EXAMINING NOZZLE EFFECT ON INSECT CONTROL IN TENNESSEE COTTON

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Abstract

Studies were conducted in 2015 and 2016 at the West Tennessee Research and Education Center in Jackson, TN. The objective of this research was to evaluate the level of insect control offered by various nozzle technologies that will be required for use with certain herbicides on new herbicide-tolerant traits in cotton. These nozzles were evaluated for the control of thrips in seedling cotton or tarnished and clouded plant bugs in flowering cotton. All nozzle types similarly controlled thrips and plant bug infestations.

Introduction

Labels for the new herbicide-tolerant cotton varieties will mandate that specific nozzles be used for certain herbicide applications in cotton. These nozzles are engineered to mitigate off-target drift and therefore have an increased droplet size compared with the flat fan tips traditionally used for insect control. Additionally, many of these nozzles are designed specifically for use with pulse width modulation (PWM) systems found on newer commercial sprayers. Our objective was to compare the level of insect control from insecticide applications with these newer nozzles and spray systems for thrips in seedling cotton or plant bugs.

Methods and Materials

Tests were done at the West Tennessee Research and Education Center in Jackson, TN to evaluate the level of insect control offered by various nozzle technologies that will be labeled for use with certain herbicides on newer traits in cotton. Phytogen® 333 WRF (WideStrike) cotton was planted no-till for a thrips trial May 9, 2016. Individual plots were 2 rows wide with a buffer row between plots (38 inch centers) x 35 feet. Phytogen® 333 WRF (WideStrike) cotton was planted no-till May 22, 2015 and May 19, 2016 for the plant bug trials. Plots were 8 rows (38 inch centers) x 35 feet. Treatments were replicated in a randomized complete block design. All agronomic practices such as fertilization, seeding rates and control of insect pests followed University of Tennessee recommendations.

A foliar application of 0.25 lb ai/acre acephate was made to seedling cotton to evaluate thrips control June 1, 2016. Acephate at 0.75 lb ai/acre was sprayed for plant bugs July 31, 2015 and July 22, 2016. All nozzles were operated under manufacturers suggested parameters for optimal performance. An application rate of 15 gallons per acre (GPA) was targeted for the thrips trial whereas the targeted rate for the plant bug trial was 15 GPA in 2015 and 10 GPA in 2016. Thrips samples were taken by cutting five seedling (2 lf stage) plants per plot at the soil level and immediately placing into jars containing a 70% ethanol solution. Samples were collected two days after treatment (2 DAT) in the thrips trial. Samples were processed in an ethanol wash and counted in the lab using a dissecting microscope. Plots in the plant bug trials were sampled with a standard 2.5 x 2.5 ft black cloth shake sheet. Two shake sheet samples were taken on the center two rows (10 row feet) of all plots. Ratings for the plant bug trials were done 5 DAT and 4 DAT in 2015 and 2016, respectively.

Nozzles used in the thrips and the plant bug trial in 2016 were flat fan, AIXR, TTI, Wilger Y and Wilger UR (Table 1). The nozzle types evaluated in the 2015 plant bug trial were flat fan, TTI, TADF, and Wilger MR.

Table 1. Nozzles types evaluated for insect control in Tennessee cotton, 2015 and 2016.

Nozzle	Type	Droplet size (microns)
Spraying Systems TeeJet XR11002FF	Flat Fan	200, Fine
Spraying Systems TTI11004	Turbo TeeJet Induction (TTI)	800, Ultra coarse
Wilger UR 04	prototype	800, Ultra coarse
Greenleaf Technology TADF02	TurboDrop Assymetrical Dual Fan	350, Coarse
Wilger MR110-02	Mid-Range	250, Fine
Wilger Y on Thrips Trial MR110-02 facing forward at 1/3 spray volume DR110-06 facing rear	Multi-tip for use with PWM system	MR 250, Fine; DR 500, Very coarse
Wilger Y on Plant Bug Trial MR110-015 facing forward at 1/3 spray volume DR110-025 facing rear	Multi-tip for use with PWM system	MR 250, Fine; DR 300, Coarse
Spraying Systems AIXR11002	Air Induction Extended Range	350, Coarse

Results and Discussion

All nozzle types, even those with ultra-coarse droplet size, similarly controlled thrips in seedling cotton. Thrips populations greatly exceeded the recommended treatment threshold of one or more thrips per plant in these plots (Fig. 1). All nozzles similarly reduced total plant bugs in 2015 and 2016 compared with the non-treated check. The tarnished plant bug was the most common pest, and populations in non-treated plots greatly exceeded the recommended treatment threshold of six or more insects per 10 row feet (Figs. 2 and 3).

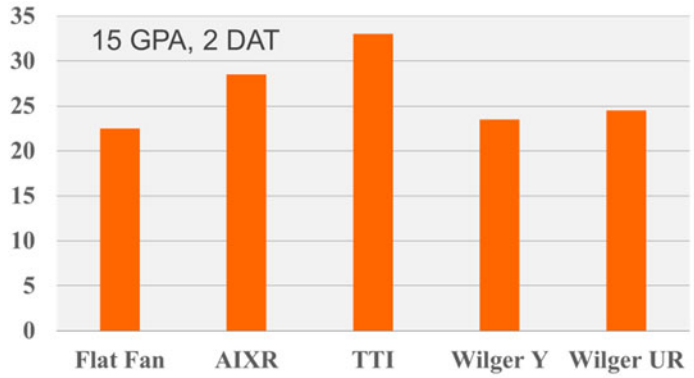

Figure 1. Average total numbers of thrips per five plants. Nozzle effects were not significant (P = 0.8056).

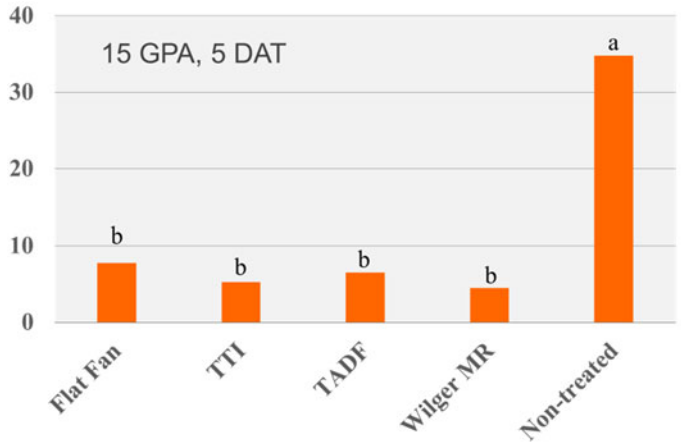

Figure 2. Average total plant bugs per 10 row feet in flowering cotton, 2015 ($P = 0.0004$).

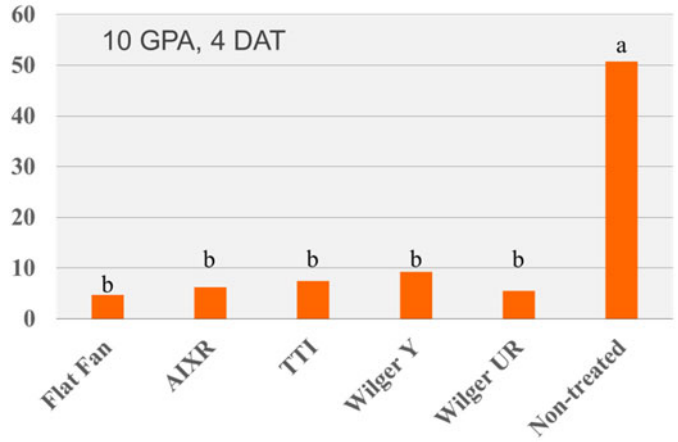

Figure 3. Average total plant bugs per 10 row feet in flowering cotton, 2016 ($P = 0.0001$).

Summary

Technological advances in nozzle designs have been occurring rapidly. Recent developments with some herbicides on herbicide tolerant crops mandate the use of specific low-drift nozzles to prevent off-target movement. Insecticide applications with several new nozzle designs, including those designed for use with a pulse width modulating spray system, provided control of thrips and plant bugs similar to that of traditional applications with a flat fan nozzle. These data suggest that insect control will not be substantially affected by the use of these specific nozzles intended for the application of herbicides. However, additional testing is needed to assess the impact of nozzle/application technologies on the control of these and other insects with different insecticides.

Acknowledgements

The authors express their appreciation to Cotton Incorporated for their financial support.