THRIPS CONTROL ON DRY BULB ONIONS

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Abstract

Onion thrips are the key direct insect pest of dry bulb onions. We have identified and quantified the relative abundance of thrips species infesting dry bulb onions in Washington State. Additionally, we have evaluated registered and candidate chemistries for their ability to suppress thrips populations, and evaluated several gallonage rates in applications and nozzle delivery pressures for optimizing insecticide coverage towards improving thrips control. During all evaluation dates, greater than 95% of the thrips collected were onion thrips (*Thrips tabaci)* with the remaining thrips being Western flower thrips (*Frankliniella occidentalis).* The most effective insecticides for controlling thrips were Lannate™ (methomyl) and Radiant™ (spinetoram). The insecticides Agri-Mek™ (abamectin) and Movento™ (spirotetremat) provided adequate control of thrips. Different application gallonage and pressure did not affect efficacy of insecticides.

Introduction

Thrips infestations are a perennial, persistent and ubiquitous problem throughout Western US dry bulb onion fields. Some very basic research is needed to ascertain which thrips species are economically damaging and developing resistance to current pest management technologies. Thrips' mobility and biology can impact control strategies, and impact insecticide performance in controlling thrips. Cultural practices including different water carrier gallonage application rates and delivery pressures to optimize thrips control require increased investigation.

When we initiated this thrips control program in 2001 most onion fields in Washington State were treated with multiple insecticides for thrips control. Lambda-cyhalothrin was the predominant insecticide used for thrips suppression. At registered rates it cost approximately $14 per acre per application. Lamda –cyhalothrin has been ineffective since 2003. Insecticides registered since 2001 are all substantially more expensive then to apply then previously used chemistries. Our research has also documented that thrips are surviving for several months in storage and are continuing to infest over 15% of the onions in storage even after the onions received a substantial insecticide load in the production field. These residual thrips infestations reduce onion shelf life and increase the incidence of several neck rots. We have also documented that in pairwise comparisons (treated for thrips vs. no treatment) among 39 onion cultivars that application of no insecticide treatment of thrips results in a 15 to 35% (depending on cultivar) decrease in bulb size at harvest among cultivars. Bulbs are graded by size and economic returns to growers decrease as bulb size decreases. Onion thrips have also been identified as the vector for Iris yellow spot virus. Our continuing thrips research program evaluates insecticide efficacy, water carrier rates, and has identified and quantified thrips species and abundance in Washington State onion fields.

Materials and Methods

In the experiments detailed below field plots of onion (var. 'Sabroso' Nunhems, Parma, ID) were established at the WSU Othello Research Farm and grown using drip irrigation and standard grower practices for agronomic and pest management inputs excluding thrips treatments. On March 29, 2010, an onion plot 120 feet wide and 350 feet long was established with two double rows of onions planted on each 44 inch wide bed. Double rows are 2 ½ inches apart with 3 inches in row spacing. Lorsban™ 15G (chlorpyriphos) was applied at planting and incorporated over the double row at the rate of 3.7 oz./1,000 row feet. Plots were established in a random complete block design with four replications. In each instance, plots were 7.5 feet wide and 30 feet long. Applications (except where specified) were made with a CO_2 pressurized back pack sprayer applying 30 gallons of water carrier per acre at 35 psi. Efficacy was evaluated four or five days after applications by counting the number immature and adult thrips per plant on 10 individual plants per plot in the field. All data for each sample date were analyzed by ANOVA and treatments means were compared to thrips population means from non-treated control plots in pairwise *t*-tests. At the end of the growing season onion yield and size were evaluated for comparison among treatments.

Results/Discussion

Sequences of insecticides were evaluated for efficacy against thrips. Applications were made weekly starting on 23 June 2010. The aim of this research was to provide producers possible insecticide management regimes to use on their farms. Figure 1 shows the average thrips count per treatment. All treatment sequences averaged significantly (p<0.05) fewer thrips per plot than the untreated check. The weekly count data (data not shown) followed the same trend. The size classes and total yield for the sequential applications are illustrated in Figure 2. There were no differences in the percentage of medium onions per plot. Significantly more onions of the colossal size class, and significantly fewer jumbo size class onions were obtained in the plots treated with a tank mix of AzaDirect and Radiant. Four of the sequential application schemes yielded significantly more onions per acre than the untreated check. Figure 3 shows the various sequences evaluated in the trial. The total cost of each treatment sequence is listed in addition to the net potential increase in revenue calculated from the plot yield in Figure 2 using the market price of $320 per ton. All treatments except for the untreated check and the 'aggressive' sequence resulted in increase profitability in this study.

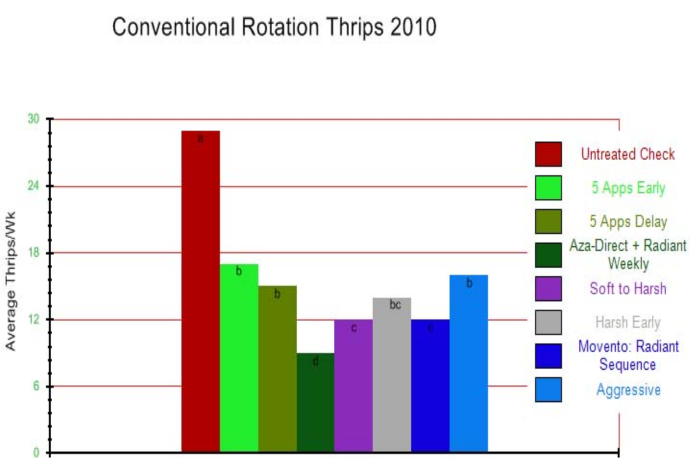

Figure 1. Thrips per plant versus sequential chemical treatments. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

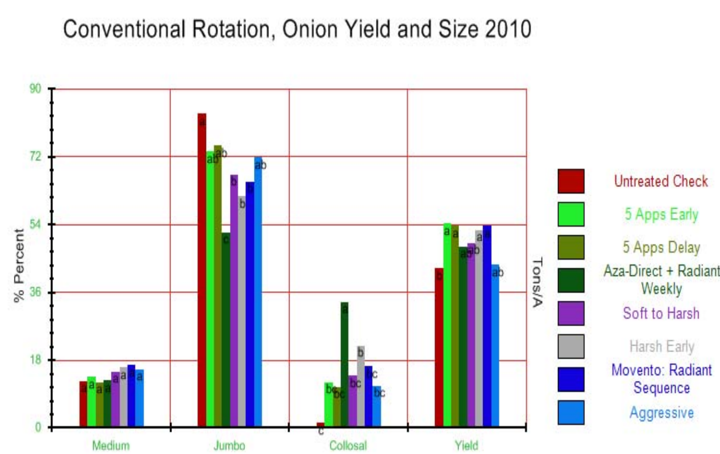

Figure 2. Size classes of onions and total yield are for the different treatment sequences. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

Week	1	2	3	4	5	6	7	8	Cost/A	Net over UTC
Untreated Check									0	0
5 Apps Early	AzaDirect + Radiant	AzaDirect + Radiant		Lannate	Agrimek		Movento		300	$3,485
5 Apps Delay		AzaDirect + Radiant	Lannate		Movento	AzaDirect + Radiant	Lannate		280	$3,352
AzaDirect+Radiant Weekly	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	AzaDirect + Radiant	679	$1,164
Soft to Harsh	AzaDirect + Radiant	AzaDirect + Movento	Radiant	Lannate	Movento	Lannate	Lannate		243	$1,904
Harsh Early	Lannate	Radiant	Radiant	Lannate	Agrimek	Movento	Lannate		300	$2,976
Movento Radiant Sequence	Movento	Radiant	Movento	Radiant	Movento	Radiant	Movento	Radiant	388	$3,225
Aggressive	Lannate	AzaDirect + Radiant	Movento	Agrimek	Lannate	Radiant	Movento		329	-$6
Based on average retail product prices and onions selling at $320 per ton. ((Treatment yield-UTC Yield)*320)-Product cost/A										

Figure 3. Application sequences by treatment week with cost per acre and net increase in potential revenue due to increased yield documented in Figure 2.

Figure 4 depict data from a trial evaluating weekly applications of insecticides to control thrips in onions. The data indicates that Lannate and Radiant were the most effective treatments in the trial. The different AgriMek and Movento treatments and the high rate of tolfenpyrad were all providing significantly better control than the untreated check, but not different form one another. The low rate of tolfenpyrad was also providing control significantly better than the untreated check.

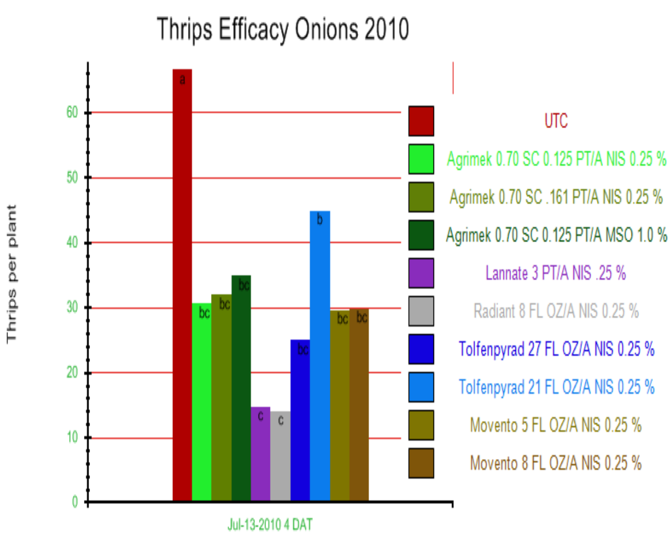

Figure 4. Thrips per plant versus chemical treatments. Weekly applications were made of each product. This data is only 1 week of 8 that were evaluated with similar trends for each week. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

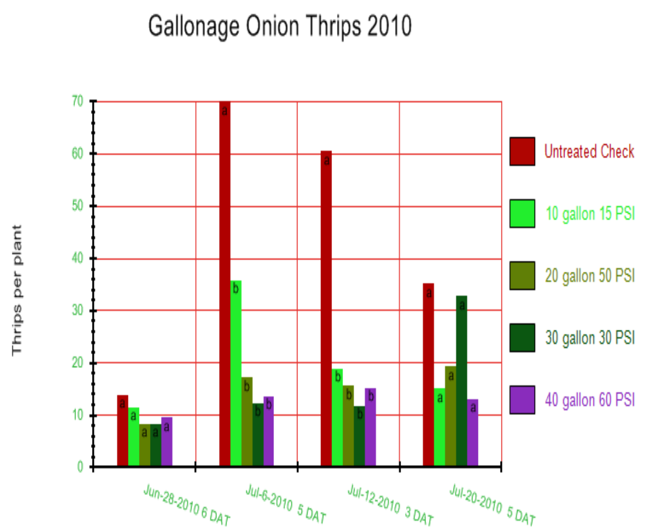

Figure 5. Gallonage experiment results. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

Ten onion plants were collected weekly from untreated check plots at the WSU Othello research station, and from farms near Patterson and Prosser, WA. The plants were taken back to the laboratory and dissected in order to collect the adult thrips on each plant. Samples were stored in alcohol and the ratio of onion thrips (*Thrips tabaci*) adults to western flower thrips (*Frankliniella occidentalis*) adults was ascertained. From the three sites the following are the percentage of western flower thrips of the total evaluated: Othello 0%, Patterson 1.97%, and Prosser 0.18%. The remainder of the 1,043 thrips evaluated were onion thrips. There did not appear to be any seasonal pattern to the species of thrips we were collecting, but it does appear that most of the thrips in the fields we evaluated are probably not migrating from other crops or sites once the populations were established.

Four applications were made to test the efficacy of the different application rates with a tank mix of Radiant (10 oz/A) and AzaDirect (16 oz/A), products known to be efficacious at controlling thrips. Water carrier gallonages including 10 gallons 15 psi, 20 gallons 50 psi, 30 gallons 30 psi, and 40 gallons 60 psi were evaluated. The tests conducted during 2010 show that the gallonage and pressure application rates did not have a different impact on thrips control. All treatments provided a level of control that was significantly better than the untreated check, but did not differ from one another. There was a numerical (not statistically significant) difference between the 10 gallon 15 psi rate compared to the other treatments. The results from 2009 and 2010 illustrate that with the tank mix tested, all gallonage ranges provided equal efficacy for thrips control.

Organic insecticides (Figure 6) were also evaluated in sequential applications for their efficacy in controlling thrips. We found that all sequences tested provided significantly better control than the untreated check when counts were summed from the plots for the season (Fig. 6).

Two products were tested for efficacy using a chemigation simulator that applied 0.1” of water per pass. Water was applied with the simulator to the untreated check plots. The products tested were Lannate and Requiem. Lannate is used frequently by onion growers and is applied through the center pivot irrigation system with 0.1” of water per pass. Figure 7 shows that the Lannate provided good control of thrips with the chemigation simulator, but the Requiem did not. A simulator like this one will be used more extensively in coming years to evaluate if products should be applied by chemigation in center pivot systems as growers routinely ask this question of products in the Columbia Basin.

Conclusions

Using insecticides that are effective at controlling thrips increases yield and size class of dry bulb onions. Radiant and Lannate were found to be the most effective products while Movento and AgriMek provided good suppression of onion thrips. Many of the sequential applications tested provided excellent season long control of thrips and if adopted by commercial growers could increase economic returns. Weekly applications are not always needed as shown on the sequences where applications were skipped either early during the season or at the middle of the season. It is important for producers to consider the mode of action of the different chemistries when integrating them into their control programs. In the onion fields where we surveyed thrips, the vast majority were onion thrips (*Thrips tabaci*) indicating that selection of insecticides for use in onions should be targeted at that species and not western flower thrips. We also found that application water carrier rates in the range that we tested did not have an effect on thrips control.

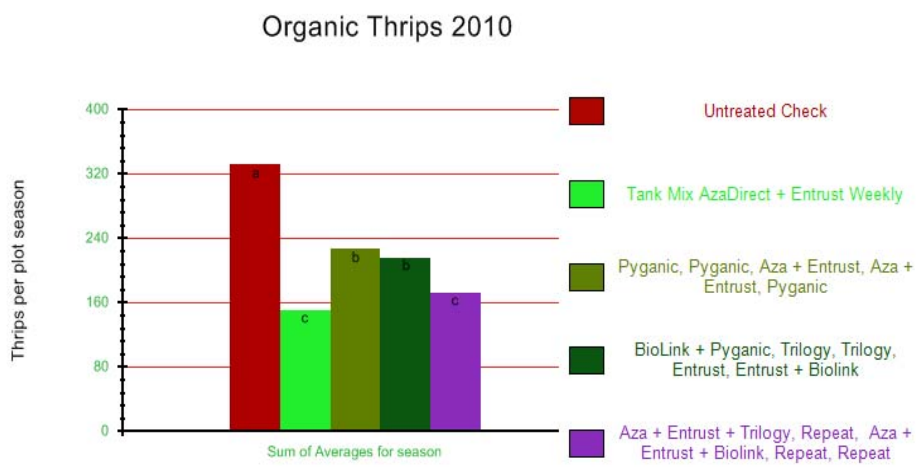

Figure 6. Thrips per plant versus chemical treatments. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

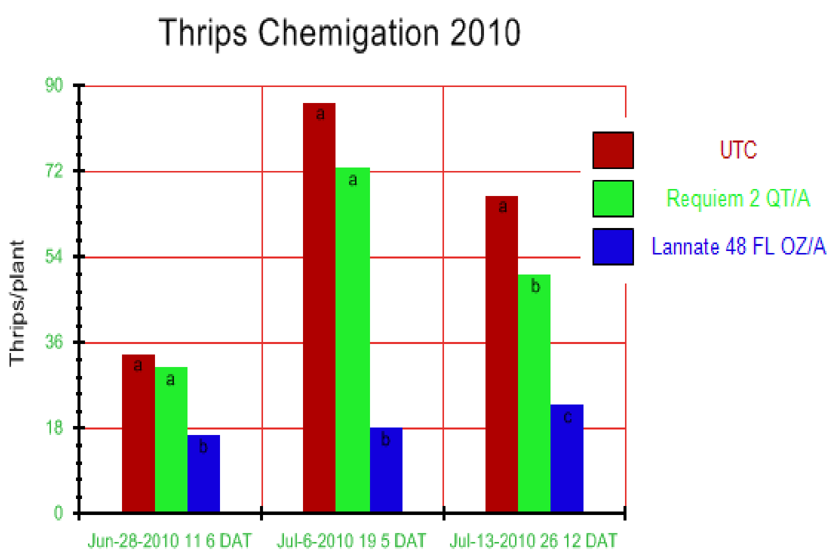

Figure 7. Thrips per plant versus chemical treatments. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test.

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