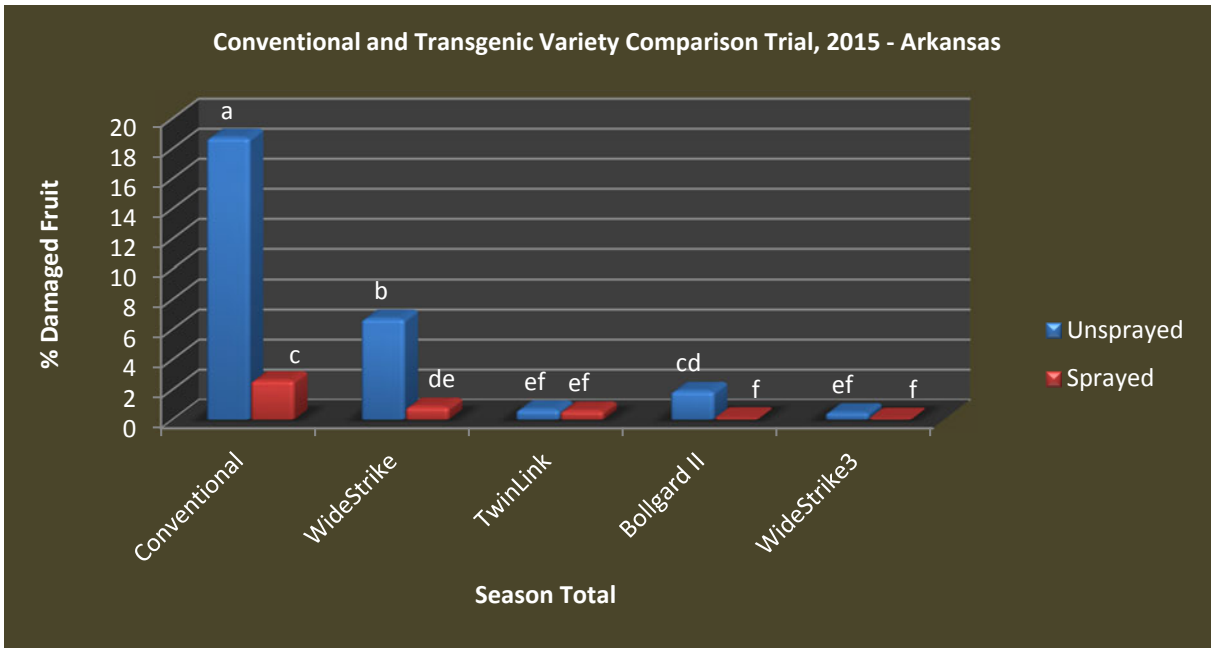
Means followed by same letter do not significantly differ (P=.10, DNMRT) Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

Figure 2: Season Totals Percent Total Damage.



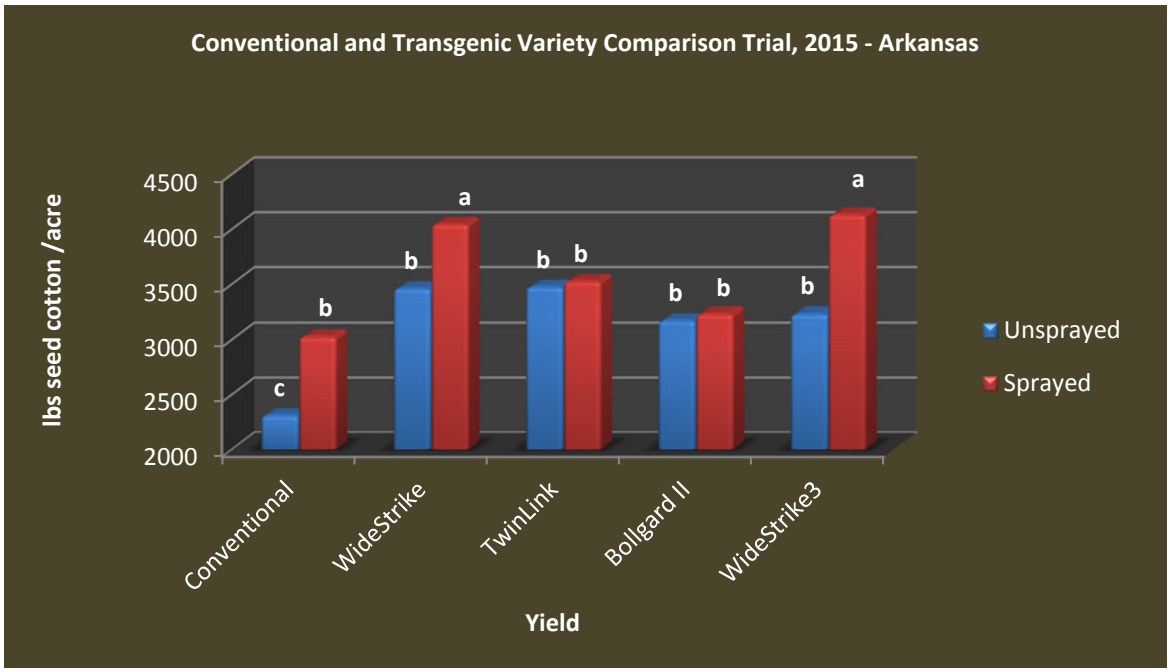
Means followed by same letter do not significantly differ (P=.10, DNMRT) Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

Figure 3: Season Totals Percent Total Damage.



Means followed by same letter do not significantly differ (P=.10, DNMRT) Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

Figure 4: Yield



Means followed by same letter do not significantly differ (P=.10, DNMRT) Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

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. These studies suggest

that in some years when a Conventional cultivar is sprayed with insecticides it can yield similarly to current Bt cultivars. Secondly, 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.

Acknowledgements

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