EVALUATING A THREE-COMPONENT IPM PROGRAM FOR ONION THRIPS

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INTRODUCTION

Onion thrips is a significant pest of onion worldwide. Thrips feeding impacts photosynthetic potential, and reduces onion bulb yield. Additionally, onion thrips transmits *Iris Yellow spot virus* and has been implicated in transmitting other pathogens that cause Purple Blotch and Bacterial center rot diseases in onion. If left uncontrolled, onion thrips can contribute to yields losses upwards of 30% (Nault unpublished).

Insecticide use is the primary method to control onion thrips in onion. However, exclusive reliance on insecticide use can lead to resistance (Shelton et al 2006). Therefore, limiting insecticide applications while maintaining a high level of onion thrips control is a priority for the onion industry. Cultivar selection and nitrogen application have been independently shown to reduce onion thrips populations. Cultivars that are yellow-green in color with lower amounts of epicuticular waxes have lower onion thrips densities, and lower amounts of feeding damage (Diaz-Montano et al 2012, Damon et al 2014). Reduced nitrogen rates have also been reported to have lower thrips densities (Malik et al 2009, Hsu et al 2008). The combination of multiple tactics for managing onion thrips infestations in onion has not been investigated.

In this study, we evaluated the combined effect of reduced nitrogen rates and reduced insecticide use on three onion cultivars that varied in onion thrips susceptibility from low to high: cv. 'Avalon', cv. 'Delgado', and cv. 'Bradley'.

METHODS and MATERIALS

This field study was conducted in Elba, NY in 2015. Three onion cultivars ranging from low to high thrips susceptibility, cv. 'Avalon', cv. 'Delgado', and cv. 'Bradley', were designated to be independently planted into a field (90 ft. x 150 ft.). Within each cultivar, there were nine treatments selected from a 3 nitrogen rate (60, 90 and 125 lbs N/acre) x 3 insecticide program (standard, IPM and untreated control) factorial in which each treatment was replicated 5 times and arranged in a RCBD (45 plots per cultivar) (Figure 1). Plots were 5 ft x 20 ft and surrounded by either 5 ft of bare ground or unfertilized onions. Nitrogen was applied to field plots and then onion seeds were planted with a commercial planter. Plots receiving the standard insecticide program were sprayed every week. Conversely, IPM plots were sprayed only when onion thrips surpassed 1 thrips per leaf. All insecticide programs were initiated when onion thrips surpassed 1 thrips larva per leaf. Movento, Agri-Mek SC, Radiant SC and Exirel were used in the order listed here.

Bulbs were harvested from each plot on September 7th 2015 and then graded as jumbo, standard or boiler following USDA standards. Percent marketable bulbs was calculated by summing the number of standard sized bulbs and jumbo sized bulbs and then dividing this total by the total number of bulbs and then multiplied by 100.

Percent marketable bulbs = ([number of standard sized bulbs + number of jumbo sized bulbs] / Total number of bulbs) x 100

Fifteen plants were randomly chosen from each plot and examined weekly for larval onion thrips. Onions were harvested, graded and weighed in September.

IPM 60 lb N	IPM 90 lb N	IPM 125 lb N	STANDARD 60 lb N	STANDARD 90 lb N	STANDARD 125 lb N	CONTROL 60 lbs. N	CONTROL 90 lb N	CONTROL 125 lb N

Figure 1: nine treatments representing the combination of three nitrogen rates, two insecticide treatments and a control.

RESULTS and CONCLUSIONS

1) Larval onion thrips densities

Across all cultivars, insecticide program was the only significant effect on larval onion thrips densities (Table 1).

Table 1: ANOVA table of significant effects on larval onion thrips densities.

	Insecticide Program			Nitrogen rate			Insecticide Program*Nitro		
Cultivar	F*	df	P value	F*	df	P value	F*	df	P value
Avalon	29.32	2, 481	<0.0001	0.21	2, 481	0.8086	0.36	4, 481	0.8338
Bradley	36.19	2, 453	<0.0001	0.25	2, 453	0.7755	0.01	4, 453	0.9997
Delgado	19.06	2, 482	<0.0001	0.27	2, 482	0.7602	0.09	4, 482	0.985

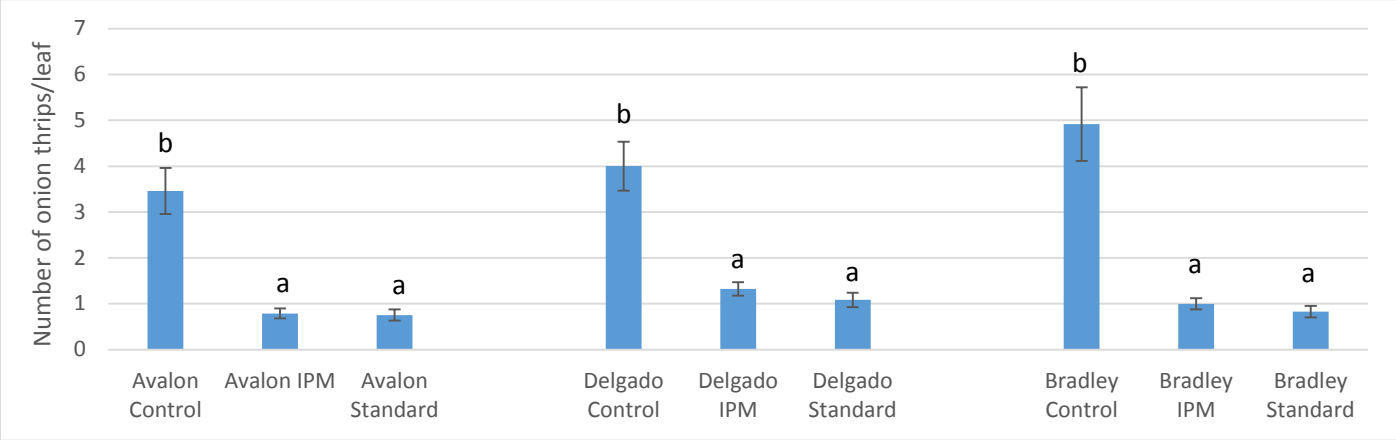

Figure 2: Seasonal average numbers of onion thrips larvae per leaf in three onion cultivars ('Avalon', 'Delgado' and 'Bradley') with two insecticide programs and a control.

IPM and standard insecticide programs were statistically similar across all cultivars. While not statistically comparable, cv. 'Bradley' had the highest amount of total onion thrips and cv. 'Avalon' had the lowest total amount of thrips.

These results indicate that **onion thrips can be controlled using an IPM approach just as well as using a standard program**.

2) Percent Marketable bulbs

cv. 'AVALON'

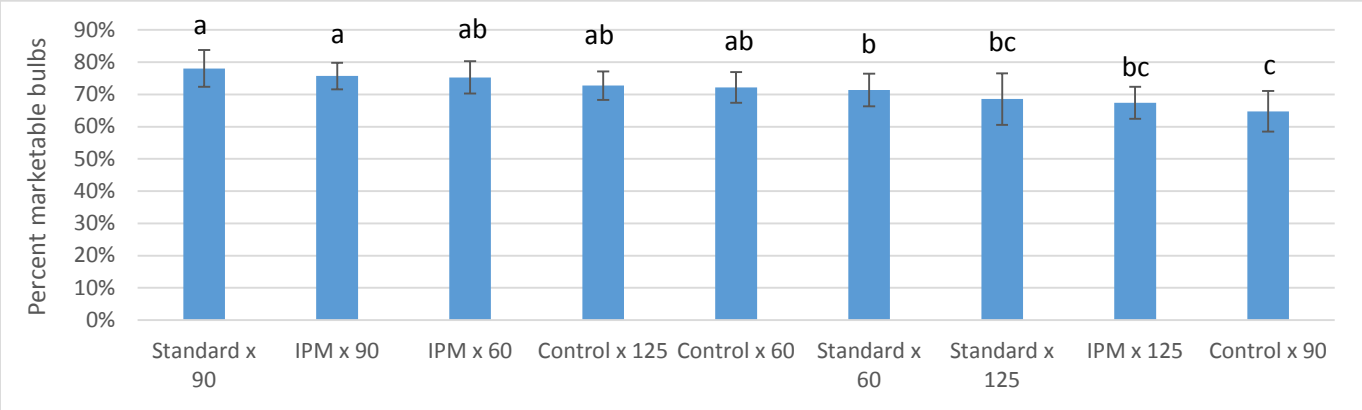

Figure 3: Total percent of marketable bulbs in cv. 'Avalon'.

Independently, insecticide program and nitrogen rate did not significantly impact percent marketable yield in cv. 'Avalon'. However, the interaction of Insecticide program*Nitrogen rate did significantly impact percent marketable yield. Plots that received 90lbs of N at planting and had either an IPM spray program or standard spray program had the highest percent marketable yields, with approximately 76.8% of bulbs marketable.

This finding suggests that NY onion growers can 1) **reduce nitrogen application** rates early in the season from 125lbs to 90 lbs in cv. 'Avalon' *and* 2) **use an IPM insecticide program** to control onion thrips without compromising on percent marketable yield in cv. 'Avalon'.

cv. 'DELGADO'

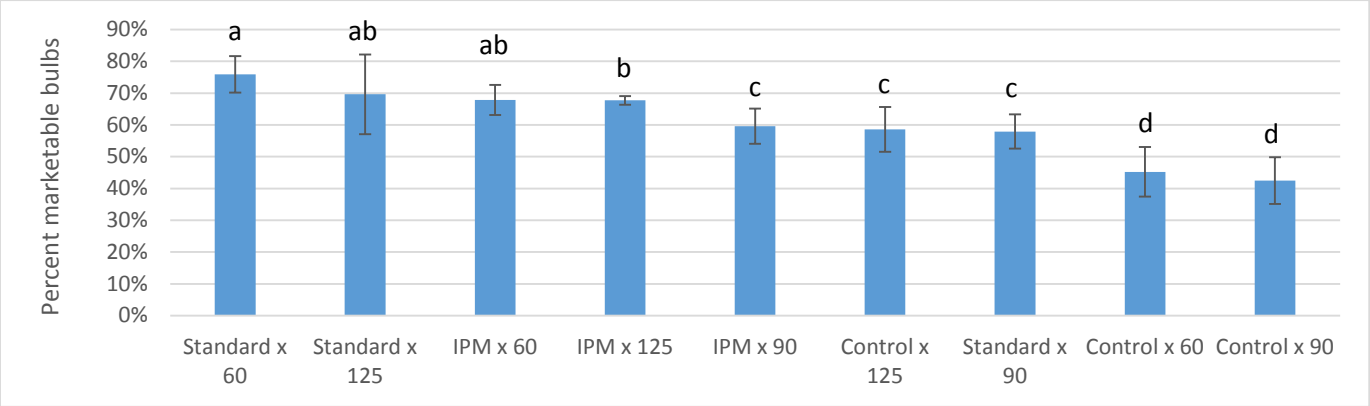

Figure 4: Total percent of marketable bulbs in cv. 'Delgado'.

Similar to cv. 'Avalon', cv. 'Delgado' yield was not significantly affected by only Insecticide program or nitrogen rate. However, the interaction of Insecticide program*Nitrogen rate did

significantly impact percent marketable yield. Plots with the highest percent marketable yields received insecticide and had either 60lbs or 125 lbs of N at planting.

This finding suggests that NY onion growers can 1) **reduce nitrogen application** rates early in the season from 125lbs to 60 lbs in cv. 'Delgado' *and* 2) **use an IPM insecticide program** to control onion thrips without compromising on percent marketable yield in cv. 'Delgado'.

cv. 'Bradley'

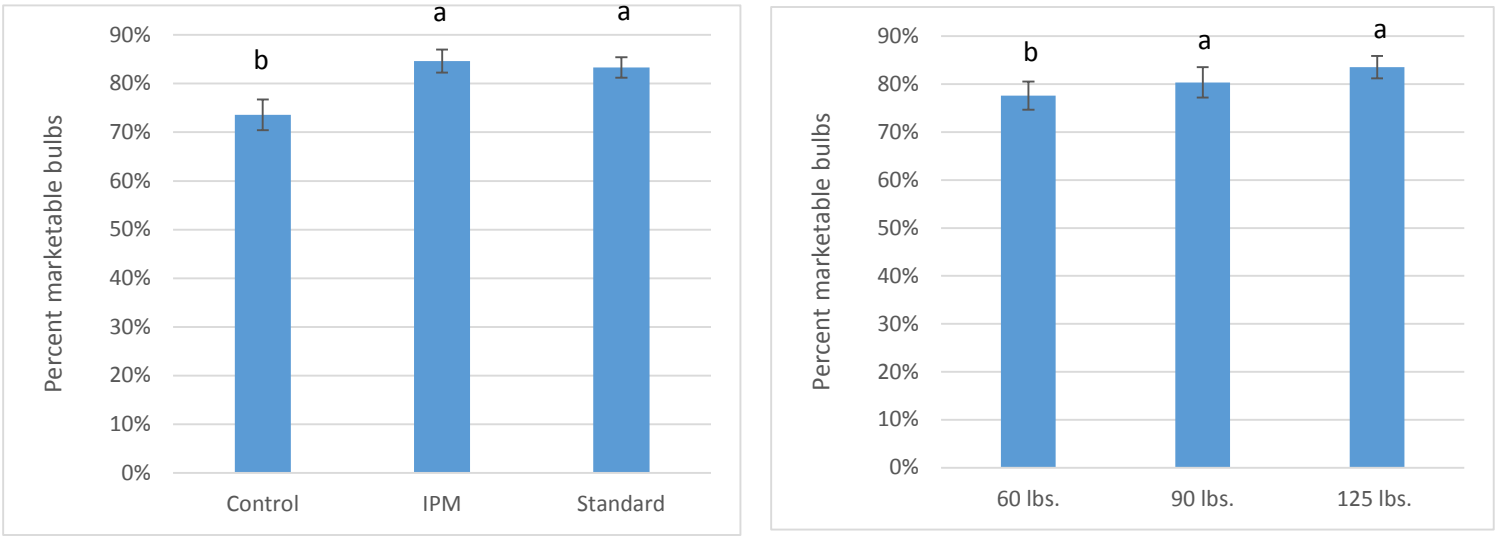

Figure 5: Total percent marketable yields within nitrogen rates and insecticide programs in cv. 'Bradley'.

Unlike the percent marketable yields for cv. 'Avalon' and cv. 'Delgado', nitrogen rate and insecticide programs significantly impacted percent marketable yield independently in cv. 'Bradley'. Those plots that received either an IPM spray program or standard spray program had significantly higher yields when compared to the control, which received no insecticide. Similarly, plots that received either 90 or 125 lbs. of N had significantly higher percent marketable yields compared to plots that received only 60 lbs. N.

This finding suggests that NY onion growers can 1) **reduce nitrogen application** rates early in the season from 125lbs to 90 lbs in cv. 'Bradley' *or* 2) **use an IPM insecticide program** to control onion thrips without compromising on percent marketable yield in cv. 'Bradley'.

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