THRIPS AND IRIS YELLOW SPOT VIRUS MANAGEMENT IN THE TREASURE VALLEY

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Objectives

1. Evaluate different treatment sequences of insecticides for thrips and Iris yellow spot management.
2. Evaluate new application methods for thrips and Iris yellow spot management.

Introduction

Insecticides remain the primary tool for thrips management. However, insecticide-based management faces difficulties because there is a limited set of registered insecticides with efficacy against onion thrips, and thrips are able to rapidly develop resistance to various classes of insecticides. Therefore, it is important to assess the effectiveness of currently registered insecticides and to determine when during the season different insecticides may be used most effectively. It is also important to determine the effectiveness of new products and how they may be integrated into an overall thrips management program.

Production practices for onions continue to evolve in the Treasure Valley. Today, the majority of onions are grown under drip irrigation, and with the expanding use of drip irrigation, it is important to evaluate insecticides that can be applied through drip systems.

Therefore, we conducted two field trials to evaluate different insecticide management programs, with products applied in various sequences over the growing season. The “foliar” application trial consisted of 24 different treatment regimens (Table 1). Applications in this trial were made on a 7-day interval. Treatment programs with experimental or unregistered insecticides are not shown.

A second trial was designed to compare treatment regimens in which products were applied by drip application versus corresponding foliar applications. This trial included 12 different treatment regimens, in which applications were made on an approximate 10-day interval (Table 2). Treatment programs with experimental or unregistered insecticides are not shown.

Materials and Methods

Cultural Practices

The field was drip irrigated with drip tape laid at 4-inch depth between two onion beds during planting. The drip tape had emitters spaced 12 inches apart and an emitter flow rate of 0.22 gal/min/100 ft (T-Tape, Rivulis USA, San Diego, CA). The distance between the tape and the center of each double row of onions was 11 inches.

Onions were irrigated automatically to maintain the soil water tension (SWT) in the onion root zone below 20 cb. Soil water tension was measured with six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer Co., Riverside, CA) installed at 8-inch depth in the center of the double row. Sensors had been calibrated to SWT. Irrigations were run by a controller programmed to irrigate twice a day applying 0.48 inch of water per irrigation. A Watermark Electronic Module (WEM, Irrometer Co.) was adjusted to override controller irrigations if the SWT was below 20 cb. Four Watermark sensors were connected to the WEM.

Foliar Insecticide and Adjuvant Trial Applications

Insecticides were applied weekly from June 2 to July 21, according to the schedule and rates listed in Table 1. Certain programs had two additional treatments at the end of the season (July 28 and August 4). Insecticides were applied with a CO_2 backpack sprayer using a 4-nozzle boom with 11004 nozzles at 30 psi and 35 gal/acre.

Drip Insecticide Trial Applications

Drip applications began after 1 hour of water was applied at the beginning of an 8-hour set (1 hour water, 6 hour insecticide injection, 1 hour water). Foliar applications of insecticides for this trial were made with a CO_2 backpack sprayer, as described above. Applications in this trial were made on a 10-day schedule, beginning on June 6 and continuing until August 11. A total of 7 applications were made in this trial.

Data Collection

Weekly thrips counts were made, starting on May 4 (before applications began). Thrips counts were made by counting the number of thrips on 10 consecutive plants in one of the middle two rows of each plot. Adult and larval (immature) thrips were counted separately. Each treatment plot was 4 double rows wide by 23 ft long.

Onions in each plot were evaluated visually for severity of symptoms of iris yellow spot virus (IYSV) and thrips feeding damage on August 3 in the foliar trial and August 14 in the drip trial. Ten consecutive plants in one of the middle two rows of each plot were rated on a scale of 0 to 4 of increasing severity of symptoms or feeding damage. Separate ratings were made for the inner, middle, and outer leaves of each plant to estimate damage occurrence over the course of the growing season.

The rating scale was as follows:

Rating	IYSV lesions (% foliage with lesions)	Feeding damage (% foliage with scarring)
0	0	0
1	1–25	1–25
2	26–50	26–50
3	51–75	51–75
4	76–100	76–100

Onions from the middle two double rows in each plot were lifted, topped by hand, bagged and placed in storage. The onions from each plot were graded on November 3 for the drip trial and November 6 for the foliar trial. 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, medium, jumbo, colossal, and supercolossal. Bulb counts per 50 lb of supercolossal onions were determined for each plot by weighing and counting all supercolossal bulbs during grading. Marketable yield consisted of No.1 bulbs in the medium or larger size classes (larger than 2¼ inches).

Table 1. Treatments used in the foliar thrips trial. Applications were made weekly from June 2 to July 21, for up to eight applications. Treatment 17 included two additional late season applications (July 28 [I] and August 4 [J]). Treatment programs with experimental or unregistered products are not included in the table or the results. Malheur Experiment Station, Ontario, OR, 2017. Continued on next page.

Trt	Treatment Name	Formulation Type*	Rate	Application Timing**	Application Description	pH
1	Untreated Check				Control	
2	MOVENTO	SC	5 fl oz/acre	AB	Standard Treatment	pH 6.5
	MSO	SL	0.5 % vol/vol	AB		
	AGRI-MEK	SC	3.5 fl oz/acre	CD		pH 7
	MSO	SL	0.5 % vol/vol	CD		
	RADIANT	SC	8 fl oz/acre	EF		pH 7
	DYNE-AMIC	SL	0.7 pt/acre	EF		
	LANNATE LV	L	3 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
3	AZA-DIRECT	EC	12 fl oz/acre	ABC	Delayed use of Movento	pH 6
	M-PEDE	SL	2 % vol/vol	ABDFG	No Lannate	
	MOVENTO	SC	5 fl oz/acre	CD		pH 6.5
	MSO	SL	0.5 % vol/vol	D		
	AGRI-MEK	SC	3.5 fl oz/acre	H		pH 7
	MSO	SL	0.5 % vol/vol	H		
	RADIANT	SC	8 fl oz/acre	FG		pH 7
	CAPTIVA	EC	11 fl oz/acre	E		pH 7
	CAPTIVA	EC	7 fl oz/acre	H		
4	RADIANT	SC	8 fl oz/acre	B	Radiant as adulticide with	pH 7
	MOVENTO	SC	5 fl oz/acre	BD	Movento. Delayed start of	pH 6.5
	MSO	SL	0.5 % vol/vol	BD	applications.	
	AZA-DIRECT	EC	16 fl oz/acre	D		pH 6
	M-PEDE	SL	2 % vol/vol	FH		
	LANNATE LV	L	3 pt/acre	FH		
	NIS	SL	0.25 % vol/vol	FH		
5	RADIANT	SC	8 fl oz/acre	A	Radiant as adulticide with	pH 7
	MOVENTO	SC	5 fl oz/acre	AC	Movento. Early season start	pH 6.5
	MSO	SL	0.5 % vol/vol	AC		
	AZA-DIRECT	EC	16 fl oz/acre	C		pH 6
	M-PEDE	SL	2 % vol/vol	EG		
	LANNATE LV	L	3 pt/acre	EG		pH 5
12	MINECTO PRO	SC	10.0 fl oz/acre	AB	Minecto Pro substituted for	pH 6.5
	NIS	SL	0.25 % vol/vol	AB	Agri-Mek, beginning of season	
	MOVENTO	SC	5.0 fl oz/acre	CD		pH 7
	NIS	SL	0.25 % vol/vol	CD		
	RADIANT	SC	8.0 fl oz/acre	EF		pH 7
	NIS	SL	0.25 % vol/vol	EF		
	LANNATE LV	L	3.0 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
13	MINECTO PRO	SC	10.0 fl oz/acre	AB	Minecto Pro substituted for	pH 6.5
	NIS	SL	0.25 % vol/vol	AB	Agri-Mek, beginning of season	
	MOVENTO	SC	5.0 fl oz/acre	EF	Earlier use of Radiant	pH 7
	NIS	SL	0.25 % vol/vol	EF		
	RADIANT	SC	8.0 fl oz/acre	CD		pH 7
	NIS	SL	0.25 % vol/vol	CD		
	LANNATE LV	L	3.0 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
14	MOVENTO	SC	5.0 fl oz/acre	AB	Minecto Pro substituted for	pH 7
	NIS	SL	0.25 % vol/vol	AB	Agri-Mek, later season	
	LANNATE LV	L	3.0 pt/acre	CD		pH 5
	NIS	SL	0.25 % vol/vol	CD		
	MINECTO PRO	SC	10.0 fl oz/acre	EF		pH 6.5
	NIS	SL	0.25 % vol/vol	EF		
	RADIANT	SC	8.0 fl oz/acre	GH		pH 7
	NIS	SL	0.25 % vol/vol	GH		

* Formulation Type: EC = Emulsifiable Concentrate, L = Liquid, SC = Soluble Concentrate, SL = Soluble Liquid,
**Application Timing: June 2 = A, June 9 = B, June 16 = C, June 23 = D, June 30 = E, July 7 = F, July 14 = G, July 21 = H, July 28 = I, and August 4 = J.

Table 1. Continued. Treatments used in the foliar thrips trial. Applications were made weekly from June 2 to July 21, for up to eight applications. Some treatments included fewer than eight applications. Treatment 17 included two additional late season applications (July 28 [I] and August 4 [J]). Treatment programs with experimental or unregistered products are not included in the table or the results. *Malheur Experiment Station, Ontario, OR, 2017.*

Trt	Treatment Name	Formulation Type*	Rate	Application Timing**	Application Description	pH
15	RADIANT	SC	8.0 fl oz/acre	AB		pH 7
	NIS	SL	0.25 % vol/vol	AB		
	LANNATE LV	L	3.0 pt/acre	CD		pH 5
	NIS	SL	0.25 % vol/vol	CD		
	MINECTO PRO	SC	10.0 fl oz/acre	EF	Minecto Pro substituted for	pH 6.5
	NIS	SL	0.25 % vol/vol	EF	Agri-Mek, later season	
	MOVENTO	SC	5.0 fl oz/acre	GH		pH 7
	NIS	SL	0.25 % vol/vol	GH		
16	MOVENTO	SC	5.0 fl oz/acre	AB		pH 7
	NIS	SL	0.25 % vol/vol	AB		
	MINECTO PRO	SC	10.0 fl oz/acre	CD	Minecto Pro substituted for	pH 6.5
	NIS	SL	0.25 % vol/vol	CD	Agri-Mek	
	RADIANT	SC	8.0 fl oz/acre	EF		pH 7
	NIS	SL	0.25 % vol/vol	EF		
	LANNATE LV	L	3.0 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
17	MOVENTO	SC	5.0 fl oz/acre	AB		pH 7
	NIS	SL	0.25 % vol/vol	AB		
	MINECTO PRO	SC	10.0 fl oz/acre	CD	Minecto Pro substituted for	pH 6.5
	NIS	SL	0.25 % vol/vol	CD	Agri-Mek, early season	
	RADIANT	SC	8.0 fl oz/acre	EF		pH 7
	NIS	SL	0.25 % vol/vol	EF	Agri-Mek used later for longer	
	AGRI-MEK	SC	3.5 fl oz/acre	GH	Spray season	pH 7
	MSO	SL	0.5 % vol/vol	GH		
	LANNATE LV	L	3.0 pt/acre	IJ		pH 5
	NIS	SL	0.25 % vol/vol	IJ		
22	MOVENTO	SC	5 fl oz/acre	AB	Movento with different adjuvant	pH 6.5
	DYNE-AMIC	SL	0.7 pt/acre	AB		
	AGRI-MEK	SC	3.5 fl oz/acre	CD		pH 7
	MSO	SL	0.5 % vol/vol	CD		
	RADIANT	SC	8 fl oz/acre	EF		pH 7
	DYNE-AMIC	SL	0.7 pt/acre	EF		
	LANNATE LV	L	3 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
23	MOVENTO HL	SC	2.5 fl oz/acre	AB	New Movento formulation	pH 6.5
	DYNE-AMIC	SL	0.7 pt/acre	AB		
	AGRI-MEK	SC	3.5 fl oz/acre	CD		pH 7
	MSO	SL	0.5 % vol/vol	CD		
	RADIANT	SC	8 fl oz/acre	EF		pH 7
	DYNE-AMIC	SL	0.7 pt/acre	EF		
	LANNATE LV	L	3 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		
24	MOVENTO HL	SC	2.5 fl oz/acre	AB	New Movento formulation and	pH 6.5
	DYNE-AMIC	SL	0.7 pt/acre	AB	Exirel substituted for Agri-Mek	
	EXIREL	SC	13.5 fl oz/acre	CD		pH 7
	DYNE-AMIC	SL	0.7 pt/acre	CD		
	RADIANT	SC	8 fl oz/acre	EF		pH 7
	DYNE-AMIC	SL	0.7 pt/acre	EF		
	LANNATE LV	L	3 pt/acre	GH		pH 5
	NIS	SL	0.25 % vol/vol	GH		

* Formulation Type: EC = Emulsifiable Concentrate, L = Liquid, SC = Soluble Concentrate, SL = Soluble Liquid,
**Application Timing: June 2 = A, June 9 = B, June 16 = C, June 23 = D, June 30 = E, July 7 = F, July 14 = G, July 21 = H, July 28 = I, and August 4 = J.

Table 2. Treatments used in the drip thrips trial. Seven applications were made approximately 10 days apart from June 6 to August 11. Malheur Experiment Station, Ontario, OR, 2017.

Trt No.	Treatment Name	Formulation Type	Rate	Appl Code	Application Description
1	Untreated Check				Untreated Control
2	VERIMARK	SC	10.3 fl oz/acre	AB	Verimark by drip substituted for Movento (Complement
	AGRI-MEK	SC	3.5 fl oz/acre	CD	To Treatment 5)
	MSO	SL	0.5 % vol/vol	CD	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	LANNATE LV	L	3 pt/acre	G	
	NIS	SL	0.5 % vol/vol	G	
3	VERIMARK	SC	10.3 fl oz/acre	CD	Verimark by drip after Movento (Complement to
	MOVENTO	SC	5 fl oz/acre	AB	Treatment 8)
	MSO	SL	0.5 % vol/vol	AB	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	AGRI-MEK	SC	3 pt/acre	G	
	MSO	SL	0.5 % vol/vol	G	
4	MOVENTO	SC	5 fl oz/acre	AB	Standard
	MSO	SL	0.5 % vol/vol	AB	
	AGRI-MEK	SC	3.5 fl oz/acre	CD	
	MSO	SL	0.5 % vol/vol	CD	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	LANNATE LV	L	3 pt/acre	G	
	MSO	SL	0.5 % vol/vol	G	
5	EXIREL	SE	13.5 fl oz/acre	AB	Exirel substituted for Movento (Complement to
	MSO	SL	0.5 % vol/vol	AB	Treatment 2)
	AGRI-MEK	SC	3.5 fl oz/acre	CD	
	MSO	SL	0.5 % vol/vol	CD	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	LANNATE LV	L	3 pt/acre	G	
	MSO	SL	0.5 % vol/vol	G	
8	MOVENTO	SC	5 fl oz/acre	AB	Exirel after Movento (Complement to Treatment 3)
	MSO	SL	0.5 % vol/vol	AB	
	EXIREL	SE	13.5 fl oz/acre	CD	
	MSO	SL	0.5 % vol/vol	CD	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	AGRI-MEK	SC	3.5 fl oz/acre	G	
	MSO	SL	0.5 % vol/vol	G	
10	AZA-DIRECT	EC	32 fl oz/acre	AB	Azadirect by drip before Movento (Complement to
	MOVENTO	SC	5 fl oz/acre	CD	Treatment 11)
	MSO	SL	0.5 % vol/vol	CD	
	VERIMARK	SC	10.3 fl oz/acre	EF	
	AGRI-MEK	SC	3.5 fl oz/acre	G	
	MSO	SL	0.5 % vol/vol	G	
11	AZA-DIRECT	EC	12 fl oz/acre	AB	Azadirect + M-Pede before Movento (Complement to
	M-PEDE	SL	2 % vol/vol	AB	Treatment 10)
	MOVENTO	SC	5 fl oz/acre	CD	
	MSO	SL	0.5 % vol/vol	CD	
	EXIREL	SE	13.5 fl oz/acre	EF	
	MSO	SL	0.5 % vol/vol	EF	
	AGRI-MEK	SC	3.5 fl oz/acre	G	
	MSO	SL	0.5 % vol/vol	G	
12	AZA-DIRECT	EC	32 fl oz/acre	AB	Azadirect and Verimark by drip
	VERIMARK	SC	10.3 fl oz/acre	CD	
	RADIANT	SC	8 fl oz/acre	EF	
	DYNE-AMIC	SL	0.7 pt/acre	EF	
	AGRI-MEK	SC	3.5 fl oz/acre	G	
	MSO	SL	0.5 % vol/vol	G	

* Formulation Type: EC = Emulsifiable Concentrate, L = Liquid, SC = Soluble Concentrate, SE = Suspo-emulsion, SL = Soluble Liquid,

**Application Timing: June 6 = A, June 16 = B, June 30 = C, July 10 = D, July 21 = E, July 31 = F, and August 11 = G

Results and Conclusions

Foliar Application Trial

Thrips began to colonize onions in late May and reached the threshold level for the trial (4 thrips per plant) by May 30. Applications in the foliar trial began on June 2, [A] June 9 [B], June 16 [C], June 23 [D], June 30 [E], July 7 [F], July 14 [G] and July 21 [H]. Treatment program 17 had two additional applications: July 28 [I] and August 4 [J]. Thrips populations began to peak in late June and early July, which has been the typical pattern in the Ontario/Cairo Junction area. However, populations rapidly collapsed soon after although populations of immature thrips rebounded in mid-July before collapsing at the end of July. As is typical, most thrips on onions throughout the season were immatures (~75%). Because of the ability of adults to move from plant to plant and recolonize treated areas, we typically do not see large differences in adult populations among insecticide treatments in field station trials.

The standard reference program of two applications of Movento®, followed by two of Agri-Mek®, two of Radiant® and two of Lannate® still performed well under this season's conditions (Treatment program 2 in Figs. 1-2). As reported previously, Movento does not show good activity until after a second application is made, but it does provide residual control of larvae for 2-3 weeks after a second application.

The effect of Movento was enhanced by combining it with an adulticide (e.g., Treatment 4, Movento + Radiant). In situations where applications need to begin earlier in the spring than late May-early June, applying Movento later in the season (by 1-2 weeks) rather than at the start of the spray season may also make better use of its activity against the large populations of immature thrips that occur during peak abundance in late June-early July. It is important to combine Movento with an adulticide with this type of use pattern so that dispersing adults do not cause excessive damage. The cool, wet spring of 2017 delayed thrips populations development, which minimized the need for applications to begin much earlier in the spring.

Minecto® Pro, which includes abamectin, the active ingredient in Agri-Mek, and cyantraniliprole, the active ingredient in Exirel® and Verimark®, provided slightly better control than Agri-Mek itself. For resistance management, it would be best to not use either Agri-Mek, or Exirel/Verimark if Minecto Pro is used.

Radiant remains the most effective insecticide in trials. It has good activity against adult and immature thrips. Because of this activity, it is a good option for use during peak thrips abundance (Figs. 1 and 2).

In many of the treatment programs in the foliar trial, thrips numbers increased during mid- to late July after dropping to low levels in early July (Figs. 1 and 2). This pattern contrasts with the pattern in the drip trial (Figs. 3 and 4), where populations decreased sharply by mid-July and remained low through the remainder of the season. One possible contributing factor relates to timing and different insecticides in the trial. In the foliar trial, most treatment programs included late season use of Lannate (7^{th} and 8^{th} applications). With the 10-day application interval in the drip trial, most programs included the use of Radiant in mid- to late July. There are concerns regarding the efficacy of Lannate, and growers should avoid overuse of Lannate and consider using other products during periods of peak thrips abundance.

Treatment program 3, which did not include Lannate, provided good late season control of thrips. This program also started applications of Movento 1 week later than the standard program (Treatment 2).

Onion yields in programs with insecticides were higher than in the untreated check. The average yield for all of the insecticide programs was more than 62% higher than in the untreated check. Yields were low, reflecting the late planting and high temperatures during the season that affected plant growth. It also may reflect the late season thrips pressure. Treatment programs 3, 8, 15, 17, and 22 had size profiles weighted to larger size classes than other treatments (Fig. 5). Treatment program 3 included later use of Movento and Radiant than the standard program and did not include Lannate. Program 15 included Lannate but used it earlier in the season and included Minecto Pro later in the season.

Drip Application Trial

In the drip application trial, applications were made on an approximately 10-day interval from June 6 to August 11. Application dates were June 6 [A], June 16 [B], June 30 [C], July 10 [D], July 21 [E], July 31 [F] and August 11 [G]. The drip trial included the standard foliar applications of Movento, Agri-Mek, Radiant, and Lannate for comparison (Treatment 4 in this trial).

The foliar standard performed well and gave good season-long management of thrips (Figs. 3 and 4).

Exirel, the foliar version of cyantraniliprole, and Verimark, the drip version of cyantraniliprole, performed well. Their use at the beginning of the season followed by foliar applications of Movento gave good control and allowed Movento to continue to control immature thrips through the peak abundance time.

Foliar applications of Aza-Direct® (12 fl oz/acre) gave better control of thrips than drip applications of Aza-Direct (32 fl oz/acre).

In terms of onion yield, there were no statistical differences in marketable yields among the treatments (Fig. 6). However, size profiles were weighted toward larger sizes in Treatments 2, 4, 10, and 12. Treatment 2 used Verimark by drip as a substitute for Movento. Treatment 4 was the standard foliar program of Movento (2X), Agri-Mek (2x), Radiant (2X), and Lannate (1X). Treatments 10 and 12 included drip applications of Aza-Direct. Treatment program 2 started with drip applications of Verimark and had significantly higher yields of colossal and supercolossal bulbs (36% of marketable yield) compared with the other treatments (Fig. 6). This is similar to results from our 2016 trial.

Although drip applications of Aza-Direct did not give as good thrips management as foliar applications, the drip programs had the highest yields and larger size profiles than other treatments, with total marketable yields 5-7% higher than the standard program (Fig. 6). Colossal and supercolossal bulbs made up 28-34% of the marketable yield in the Aza-Direct by drip treatments (Treatments 10 and 12).

Again, the longer application windows in the drip trial probably contributed to the larger yields than in the foliar trial, where applications ended July 21.

Acknowledgments

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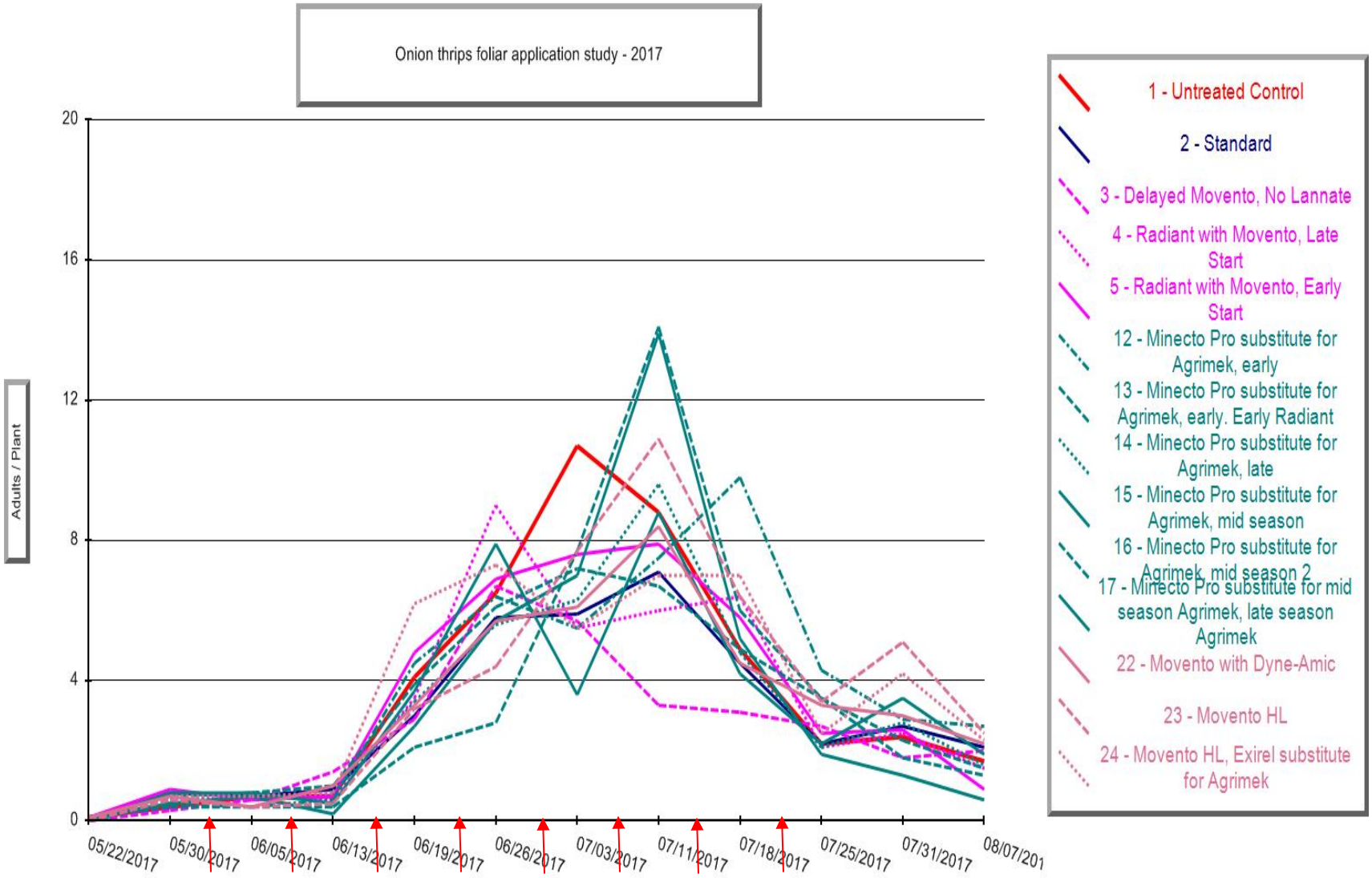

Figure 1. Average adult thrips per onion plant in the foliar thrips trial. Arrows on the date axis mark when applications were made. Malheur Experiment Station, Ontario, OR 2017.

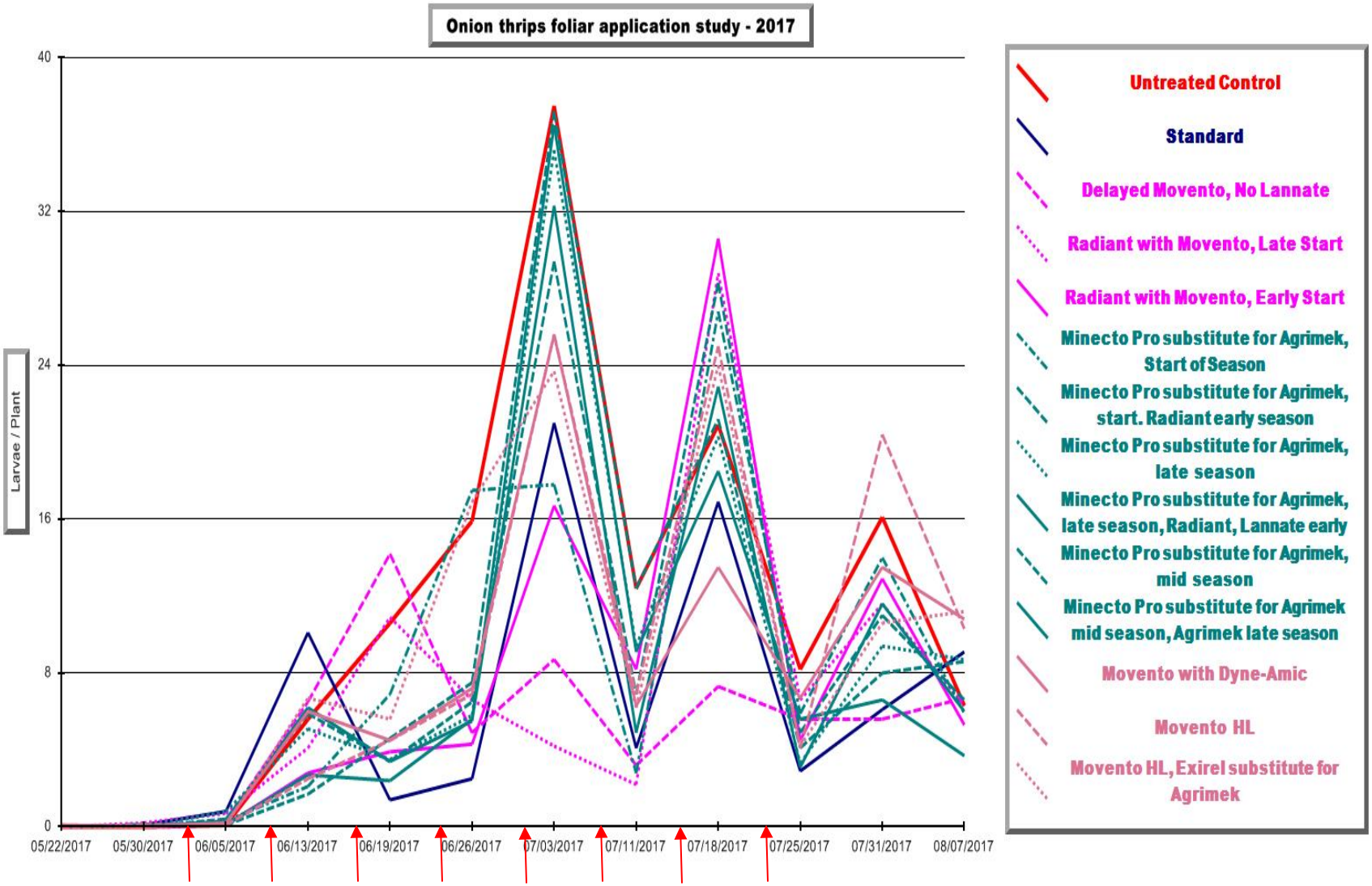

Figure 2. Average immature thrips per onion plant in the foliar thrips trial. Arrows on the date axis mark when applications were made. Malheur Experiment Station, Ontario, OR 97914.

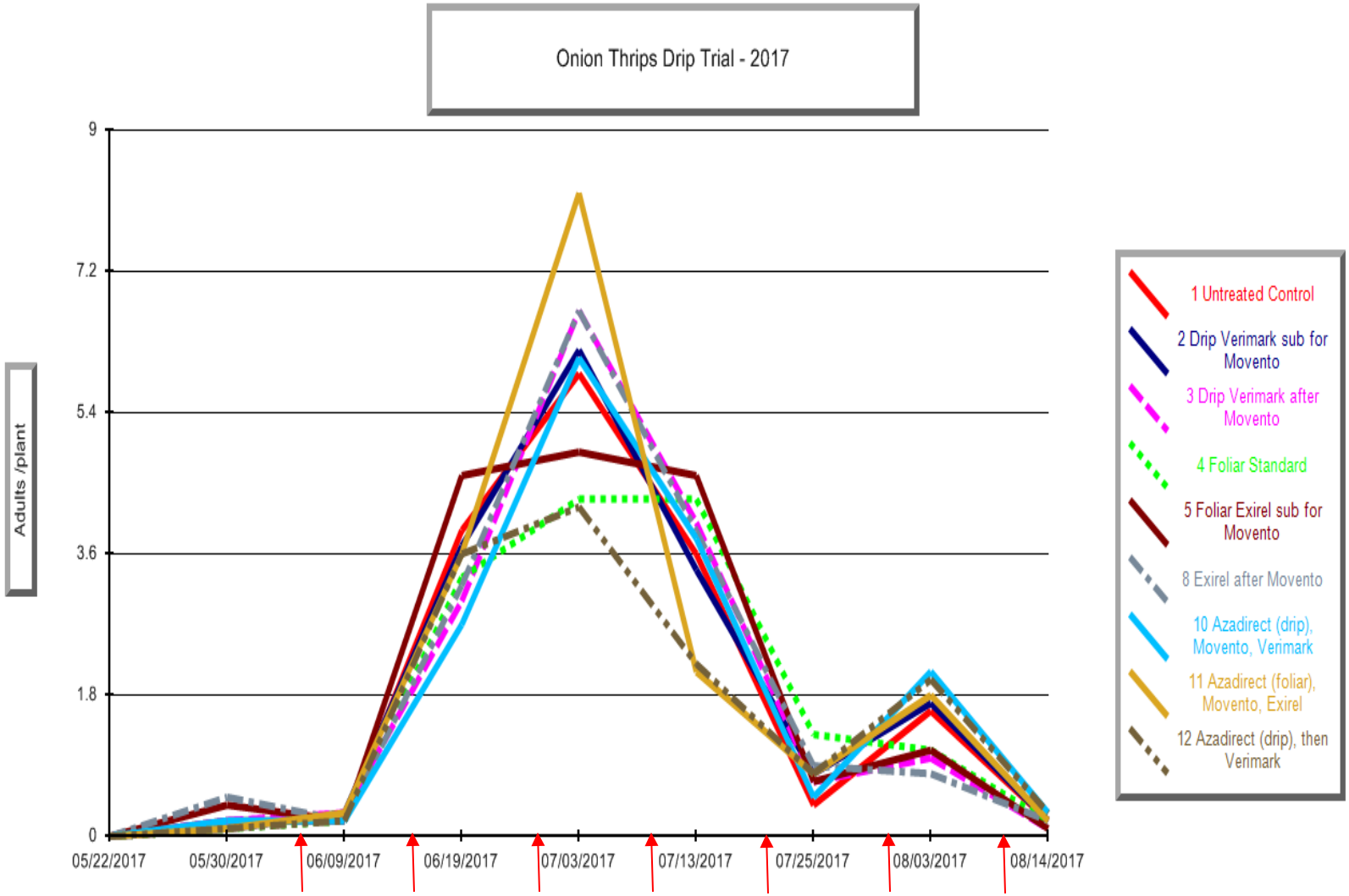

Figure 3. Average adult thrips per onion plant in the drip thrips trial. Malheur Experiment Station, Ontario, OR, 2017.

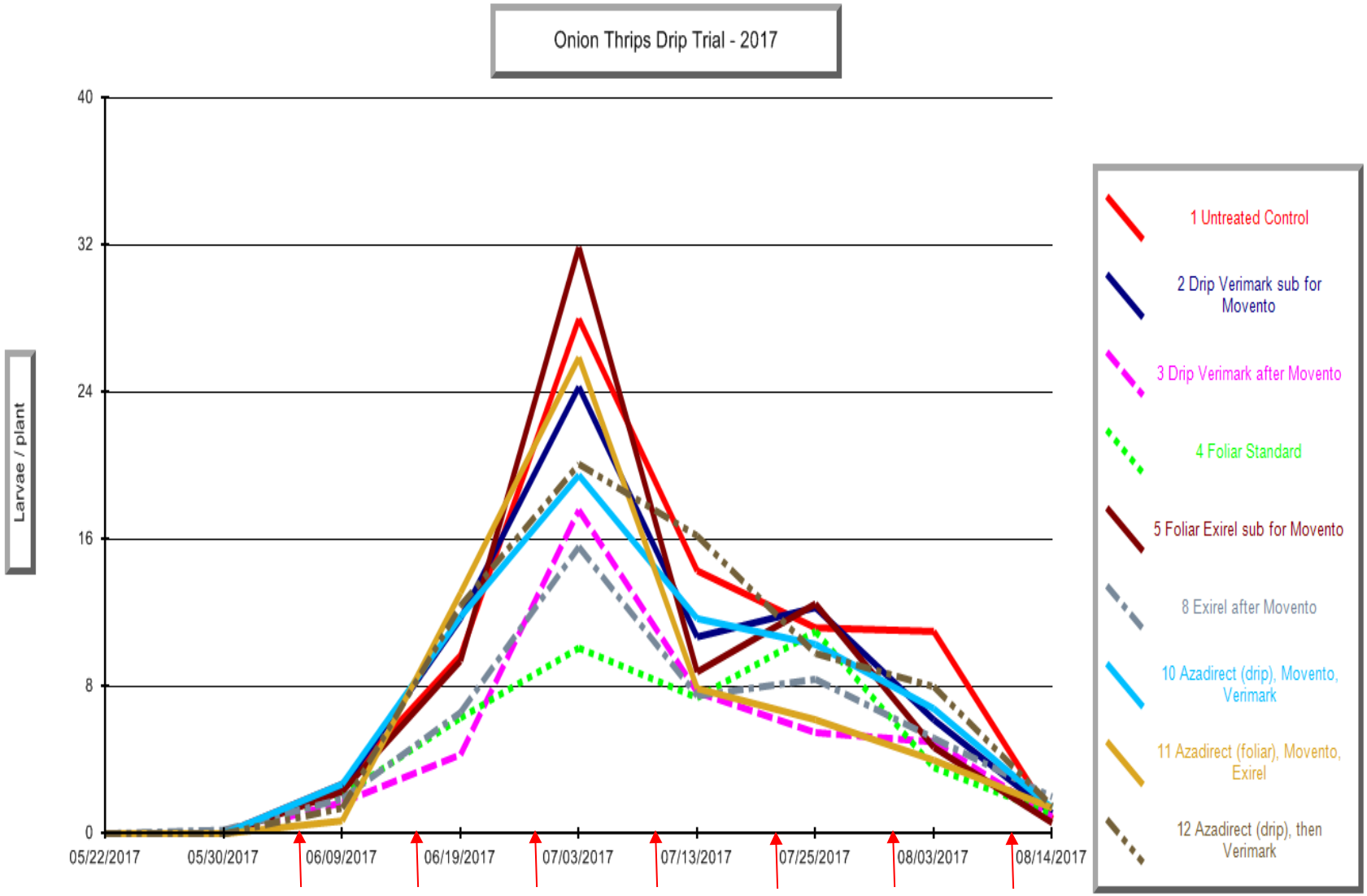

Figure 4. Average immature thrips per onion plant in the drip trial. Malheur Experiment Station, Ontario, OR, 2017.

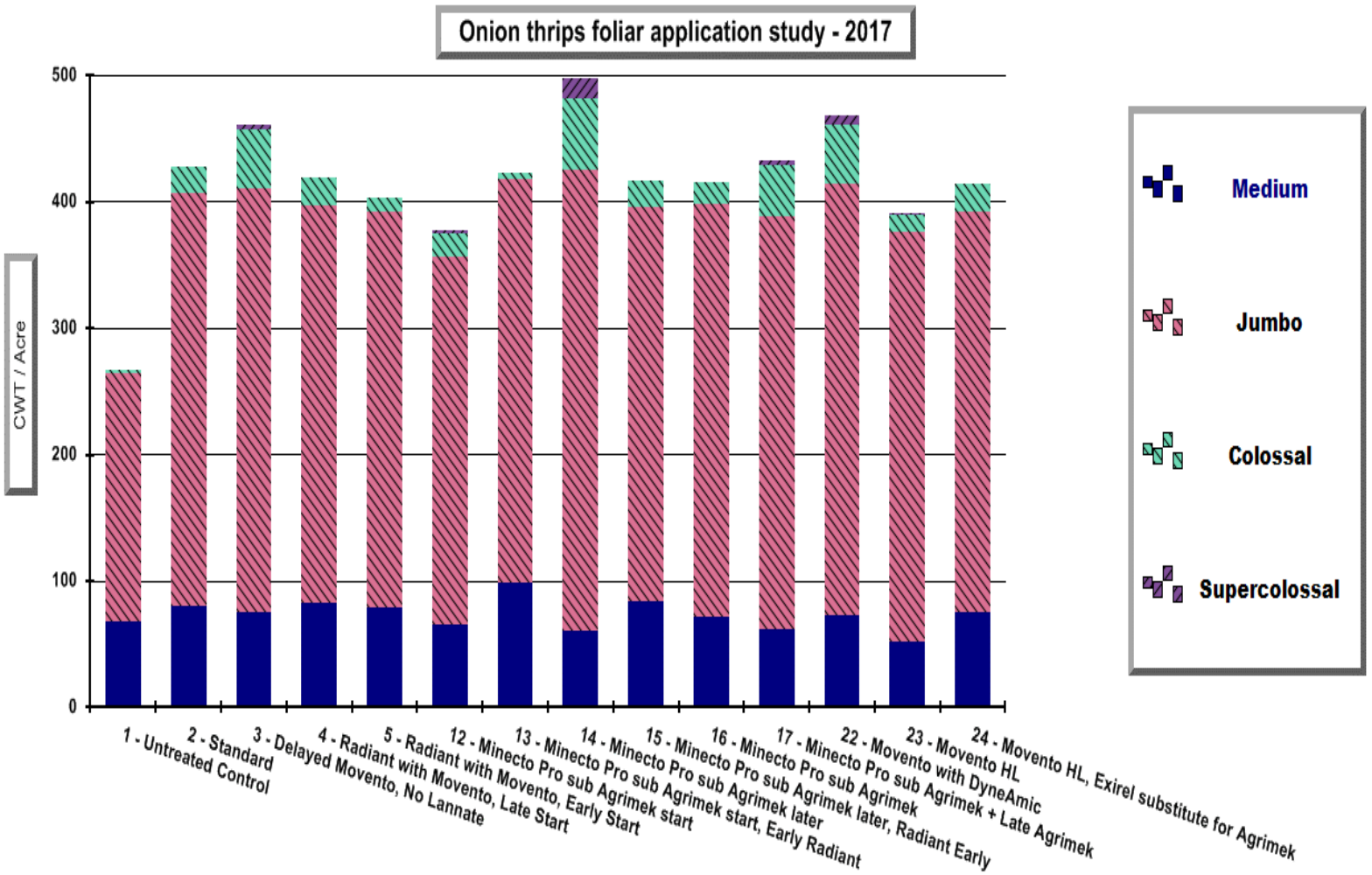

Figure 5. Onion yield by size class (cwt/acre) in the foliar trial. Malheur Experiment Station, Ontario, OR, 2017.

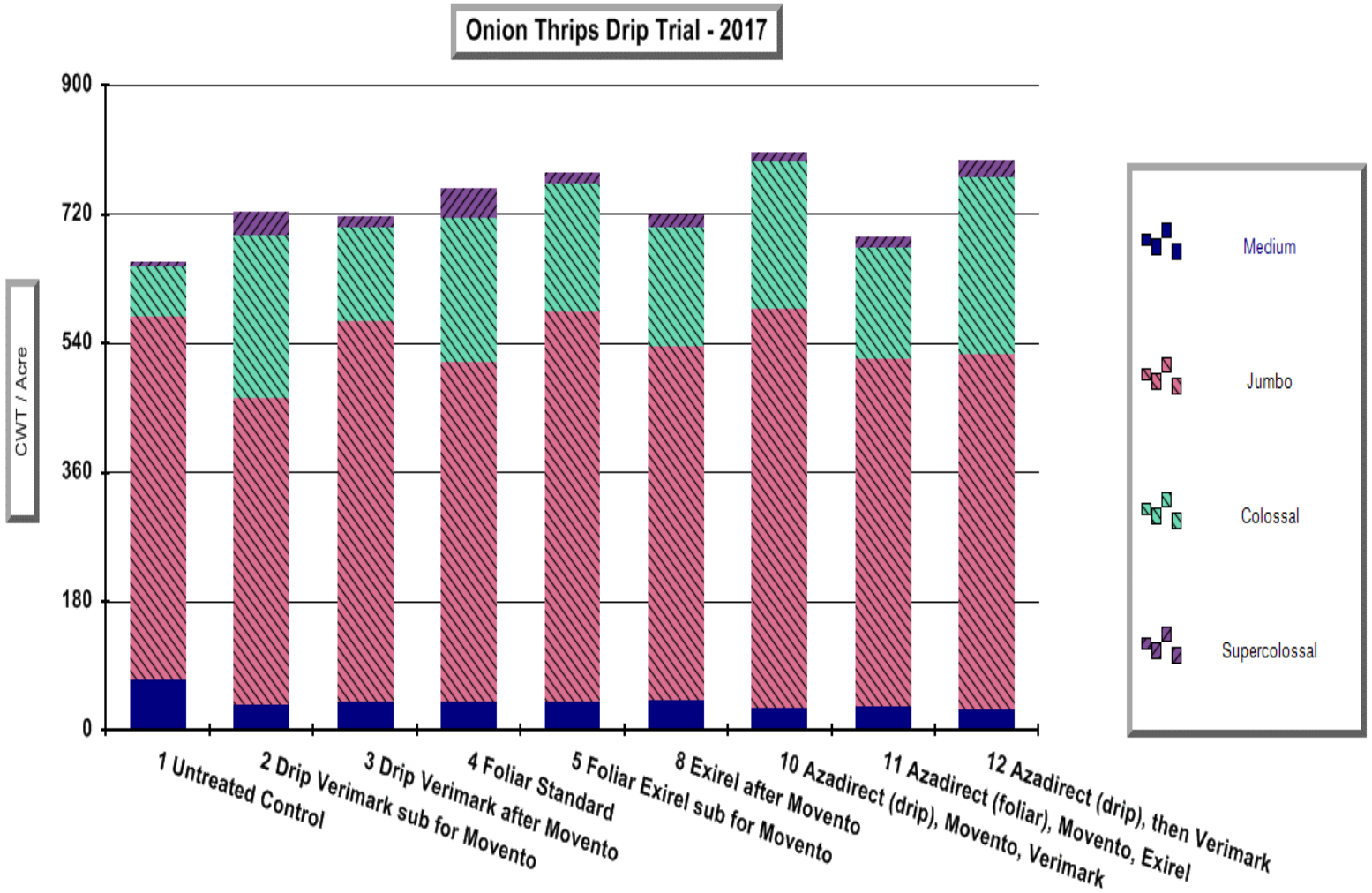

Figure 6. Onion yield by size class (cwt/acre) in the drip trial. Malheur Experiment Station, Ontario, OR, 2017.