A THREE-YEAR STUDY ON VARIETAL RESPONSE TO AN ALTERNATIVE APPROACH FOR CONTROLLING ONION THRIPS (*THRIPS TABACI*) IN SPANISH ONIONS

Lynn Jensen
Malheur County Extension Service
Clinton C. Shock and Lamont D. Saunders
Malheur Experiment Station
Oregon State University
Ontario, OR

Introduction

Onion (*Allium cepa* L.) is a major economic crop in the Treasure Valley of eastern Oregon and western Idaho. Annually about 20,000 acres of onion are grown in the valley. Typically, Spanish hybrids are grown for their large size, high yield, and mild flavor.

The principal onion pest in this region is onion thrips (*Thrips tabaci*, Lindeman). Thrips cause yield reduction by feeding on the epidermal cells of the plant. Onion thrips can reduce total yields from 4 to 27 percent, depending on the onion variety, but can reduce yields of the largest sized bulbs from 27 to 73 percent. The larger sized colossal and supercolossal bulbs (greater than 4 inches and 4.25 inches, respectively) are difficult to grow and demand a premium in the marketplace. Growers typically spray three to six times per season to control onion thrips. Treatments include the use of synthetic pyrethroid, organophosphate, and carbamate insecticides. The ability of these products to control thrips has decreased from over 90 percent control in 1995 to less than 40 percent control in 2005. Onion growers are applying insecticides more frequently in order to keep thrips populations low.

New biological insecticides with low toxicity to beneficial predators have been developed, including neem tree (*Azadirachta indica* A. Juss.) extracts (azadirachtin) and bacterial fermentation products (spinosad). Both of these materials have previously been evaluated for thrips control and have performed poorly compared to conventional insecticides. However, studies during the past 3 years have shown that season-long-applications of spinosad and azadirachtin are superior to conventional insecticide programs for controlling onion thrips.

Materials and Methods

A 1.5-acre field was planted to the onion varieties 'Vacquero' (Nunhems, Parma, ID) and 'Redwing' (Bejo Seeds, Oceano, CA) in a split-plot design on March 14, 2003, March 23, 2004, and March 21, 2005. Vaquero is a yellow variety and Redwing is a red variety. Red varieties are generally assumed to be more attractive to thrips than yellow

varieties. The onion varieties were planted as two 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 in a 6-inch band over each row at planting at a rate of 3.7 oz/1,000 ft of row for onion maggot control. Water was applied by furrow irrigation. The field was divided into plots 37 ft wide by 100 ft long. There were three treatments with six replications.

The three treatments were a grower standard treatment, an untreated check, and the alternative treatment. The grower standard treatment included Warrior® (lambda-cyhalothrin), MSR® (oxydemeton-methyl), and Lannate® (methomyl). The untreated check did not receive any treatments for thrips control. The alternative treatment included Success® (spinosad) and Aza-Direct® (azadirachtin).

Insecticide treatments were applied 7-10 days apart during the growing season (Table 1). All insecticides were sprayed in water at 31 gal/acre in 2003 and 39 gal/acre in 2004 and 2005. Thrips populations were sampled by two methods. The first was by visually counting the number of thrips on 20 plants. The second method was by cutting 10 plants at ground level and inserting the plants into a Berlese funnel. Turpentine used in the Berlese funnel dislodged the thrips from the plant, into a jar containing 90 percent isopropyl alcohol. The collected thrips and predators were then counted through a binocular microscope. Thrips populations were monitored weekly through the growing season.

The predator populations were monitored using pitfall traps that contained ethylene glycol. They were evaluated three times per week. The Berlese funnel was also used to monitor predators foraging on the plants. The onions were harvested in September and graded in October of each year.

Results and Discussion

Weekly thrips populations are compared in Figure 1. The alternative program had a significantly lower average thrips population than the untreated check in all years (Fig. 2). Visual damage to the foliage was observed with the variety Vaquero in 2004 and 2005 but not in 2003. The visual thrips damage to Redwing was greater than for Vaquero.

There were no yield differences between any of the treatments with Vaquero in 2003 but the alternative treatment had significantly more colossal- and supercolossal-sized bulbs in 2004. In 2005 the alternative program produced significantly fewer mediums and higher total yield than the untreated check. The alternative program gave significantly higher colossal and supercolossal yield compared to the untreated check (Table 2).

Redwing had significantly more colossal-sized bulbs with the alternative treatment all years compared to both the standard or untreated check and a significantly higher total yield in 2003 compared to the untreated check. In 2005 the alternative program had

significantly higher yields than either the standard treatment or the untreated check (Table 3).

Predator populations (Fig. 3) were significantly higher in the alternative and untreated check treatments than in the standard treatment. The predator population consisted mostly of spiders, big-eyed bugs, minute pirate bugs, damsel bugs, lacewings and lady bird beetles.

The 2004 and 2005 seasons produced an epidemic of iris yellow spot virus (IYSV) in the trial area and surrounding fields. The IYSV is a new disease currently spreading to most production areas of the United States and the world. Onion thrips is the vector, so this trial gave the opportunity to evaluate the alternative program for IYSV control (Table 5). The onions grown under the alternative treatment were healthier and had significantly less virus than those under the standard insecticide treatment or the untreated check.

Red onions often exhibit thrips scarring when placed in storage due to continued feeding by the insects. The alternative treatment produced significantly fewer damaged bulbs after storage compared to the untreated check for the Redwing variety.

Conclusion

The alternative treatments were equal to or in some cases significantly better than the standard insecticide program. There was a general trend towards higher yields in the larger bulb classes, which give a higher return to the grower. The alternative program gave better thrips control, reduced foliage damage and increased beneficial insect populations, perhaps by allowing the beneficials to forage on thrips. The alternative program produced less thrips damage to red onions in storage and reduced the incidence of iris yellow spot virus.

References

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Jensen, L., C. Shock, B. Simko, and L. Saunders. 2003c. Straw mulch and insecticide to control onion thrips *(Thrips tabaci)* in dry bulb onions. Pages 19-30 *in* Proceedings of the Pacific Northwest Vegetable Association Seventeenth Annual Meeting.

Table 1. Application dates of insecticide treatments for thrips control in onions, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003-2005.

2003		2004		2005	
Application date	Treatment*	Application date	Treatment	Application date	Treatment
June 7	A, D	June 6	B, D	June 7	A, D
June 14	D	June 16	B, D	June 15	B, D
June 25	C	June 23	C, D	June 22	C, D
July 3	D	July 1	C, D	June 29	B, D
July 7	B	July 8	B, D	July 8	C, D
July 11	D	July 19	C, D	July 22	B, D
July 25	C	July 29	C, D	August 1	C, D
July 29	D				

*Treatments	Rate Amount/acre
A: Warrior	3.84 oz
B: Warrior	3.84 oz
MSR	2.0 pt
C: Warrior	3.84 oz
Lannate	3.0 pt
D: Success	10.0 oz
Aza-Direct	20.0 oz

Table 2. Yield and grade of Vacquero onion with different strategies for controlling onion thrips, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003-2005.

2003

Treatment	Medium	Jumbo	Colossal	Super-colossal	Total yield
	cwt/acre				
Untreated check	9.7	459.7	464.1	124.0	1057.5
Standard*	9.8	451.0	489.6	140.9	1091.3
Alternative†	10.9	446.1	484.2	145.2	1086.4
LSD(0.05)‡	ns	ns	ns	ns	ns

2004

Treatment	Medium	Jumbo	Colossal	Super colossal	Total yield
	cwt/acre				
Untreated check	17.6	586.1	254.5	29.8	888.0
Standard	11.9	511.3	306.9	52.3	882.4
Alternative	14.8	409.3	377.4	126.9	928.4
LSD(0.05)	ns	ns	76.9	71.9	ns

2005

Treatment	Medium	Jumbo	Colossal	Super colossal	Total yield
	cwt/acre				
Untreated check	62.8	557.2	12.1	0.7	632.8
Standard	45.4	691.2	75.0	1.9	813.5
Alternative	43.2	641.9	130.8	1.3	817.2
LSD(0.05)	16.7	90.2	73.4	ns	96.0

*The grower standard treatment included Warrior, MSR, and Lannate.
†The alternative treatment included Success and Asa-Direct.
‡Least significant difference at alpha = 0.05

Table 3. Yield and grade of Redwing onion with different strategies for controlling onion thrips, Malheur Experiment Station, Oregon State University, Ontario, OR.

2003

Treatment	Medium	Jumbo	Colossal	Super-colossal	Total yield
	cwt/acre				
Untreated check	12.0	726.4	107.4	4.0	849.8
Standard*	14.2	724.2	174.3	2.2	914.9
Alternative†	11.6	701.2	240.2	6.9	959.9
LSD(0.05)	ns	ns	62.2	ns	56.3

2004

Treatment	Medium	Jumbo	Colossal	Super-colossal	Total yield
	cwt/acre				
Untreated check	57.6	395.1	9.1	0	461.8
Standard	50.8	509.0	15.4	0	575.2
Alternative	52.1	445.6	36.9	0	534.6
LSD(0.05)	ns	ns	16.5	ns	ns

2005

Treatment	Medium	Jumbo	Colossal	Super-colossal	Total yield
	cwt/acre				
Untreated check	272.5	266.1	0	0	425.1
Standard	176.0	447.9	1.4	0	552.0
Alternative	99.4	565.7	13.6	0	637.2
LSD(0.05)	128.5	100.7	ns	ns	70.4

*The grower standard treatment included Warrior, MSR, and Lannate.
†The alternative treatment included Success and Asa-Direct.

Table 4. Average iris yellow spot virus (IYSV) injury among insecticide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004-2005.

Treatment	IYSV* 2004	IYSV* 2005
Untreated check	1.5	1.7
Standard	1.7	3.3
Alternative	2.2	3.7
LSD (0.05)	0.4	0.6

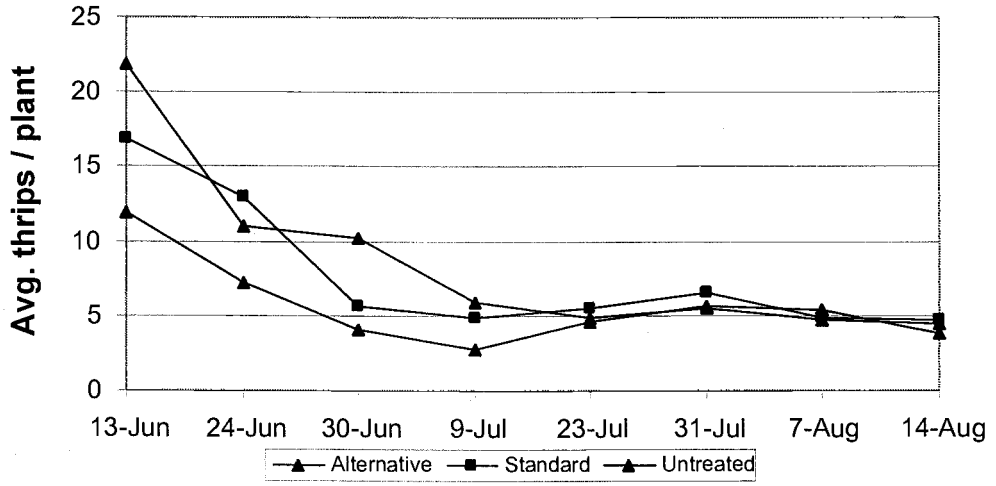
*Scale: 0 = dead, 5 = healthy, no lesions.

Table 5. Thrips injury on stored Redwing red onion, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

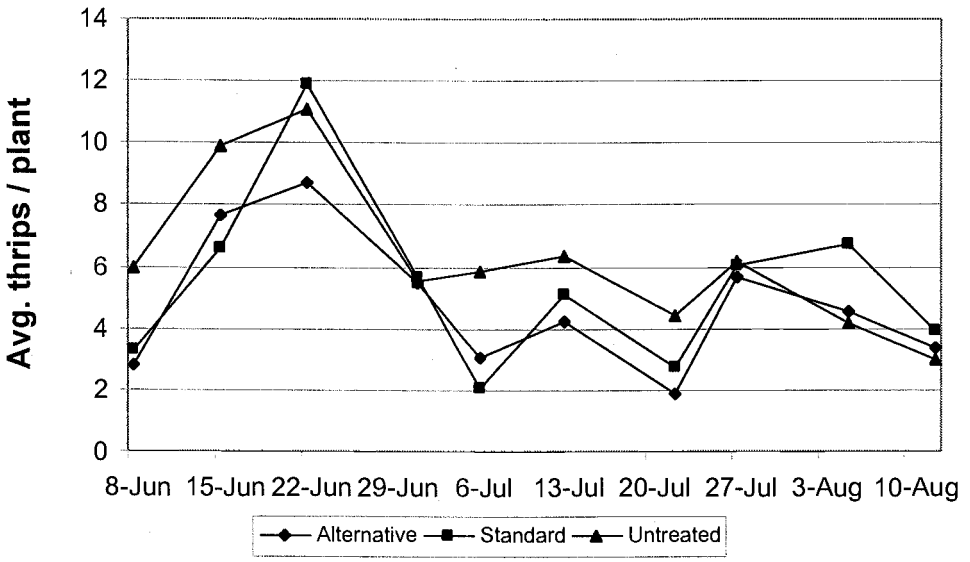
Treatment	Thrips injury* Redwing
Alternative	1
Standard	1.3
Untreated check	1.5
LSD (0.05)	0.3

*Scale: 0 = no injury, 10 = severe injury.

2003



2004



2005

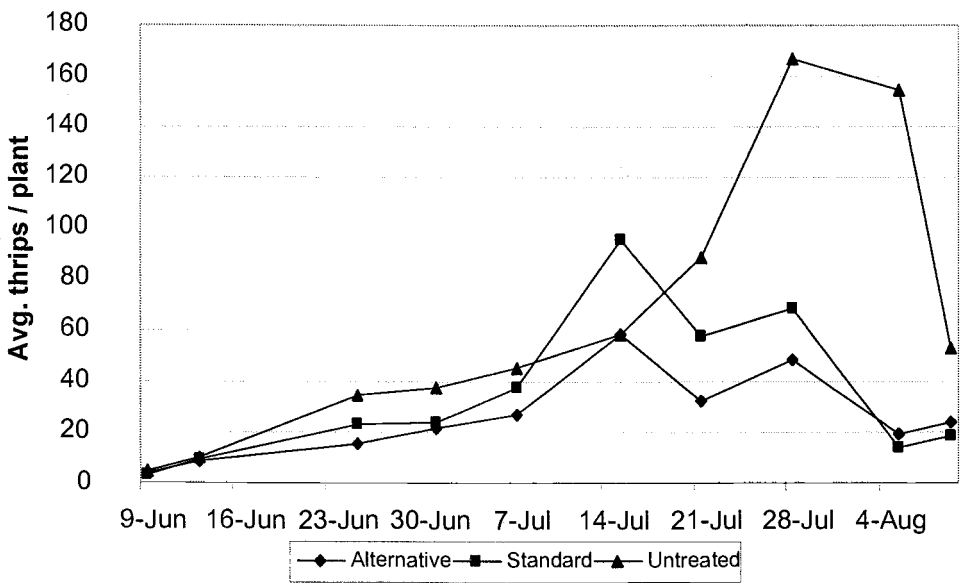
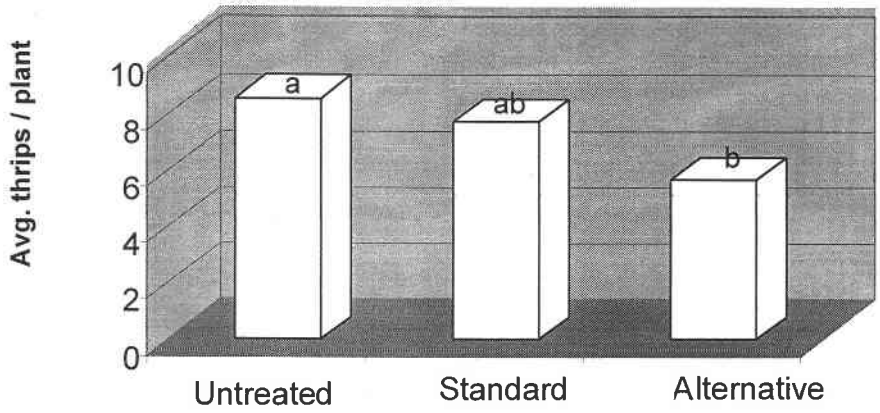
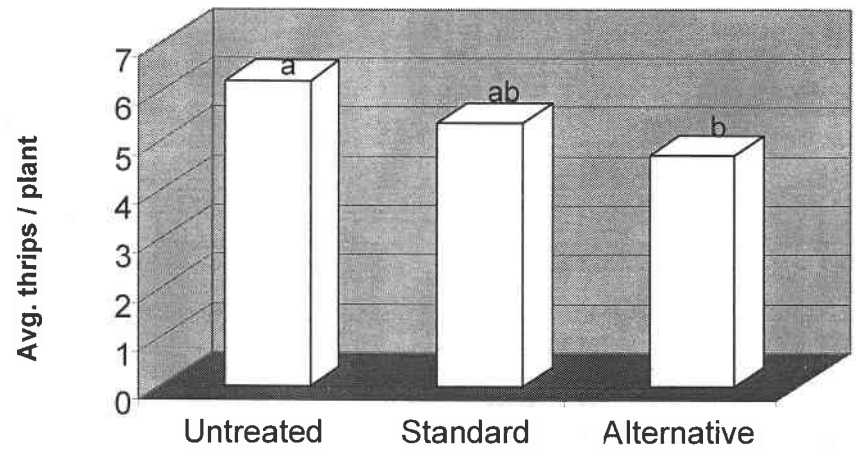


Figure 1. Thrips population response to an alternative thrips control program on onions, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

2003



2004



2005

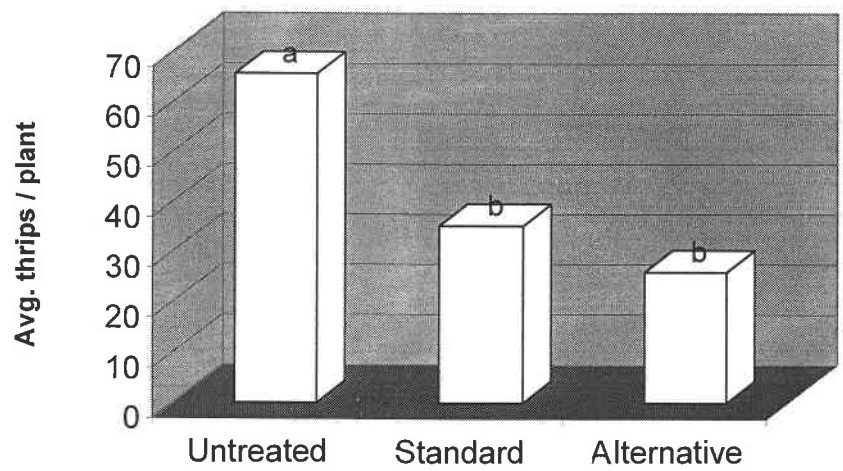


Figure 2. Average season-long thrips populations on onions in an alternative thrips control program. Columns with the same letter are not significantly different, Malheur Experiment Station, Oregon State University, Ontario, OR.

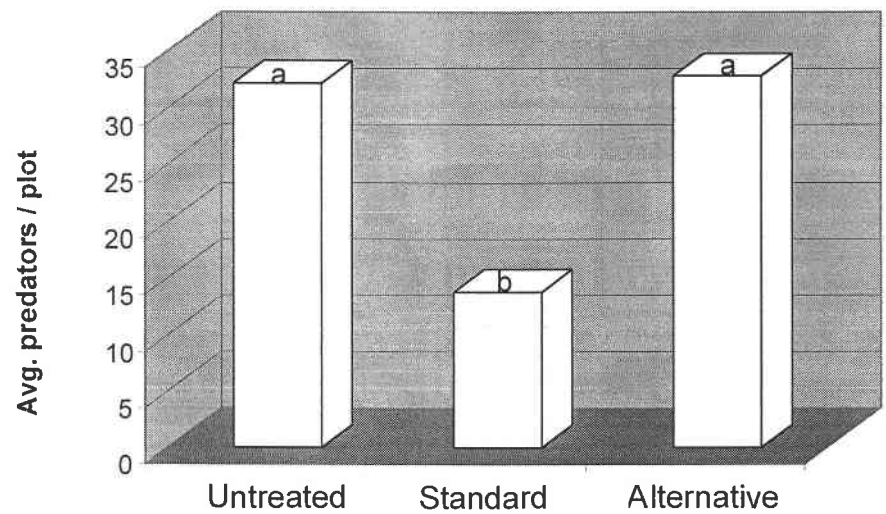


Figure 3. Predator populations in the alternative thrips control trial in onions, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.