

Onion Variety Tolerance to Thrips Feeding, Fruita CO

Robert Hammon

Summary

Twenty onion varieties were planted in a replicated trial to determine relative tolerance to thrips feeding. One half of the plots were treated with Vydate L to control thrips, while thrips were allowed to feed and reproduce in the remaining half of the plots. Varietal response to the insecticide was quite variable, with increased yield and bulb size in some, no change in some, and decreased yield and size in others. Thrips control varied with variety. The response of onion varieties to the Vydate L applications cannot be attributed solely to thrips control, but was probably due in part to growth regulator characteristics of the compound. Further research is necessary to characterize onion varietal tolerance to thrips feeding.



Introduction and Objectives

Approximately 2000 acres of onions are grown in western Colorado. Onion thrips, *Thrips tabaci*, is a primary pest of onion production in the region. They had been managed with organophosphate insecticides prior to 1990, when the thrips population began showing signs of resistance. Pyrethroid insecticides were used extensively during the 1990's with good control achieved for the most part. About 1999 the onion thrips population began showing signs of resistance to pyrethroid insecticides, and by 2001 control failure was experienced with them much of the time. Carbamate insecticides have also been used, but onion thrips are now showing signs of resistance to them. Onion varieties are known to vary in their tolerance to thrips feeding, and knowledge of the characteristics of particular varieties can be important in determining a management

program.

The objectives of this research are:

- 1) Evaluate onion varieties grown in western Colorado for tolerance to onion thrips feeding.
- 2) Evaluate onion varieties for yield potential under conditions at Fruita Colorado.

Methods

Twenty varieties of onions (Table 1) were planted at the Western Colorado Research Center at Fruita on 3 April 2001. The experiment was arranged as a randomized complete block, split plot, with four replications. Variety was arranged as main plot (plot size 5 ft x 15 ft) and insecticide as sub-plot (plot size 2.5 ft x 15 ft).

Onions were planted in 2 rows per 30" bed with 10" spacing between rows. Seed was planted at a rate of 1 seed/row inch, then hand-thinned to 1 plant per 2-3 inches on 17 May 2001. Two hundred lb/A of 11-52-0 fertilizer was incorporated prior to planting, and 160 lb/A N (32-0-0) top dressed with hand held applicator. 40 lb/A was applied weekly during the last week of May and the each of the first three weeks of June. The field was furrow irrigated. Three irrigations were applied to germinate seed and control soil crusting, followed by eleven irrigations during the season. Irrigations ranged from 8 to 16 hour sets depending on soil and weather conditions and water availability. May through September

precipitation for Fruita was recorded at 3.68 inches.

Table 1. Onion variety characteristics, thrips counts, onion yield and size distribution. All data presented in this table is the average over insecticide treated and untreated plots. Means within a column followed by the same letter are not significantly different (LSD P=0.05).

Variety	Company	Days	Market Class	Spacing inches	Thrips per plant	Marketable ¹ CWT/A		% Medium		% Jumbo +	
Outrigger	Asgrow	107	Export	2.1	29.75 ab	206.57	GHI	48.94	ABCD	9.41	GHI
Tamara	Bejo	115	Export	2.1	34.12 ab	224.20	FGHI	58.56	A	2.90	I
X351	Palmer	102	Hard globe	2	13.12 ab	144.11	HIJ	37.81	CD	6.38	HI
Husky X302	Palmer	90	Hard globe	2.5	15.18 ab	180.39	HI	47.77	ABCD	12.39	GHI
Kodiak X400	Palmer	112	Spanish x hard globe	2.7	27.75 ab	303.11	DEFG	43.02	ABCD	33.49	CDE
Sharon	Bejo	100	Spanish storage	2	44.38 b	127.37	IJ	41.22	BCD	1.20	I
Arsenal	Asgrow	102	Spanish storage	1.8	31.38 ab	116.23	IJ	38.18	CD	0.00	I
Pinnacle	Petoseed	110	Spanish storage	1.8	20.38 ab	469.20	BC	48.08	ABCD	30.03	DEF
Spinnaker	Asgrow	110	Spanish storage	2.1	24.12 ab	176.63	HI	50.56	ABCD	5.63	HI
Teton	Petoseed	110	Spanish storage	2.2	38.25 b	363.59	CD	55.54	AB	22.36	DEFG
Gunnison	Bejo	113	Spanish storage	1.9	33.00 ab	245.22	EFGH	53.84	ABC	6.22	HI
Tioga	Petoseed	115	Spanish storage	2.1	16.00 ab	475.61	BC	38.53	CD	45.83	ABC
X333	Palmer	102	Full Spanish	2.7	21.75 ab	312.33	DEFG	59.18	A	19.49	EFGH
Mira	Asgrow	105	Full Spanish	1.8	21.38 ab	390.29	CD	53.40	ABC	20.13	EFGH
Regiment	Asgrow	110	Full Spanish	2.1	16.38 ab	338.96	DE	50.39	ABCD	22.67	DEFG
Vision	Petoseed	117	Full Spanish	2.5	33.75 ab	556.67	B	35.85	DE	53.75	A
Mesquite X202	Palmer	120	Full Spanish	2	14.62 ab	678.35	A	38.63	BCD	49.84	AB
Raptor	Seedworks	120	Full Spanish	2	15.00 ab	514.85	B	42.42	ABCD	36.41	BCD
Caballero	Petoseed	95	Intermediate	2.1	4.50 a	326.56	DEF	58.99	A	15.24	FGHI
Gallatin	Bejo	95	Intermediate	1.9	2.675 a	48.23	J	19.26	E	0.00	I
LSD (0.05)					32.7	114.1		17.01		15.37	

¹ Marketable onions are medium and larger in size.

Herbicides were applied with a CO₂ pressured, rickshaw type sprayer. Buctril (14 oz/A; 0.22 lb a.i./A) plus Goal 2XL (12 oz/A; 0.19 lb a.i./A) were applied 3 May, 18 May and 21 May. Buctril plus Prowl 3.3 EC (1.8 pt/A; 0.75 lb a.i./A) was applied on 1 June. Goal 2XL plus Prowl 3.3 EC was applied on 29 June. The plots were hand weeded twice.

Vydate L was applied three times: 28 June, 12 July, and 2 August. All applications were at a rate of 4 pt/A (1.0 lb a.i./A) using a hand held CO₂ pressured sprayer calibrated to apply 18 gal/A of finished spray material. Non ionic spreader sticker (Activator 90, Loveland Industries) was added to all applications at a rate of 2 pt/100 gal.

The onion thrips population was sampled once during the growing season (26 & 27 July) by choosing five random plants per plot and counting the thrips in the field. The average

number of thrips per plant was used in the analysis of variance.

The onions were undercut with a double rod weeder on 20 September, and onions left to cure in the field. Plots were evaluated for yield on September 27-29, after one week of field curing. One row (13 row-ft) was chosen for evaluation and onions sorted by size: boiler < 1.75"; pre-pack 1.75"-2.25"; medium 2.25"-3.0", jumbo 3.0-4.0"; colossal >4.0". The number and total weight of onions in each size class was recorded.

Analysis of variance was conducted on all data. Yield by size categories, percentage of yield within a size category and thrips counts were subjected to a two way, split plot analysis (Table 1). Variety response to insecticide application was calculated by subtracting the untreated from treated data for each data category and conducting a one way analysis of

variance on the difference. If a variety mean was within two standard errors of zero, it was categorized as having no response. If the mean was greater than two standard error values from zero, the variety was considered to have either a positive or negative response to the insecticide treatment (Table 2.).

Table 2. Onion variety response to insecticide applications. Greater values denote larger differences between treated and untreated plots. Cells with light shading had a statistically significant positive response to insecticide application. Those with dark shading had a significant negative response to insecticides. Unshaded cells had no significant response to insecticide. Means within a column followed by the same letter are not significantly different (LSD, P=0.05 column 3, P=0.10 column 4)

	CWT/A		% of MJC
	Med + ¹	Jum + ²	% Jum + ³
Outtrigger	7.23	-6.79 cd	-4.58 cdef
Tamara	91.75	20.95 bcd	4.73 abcd
X351	123.90	39.68 bcd	12.62 ab
Husky	90.57	16.96 bcd	2.70 abcde
Kodiak	48.68	47.05 bcd	7.29 abcd
Sharon	11.06	8.85 bcd	3.15 abcde
Arsenal	-11.21	0.00 cd	0.00 bcdef
Pinnacle	78.47	87.32 abc	3.40 abcde
Spinnaker	-39.09	-30.53 cd	-11.77 f
Teton	-105.61	-89.68 d	-9.57 ef
Gunnison	24.04	20.95 bcd	4.97 abcd
Tioga	-28.17	67.85 abcd	7.91 abc
X333	40.56	-17.85 cd	-4.26 cdef
Mira	-69.92	-54.58 cd	-9.71 ef
Regiment	-27.44	70.65 abcd	5.53 abcd
Vision	69.33	169.92 ab	9.29 ab
Mesquite	171.99	218.45 a	9.25 ab
Raptor	216.97	234.97 a	15.80 a
Caballero	-55.46	-41.74 cd	-5.62 def
Gallatin	12.10	0.00	0.00 bcdef
LSD		168.3	13.4
P-Value	0.2296	0.0180	0.0519

¹ Treated medium, jumbo, and colossal minus untreated medium, jumbo, and colossal CWT/A.

² Treated jumbo and colossal minus untreated jumbo and colossal CWT/A.

³ Treated percentage jumbo and colossal of marketable onions minus untreated percentage.

Results and Discussion

Thrips counts, yield, and size class distribution

of onions are displayed in Table 1. Thrips counts were reduced only slightly by Vydate treatments, from an average of 24.6 per plant in the untreated to 21.1 in the treated, but the difference was statistically significant (P<0.0001). The thrips sample was taken two weeks after the second Vydate application. The thrips population was sampled only once, so the exact size of late season infestations are unknown. The greatest yields were in the long season full Spanish varieties 'Mesquite' and 'Raptor', and Spanish storage varieties 'Tioga' and 'Pinnacle'. The greatest percentage of jumbo's tended to be in the longer season full Spanish varieties, although Tioga' had a greater percentage of jumbo's than other Spanish storage varieties.

Onion variety response to insecticide applications is displayed in Table 2. Some varieties show a relatively large response which did not calculate to be significant because of variability in the data and resultant large standard error. The full Spanish varieties tended to show the greatest positive response to the insecticide. 'Spinnaker' and 'Teton' showed a negative response to the insecticide applications.

Onion response to Vydate L applications are probably due more to the growth regulator effects of the compound than to reduction in thrips populations. Visual surveys of the thrips late in the season showed that populations never reached the levels that many western Colorado growers have experienced.

More research will be necessary to confirm varietal response to insecticide treatments. Contact and non-systemic insecticides should be compared with systemic carbamates such as Vydate L to determine exactly what growth regulator effect exists and to separate these effects from those of thrips feeding.

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