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 evaluated candidate chemistries and sequences of currently registered products for their ability to suppress thrips populations in dry bulb onions in Washington State. Additionally, we have evaluated currently registered products when applied via chemigation. All of the sequences of applications significantly reduced thrips numbers, and increased potential profitability. The most effective insecticides for controlling thrips were Lannate™ (methomyl), and Radiant™ (spinetoram). The insecticides Agri-Mek™ (abamectin), Torac™ (tolfenpyrad), Benevia™ (cyazypyr) and Movento™ (spirotetremat) provided adequate control of thrips. Lannate, Radiant, Benevia and Torac all decrease thrips populations when applied via chemigation as well.

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.

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. Lamda –cyhalothrin has been ineffective since 2003. Insecticides registered since 2001 are all substantially more expensive 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 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 Research Farm in Pasco, WA and grown using drip irrigation and standard grower practices for agronomic and pest management inputs excluding thrips treatments. On April 4, 2013, 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 8 June 2013. 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 overall trends and differences seen in the 2013 trial closely follow results from 2011 and 2012. The only difference was that the overall yields were greater in 2013 and therefore potential profitability was greater. The total yields for the sequential applications are also illustrated in Figure 1. Overall thrips pressure was low this year, yet there were statistically significant differences in terms of overall yield and bulb size of the 'NY Res Man' sequence when compared to the untreated check. All treatments numerically increased yields over the check, but differences were not statistically significant. The yield increases are directly attributed to increased size profiles of onions where thrips damage was reduced.

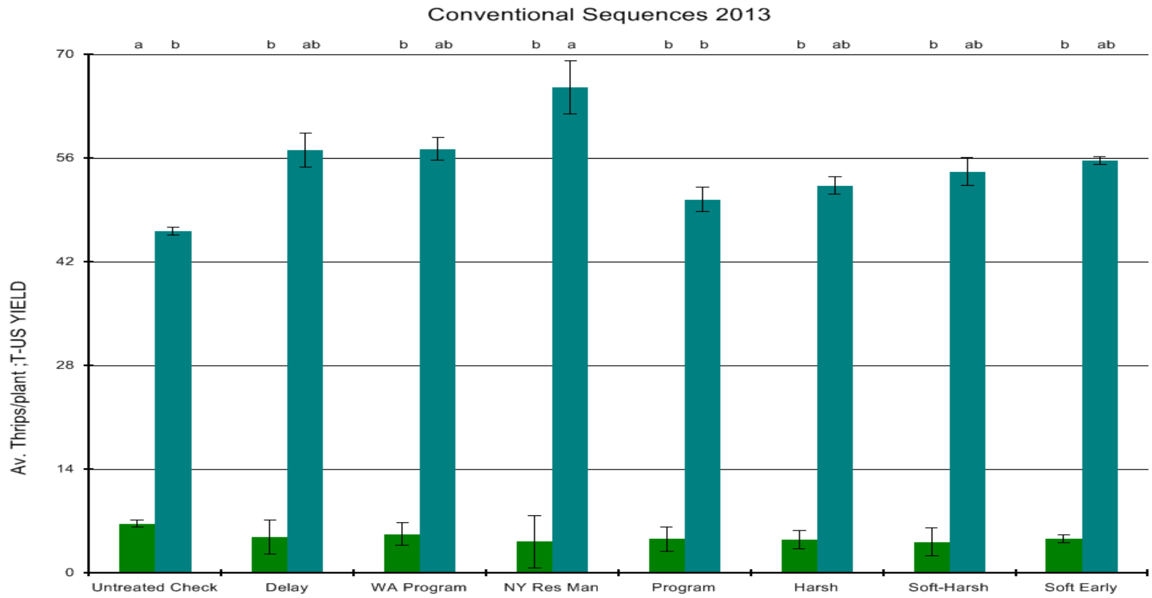

Figure 1. Thrips per plant (green bars) and yield (blue bars)(tons/A) versus sequential chemical treatments. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

Figure 2 shows the various sequences evaluated in the trial with the applications listed by the week in which they were applied. 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 $240 per ton. All treatment sequences resulted in increase profitability in this study as indicated above. The information in Table 2 is important for producers to consider when choosing insecticides, but local conditions will alter how the compounds react, so that should be considered.

	A	B	C	D	E	F	G	H				
Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Cost/A $**	**yield tons/A**	**Net over Check $/A**	**Thrips/Week**
Untreated Check									0	46.16	0.00	6.68a
Delay		Radiant + Movento	Movento	Radiant	Agrimek		Lannate		275	57.1	2350.60	4.83b
WA Program		Movento	Movento	AzaDirect + Radiant	AzaDirect + Radiant		Lannate	Lannate	303	57.27	2363.40	5.3b
NY Res. Man.	Movento	Movento	Agrimek	Agrimek	Lannate	Lannate	Radiant	Radiant	356	65.6	4309.60	4.2b
Program	AzaDirect + Radiant	Movento	Radiant	Agrimek		Lannate	Lannate		293	50.4	724.60	4.6b
Harsh	Lannate	Movento		Lannate	Agrimek	Radiant	Lannate		239	52.3	1233.40	4.5b
Soft to Harsh	Movento	Movento	Radiant	Radiant	Agrimek	Lannate		Lannate	305	54.2	1624.60	4.2b
Soft Early	Radiant + Movento	Movento		Radiant	Agrimek		Lannate		275	55.7	2014.60	4.6b
Based on average retail product prices and onions selling at $240 per ton. ((Treatment yield-UTC Yield)*240)-Product cost/A.												

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

Figures 3 & 4 depict data from trials evaluating weekly applications of insecticides to control thrips in onions. The data in Fig. 3 indicates that the treatments that included a tank mix with Radiant were more effective at controlling thrips populations than the untreated check. The other compounds tested did not significantly reduce thrips numbers. Overall yields did not differ significantly among any of the treatments.

In Fig. 4, all insecticides evaluated provided significantly better control than the untreated check, but not different from one another in terms of overall thrips numbers. Products were compared by chemigation and foliar applications as well with no statistical separation in application method for Torac. The rotation programs that alternated Movento and Torac tended to have numerically more thrips than the other programs, but the results did not differ statistically (data not shown). Yield impacts were not statistically different from one another.

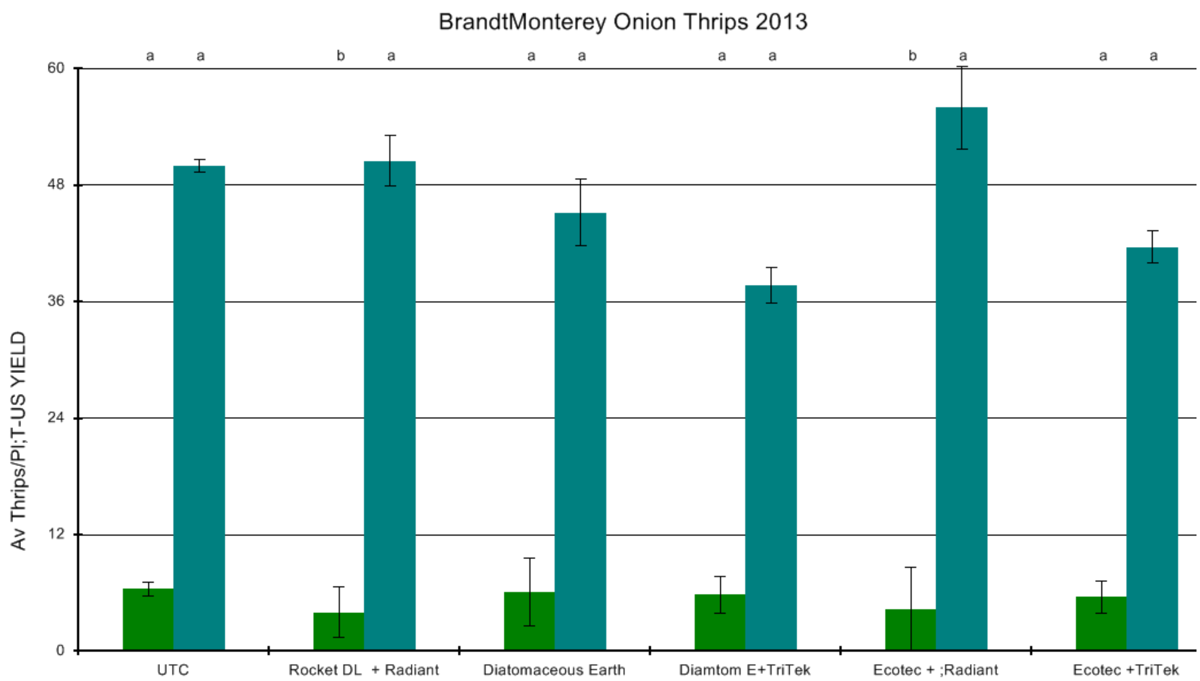

Figure 3. Thrips per plant (green bars) and overall yield (blue bars) versus chemical treatments. Weekly applications were made of each product. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

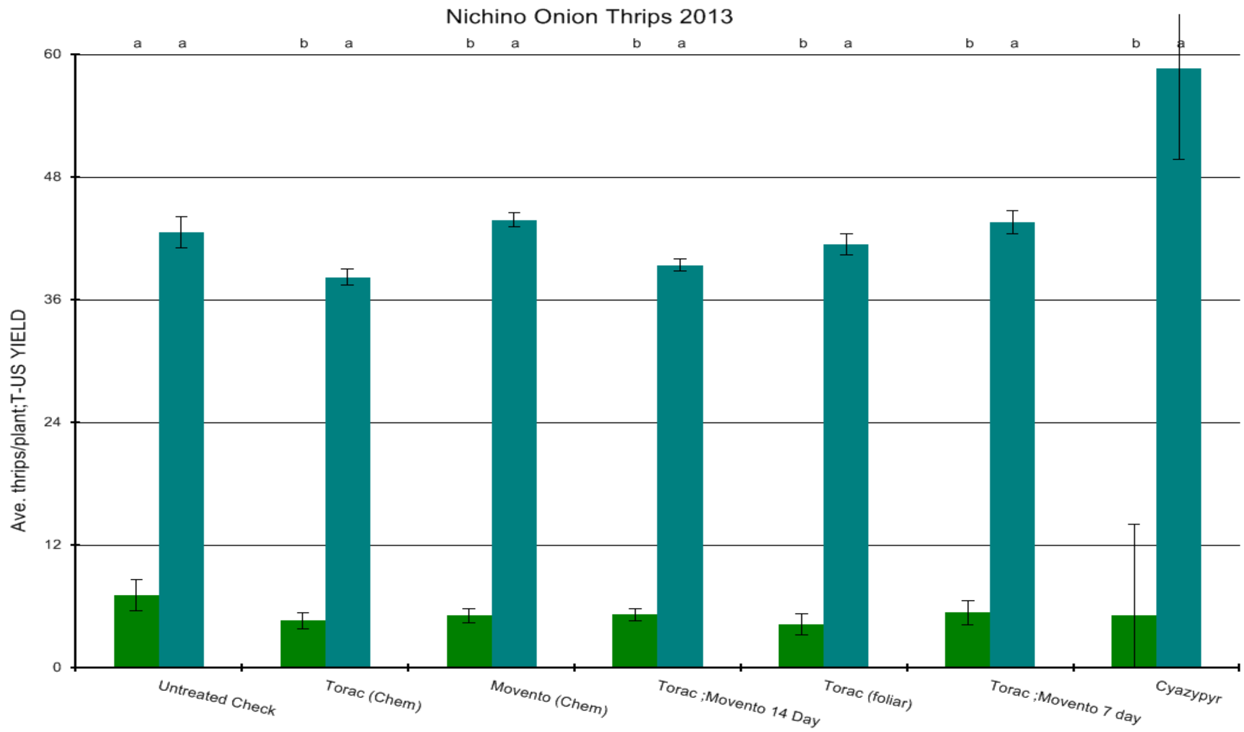

Figure 4. Thrips per plant (green bars) and overall yield (blue bars) versus chemical treatments. Weekly applications were made of each product. Some products were applied by chemigation as denoted (Chem) and some in weekly or 14 day rotation with each other as noted. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test)

Figures 5 and 6 depict chemigation treatments where Fig. 5 treatments were applied using drip irrigation and Fig. 6 treatments were applied using overhead (sprinkler simulated) chemigation. In Fig. 5, the Lannate, Vydate, and rotation program of Verimark and Vydate provided control of thrips that was significantly better than the untreated check. The Verimark, when applied by its self, did not reduce thrips numbers across the season. It should be noted that in some of the evaluations, the high rate of Verimark significantly decreased thrips numbers compared to the check. This likely provides further support to the above mention that Verimark when applied in rotation with other compounds by drip irrigation could be an effective program, though further investigation is warranted (data not shown). All treatments numerically increased overall yield, but the data were not statistically significant.

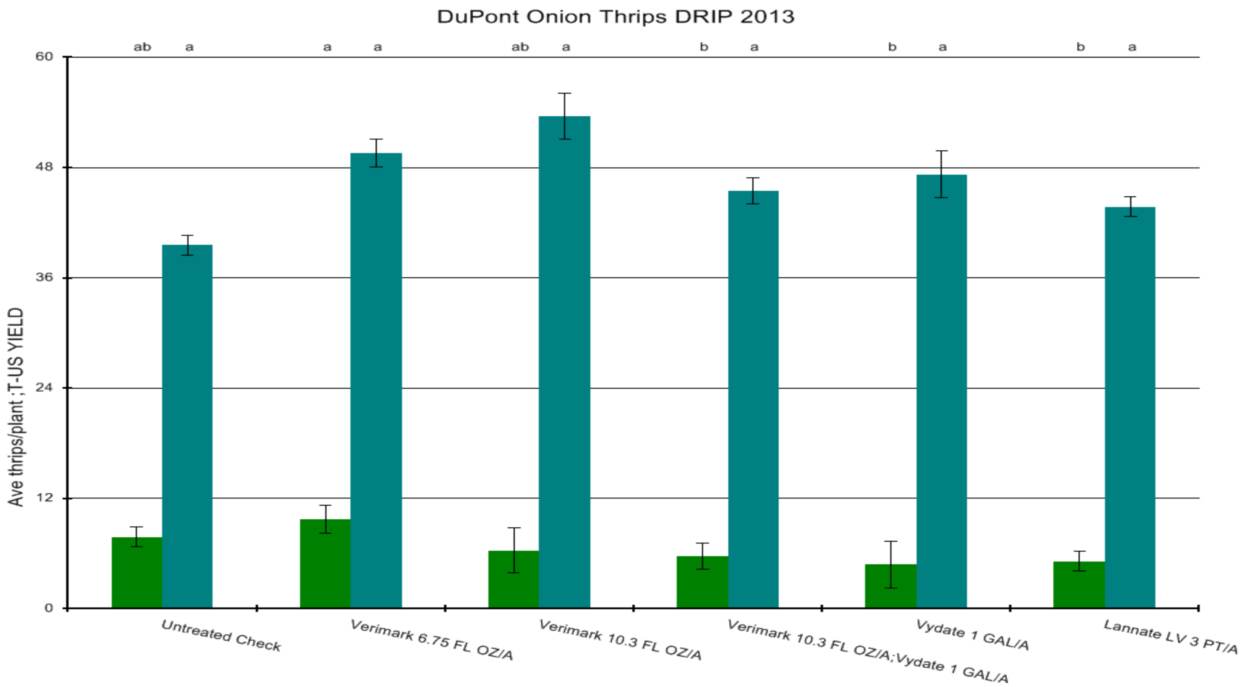

Figure 5. Thrips per plant (green bars) and overall yield (blue bars) versus chemical treatments. Weekly applications were made of each product applied by injection into buried drip tape. One treatment as indicated consisted of a rotation of Verimark and Vydate in alternating weeks. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test).

The results in Fig. 6 are not statistically different from one another, but the numeric trend exhibited is the same as results from 2011 and 2012 where significant differences were detected (data not shown). With results from previous years, there is strong evidence that both Lannate and Radiant are effective choices for thrips control when applied via overhead chemigation. Results from Fig. 4 and 6 indicate that there is some activity against thrips by Movento, Exirel, and Torac, but further studies should be conducted to verify the results.

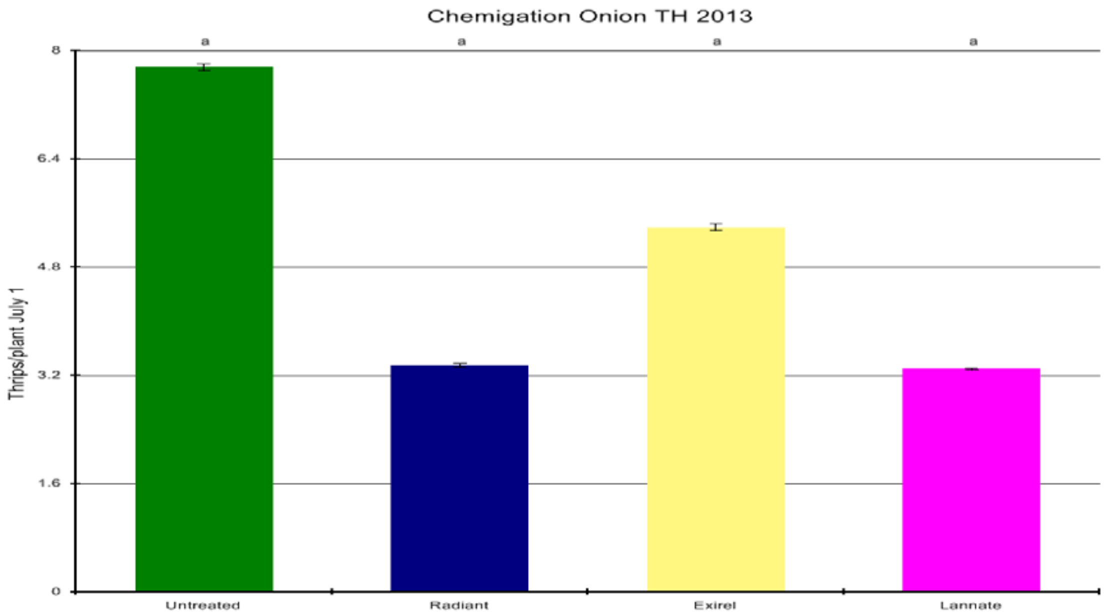

Figure 6. Thrips per plant versus chemical treatments. Weekly applications were made of each product applied with 0.1 inches of irrigation water. Treatments with the same letters are not statistically different from one another (P=0.05 Student-Newman-Keuls test).

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, Benevia/Exirel, Torac and AgriMek provided good suppression of onion thrips. All 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. Chemigation proved to be an effective way to apply Lannate, and Radiant. There is evidence that Movento, Torac, and Exirel may be effective by chemigation, but further work should be performed for confirmation.

Not all compounds tested are currently registered for use on Onions in Washington State. Do not use unregistered compounds. Consult your local Extension office and read and follow label directions. Oregon and Washington labels (PICOL): http://cru66.cahe.wsu.edu/LabelTolerance.html

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