ALTERNATIVE METHODS FOR THRIPS CONTROL IN ONIONS, 2012

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Introduction

Onion thrips and the iris yellow spot virus (IYSV) that these thrips can transmit are major production limiting factors in the Treasure Valley. There are about 20,000 acres of onions produced within a 50-mile radius of Ontario, Oregon. This high concentration of onions makes for unique production challenges, especially for onion thrips and IYSV management. Thrips can rapidly develop resistance to insecticides, and new insecticides may rapidly lose their effectiveness. Therefore, it is important to develop alternative management methods as part of an overall Integrated Pest Management (IPM) program. A field experiment was conducted to evaluate five different alternative control programs for thrips management.

Materials and Methods

Onions were grown on an Owyhee silt loam with a pH of 7.7 and 1.7 percent organic matter, previously planted to wheat. In the fall of 2011, the wheat stubble was shredded and the field was irrigated. Based on a soil analysis, 100 lb of phosphorus/acre, 200 lbs of sulfur/acre, 1,000 lbs of gypsum/acre, and 1 lb of boron/acre were broadcast. The field was then disked, moldboard plowed, and groundhogged. On September 25, the field was fumigated with Vapam® at 15 gal/acre and bedded at 22 inches.

Onion seed ('Vaquero'; Nunhems, Parma, ID) was planted on March 13 in double rows, spaced 3 inches apart using 150,000 seeds/acre. Each double row was planted on beds spaced 22 inches apart. Planting was done with a Beck planter. Onions were grown under drip irrigation. Drip tape (Toro Aqua-Traxx, Toro Co., El Cajon, CA) with emitters spaced 12 inches apart and an emitter flow rate of 0.22 gal/minute/100 ft was laid 2-4 inches deep between 2 onion beds at the time of planting. The distance between the tape and the center of each bed was 11 inches. The water application rate was 0.06 inch/hour. Immediately after planting, Lorsban® 15G insecticide was banded at 3.7 oz/1,000 ft of row (0.82 lbs ai/acre), and the soil surface was rolled.

The field was irrigated as necessary to maintain soil water tension at 20 cb at 8-inch depth. Soil water tension was monitored by six granular matrix sensors (Watermark Soil Moisture Sensors Model 200SS, Irrometer Co. Inc., Riverside, CA) centered at 8-inch depth below the onion row. The sensors were automatically read three times a day with an AM-400 meter (Mike Hansen Co., East Wenatchee, WA).

Onion emergence started on April 12. Weekly thrips counts were made, starting on May 14. Thrips counts were made by counting the number of thrips on 15 consecutive plants in one of the middle 2 rows of each plot. Each treatment plot was 4 double rows wide by 27 ft long.

Treatments were applied weekly beginning May 30, according to the schedule and rates listed in Tables 1 and 2. Five alternative treatments were compared with an untreated control and a standard insecticide program. Straw mulch has been shown to enhance populations of some beneficial insects in onion. Mycotrol® O is an insecticide whose active ingredient is the naturally occurring fungus, *Beauveria bassiana.* Powdered kaolinite clay (Surround®, Tessenderlo Kerley, Inc., Phoenix, AZ) has been found to control some insects by acting as a repellant and physical barrier to insect movement. Diatomaceous earth is powdered sedimentary rock formed from fossilized diatoms. Diatomaceous earth may kill insects through abrasion and dehydration. The insecticides and Mycotrol O were applied with a CO_2 backpack sprayer using a 4-nozzle boom with 8010 nozzles at 40 PSI and 100 gal/acre.

Onions in each plot were evaluated subjectively for severity of symptoms of IYSV on August 15. Fifteen consecutive plants in one of the middle 2 rows of each plot were rated on a scale of 0 to 5 of increasing severity of symptoms, where the rating was 0 if there were no symptoms, 1 if 1-25 percent of foliage was diseased, 2 if 26-50 percent of foliage was diseased, 3 if 51-75 percent of foliage was diseased, 4 if 76-99 percent of foliage was diseased, and 5 if 100 percent of foliage was diseased.

The onions were lifted on September 13 to field cure. Onions from the middle two double rows in each plot were topped by hand and bagged on September 24.

The onions from each plot were graded on October 19. During grading, bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), neck rot (bulbs infected with the fungus *Botrytis allii* in the neck or side), plate rot (bulbs infected with the fungus *Fusarium oxysporum*), and black mold (bulbs infected with the fungus *Aspergillus niger*). The No. 1 bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Bulb counts per 50 lb of supercolossal onions were determined for each plot of every variety by weighing and counting all supercolossal bulbs during grading. Marketable yield consisted of No. 1 bulbs larger than 2¼ inches.

Results and Discussion

Thrips populations reached an average of one thrips per plant on May 21 and peaked in late June and early July (Table 3). For the season and at the peak thrips counts, there was no significant difference in average number of thrips per plant between the untreated check (treatment 1) and any of the alternative control treatments (3-7). The standard insecticide (treatment 2) had lower average number of thrips per plant for the season and at the peak thrips counts than the untreated check and the alternative treatments (Fig. 1).

Treatment 2 (standard insecticide treatment) had higher total and marketable yield than the other treatments (Table 4). None of the other treatments differed in total and marketable yield from the untreated check at a 95 percent probability level (LSD 0.05). At a 90 percent probability level (LSD 0.10), treatment 6 (mulch, Mycotrol O, and diatomaceous earth) had greater total,

marketable, and jumbo yield and lower peak thrips counts than the untreated check. Treatment 2 had the highest yield of bulbs larger than 4 inches in diameter followed by treatment 3. There was no difference in yield of bulbs larger than 4 inches in diameter between the other treatments and the untreated check. The severity of IYSV symptoms in 2012 was low, with no significant differences between treatments.

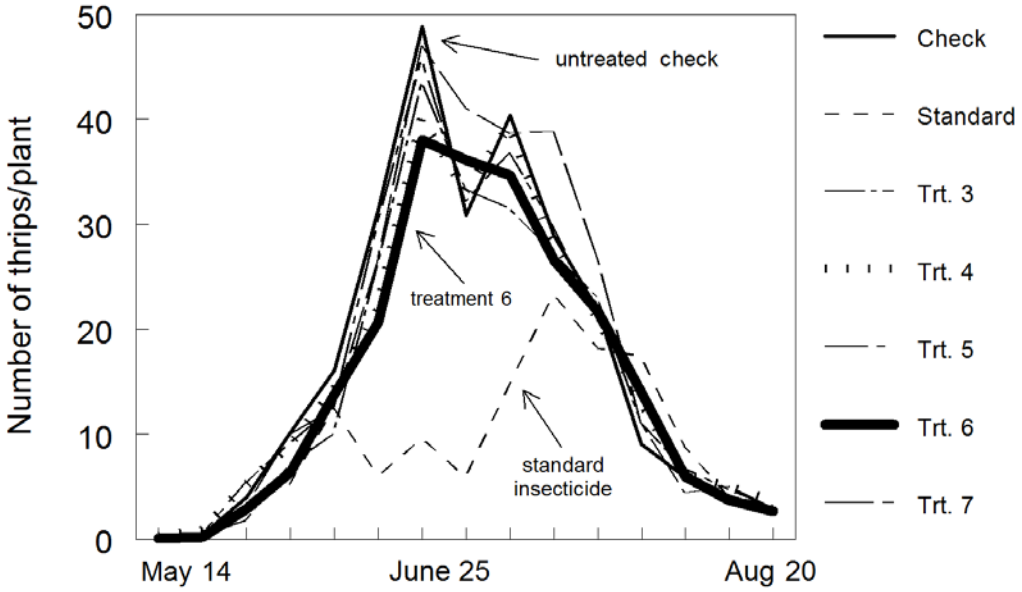

Figure 1. Average number of thrips per onion plant over time for alternative control treatments, a standard insecticide treatment, and an untreated check. Malheur Experiment Station, Oregon State University, Ontario, OR, 2012.

Table 1. Alternative thrips management treatments tested for efficacy against onion thrips. Malheur Experiment Station, Oregon State University, Ontario, OR, 2012.

Date		5/30/2012	6/5/2012	6/12/2012	6/19/2012	6/26/20122	7/3/2012	7/12/2012	7/19/2012
Treatment		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
1	Untreated control	-	-	-					
2	Movento	Movento	Lannate	Lannate	Radiant	Radiant	Lannate	Lannate	
3	Mulch, Mycotrol O, Kaolin, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Kaolin, Diatomaceous Earth				
4	Mycotrol O, Kaolin, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Kaolin, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Kaolin, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	
5	Mulch, Kaolin, Diatomaceous Earth	Diatomaceous Earth	Diatomaceous Earth	Kaolin, Diatomaceous Earth	Diatomaceous Earth	Diatomaceous Earth	Kaolin, Diatomaceous Earth	Diatomaceous Earth	
6	Mulch, Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	Mycotrol O, Diatomaceous Earth	
7	Mulch, Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	Mycotrol O, Kaolin	

Table 2. Characteristics of products tested in six treatments for efficacy against onion thrips. Malheur Experiment Station, Oregon State University, Ontario, OR, 2012.

Product	**Rate**	**Adjuvant**	**Active Ingredient**	**Mode of Action Group**
Mycotrol O[a]	1 qt/100 gal		Beauveria bassiana GHA	(fungal pathogen)
Surround[a]	50 lbs/acre		Kaolin	(reflective, physical barrier)
Diatomaceous earth[a]			none	(abrasion)
Straw mulch	1000 lbs/acre		none	(favors predators)
Lannate	3 pt/acre	Preference 0.25% v/v	Methomyl	1A
Movento	5 fl oz/acre	Ballast 1.5-2 oz/100 gal; MSO Destiny 2.8 pt	Spirotretramat	23
Radiant	8 fl oz/acre	Dyne-Amic 0.7 pt	Spinetoram	5

[a]Mycotrol O, Surround, and Diatomaceous earth are OMRI-approved products for organic production.

Table 3. Average number of thrips per onion plant by sampling date in response to five alternative thrips control treatments (3-7) compared to a standard insecticide treatment (2), and an untreated check (1). First insecticide application was made May 30. Malheur Experiment Station, Oregon State University, Ontario, OR, 2012.

Trt	14 May	21 May	29 May	4 Jun	11 Jun	18 Jun	25 Jun	2 Jul	9 Jul	16 Jul	23 Jul	30 Jul	6 Aug	13 Aug	20 Aug	Avg
1	0.1	0.4	4.0	10.2	16.1	31.4	48.8	30.9	40.4	28.9	21.8	9.1	5.9	4.1	2.7	17.0
2	0.1	0.5	3.4	5.3	12.6	6.1	9.7	6.0	14.8	23.4	18.3	17.5	8.9	4.1	3.3	8.9
3	0.2	0.6	1.9	7.2	10.2	26.3	43.6	33.4	31.6	27.3	23.1	11.2	6.6	4.0	2.9	15.3
4	0.3	0.9	5.2	9.1	14.3	21.9	40.1	33.2	39.4	28.0	21.1	13.1	6.1	5.1	3.8	16.1
5	0.2	0.5	5.5	9.3	12.8	30.3	45.8	32.2	36.9	29.8	20.9	13.6	6.8	4.8	3.0	16.8
6	0.1	0.2	2.9	6.4	13.8	20.7	38.0	36.1	34.7	26.6	21.7	14.0	6.0	3.7	2.7	15.2
7	0.3	0.3	3.1	10.1	12.5	26.6	47.1	41.1	38.7	38.9	26.8	11.2	4.5	5.1	3.0	18.0
Avg	0.2	0.5	3.7	8.2	13.2	23.3	39.0	30.4	33.8	29.0	22.0	12.8	6.4	4.4	3.0	15.3
LSD (0.05)	NS	NS	NS	NS	NS	11.6	12.3	13.2	8.3	6.7	NS	NS	1.6	NS	NS	2.4

Table 4. Onion yield and iris yellow spot virus (IYSV) symptom severity in response to five alternative thrips control treatments, a standard control treatment (2), and an untreated check treatment (1). Malheur Experiment Station, Oregon State University, Ontario, OR, 2012.

		Marketable yield by grade										
Treatment	Total yield	Total	>4 in	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	No. 2s	Small	Total rot	Bulb counts >4¼ in	IYSV
	---------- cwt/acre ----------									% of total yield	#/50 lb	0 - 5
1	961.4	954.5	362.0	37.7	324.3	565.0	27.6	0.0	6.8	0.0	31.0	1.1
2	1125.4	1116.7	565.0	92.4	472.7	533.8	17.9	0.0	8.8	0.0	32.3	1.1
3	969.5	961.3	450.8	42.4	408.4	492.0	18.5	0.0	6.4	0.2	34.1	1.1
4	994.1	985.7	293.6	14.0	279.6	656.4	35.6	0.0	7.1	0.1	31.2	1.1
5	960.6	951.0	363.4	37.7	325.7	568.3	19.3	0.0	6.5	0.3	32.0	1.1
6	1032.8	1026.2	376.4	28.4	348.0	629.0	20.8	0.0	4.1	0.3	30.6	1.1
7	999.1	990.2	224.1	5.3	218.8	742.6	23.5	0.0	4.6	0.4	32.8	1.0
Average	1006.1	997.9	376.5	36.8	339.6	598.2	23.3	0.0	6.3	0.2	32.0	1.1
LSD (0.05)	73.0	71.9	64.6	37.0	75.5	68.1	NS	NS	NS	NS	NS	NS
LSD (0.10)	59.7	58.8	52.8	30.2	61.8	55.7	NS	NS	NS	NS	NS	NS