

EVALUATION OF NEW ONION LINES FOR RESISTANCE TO ONION THRIPS AND IRIS YELLOW SPOT VIRUS

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Introduction

Onion thrips are the most important insect pest of onion in the Treasure Valley because their direct feeding damage and their transmission of iris yellow spot virus (IYSV) significantly reduce bulb size and yield. Control of thrips continues to rely on frequent insecticide applications, which are costly and are not always reliable in suppressing damage. Further, the intense use of the relatively small number of insecticides creates the risk of thrips developing resistance to one or more of these insecticides.

Host plant resistance could provide a more sustainable and cost-effective means to manage thrips and IYSV. Therefore, the objectives of this project were to evaluate newly developed onion selections for their resistance to onion thrips and IYSV compared to standard commercial cultivars in a field setting.

Materials and Methods

Onions were grown in 2015 as part of the Malheur Experiment Station onion variety trial. Cultural practices followed those described in the 2015 Onion Variety Trials Report.

The experimental onion lines were NMSU 14-81, NMSU 14-208, NMSU 14-240, NMSU 14-244. The three commercial cultivars used for comparison were 'Barbaro', 'Joaquin', and 'Vaquero'. Onions were planted on March 19 in plots 4 double rows wide and 27 ft long. Because of seed availability, not all plots of the experimental lines were the full length.

Seed was planted in double rows spaced 3 inches apart at 9 seeds/ft of single row. Each double row was planted on beds spaced 22 inches apart. Planting was done with customized John Deere Flexi Planter units equipped with disc openers. Immediately after planting, the field received a narrow band of Lorsban[®] 15G at 3.7 oz/1,000 ft of row (0.82 lb ai/acre) over the seed rows and the soil surface was rolled. On May 14-15, the seedlings were hand thinned to a spacing of 4.75 inches between individual onion plants in each single row, or 120,000 plants/acre.

For thrips control, the following insecticides were applied: Movento[®] at 5 oz/acre on May 24 by ground application; Movento at 5 oz/acre and Aza-Direct[®] at 2 pt/acre on June 4 by ground

application; Agri-Mek[®] SC at 3.5 oz/acre on June 11 and 18 by ground application; Radiant[®] at 10 oz/acre on June 25 by ground application and on July 4 by aerial application; Lannate[®] at 0.9 lb ai/acre on July 15 and 25 by aerial application; and Radiant at 10 oz/acre on August 8 by aerial application.

Adult and immature thrips were counted on 10 randomly selected plants per plot every 2 weeks from May 29 to August 10. Onions were evaluated for thrips damage and severity of symptoms of IYSV on August 7. Onions in each plot were evaluated visually for thrips and IYSV damage. Ten randomly selected plants per plot were evaluated for both thrips and IYSV damage.

Thrips ratings were based on the following scale:

- 0 = no thrips damage evident
- 1 = evident thrips feeding damage but no silvering of leaf surface
- 2 = some silvering patches on 1 or more leaves
- 3 = extensive silvering patches on 1 or more leaves, but healthy green tissue still noticeable
- 4 = silvering covers most of the leaf surface.

Iris yellow spot virus ratings were based on a scale developed by Howard Schwartz (Colorado State University;

<http://www.alliumnet.com/images/IYSV%20Disease%20Rating%20Guidelines%202.pdf>).

- The rating was 0 if there were no symptoms,
- 1 = 1-2 small lesions per leaf
- 2 = 3-10 medium-sized lesions per leaf
- 3 = 11-25 medium to large sized lesions per leaf
- 4 = >25 medium- to large-sized lesions per leaf

Because the experimental lines are not yet commercially acceptable, yield data were not collected for this trial.

Results

The experimental onion lines tended to have fewer adult and immature larval thrips than the three commercial cultivars (Table 1). The lines NMSU 14-81, NMSU 14-208, and NMSU 14-240 had much lower levels of thrips, especially through the peak time of thrips abundance in late June and July. NMSU 14-244 did not perform as well as the other three experimental lines, as evidenced by the high numbers of thrips larvae during July.

There were significant differences among the onion types in terms of thrips feeding damage and IYSV damage. The four experimental lines had significantly lower amounts of thrips feeding damage than the three commercial cultivars (Fig. 1). NMSU 14-81, NMSU 14-208 and NMSU 14-240 had the lowest amounts of damage. Mean damage ratings for these three lines ranged from 1.0 to 1.1. NMSU 14-244, with a mean damage rating of 1.9, had greater amounts of thrips

feeding damage than the other three experimental lines. The cultivar Joaquin, with a mean damage rating of 2.6 had significantly less damage than Barbaro (mean damage rating = 3.1) or Vaquero (mean damage rating = 3.3).

Iris yellow spot virus damage ratings (Fig. 2) followed a similar pattern as the thrips feeding damage ratings. NMSU 14-81, NMSU 14-208, and NMSU 14-240 had mean IYSV damage ratings of 0.1 to 0.2, meaning that few plants had virus lesions, and the plants that did have lesions had very minimal damage. NMSU 14-244 and the commercial cultivars had significantly greater amounts of damage, with mean IYSV ratings ranging from 0.9 to 1.2.

Acknowledgements

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Table 1. Mean number of onion thrips per plant on different onion selections and commercial cultivars grown under standard commercial practices at the Oregon State University, Malheur Experiment Station, Ontario, OR, 2015. For each life stage and sample date, means denoted with the same letter are not statistically different.

Adult thrips												
Onion variety	5/29/2015		6/15/2015		6/29/2015		7/13/2015		7/27/2015		8/10/2015	
NMSU 14-81	2.02	b	2.74	c	0.72	bc	0.24	bc	0.28	b	0.00	a
NMSU 14-208	2.54	b	3.86	b	1.08	bc	0.16	c	0.22	b	0.06	a
NMSU 14-240	2.00	b	4.82	bc	0.62	abc	0.56	bc	0.48	b	0.00	a
NMSU 14-244	1.76	b	3.12	c	1.62	abc	1.36	a	2.74	a	0.14	a
Barbaro	5.76	a	7.64	a	2.28	a	0.84	ab	0.60	b	0.12	a
Joaquin	4.70	a	5.48	ab	1.38	abc	0.32	bc	0.66	b	0.04	a
Vaquero	4.02	a	7.04	a	1.84	ab	0.74	abc	0.86	b	0.10	a
Immature thrips												
Onion Variety	5/29/2015		6/15/2015		6/29/2015		7/13/2015		7/27/2015		8/10/2015	
NMSU 14-81	1.66	d	1.28	cd	2.64	b	1.02	d	1.28	c	0.00	d
NMSU 14-208	3.40	bc	1.74	bcd	4.34	b	0.98	d	0.30	c	0.04	cd
NMSU 14-240	3.02	c	1.10	d	7.66	b	2.70	cd	3.10	c	0.00	d
NMSU 14-244	4.72	b	1.38	d	9.90	b	15.88	a	14.68	ab	1.10	bc
Barbaro	10.04	a	3.84	a	14.54	a	15.84	ab	15.24	a	2.04	b
Joaquin	9.56	a	2.82	abc	7.54	ab	7.24	abc	11.06	ab	3.34	a
Vaquero	9.36	a	3.50	ab	6.64	ab	6.14	bcd	8.56	b	0.56	cd
Total thrips												
Onion Variety	5/29/2015		6/15/2015		6/29/2015		7/13/2015		7/27/2015		8/10/2015	
NMSU 14-81	3.68	c	4.02	c	3.36	b	1.26	cd	1.56	b	0.00	a
NMSU 14-208	5.94	b	5.60	bc	5.42	b	1.14	d	0.52	b	0.10	a
NMSU 14-240	5.02	bc	5.92	bc	8.28	b	3.26	bc	3.58	b	0.00	a
NMSU 14-244	6.48	b	4.50	c	11.52	b	17.24	a	17.42	a	1.24	a
Barbaro	15.80	a	11.48	a	16.82	a	16.68	a	15.84	a	2.16	a
Joaquin	14.26	a	8.30	ab	8.92	ab	7.56	ab	11.72	a	3.38	a
Vaquero	13.38	a	10.54	a	8.48	ab	6.88	abc	9.42	a	0.66	a

Thrips damage ratings - 2015

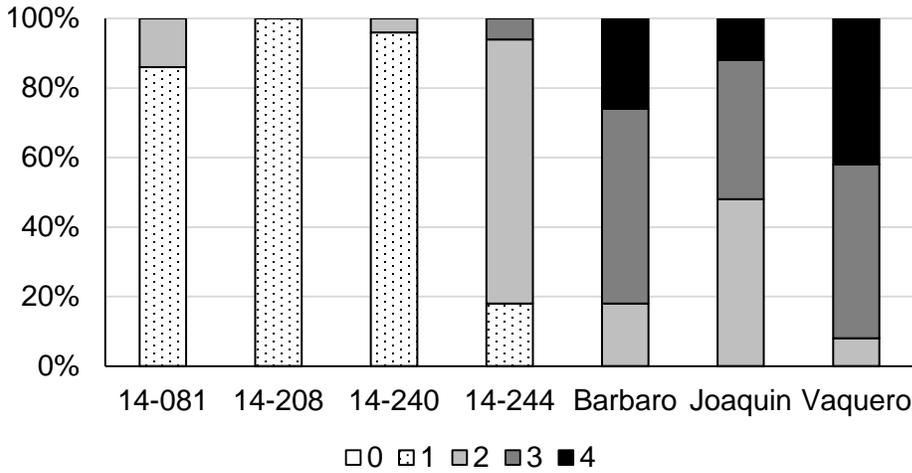


Figure 1. Thrips feeding damage ratings on experimental onion lines and commercial cultivars grown at the Oregon State University, Malheur Experiment Station, Ontario, OR, 2015. Data show the percentage of plants of each type with ratings of 0 (no damage) to 4 (most severe damage). Plants of the experimental lines tended to have less thrips feeding damage than those of commercial cultivars.

IYSV ratings - 2015

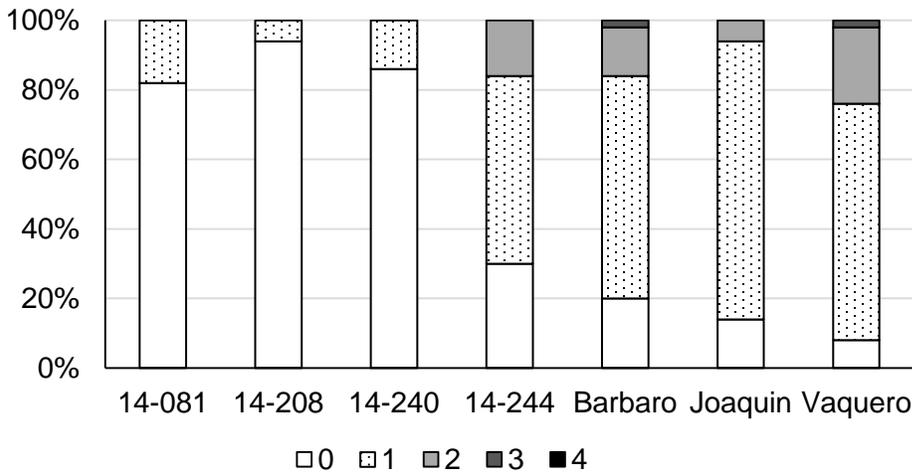


Figure 2. Iris yellow spot virus (IYSV) damage ratings on experimental onion lines and commercial cultivars grown at the Oregon State University, Malheur Experiment Station, Ontario, OR, 2015. Data show the percentage of plants of each type with ratings of 0 (no damage) to 4 (most severe damage). Plants of the experimental line tended to have less IYSV damage than those of commercial cultivars.