MANAGING THRIPS IN ORGANIC COTTON WITH HOST PLANT RESISTANCE AND SPINOSAD INSECTICIDE Monti Vandiver

Texas A&M AgriLife Extension Service Muleshoe, TX Dylan Wann Apurba Barman Megha Parajulee Jane Dever Mark Arnold Texas A&M AgriLife Research and Extension Center Lubbock, TX

<u>Abstract</u>

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. A replicated trial, evaluating 4 cotton cultivars, 2 experimental cultivars, a susceptible check, and a commercial standard was conducted near Muleshoe, TX. Plots were split into 2 foliar regimes, spinosad (Entrust®) at 2 oz/acre and unsprayed. In general, thrips pressure was moderate. Spinosad insecticide reduced thrips pressure, and subsequent applications appear to be additive. Cultivars did not differ in thrips colonization, but the experimental cultivars did have a significant impact on thrips damage. These data suggest that these cultivars do not express host plant resistance but may have more tolerance to thrips compared to commercial varieties.

Introduction

Thrips are a recurring problem to seedling cotton in the Texas High Plains where the dominant species is western flower thrips, Frankliniella occidentalis (Pergande). More acres of cotton were infested by thrips than any other pest in 2012; in addition more cotton acres were treated for thrips than all other pests combined. 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 suppress 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 2011 we investigated the efficacy of 13 Organic Materials Review Institute (OMRI) approved insecticides at various rates and combinations for thrips suppression in cotton (Aza-Direct, Bugitol, Cedar Gard, Ecotec, Entrust, Pest Out, Pyganic, Saf-T-Side, SucraShield, and Surround). In 2012 we continued the study but reduced the treatment list to only those products which showed potential to provide significant thrips suppression in 2011 (Aza-Direct, Bugitol, Entrust, and Saf-T-Side+Ecotec). Entrust proved to be most effective in suppressing thrips in 2012 and was selected for continued testing in 2013 along with 3 cultivars with varying degrees of host plant resistance (tolerance) to thrips and a susceptible check. 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.

Materials and Methods

This trial was conducted in a commercial organic cotton field in Bailey County near Muleshoe, TX. Historically, western flower thrips have been the dominant thrips species infesting cotton in this area. The trial was planted 13 May, 2013 on 30-inch rows with a John Deere MaxEmerge planter equipped with cone planting units and irrigated using a low elevation spray application (LESA) center pivot irrigation system. Plots were 4-rows wide \times 55 ft long and were arranged in a split-plot design with 4 replicates. Treatments included 4 cotton cultivars, two experimental, (07-7-1407 and 07-7-1020), a susceptible check (AT Atlas), and the industry standard (FM 958). Each cultivar plot was split into untreated and treated plots; spinosad (Entrust®) was applied to treated plots at 2 oz/acre. The insecticide application was applied in accordance with label recommendations at 26.4 gallons/acre (GPA) total volume and included AgAid, an OMRI approved adjuvant, at 80z/100 gallons of water. Three insecticide applications were made weekly, beginning at near 100% emergence, 28 May. Treatments were applied in a 15 inch

band directly over the top of the crop row with a CO2 pressurized backpack sprayer and hand held boom equipped with hollow cone nozzles. The crop stage was noted and thrips were counted at crop emergence and 7, 14, 17, and 21 days after emergence (DAE); all counts were made prior to insecticide applications. Thrips counts were made by collecting ten plants/plot and washing in an alcohol solution; adult and immature thrips collected in solution were filtered out and counted under a dissecting stereo scope. Thrips samples collected were also separated by life stage. Plant damage ratings were assessed at 14 and 21 DAE, the rating scale ranged from 1 to 5, where a rating of 1 indicates no damage and a rating of 5 indicates severe damage. Leaf area was estimated 7, 14, and 21 DAE by collecting 10 plants per plot and measuring the leaf area per plant using a LI-COR, Inc. LI-3100 laboratory area meter. 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. Thrips days were calculated by following the methodology described by Ruppel (1983; J. Econ. Entomol. 76:2, pp. 375-377).

Results and Discussion

Environmental conditions at the trial site were windy with temperatures near normal to slightly above normal (Figure 1). Three separate rain events occurred June 3, 6, and 8; a nearby NOAA weather station recorded .38, .88 and .97 inches respectively. Thrips pressure, in general, was moderate. Much of the area wheat, which is an alternative host that normally supports and bridges thrips populations until cotton emergence, had desiccated prematurely due to extreme winter and early spring environmental conditions limiting early season populations.



Figure 1. High and low temperatures from 2013 vs. the 30 year long term averages (1980-2010).

The cotton was slow to emerge, 15 days were required to attain near 100% emergence on 28 May and an additional 7 days from emergence until a trial average of 1.5 true leaves had developed on 4 June. Mean thrips numbers of untreated plots were less than 50% of action threshold when the initial insecticide application was applied (28 May, 100% emergence) but was over 2X the established action threshold of one thrips per true leaf by 7 DAE, and maximum pressure, 8X action threshold, was reached by 17 DAE (14 June) (Figure 2). No differences in thrips densities were observed at any sample date when comparing cotton cultivars within insecticide treatments. A significant differences were noted in plant damage ratings at 14 DAE (data not presented), but by 21 DAE, significant differences were apparent (Figure 4). The untreated commercial cultivars exhibited the greatest thrips damage; injury was reduced in the experimental cultivars and plots treated with spinosad insecticide. Leaf area measurements revealed significant differences between treatments at 21 DAE, but no differences were observed on earlier sampling dates (Figure 5). The treated 7-07-1020 cultivar had most leaf area, and the untreated 7-07-1020 cultivars.



Figure 2. Mean thrips per 10 plants 28 May – 18 June compared to threshold.



Figure 3. Mean thrips per 10 plants 17 days after emergence, Treat Prob(F) 0.0008.



Figure 4. Mean thrips damage ratings 21 days after emergence, Treat Prob(F) 0.0005.



The percent of a thrips population which is immature is a good indicator of that population's ability to colonize; a higher percentage of immature thrips suggests a higher degree of colonization. When data from all post treatment sampling dates were combined and analyzed, cultivar had no impact on the percentage of the population which was immature (Figure 6). In 2 cultivars, Atlas and 07-7-1020, the Entrust insecticide significantly reduced the immature percentage but only provided slight numeric reductions in the other cultivars. Based on this data, Entrust appears to suppress colonization to a degree but cultivar did not have an impact.



Figure 6. Post treatment seasonal mean percent immature thrips, Prob(F) 0.0367.

Cumulative thrips days can give an indication of thrips pressure over time. No differences in thrips days were observed when comparing cotton cultivars within insecticide treatments but a significant difference was observed when comparing all treatments (Figure 7). Spinosad reduced thrips days by 23.4% when comparing only insecticide treated vs untreated plots. This decrease is an indication of reduced overall thrips pressure and feeding duration.



Figure 7. Mean accumulated thrips days per plant 28 May – 18 June.

Thrips pressure was moderate but exceeded action threshold throughout most of the seedling stage. Spinosad insecticide lowered the seasonal mean percent immature thrips, decreased thrips numbers at 17 DAE, and reduced accumulated thrips days. Cultivars did not differ in thrips colonization but had a significant impact on thrips damage and leaf area. These data suggest that the new cultivars do not express host plant resistance but may have more tolerance to thrips compared to commercial varieties.

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