INSECTICIDE ROTATION TRIAL FOR MAXIMUM EFFICACY AGAINST THRIPS IN DRY BULB ONIONS - 2009

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Objective

Determine the most effective insecticide application sequence and rates to provide season-long thrips control to reduce the risk of resistance development. **Not all insecticides referred to in this report are registered for use on onions. Always obtain and read the insecticide label to ensure that the product is registered for the crop for which it is intended.**

Introduction

Resistance management is a key component of this trial, to determine the most effective strategies to maintain yield and quality while rotating insecticides with different modes of action. The 2008 trial suggested that rotations including Lannate®, Carzol®, Movento®, and Radiant® in different rotations were significantly better than those with other insecticides in the rotation. This project was designed to determine the optimum rate, timing, and rotation sequence of labeled insecticides, plus insecticides that may be labeled in the next few years.

Materials and Methods

A block of onion 29 ft wide by 270 ft in length was planted to 'Vaquero' (Numhems, Parma, ID) on March 20, 2009. The onions were planted as 2 double rows on a 44-inch bed. The double rows were spaced 2 inches apart. The seeding rate was 137,000 seeds per acre. Lorsban® 15G was applied at planting in a 6-inch band over each double row at a rate of 3.7 oz/1,000 ft of row for onion maggot control.

The plots were 30 ft long by 7.3 ft wide. Insecticide applications were made with a CO_2-pressurized back pack sprayer. Materials were applied with water at 38.0 gpa. Each treatment was replicated three times. Thrips counts were made weekly by visually counting the total number of thrips on 15 plants in each plot. Foliage injury ratings were taken as a subjective measurement of foliage damage caused by thrips feeding and iris yellow spot virus disease development. A scale of 0-5 (0 = no injury, 5 = complete

silvering of the leaves) was used. The onions were harvested September 17-18, 2009, and graded on October 14-15, 2009.

The experimental design was a randomized complete block with three replications. Twelve different insecticide rotation sequences were applied. The insecticides tested were Lannate, Carzol, Radiant, Movento, Trilogy® and Mustang®. Rates, application dates, and sequences are listed in Table 1. Environmental conditions at each application date are listed in Table 2.

Results and Discussion

The thrips population data are shown in Table 3 and the foliage damage evaluations in Table 4. Treatments are listed by number so the reader should refer to Table 1 for specific information about each treatment. The season average thrips population is shown in Figure 1.

Thrips control was fairly uniform across treatments except where the synthetic pyrethroid, Mustang, was first applied. Thrips control when Mustang was applied early was significantly poorer compared to either Movento or Radiant applied during the first applications. There was also a trend for thrips control to be more erratic when Lannate was applied early, followed later in the season by Movento and Radiant (Fig. 2). The most consistent results were obtained when Movento was the first insecticide applied (Fig. 3).

When Radiant was applied first in the season, there was good thrips control, but not as consistent as when Movento was the first application (Fig. 4). The data suggest that two Movento applications, followed by two Radiant applications, then using Lannate for the rest of the season will give the best results.

There were no significant differences in total yield (Table 5) between the various treatments, but Treatments 3 and 8, which gave the poorest thrips control, also had the lowest total yield. There were significant size reductions in the colossal sized bulbs, with Treatments 3, 7, and 8 having poorer yields in this size category. These data, along with 2007–2009 efficacy data, suggest that using synthetic pyrethroid insecticides in a thrips control program will be detrimental to thrips control and yield.

Conclusions

Using the “soft insecticides”, Radiant or Movento, first in a rotation gave better overall thrips control and yield than using Lannate first. The synthetic pyrethroid Mustang applied early had a negative impact on thrips control and on yield.

Table 1. Insecticide rates, application dates and sequence in onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

Treatment number	Application date							
	6/4 2009	6/10 2009	6/16 2009	6/23 2009	7/1 2009	7/10 2009	7/20 2009	7/29 2009
1	Radiant	Radiant	Movento	Movento	Lannate	Lannate	Carzol (1.25)	Lannate
2	Movento	Movento	Radiant	Radiant	Lannate	Lannate	Carzol (1.25)	Lannate
3	Lannate	Lannate	Radiant	Radiant	Movento	Movento	Carzol (1.25)	Lannate
4	Lannate	Lannate	Carzol (1.25)	Lannate	Radiant	Radiant	Movento	Movento
5	Radiant	Movento	Lannate	Carzol (1.25)	Radiant	Movento	Lannate	Carzol (1.25)
6	Movento	Radiant	Lannate	Carzol (1.25)	Movento	Radiant	Lannate	Carzol (1.25)
7	Radiant	Radiant	Lannate	Lannate	Carzol (1.25)	Trilogy	Lannate	Lannate
8	Mustang	Mustang	Radiant	Radiant	Movento	Movento	Carzol (1.25)	Lannate
9	Movento	Movento	Radiant	Radiant	Carzol (0.5)	Carzol (0.5)	Lannate	Lannate
10	Movento	Movento	Radiant	Radiant	Carzol (0.75)	Carzol (0.75)	Lannate	Lannate
11	Radiant	Radiant	Movento	Movento	Lannate	Lannate	Carzol (1.0)	Lannate
12	Radiant	Radiant	Carzol (0.25)	Carzol (0.25)	Lannate	Lannate	Carzol (0.25)	Carzol (0.25)

Product	Rate
Radiant	8.0 oz
Movento	5.0 oz
Lannate	3.0 pt
Warrior	3.8 oz
Trilogy	29.9 ml
Carzol	1.25 lb
Carzol	1.0 lb
Carzol	0.75 lb
Carzol	0.5 lb

Table 2. Application information for insecticides used in onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

Application date	Time	Temperature	Relative humidity	Wind
June 4	8:00 A.M.	66°F	65	5.1
June 10	7:00 A.M.	59°F	71	7.0
June 16	7:30 A.M.	57°F	93	3.4
June 23	7:30 A.M.	49°F	77	4.4
July 1	6:30 A.M.	60°F	39	6.1
July 10	6:30 A.M.	56°F	67	1.2
July 20	6:00 A.M.	59°F	45	5.0
July 29	7:00 A.M.	63°F	68	3.6

Table 3. Weekly and season average thrips counts; each number is an average of total thrips/plant, 15 plants/plot, averaged over 4 replications. Malheur Experiment Station, Oregon State University, Ontario, OR 2009

Treatment number	8-Jun	22-Jun	2-Jul	7-Jul	14-Jul	22-Jul	30-Jul	6-Aug	Season average
					average thrips/plant				
1	10.9	18.3	7.3	15.6	9.5	6.9	11.4	10.2	11.3
2	14.4	11.2	8.1	22.9	16.0	7.5	9.2	11.0	12.5
3	8.7	14.9	23.3	21.3	16.6	6.9	13.2	10.9	14.5
4	7.9	12.2	29.6	26.4	16.1	9.7	14.6	11.7	16.0
5	12.8	11.0	14.1	25.1	11.8	7.2	10.2	9.9	12.8
6	17.9	9.6	9.9	25.6	11.9	7.9	11.9	11.5	13.3
7	10.0	9.2	19.0	32.6	10.4	7.7	12.1	11.8	14.1
8	16.3	34.5	24.5	25.8	9.3	7.3	9.7	10.3	17.2
9	13.1	12.0	9.3	24.6	12.8	9.1	9.7	10.3	12.6
10	13.1	8.7	9.5	24.5	11.7	8.7	10.0	10.4	12.1
11	8.2	13.8	6.8	22.4	9.1	6.8	10.9	10.4	11.0
12	8.3	9.2	16.5	25.2	10.9	10.0	9.3	14.9	13.0
LSD (0.05)	4.6		11.5	ns		ns		ns	2.1
LSD (0.1)		12.0			4.8		2.8		

Table 4. Onion foliage damage caused by thrips feeding. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

Treatment number	Average[a]
1	1.3
2	1.3
3	1.5
4	1.3
5	1.1
6	1.3
7	1.1
8	1.8
9	1.3
10	1.2
11	1.2
12	1.4
LSD (0.05)	0.3

[a]Injury scale: 1-5 with 1 = no damage, 5 = complete silvering of foliage from thrips and iris yellow spot virus injury.

Table 5. Yield and grade of onions treated with different rotation sequences of insecticides for thrips control. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

Treatment	Medium	Jumbo	Colossal	S. Colossal	Total yield
	---------- cwt/acre ----------				
1	19.7	747.5	315.5	32.7	1115.4
2	16.3	763.8	359.2	19.4	1158.7
3	25.0	824.5	218.2	9.9	1077.5
4	18.5	812.1	310.7	3.4	1144.6
5	34.8	797.6	297.6	13.6	1143.6
6	20.7	879.5	275.1	18.5	1193.7
7	21.8	850.7	220.4	29.3	1122.2
8	35.8	872.0	170.8	4.3	1082.9
9	29.3	756.8	328.3	31.2	1145.5
10	24.7	773.1	326.1	22.5	1146.4
11	20.4	835.2	273.2	19.7	1148.5
12	25.0	809.3	272.6	4.9	1111.8
LSD (0.05)	ns	ns	81.7	ns	ns

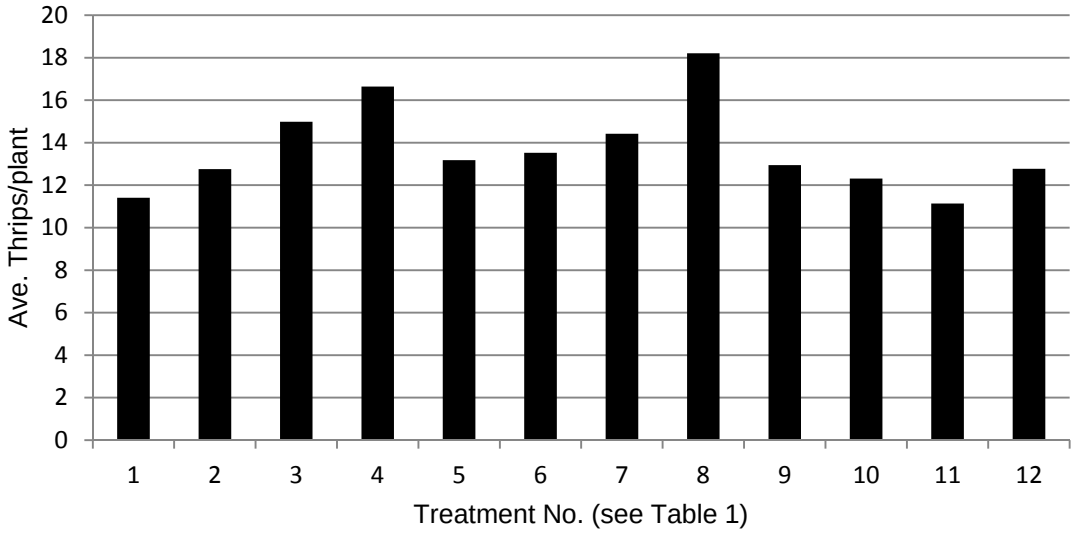

Figure 1. Season average thrips/plant with different insecticide rotations. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

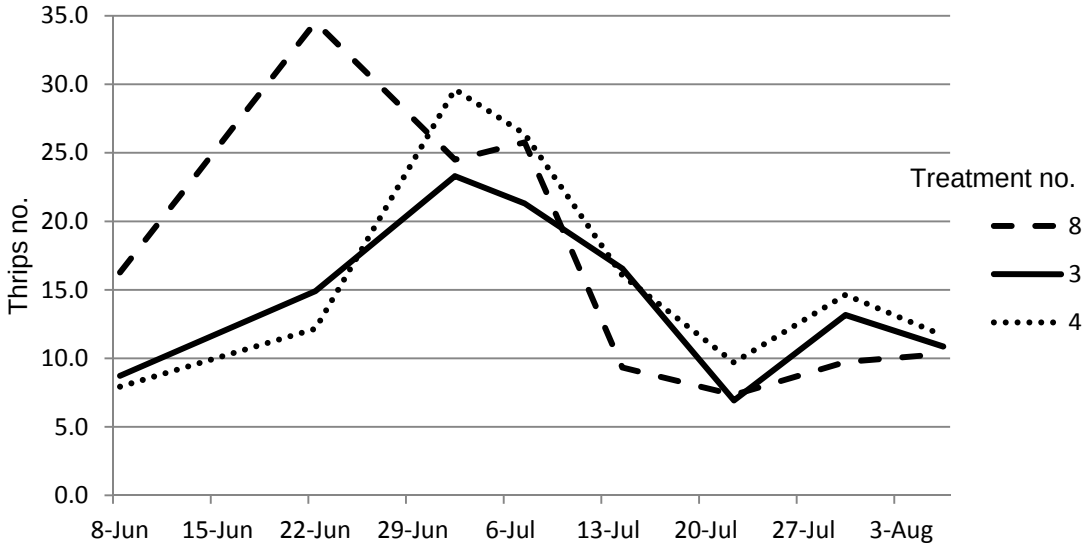

Figure 2. Average weekly thrips populations when Mustang or Lannate was the first insecticide applied. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

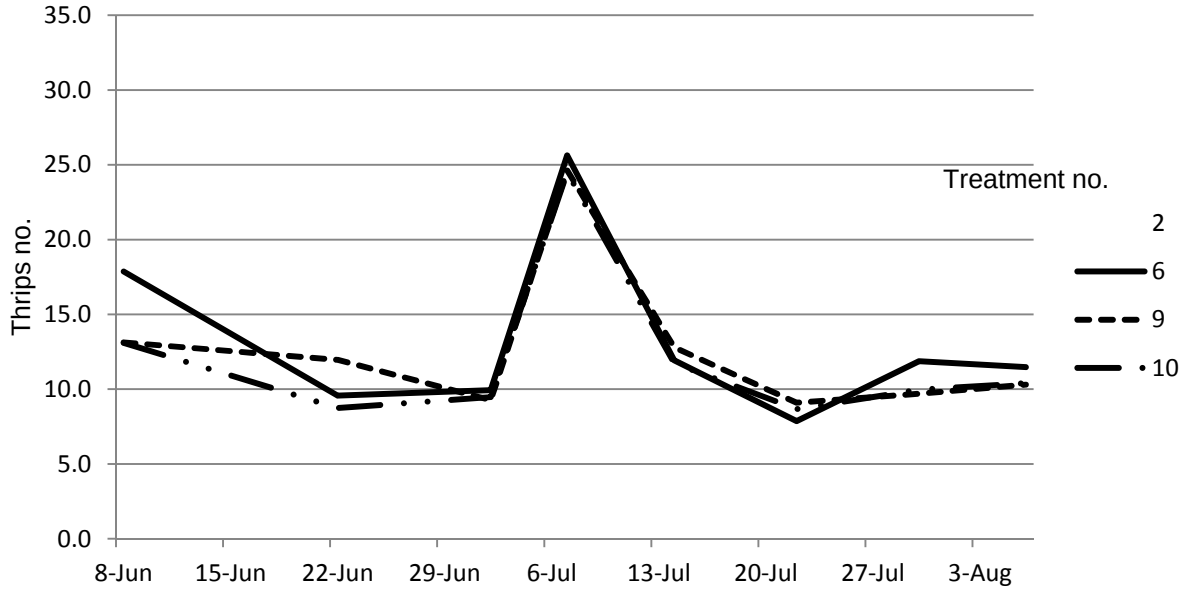

Figure 3. Average weekly thrips populations when Movento was the first applied insecticide. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.

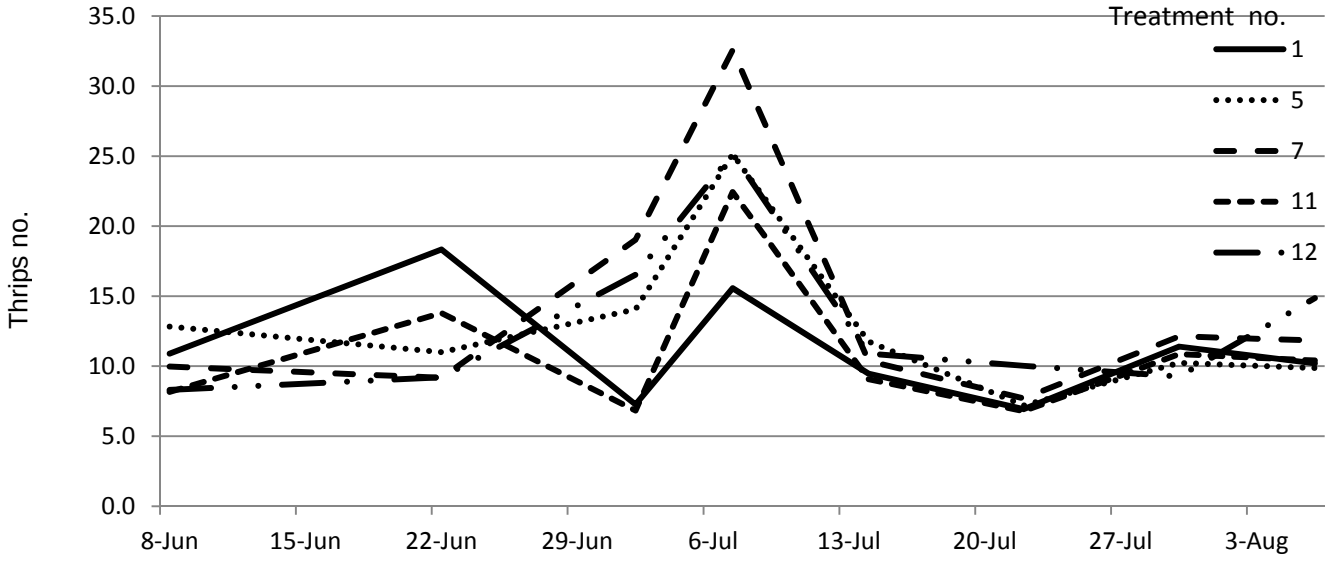

Figure 4. Average weekly thrips populations when Radiant was the first insecticide applied. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009.