MANAGING INSECTICIDES FOR MAXIMUM EFFICACY AGAINST THRIPS IN DRY BULB ONIONS - 2008

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Objective

My objective was to determine the most effective rates and combinations of insecticides to provide season-long thrips control and 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 onion yield and quality while rotating insecticides with different modes of action. 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 87 ft wide by 320 ft in length was planted to 'Vaquero' (Numhems, Parma, ID) on March 24, 2008. 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® 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 40 ft long by 6.67 ft wide. Insecticide applications were made with a CO_2-pressurized backpack sprayer. Materials were applied with water at 35.8 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 plot. Thrips 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 22-24, 2008, and graded on October 9-13, 2008.

The experimental design was a randomized complete block with four replications. Twenty-six different insecticide rotation sequences were applied. The insecticides

tested were Lannate® (2 and 3 pt), Carzol® (8, 12, 16, and 20 oz), Radiant™, Movento®, Agri-Mek®, MSR, Batallion®, Penncap-M®, Success®, and Aza-Direct®. Rates, application dates and sequence are listed in Table 1.

Results and Discussion

The thrips data are shown as a visual evaluation of thrips damage to onion foliage (Table 2). Since there were so many different rotations evaluated, they are listed by number. The reader should refer to Table 1 for specific rotations that may be of interest.

There were a number of treatments with low thrips damage (below 1.0), some treatments with very high numbers that had heavy foliage damage (above 1.5) and a number of treatments with intermediate damage.

The yield and grade data are listed in Table 3.

There were significant differences between treatments with high, medium, and low yields, similar to the thrips damage evaluation. This is even more apparent with the colossal plus supercolossal data. Three parts of these data are of interest: first is the relationship between thrips damage, grade, and yield; second, the treatments that did not work, those with high thrips damage and low yield; and third, those treatments that were effective in lowering thrips damage and increasing yield.

Thrips feeding damage is shown in Figure 1. The five lowest and highest treatments are highlighted. The total yield data are shown in Figure 2 with the same treatments highlighted as in Figure 1. The five treatments with the highest thrips feeding damage are also the five lowest yielding treatments. An examination of these five treatments might suggest what types of treatments to avoid. These treatments are listed in Table 4.

Treatment 7 is a synthetic pyrethroid-only treatment. The thrips feeding damage was significantly higher and total yield was significantly lower than for any other treatment including the untreated check. This response to the synthetic pyrethroid class of insecticides is consistent with previous results.

Treatment 6 is the untreated check. The next three lowest treatments all had at least 2 weeks during the growing season where no thrips control applications were made. Previous work with Carzol SP showed the importance of keeping a 7- to 10-day application interval to maximize yield and grade size. These data suggest that longer spray intervals have a negative impact on yield.

The top five treatments with the lowest thrips feeding injury also had high yields. With the exception of treatment 4, they were the highest yielding treatments. Colossal plus supercolossal yields are shown in Figure 3. Treatments 11, 14, 9, and 12 all had significantly higher yields of colossal plus supercolossal bulbs compared to the other treatments (Table 5).

These four treatments are the only treatments that have the insecticides Lannate, Carzol SP, Radiant, and Movento in the rotation. There may be some synergistic activity with these four treatments that is enhancing yield of large-sized bulbs as well as overall yield.

The relationship of thrips feeding damage and yield of colossal plus supercolossal bulbs is illustrated in Figure 4; there is a strong relationship between thrips feeding and colossal plus supercolossal yield.

Conclusion

Those rotations that included missed weeks did not perform as well as those that were treated weekly for the duration of the treatment period.

Treatments that included Lannate, Carzol SP, Radiant, and Movento had significantly higher yield of colossal- plus supercolossal-sized bulbs than any other treatments.

Table 1. Rotation trial – insecticide treatments in onions applied during the growing season, Malheur Experiment Station, Oregon State University, Ontario, OR. 2008.

	Application 1		Application 2		Application 3		Application 4		Application 5		Application 6		Application 7		Application 8	
	5 Jun	Rate/a	12 Jun	Rate/a	19 Jun	Rate/a	25 Jun	Rate/a	2 Jul	Rate/a	11 Jul	Rate/a	21 Jul	Rate/a	28 Jul	Rate/a
1	Radiant	6 oz	Radiant	6 oz	Radiant	6 oz	Radiant	6 oz	Lannate	2 pt	Lannate	2 pt	Lannate	2 pt	Carzol	20 oz
2	Lannate	2 pt	Lannate	2 pt	Lannate	2 pt	Lannate	2 pt	Lannate	2 pt	Radiant	6 oz	Radiant	6 oz	Carzol	20 oz
3	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Radiant	6 oz	Radiant	6 oz	Lannate	3 pt	Radiant	6 oz	Carzol	20 oz
4	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Radiant	6 oz
5	Radiant	6 oz	Radiant	6 oz	Radiant	6 oz	Radiant	6 oz	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Carzol	20 oz
6	UTC		UTC		UTC		UTC		UTC		UTC		UTC		UTC	
7	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz
8	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	MSR Aza-Direct	3 pt 2 pt	Lannate	3 pt	Carzol	20 oz	Lannate	3 pt	Lannate	3 pt
9	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Carzol	8 oz	Carzol	8 oz	Carzol	8 oz	Lannate	3 pt
10	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	AgriMek	1 pt	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Lannate	3 pt
11	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Lannate	3 pt
12	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Movento	5 oz	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Lannate	3 pt	Lannate	3 pt
13	Radiant Aza-Direct	6 oz 2 pt	AgriMek	1 pt	AgriMek	1 pt	Lannate	3 pt			Carzol	20 oz			Lannate	3 pt
14	Movento	5 oz	Radiant	6 oz	Radiant	6 oz	Carzol	20 oz	Radiant	6 oz	Lannate	3 pt	Radiant Movento	6 oz 5 oz	Lannate	3 pt
15	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Radiant	6 oz
16	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	Carzol Penncap M	20 oz 3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt
17	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	Lannate Batallion	3 pt 20 oz	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt
18	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	Carzol Lannate	20 oz 3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Radiant	6 oz

Table 1. (Cont'd.)

	Application 1		Application 2		Application 3		Application 4		Application 5		Application 6		Application 7		Application 8	
	5 Jun	**Rate/a**	**12 Jun**	**Rate/a**	**19 Jun**	**Rate/a**	**25 Jun**	**Rate/a**	**2 Jul**	**Rate/a**	**11 Jul**	**Rate/a**	**21 Jul**	**Rate/a**	**28 Jul**	**Rate/a**
19	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	MSR	3 pt	Lannate	3 pt	Carzol	20 oz	Lannate	3 pt	Lannate	3 pt
20	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	AgriMek	1 pt	Lannate	3 pt	Carzol	20 oz	Lannate	3 pit	Lannate	3 pt
21	Success Aza-Direct	8 oz 2 pt	Radiant	6 oz	Radiant	6 oz	Carzol Aza-Direct	20 oz 2 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt
22	Radiant Aza-Direct	6 oz 2 pt	Lannate	3 pt	Lannate	3 pt	Carzol	12 oz	Radiant Aza-Direct	6 oz 2 pt	Lannate	3 pt	Carzol	12 oz	Radiant Aza-Direct	6 oz 2 pt
23							Carzol	20 oz	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt
24									Carzol	20 oz	Lannate	3 pt	Lannate	3 pt	Lannate	3 pt
25											Carzol	20 oz	Lannate	3 pt	Lannate	3 pt
26													Carzol	20 oz	Lannate	3 pt

Table 2. An evaluation of thrips feeding damage to onion foliage for 2008, Malheur Experiment Station, Oregon State University, Ontario, OR.

	Thrips damage rating (0-5)[a]		
Treatment	7/22/2008	7/31/2008	Average
4	0.5	0.6	0.6
11	0.5	0.6	0.6
12	0.5	0.6	0.6
9	0.5	0.8	0.6
14	0.6	0.8	0.7
18	0.6	1.0	0.8
15	0.9	0.9	0.9
23	0.8	1.0	0.9
3	0.9	1.0	0.9
16	0.8	1.1	0.9
21	0.9	1.0	0.9
22	0.9	1.0	0.9
1	1.0	1.1	1.1
5	1.0	1.1	1.1
10	1.0	1.1	1.1
2	1.1	1.1	1.1
19	1.3	1.1	1.2
20	1.3	1.1	1.2
8	1.1	1.4	1.3
17	1.3	1.4	1.3
24	1.3	1.4	1.3
13	1.8	1.5	1.6
25	1.9	1.9	1.9
26	2.5	2.9	2.7
6	2.9	3.5	3.2
7	3.5	4.3	3.9
LSD (0.05)	0.5	0.4	0.4

[a]0 = no feeding damage, 5 = complete silvering of foliage

Table 3. Carzol SP rotation trial onion yield, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008. (Displayed in highest total yield to smallest.)

Treatment	Medium	Jumbo	Colossal	Super Colossal	Col. + Sup. Col.	Total Yield
	- -cwt/acre -
11	49.3	854.6	347.2	36.1	383.3	1,287.2
14	12.0	861.4	361.2	33.8	395.1	1,268.5
9	20.7	853.7	337.7	44.8	382.5	1,256.9
12	14.3	819.2	373.4	24.8	398.3	1,231.8
15	39.7	902.2	266.1	17.3	283.4	1,225.2
3	28.2	874.6	300.3	20.4	320.6	1,223.4
10	33.6	919.5	254.0	11.0	265.1	1,218.1
20	16.4	902.8	275.2	21.0	296.2	1,215.4
18	11.3	880.7	288.7	21.1	309.8	1,201.9
23	27.4	913.6	229.3	11.5	240.7	1,181.7
4	21.2	841.6	284.1	20.2	304.3	1,167.1
17	30.2	925.6	190.5	17.6	208.1	1,163.9
21	23.9	896.1	217.4	17.4	234.8	1,154.8
22	15.3	928.8	197.2	9.9	207.1	1,151.1
24	28.8	875.8	227.7	17.1	244.8	1,149.4
19	19.4	883.0	228.2	18.3	246.6	1,149.0
1	25.2	920.9	188.4	7.8	196.2	1,142.3
16	19.3	875.7	237.9	8.8	246.7	1,141.7
5	42.3	882.4	192.6	11.2	203.9	1,128.6
8	26.0	902.6	178.7	14.3	193.0	1,121.6
2	33.1	832.3	243.0	8.2	251.2	1,116.5
13	41.9	866.5	151.6	7.2	158.8	1,067.2
25	37.8	892.2	109.5	0.0	109.5	1,039.4
26	50.7	889.8	55.7	1.5	57.2	997.6
6	63.2	800.5	39.6	0.0	39.6	903.2
7	125.2	599.3	3.3	0.0	3.3	727.7
LSD (0.05)	27.4	84.8	88.8	16.1	94.7	84.4

Table 4. Insecticide rotation sequences that resulted in high thrips feeding injury and low total yields in onions, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008.

	Application 5 Jun	Rate/a	Application 12 Jun	Rate/a	Application 19 Jun	Rate/a	Application 25 Jun	Rate/a	Application 2 Jul	Rate/a	Application 11 Jul	Rate/a	Application 21 Jul	Rate/a	Application 28 Jul	Rate/a
13	Radiant Aza-Direct	6 oz 2 pt	AgriMek	1 pt	AgriMek	1 pt	Lannate	3 pt			Carzol	20 oz			Lannate	3 pt
25											Carzol	20 oz	Lannate	3 pt	Lannate	3 pt
26													Carzol	20 oz	Lannate	3 pt
6	UTC		UTC		UTC		UTC		UTC		UTC		UTC		UTC	
7	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz	Batallion	20 oz

Table 5. Insecticide rotation sequences that resulted in low thrips feeding injury and high colossal plus supercolossal and total onion yield, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008.

	Application 5 Jun	Rate/a	Application 12 Jun	Rate/a	Application 19 Jun	Rate/a	Application 25 Jun	Rate/a	Application 2 Jul	Rate/a	Application 11 Jul	Rate/a	Application 21 Jul	Rate/a	Application 28 Jul	Rate/a
11	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Lannate	3 pt
14	Movento	5 oz	Radiant	6 oz	Radiant	6 oz	Carzol	20 oz	Radiant	6 oz	Lannate	3 pt	Radiant Movento	6 oz 5 oz	Lannate	3 pt
9	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Carzol	8 oz	Carzol	8 oz	Carzol	8 oz	Lannate	3 pt
12	Radiant Aza-Direct	6 oz 2 pt	Movento	5 oz	Movento	5 oz	Carzol	20 oz	Lannate	3 pt	Radiant	6 oz	Lannate	3 pt	Lannate	3 pt

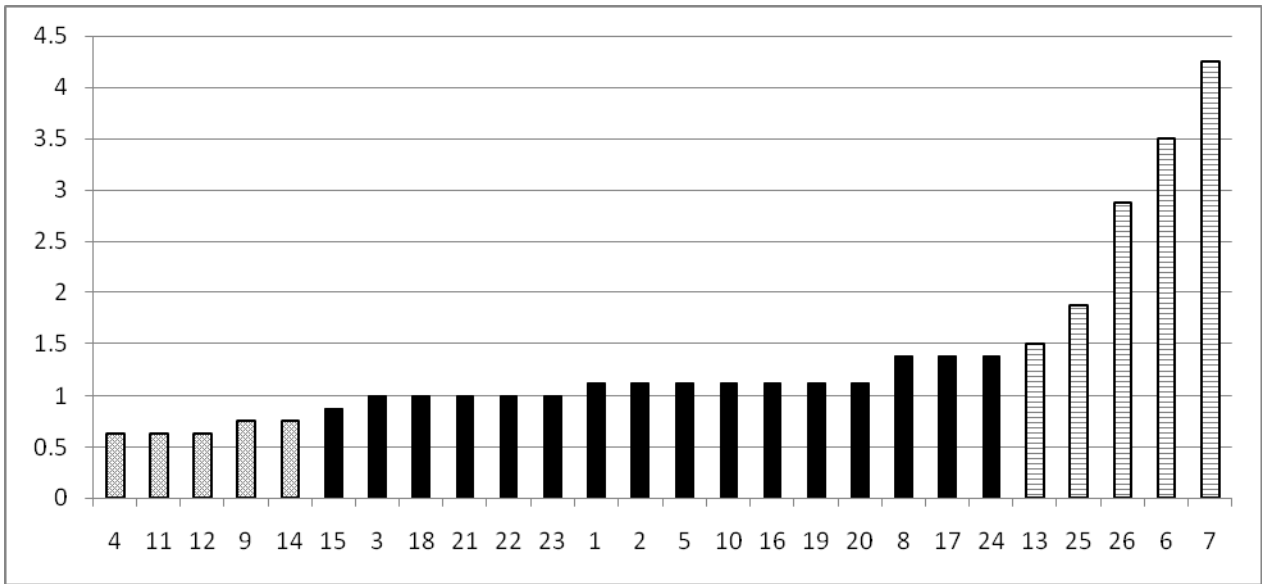

Figure 1. Evaluation of thrips feeding damage to onions on 26 different insecticide rotations, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008. Thrips feeding damage is rated 0 = no feeding damage to 5 = complete silvering of foliage.

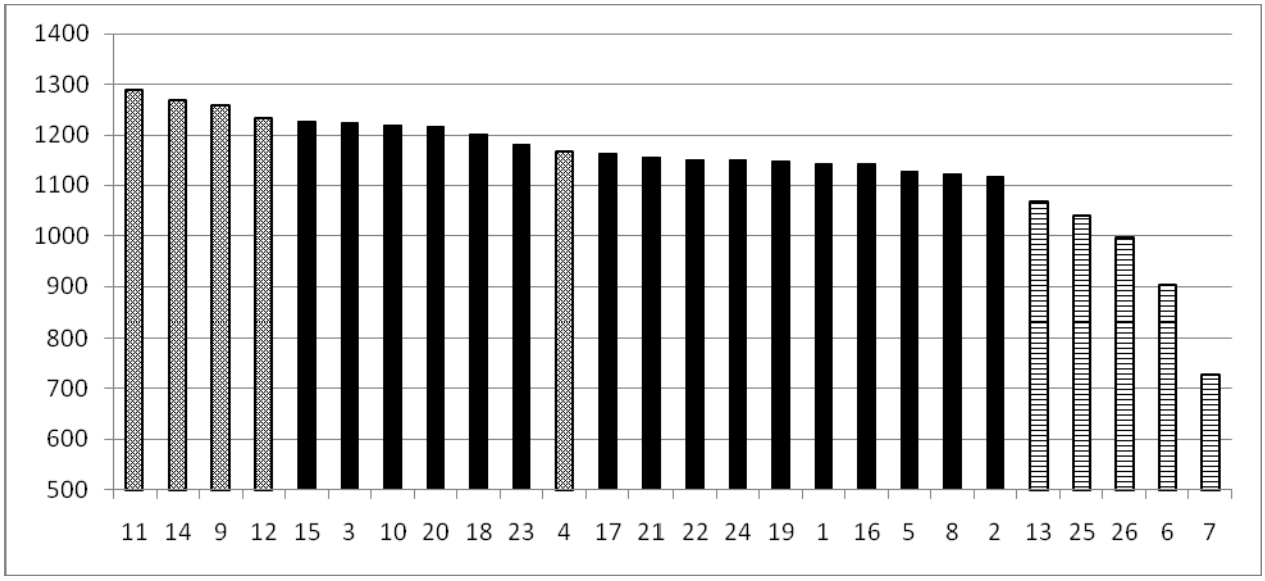

Figure 2. Onion total yield (CWT/acre) for 26 different insecticide rotation treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008.

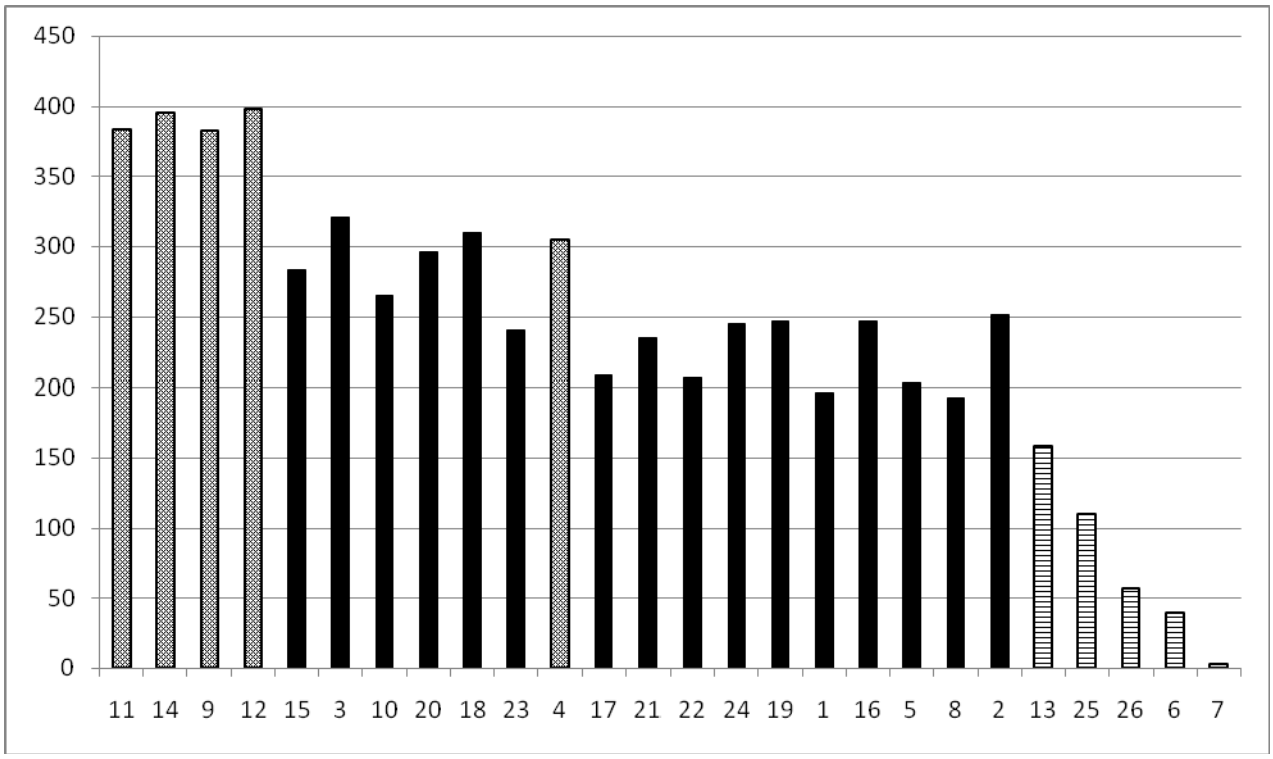

Figure 3. Colossal plus supercolossal onion yield (CWT/acre) for 26 different insecticide rotation treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008.

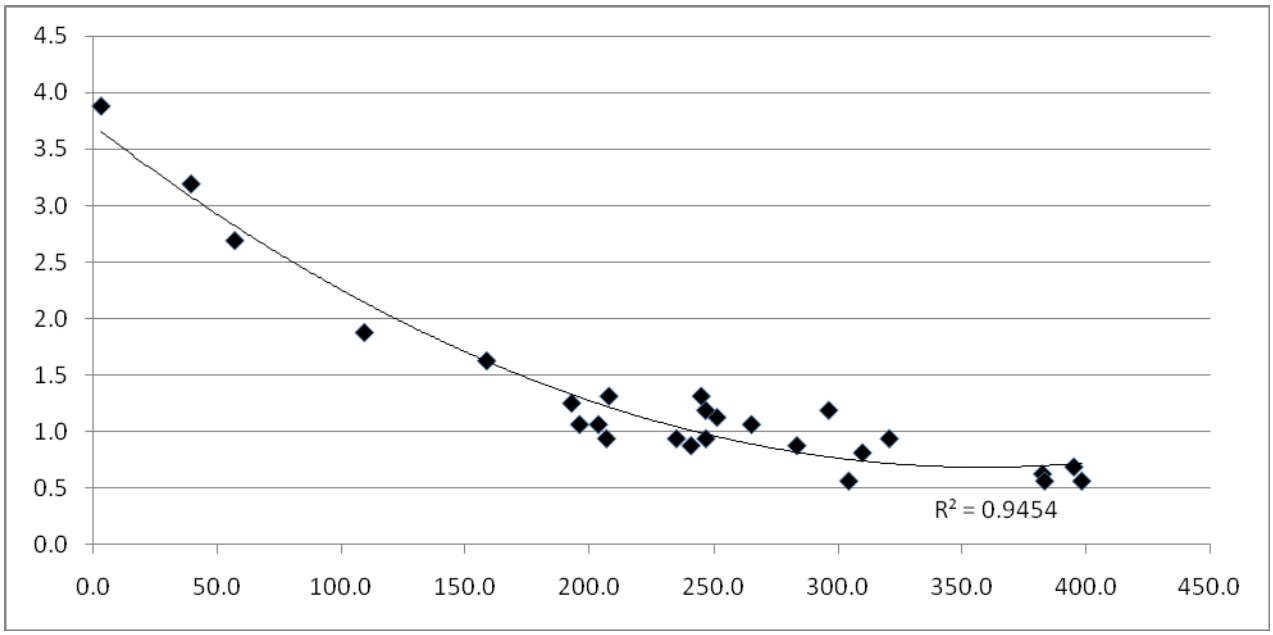

Figure 4. Relationship of thrips feeding damage and yield of colossal plus supercolossal onion bulbs, Malheur Experiment Station, Oregon State University, Ontario, OR, 2008. Thrips feeding damage is rated 0 = no feeding damage to 5 = complete silvering of foliage.