

# MAXIMIZING THE ECONOMIC VALUE OF INSECTICIDE APPLICATIONS FOR THRIPS CONTROL – A TWO-YEAR STUDY

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## Objective

Our objective was to determine the economic value of insecticide applications to onion cultivars that are either sensitive or resistant to thrips feeding and iris yellow spot virus (IYSV) disease damage by determining yield and grade reductions from reduced insecticide applications.

## Introduction

There is a need for growers to understand the economic impact of their decision about how often they should apply insecticides for thrips control. Since onion varieties vary in their ability to withstand thrips damage, and have different tolerances for IYSV, it is important for growers to be able to make decisions with some certainty about how insecticides will impact the varieties they have planted.

## Materials and Methods

Onion plots were 30 ft long by 14.6 ft wide. The plot design was a split plot with one-half of each plot planted to ‘Vaquero’ (Nunhems, Parma, ID) and the other half to ‘Charismatic’ (Seminis, Payette, ID) on March 20, 2009 and March 18, 2010. Charismatic is generally believed to be more tolerant of thrips damage and injury from IYSV disease. 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/acre. Lorsban 15G<sup>®</sup> 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.

Insecticide applications were made with a CO<sub>2</sub>-pressurized bicycle sprayer. Materials were applied with water at 35 gal/acre. Each treatment was replicated four times. Thrips counts were made weekly by visually counting the total number of thrips on 15 plants in each subplot. Thrips and IYSV injury ratings were taken as a subjective measurement of foliage damage caused by thrips feeding.

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 September 9-10, 2010 and graded on October 14-15, 2009 and September 16-17, 2010.

The experimental design was a randomized complete block split plot with four replications. Rates, application dates, and sequence are listed in Table 1. Environmental conditions on each application date are listed in Table 2.

Table 1. Application dates and applied treatments of insecticides in onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

Application dates										
2009										
	6/5	6/9	6/16	6/24	7/2	7/10	7/20	7/29		
2010										
	6/3	6/14	6/22	6/29	7/6	7/13	7/20	--	Total number of insecticide applications	
Insecticide applied:	Radiant (8 oz)	Radiant (8 oz)	Movento (5 oz)	Movento (5 oz)	Lannate (3 pt)	Lannate (3 pt)	Lannate (3 pt)	Lannate (3 pt)		
Treatment number									2009	2010
1	X	X	X	X	X	X	X	X*	8	7
2		X		X		X		X*	4	3
3		X	X	X	X	X	X	X*	7	6
4			X	X	X	X	X	X*	6	5
5			X	X	X	X	X		5	5
6			X	X	X	X			4	4
7	X		X		X		X		4	4
8	X	X	X			X	X	X*	6	5
9		X	X	X	X	X	X		6	6
10									0	0

\*2009 application only

Table 2. Application information for insecticides applied to onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

Application date	Time	Temperature	Relative humidity (%)	Wind (mph)
2009				
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
2010				
June 3	4:30 P.M.	68°F	48.7	7.7
June 14	7:00 A.M.	59°F	58.8	6.8
June 22	7:30 A.M.	52°F	84.6	3.8
June 29	6:30 A.M.	65°F	72.4	6.9
July 6	8:00 A.M.	59°F	57.9	7.0
July 13	5:00 A.M.	79°F	22.2	3.1
July 20	6:45 A.M.	57°F	52.9	3.7

## Results and Discussion

The thrips data are shown in Tables 3 and 4. The foliage damage evaluations are in Table 5. Thrips populations were significantly higher in Vaquero than in Charismatic for both years. Some of the factors that influence thrips preference for a particular variety include neck tightness, leaf uprightness, wax type, and amount of wax on the foliage. No attempt was made to determine which factors might be involved in thrips preference for Vaquero. Thrips populations were significantly lower in 2010 than they were in 2009.

The untreated check (treatment 10) always had the highest average thrips population over both years and varieties, though it was not always statistically significant from other treatments (Fig. 1). When all of the data are combined, the untreated check was significantly different from any other treatment.

Treatment 1 had the most insecticide applications, with treatments on a weekly schedule. It also had the lowest average thrips population, although not always significantly different from other treatments. When all of the data for varieties and years are combined, treatment 1 had significantly better thrips control than any other treatment except treatment 3. Treatment 3, which had slightly less control than treatment 1, was similar to treatment 1 except that thrips applications were initiated 1 week later in the spring.

Thrips feeding damage and IYSV damage was less in 2010 than in 2009 (Table 5). Both years Vaquero had higher foliage damage than did Charismatic, again correlating well with the higher thrips pressure in Vaquero.

Onion yields were much lower in 2010, reflecting the cool, late summer and lower heat units for that year (Table 6). Total yield was similar between varieties for both years, but Charismatic tended to have higher colossal and supercolossal yields than did Vaquero.

The untreated check (treatment 10) had low total yield and low yield of colossal and supercolossal bulbs. Treatment 7 was comparable to the untreated check for both years over both varieties. Treatment 1 was one of the most consistent treatments over time and variety.

Dollar values were applied to the yield data (Table 7). Three price points were selected for analysis based on similar price points received during the 2009 marketing season. The first price point was \$5, \$6, \$7, and \$7 for medium, jumbo, colossal and supercolossal, respectively. The second price point was \$5, \$6, \$7, and \$11, and the third was \$9, \$11, \$11, and \$12 for the different size classes.

Since the object of this study was only to determine the economic impact of insecticide applications for thrips control, the untreated control was set at 0. The dollar values listed under the different price points are the gross and net returns for each treatment. The cost of an insecticide treatment can vary slightly, depending on products used, but was rounded out to \$50/treatment based on information supplied by ag-chem dealers in the production area.

Treatment 7 was a poor investment and lost money compared to the untreated check over most price points. Treatments 6 and 9 gave good returns with Charismatic but poor with Vaquero. Treatment 8 did not give good returns with either variety.

The most consistent returns over both years and both varieties was treatment 1, based on a 7- to 10-day treatment interval. Other treatments gave better returns over some years, or over variety, but were not consistent over years and varieties.

Table 3. Average thrips per onion plant and season average. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

2009									
Charismatic									
Treatment	Jun 8	Jun 11	Jun 23	Jul 1	Jul 9	Jul 14	Jul 23	Aug 3	Season average
1	8.3	11.5	33.2	18.0	12.2	24.3	7.3	11.8	15.8
2	12.6	12.6	31.6	20.4	12.4	22.7	7.9	12.9	16.6
3	14.7	12.2	25.4	18.8	17.3	20.3	7.3	11.2	15.9
4	14.1	18.4	41.6	14.7	14.7	24.4	7.3	12.1	18.4
5	9.9	16.7	39.9	14.1	14.3	30.7	8.2	11.7	18.2
6	12.7	18.4	47.1	17.7	15.9	21.0	8.9	13.2	19.3
7	8.5	12.8	32.2	16.3	21.8	23.3	7.3	11.1	16.7
8	7.4	11.5	26.4	16.0	23.3	21.9	8.0	13.3	15.9
9	12.8	12.7	36.8	15.9	15.2	25.0	8.7	11.0	17.3
10	14.5	16.6	32.0	28.7	21.6	27.6	7.6	10.6	19.9
LSD (0.05)	4.5	5.1	NS	7.6	NS	NS	NS	NS	2.4
Vaquero									
1	11.5	18.6	35.5	17.3	13.7	24.0	7.6	12.0	17.5
2	21.8	24.5	34.3	37.2	19.3	20.9	7.2	13.6	22.3
3	17.7	21.5	38.8	19.5	14.1	18.2	7.1	13.0	18.7
4	19.8	28.3	48.8	20.2	19.0	18.8	8.0	11.9	21.8
5	18.2	27.5	49.5	17.0	16.9	22.6	7.8	12.8	21.5
6	15.8	25.4	49.6	24.7	20.7	23.2	8.6	12.4	22.5
7	13.4	22.0	51.1	17.1	27.8	26.3	8.5	12.8	22.4
8	12.7	19.5	34.9	17.6	22.4	33.3	7.3	11.4	19.9
9	19.6	22.7	45.9	17.2	16.3	24.2	8.0	10.8	20.6
10	21.7	27.6	55.4	50.6	23.4	25.2	7.6	12.0	27.9
LSD (0.05)	5.9	NS	NS	14.5	NS	NS	NS	NS	4.3

Table 3 continued.

2010									
Charismatic									
Treatment	Jun 3	Jun 15	Jun 21	Jul 2	Jul 8	Jul 12	Jul 27	Jul 30	Season average
1	4.9	9.5	7.7	4.3	8.5	15.1	20.7	6.3	9.6
2	5.9	12.4	12.5	6.6	16.7	13.4	16.6	8.4	11.5
3	5.4	10.3	9.9	6.6	6.2	14.9	16.3	7.7	9.6
4	5.7	11.5	10.6	10.3	12.9	12.0	17.6	6.7	10.9
5	4.6	11.4	11.6	12.3	15.1	11.1	22.3	6.4	11.8
6	5.8	10.2	11.4	12.4	18.5	14.5	15.9	8.0	12.1
7	4.6	7.0	7.5	17.0	19.4	24.4	18.6	6.7	13.1
8	4.0	6.8	6.3	7.9	14.8	29.7	15.3	7.1	11.5
9	4.6	9.7	11.7	5.9	7.4	21.7	15.0	7.4	10.4
10	5.2	9.5	10.5	23.7	32.1	21.9	18.3	10.1	16.4
LSD (0.05)	NS	NS	NS	5.3	5.9	NS	NS	NS	3.3
Vaquero									
1	9.4	11.2	8.5	3.8	5.5	10.9	16.8	7.6	9.2
2	12.6	21.5	17.0	5.7	14.0	10.8	15.6	8.8	13.2
3	10.9	18.5	16.7	7.9	7.1	11.2	12.7	5.7	11.3
4	9.4	15.0	16.4	10.5	15.1	11.0	17.2	6.9	12.7
5	11.3	20.4	21.0	11.0	16.6	11.8	15.0	8.3	14.4
6	10.0	17.4	13.5	12.6	15.0	13.8	19.4	9.2	13.8
7	10.4	11.9	9.2	19.5	18.4	24.0	16.3	7.4	14.6
8	9.8	10.7	8.8	9.3	13.5	24.2	15.1	6.7	12.3
9	11.5	17.4	19.6	7.9	5.9	14.7	18.2	6.5	12.7
10	8.2	13.9	16.0	21.3	29.5	19.0	14.3	7.4	16.2
LSD (0.05)	NS	7.6	6.3	4.3	5.0	7.3	NS	NS	2.8

Table 4. Summary of thrips populations on two onion varieties, Charismatic and Vaquero. Malheur Experiment Station, Oregon State University, OR, 2009-2010.

<b>2009</b>	
	<b>Average</b>
Charismatic	17.4
Vaquero	21.5
LSD (0.05)	1.9
<b>2010</b>	
Charismatic	11.6
Vaquero	12.7
LSD (0.05)	0.6
<b>2009+2010</b>	
Charismatic	14.5
Vaquero	17.1
LSD (0.05)	1.3

Table 5. Visual ratings of thrips and iris yellow spot virus injury to onion foliage. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

Treatment	Vaquero		Charismatic	
	2009	2010	2009	2010
1	1.9	1.8	1.5	1.3
2	2.9	1.6	1.6	1.6
3	2.3	1.3	1.3	1.0
4	1.9	1.8	1.3	1.1
5	2.3	1.4	1.5	1.1
6	2.8	2.0	2.1	1.3
7	2.9	1.3	2.1	1.1
8	2.8	1.9	1.9	1.0
9	2.0	1.9	1.4	1.5
10	3.0	1.8	2.5	1.5
LSD (0.05)	0.5	NS	0.5	0.4

Thrips injury scale 1-5 with 1 = no damage, 5 = complete silvering of foliage from thrips and iris yellow spot virus injury.

Table 6. Yield and grade of two onion varieties sprayed with insecticides for thrips control at different timing sequences. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

2009					
Charismatic					
Treatment	Medium	Jumbo	Colossal	S. Colossal	Total yield
	----- cwt/acre -----				
1	22.7	529.1	416.1	73.2	1041.1
2	22.9	573.3	414.6	20.1	1030.9
3	27.5	591.4	367.2	45.6	1031.8
4	21.2	589.8	365.6	42.4	1019.0
5	27.5	562.9	391.1	60.7	1042.2
6	28.7	619.7	377.6	21.5	1047.6
7	22.4	621.4	309.2	12.3	965.2
8	22.0	669.6	340.5	12.7	1044.8
9	25.2	645.6	357.7	33.6	1062.1
10	26.6	645.0	264.2	16.7	952.5
LSD (0.05)	NS	NS	NS	32.0	NS
Vaquero					
1	20.6	775.0	225.8	32.4	1053.8
2	29.1	804.7	169.2	3.0	1006.1
3	32.8	780.6	214.8	6.5	1034.7
4	28.0	768.0	243.4	48.4	1087.8
5	31.1	774.4	205.1	13.4	1024.0
6	30.6	818.7	148.1	6.5	1003.9
7	25.3	797.5	123.0	6.5	952.3
8	36.4	790.1	172.6	6.5	1005.6
9	28.1	733.6	234.1	16.0	1011.8
10	43.5	785.2	159.5	3.0	991.3
LSD (0.05)	NS	NS			64.7
LSD (0.10)			65.4	25.7	



Table 6 continued.

2010					
<b>Charismatic</b>					
Treatment	Medium	Jumbo	Colossal	S. Colossal	Total yield
	----- cwt/acre -----				
1	21.1	511.6	312.5	30.9	876.1
2	27.4	556.5	247.9	27.5	859.3
3	34.7	518.1	245.7	24.0	822.6
4	25.9	538.5	283.4	19.2	867.0
5	34.4	527.5	248.0	28.3	838.2
6	26.6	599.7	202.0	23.4	851.7
7	33.2	587.7	159.7	16.0	796.7
8	29.0	535.4	211.0	36.8	812.2
9	23.3	540.4	245.4	34.9	844.0
10	46.6	586.2	133.2	4.3	770.3
LSD (0.05)	10.4	NS	61.5	NS	57.1
<b>Vaquero</b>					
1	48.6	750.3	84.2	0.0	883.1
2	56.2	753.7	60.5	3.6	874.0
3	52.2	764.2	62.7	6.9	886.0
4	60.8	720.5	54.5	1.1	836.9
5	34.5	736.6	104.5	1.5	877.1
6	46.6	753.1	34.0	1.5	835.2
7	68.4	699.2	63.5	6.3	837.4
8	52.2	720.0	74.8	2.9	850.0
9	60.0	734.5	50.1	1.3	845.9
10	83.5	652.5	34.8	2.5	773.2
LSD (0.05)	24.8	NS	NS	NS	NS

Table 7. Dollar return from insecticide applications for thrips control in onions with different application scenarios as compared to the untreated check. Three different price points were selected for analysis. Malheur Experiment Station, Oregon State University, Ontario, OR, 2009-2010.

<b>Charismatic</b>						
<b>2009</b>						
Treatment	Gross return			Net return		
	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*
1	\$743.60	\$969.80	\$1038.40	\$343.60	\$569.80	\$638.40
2	627.70	641.40	873.00	427.70	441.40	673.00
3	606.40	722.20	898.70	256.40	372.20	548.70
4	531.50	634.30	768.00	234.50	334.30	468.00
5	708.10	884.20	1028.90	458.10	634.20	778.80
6	686.30	705.70	1045.90	486.30	505.70	845.90
7	120.90	103.30	143.70	-79.10	-96.70	-56.30
8	630.30	614.50	1019.70	330.30	314.50	719.70
9	769.00	836.60	1224.70	469.00	536.60	924.70
10	0	0	0	0	0	0
<b>Vaquero</b>						
1	493.90	611.50	763.40	93.90	211.50	363.40
2	112.90	112.90	191.60	-87.10	-87.10	-8.40
3	330.20	344.00	502.80	-19.80	-5.90	152.80
4	724.00	905.50	1138.40	424.00	605.60	838.40
5	264.90	306.50	395.40	14.90	56.50	145.40
6	80.90	94.80	168.60	-119.00	-105.20	-31.40
7	-248.70	-234.90	-388.90	-448.70	-434.90	-588.90
8	109.90	123.80	175.70	-190.10	-176.20	-124.30
9	226.20	278.10	269.60	-73.80	-21.90	-30.40
10	0	0	0	0	0	0

Table 7 continued.

<b>2010</b>						
<b>Charismatic</b>						
Treatment	Gross return			Net return		
	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*
1	\$760.00	\$972.60	\$1241.40	\$410.00	\$622.60	\$891.40
2	690.40	783.90	1040.60	540.40	633.90	890.60
3	456.60	536.10	617.70	156.60	236.10	317.70
4	765.30	825.60	1120.00	515.30	575.60	870.00
5	557.70	654.40	795.30	307.70	404.40	545.30
6	594.90	672.70	954.50	394.90	472.70	754.50
7	215.40	256.20	327.80	15.40	56.20	127.80
8	378.60	509.30	528.60	128.60	259.30	278.60
9	607.60	730.70	887.90	307.60	430.70	587.90
10	0	0	0	0	0	0
<b>Vaquero</b>						
1	740.60	730.60	1275.10	390.60	380.60	925.10
2	658.30	662.70	1163.40	508.30	512.70	1013.40
3	739.80	757.40	1306.70	439.88	457.40	1006.70
4	422.60	417.00	743.60	172.60	167.00	493.60
5	740.50	736.50	1238.80	490.50	486.50	988.80
6	406.50	402.50	753.70	206.50	202.50	553.70
7	432.20	447.40	739.10	232.20	247.40	539.10
8	531.30	532.90	905.60	281.30	282.90	655.60
9	473.20	468.40	844.40	173.20	168.40	544.40
10	0	0	0	0	0	0

Table 7 continued.

2009-2010 Averages						
Charismatic						
Treatment	Gross return			Net return		
	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*	(\$5,6,7,7)*	(\$5,6,7,11)*	(\$9,11,11,12)*
1	\$751.80	\$971.20	\$1139.90	\$376.80	\$596.20	\$764.90
2	659.05	712.65	956.80	484.05	537.65	781.80
3	531.50	629.15	758.20	206.50	304.15	433.20
4	648.40	729.95	944.00	374.90	454.95	669.00
5	632.90	769.30	912.10	382.90	519.30	662.05
6	640.60	689.20	1000.20	440.60	489.20	800.20
7	168.15	179.75	235.75	-31.85	-20.25	35.75
8	504.45	561.90	774.15	229.45	286.90	499.15
9	688.30	783.65	1056.30	388.30	483.65	756.30
10	0	0	0	0	0	0
Vaquero						
1	617.25	671.05	1019.25	242.25	362.10	644.25
2	385.60	387.80	677.50	210.60	212.80	502.50
3	535.00	550.70	904.75	420.08	225.75	579.75
4	573.30	661.25	941.00	298.30	386.30	666.00
5	502.70	521.50	817.10	252.70	271.50	567.10
6	243.70	248.65	461.15	43.75	48.65	261.15
7	91.75	106.25	175.10	-108.25	-100.65	-24.90
8	320.60	328.35	540.65	45.60	53.35	265.65
9	349.70	373.25	557.00	49.70	73.25	257.00
10	0	0	0	0	0	0

\*Dollar price for medium, jumbo, colossal and supercolossal reading across respectively.

## Conclusion

When the decision is made to apply insecticides to control thrips and the iris yellow spot virus disease vectored by thrips, then the grower should choose a treatment strategy that will insure a satisfactory return on that investment. The most consistent return appears to be a spray schedule that includes applications of insecticides on a 7- to 10-day interval with 7-8 applications over the growing season. Since most growers plant several varieties, and since there is some difference in how varieties interact with spray treatments, then it makes sense to choose the application sequence that appears to be most consistent across varieties.

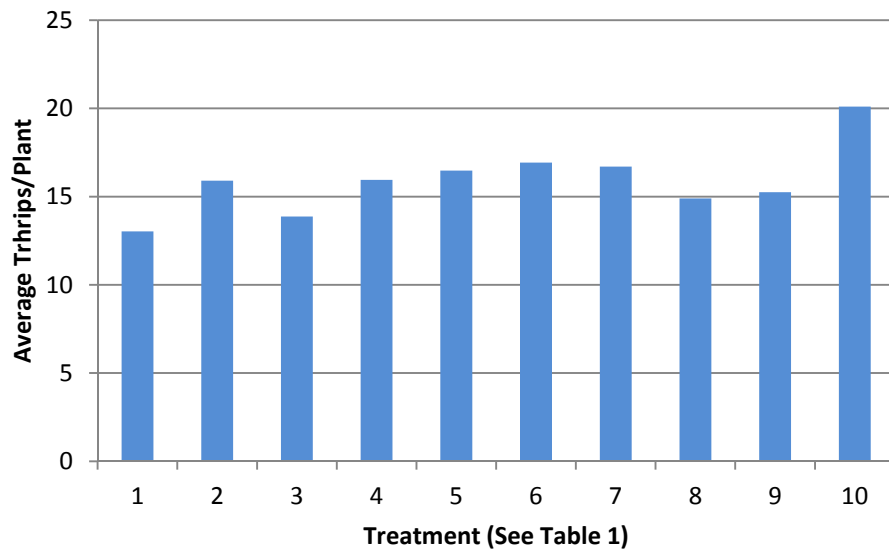


Figure 1. Thrips population in onions averaged over 2 years and 2 varieties. OSU Malheur Experiment Station, Ontario, OR, 2009-2010.