Managing Thrips Using Organically Approved Insecticides

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Introduction

Thrips are a recurring problem to seedling cotton in the Texas High Plains. It has been estimated that thrips impact to the High Plains cotton industry in 2010 was in excess of $6 million. In irrigated cotton where thrips populations are historically high (usually areas where there is a significant acreage of wheat) many conventional growers may choose to utilize preventative insecticide seed treatments and/or foliar remedial insecticide treatments to control thrips. One of the most challenging factors facing organic cotton producers in the Texas High Plains is the effective management of early-season thrips in an organic production system. In this study we investigated the efficacy of numerous Organic Materials Review Institute (OMRI) approved insecticides for thrips suppression in cotton. Organic Materials Review Institute (OMRI) provides organic certifiers, growers, manufacturers, and suppliers an independent review of products intended for use in certified organic production, handling, and processing.

Objectives

1. Evaluate the efficacy of numerous OMRI approved insecticides for thrips suppression in cotton.
2. Determine yield benefits of organically approved insecticide applications for thrips.

Materials and Methods

Two tests were conducted in commercial organic cotton fields; one in Bailey County near Muleshoe, TX and the other in Lubbock County near Idalou, TX. At the Muleshoe site, 'FiberMax 958' was planted 3 May 2011 on 30-inch rows and irrigated using LESA center pivot irrigation system. At the Idalou site, 'FiberMax 989' was planted 20 May 2011 on 40-inch rows and irrigated using furrow irrigation. In both tests, plots were 4-rows wide × 100 ft long. Plots were arranged in a randomized complete block design with 4 replicates. Treatments included 13 OMRI approved insecticides and an untreated check (UTC) (Table 1). All insecticides were applied in accordance with their respective label recommendations. Insecticide applications were made weekly, beginning at emergence through the 5 true leaf stage. Treatments were applied in a 10 inch band directly over the top of the crop row with a CO_2 pressurized backpack sprayer and hand held boom equipped with hollow cone nozzles. Thrips were counted before treatment as well as 3-4 and 7-8 days after each insecticide application. Five to ten plants/plot were collected, washed in an alcohol solution; adult and immature thrips collected in solution were filtered out and counted under a dissecting stereo scope. Samples collected were also separated by life stage and identified to species. Plant damage ratings, from 1 to 5, were assessed when most plants had reached the 4 true leaf stage. Entire plots were harvested November 11 (Muleshoe) and 19 (Idalou) using an IH cotton stripper harvester equipped with integral small plot scales. Bur cotton grab samples were taken from each plot. The samples were ginned at the Texas A&M Agriculture Experiment Station in Lubbock, Texas. Data were subjected to analysis of variance (ANOVA) and when a significant F test was observed, mean separation was performed using the least significant difference (LSD) at the 5% probability level. "Box and whisker" plots were created using Sigma Plot 10.0; the "whiskers" represent the greatest and least values, the top and bottom of the box are the upper and lower quartiles, the black line within the box is the median and the white line within the box is the mean.

Table 1.

Trade name	Common name	Rate	GPA
Untreated			
Repeller	Garlic juice	6.4 fl-oz/ac	2.5
Aza-Direct[1,2]	Azadirachtin	6 fl-oz/ac	2.5
Aza-Direct[1,2]	Azadirachtin	8 fl-oz/ac	2.5
Aza-Direct + PyGanic 5%[1,2]	Azadirachtin+ Pyrethrins	6 + 9 fl-oz/ac	2.5
SucraShield[1]	Sucrose esters	1% v/v	20
Entrust[1]	Spinosad	2 oz/ac	20
Cedar Gard	Cedar oil	1 qt/ac	20
Pest Out[1]	Cotton seed/Clove/Garlic oils	1 gal/100 gal	20
Pyganic 5%[2]	Pyrethrins	18 fl-oz/ac	50
Bugitol	Capsicum /Mustard oils	96 fl-oz/100 gal	50
Saf-T-Side + Ecotec	Petroleum oil + Rosemary/Peppermint oil	1 gal + 1 qt/100 gal	50
Saf-T-Side + PyGanic 5%[2]	Petroleum oil + Pyrethrins	1 gal + 9 fl-oz/100 gal	50
Surround WP[1]	Kaolin	25 lb/ac	50

[1]*Ag-Aide added to spray mix at 8 fl-oz/100 gal (adjuvant)*
[2]*Constant BUpH-er added to the spray mix at 0.125% v/v (pH = 6)*

Results and Discussion

Due to very low thrips pressure and a later planting date at the Idalou site, data were insufficient to make any reasonable conclusions and will not be presented. The later planting date at this site reduced the thrips exposure period and resulted in more vigorous plants compared to the Muleshoe site further diluting the Idalou data.

Environmental conditions at the Muleshoe site were harsh; extremely dry, warmer than normal, and very windy (Figure 1). Thrips pressure, in general, was significantly lower compared to historical observations likely due to harsh conditions and lack of alternative hosts to support and bridge thrips populations until cotton emergence.

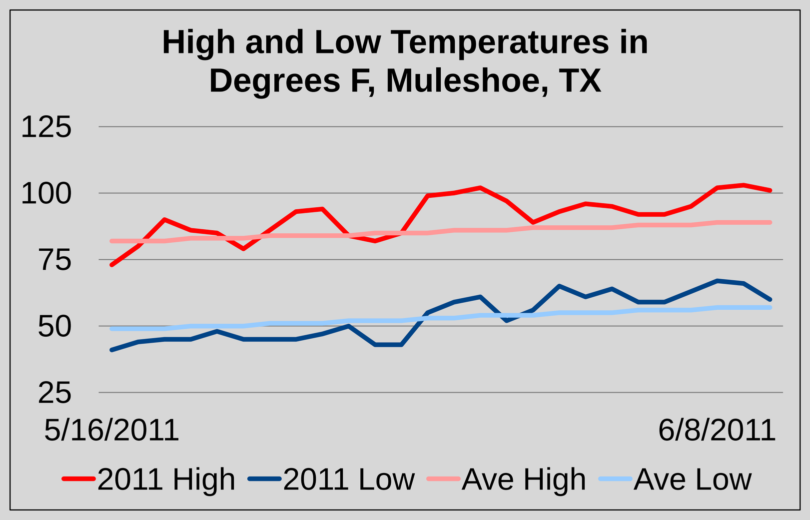


***Figure 1.** High and low temperatures from 2011 vs. the 30 year long term averages.*

The cotton was very slow to develop, 11 days were required from emergence until the 1st true leaf stage (5-16 to 5-27). Thrips numbers slightly exceeded the established action threshold of one thrips per true leaf by 23 May and remained above action threshold through 27 May but no significant difference was observed between any treatment (Table 2). Thrips pressure remained below threshold through the rest of the sampling period and no significant treatment differences were present between treatments. Data were further analyzed by calculating seasonal means by treatment and days after treatment (DAT) (Figures 3 and 4). While no statistical differences were observed when comparing all treatments, seemingly consistent numerical trends were noted. In an effort to clarify some data variability, a data analysis was performed which only included treatments which looked to have had a notable consistent numerical benefit based on the box and whisker plots. This analysis indicated a significant difference in seasonal thrips pressure 3-4 DAT (Figure 5). The high rate of Aza-Direct, Entrust, Bugitol, and Saf-T-Side + Ecotec had significantly fewer thrips/plant compared to the UTC. The same analysis showed no differences 7-8 DAT which may indicate very short residual activity of treatments.

The percentage of immature thrips of a population is a good indicator of that population's ability to colonize; a higher percentage of immatures suggests a higher degree of colonization. Forty seven to forty eight percent (47-48%) of the thrips population were immatures 3-4 and 7-8 DAT and no treatment affect was noted. When data from all post treatment sampling dates were merged and analyzed, the Entrust treatment had a significantly lower percentage of immature thrips compared to all other treatments (P = 0.10) (Figure 6). Based on this data, Entrust appears to suppress colonization to a greater degree compared to the other treatments.

Table 2.

Date	Thrips/ True Leaf[1]	Threshold[2]
5/20	.51	1
5/23	1.2	1
5/27	1	1
5/31	.86	2
6/3	1.2	3
6/7	.89	4
6/10	.21	4
6/14	.36	5

[1]*Grand mean thrips per true leaf*
[2]*Established action threshold is 1 thrips/true leaf.*

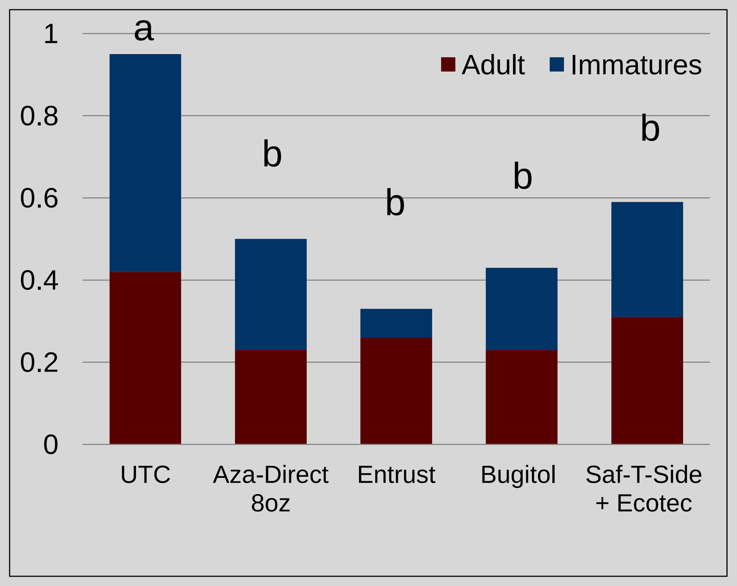
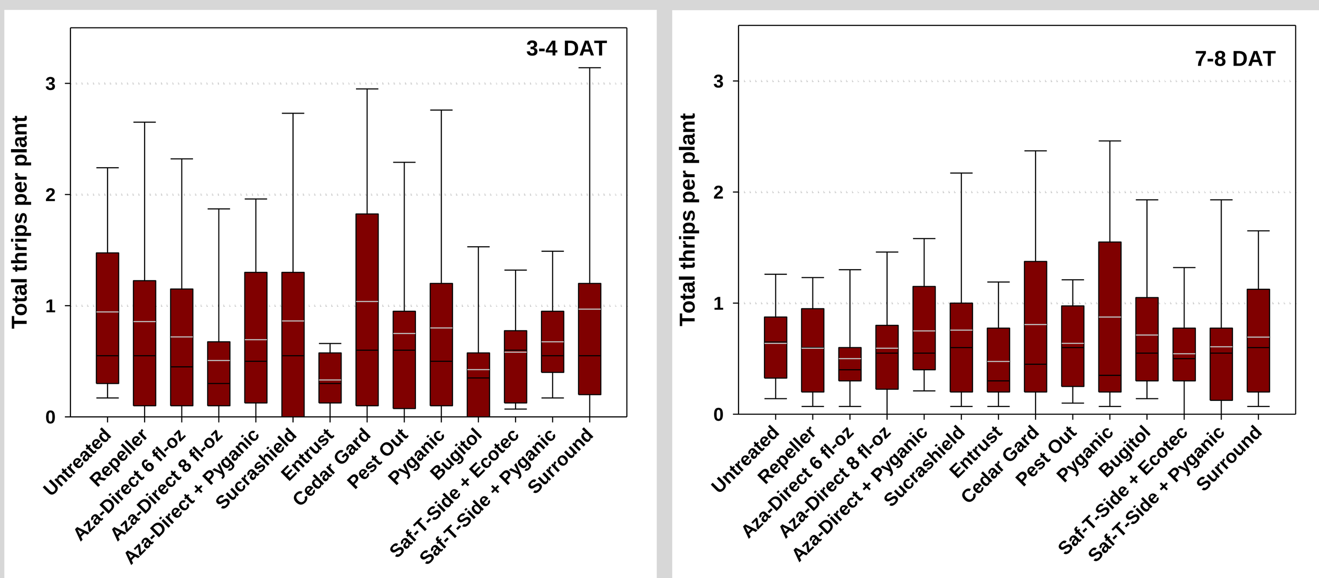


***Figure 5.** Treatment limited seasonal mean thrips per plant 3-4 DAT*



***Figures 3 and 4.** Seasonal mean thrips per plant 3-4 and 7-8 DAT*

Results and Discussion (continued)

Western flower thrips (WFT) were the dominant species identified but a significant number of onion thrips (OT) were also present (Figure 7).

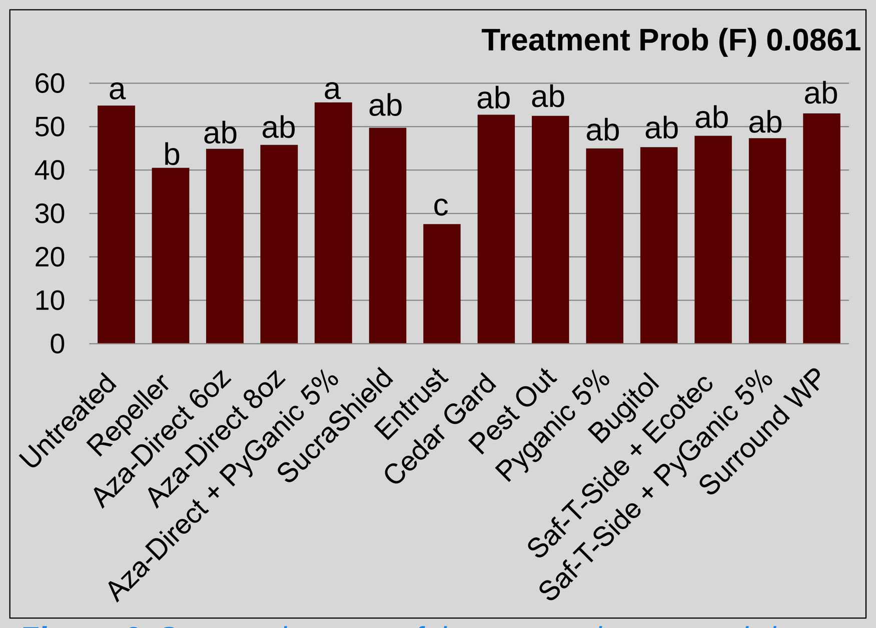


***Figure 6.** Seasonal means of the percent immature thrips.*

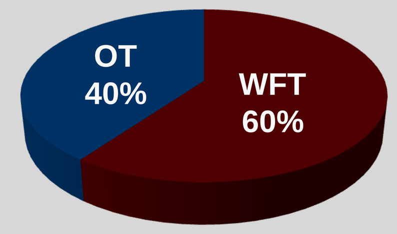


***Figure 7.** Thrips species distribution, Muleshoe, TX 2011.*

Damage ratings, where 1 was least damage and 5 was greatest damage, taken at the 4 true leaf stage on 7 June showed Entrust with lowest damage with a rating of 2; Aza-Direct, Pyganic and Bugitol had statistically similar damage ratings (Figures 8 and 9). The reason Saf-T-Side + Ecotec, which tended to have a favorable reduction in thrips, failed to exhibit a reduction in damage is uncertain. Typically, damage ratings must exceed 3 to elicit a yield response.

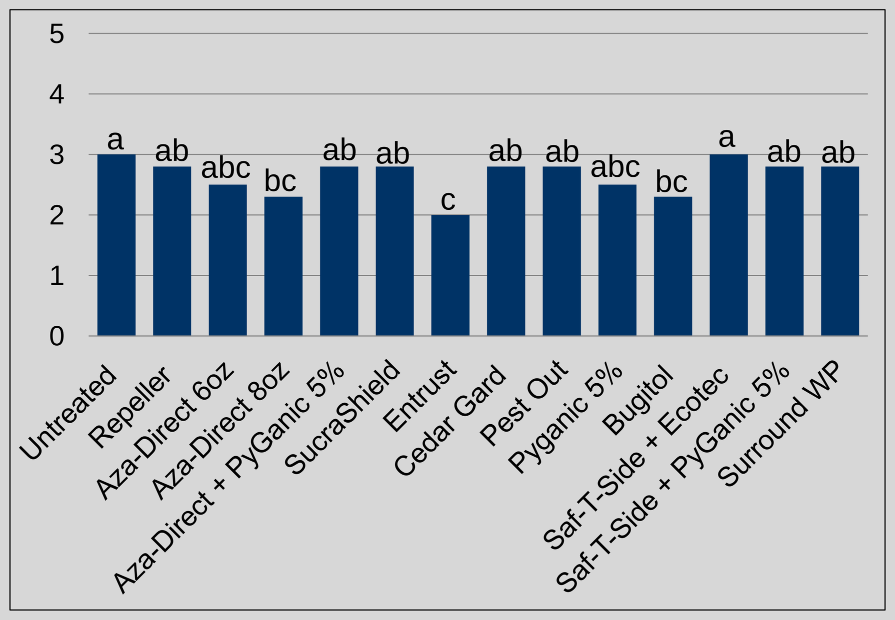


***Figure 8.** Plant damage ratings 7 June.*

***Figure 9.** Typical cotton plant with 4 true leaves and a damage rating of 2.*

The trial yielded very well, the mean lint yield across all treatments was 1125 lbs/acre and no differences between treatments were observed (Figure 10).

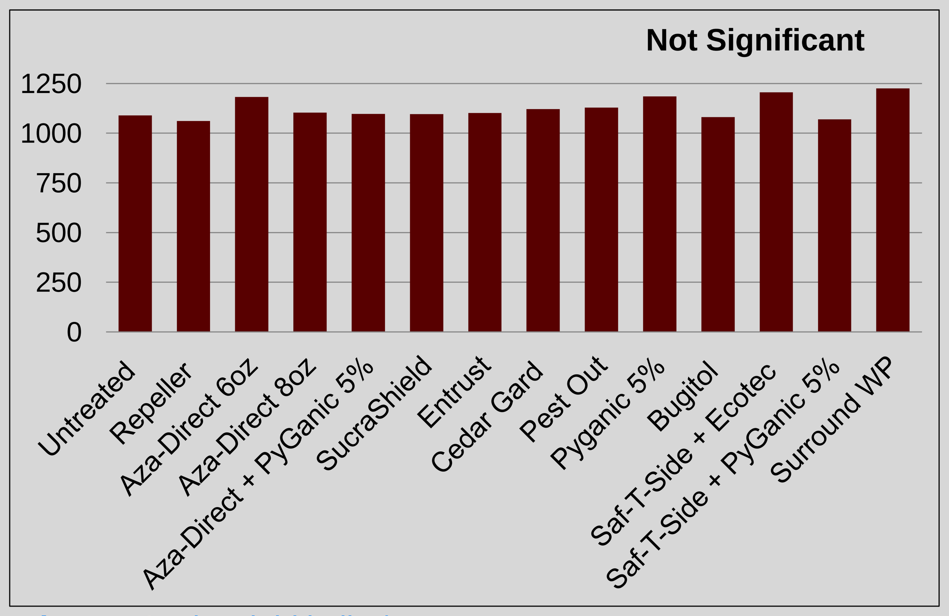


***Figure 10.** Lint yield in lbs/acre.*

Conclusions

Thrips pressure was less than normally experienced and variability was high within the trial. Never-the-less Aza-Direct (8oz), Entrust, Bugitol, and Saf-T-Side + Ecotec did provide some suppression of thrips in this trial but residual activity may be limited. Entrust appeared to curb colonization to a greater degree. No treatment provided any benefit in lint yield. This trial should be repeated under better environmental conditions which would support higher thrips pressure. Based on this data rate adjustments should also be investigated and efforts should be concentrated on the more promising insecticides.

Acknowledgements

Project sites were provided by Jimmy Wedel, Muleshoe, TX and Steve Neff, Idalou, TX.

This project was funded by the USDA National Institute of Food and Agriculture