Onion Thrips Control – 2005
USU Experiment Station, Kaysville, UT

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Objectives: To evaluate the efficacy of new and alternative insecticides for suppression of onion thrips densities in dry bulb onions.

Methods:

'Vaquero' onion seeds were planted in mid March in double-row beds (3 ft spacing between beds) on the Utah State University Experiment Station Farm in Kaysville, UT. Plots for the onion thrips control trial were 12 ft (4 beds) wide by 20 ft long. A 5 ft buffer of untreated onions was left between plots within rows. The experimental design was a randomized complete block with eight insecticide treatments and four replicate blocks (see plot map).

Onion thrips densities were sampled by collecting two whole plants per plot (each plant was cut at the lower neck above the bulb) and placing plants into a quart-sized mason jar with soapy water. Thrips were collected from plants by agitating the jar vigorously, pouring the soapy water and onion plants into a fine-mesh sieve, washing the plants thoroughly, and then rinsing the thrips from the sieve with 70% ethanol into a glass vial. Adult and immature thrips life stages were then counted in a petri dish under a dissecting microscope at 15 to 20 X magnification. To sample thrips eggs inserted within leaf tissue, one leaf (2^{nd} or 3^{rd} youngest) was collected from each plant that was sampled as described above, stained with acid fuchsin, and pressed between plates of glass with glycerin, and observed under the dissecting microscope at 25 to 30 X magnification to count the number of onion thrips eggs per leaf. Thrips densities were sampled on August 10 before applying insecticide treatments, and at 7, 14, 21, and 28 days after treatment (DAT) (on August 17, 24, and 31, and September 7, respectively).

Insecticide treatments were applied as dilute solutions with a motorized Solo brand backpack sprayer at a rate of 50 gal per acre. This rate ensured good penetration of the insecticide spray into the neck region of onion plants where thrips reside. All treatments were applied on August 10 and Treatments 4-7 (with the exception of BYI 8330 treatments and the untreated control) were reapplied on August 24. Therefore, the two BYI 8330 treatments (Trts. 2 and 3) were applied only once and thrips densities were evaluated up to 28 DAT, whereas the other insecticide treatments (Trts. 4-8) were applied twice and evaluated up to 14 DAT following each application.

Insecticide Treatments:

1. Untreated control
2. BYI 8330 150 OD at 6 oz./acre + 0.5% v/v MSO
3. BYI 8330 150 OD at 8 oz/acre + 0.5% v/v MSO
4. Success at 5 oz/acre + 1% v/v Stylet Oil
5. Diatect at 3 lb/acre + 1% v/v Stylet Oil
6. Safer's Insecticidal Soap at 2.5 oz/acre + 2% v/v Neem Oil
7. Stylet Oil at 1% v/v
8. Mustang at 4 oz/acre + 1% v/v Stylet Oil

Onion thrips densities (adults, immatures, and eggs) were compared among treatments within dates and cumulative numbers of each life stage from 7 to 28 DAT was compared among treatments with analysis of variance (Proc Glm, SAS Institute). Means and standard errors are presented on a per plant basis for adults and immatures and on a per leaf basis for eggs. Fisher's least significance difference test was used to separate means when treatments were significantly different.

Results and Discussion:

Adult onion thrips densities on plants were low during the trial, ranging from 1.5 to 9.3 adults per plant, and did not differ among insecticide treatments before or after treatments were applied (Table 1).

Immature thrips densities were much more variable and higher during the trial, ranging from 1.0 to 87.8 immatures per plant. Again, densities of immatures did not differ before treatments were applied, and although numerical counts varied among treatments across post-treatment dates, there were no statistical difference among treatments because of the high variation in densities (Table 2). Treatments that performed the best to lower densities of immature thrips were BYI 8330 150 OD at the 8 oz/acre rate which kept densities low through 28 DAT, and Success which lowered densities at 7 and 14 DAT following each of the two applications (on August 10 and 24) (Table 2). Mustang lowered immature thrips densities after the first application on August 10, but did not perform as well following the second application on August 24. Diatect, Insecticidal Soap, and Stylet Oil did not lower immature thrips densities during the trial. However, none of these differences in immature thrips counts were statistically significant.

Table 1. Densities of adult thrips per onion plant as influenced by insecticide treatments.

Treatment	Mean number of thrips per plant ± SE				
	Pre-treatment	7 DAT	14 DAT	21 (7) DAT	28 (14) DAT
Untreated control	5.5 ± 2.4	3.0 ± 1.3	12.3 ± 6.3	5.5 ± 1.8	4.3 ± 2.6
BYI 8330 150 OD 6 oz/acre + 0.5% v/v MSO	3.5 ± 1.4	2.5 ± 1.0	5.5 ± 3.2	3.8 ± 1.7	3.5 ± 2.8
BYI 8330 150 OD 8 oz/acre + 0.5% v/v MSO	3.8 ± 1.8	0.5 ± 0.3	2.3 ± 0.8	2.8 ± 2.1	1.8 ± 0.9
Success 5 oz/acre + 1% v/v Stylet Oil	3.0 ± 1.7	2.8 ± 0.9	2.5 ± 1.0	4.0 ± 0.6	1.0 ± 0.4
Diatect 3 lb/acre + 1% v/v Stylet Oil	4.0 ± 1.8	4.8 ± 2.1	8.0 ± 4.7	6.5 ± 3.6	0.8 ± 0.5
Safer's Insecticidal Soap 2.5 oz/gal + 2% v/v Neem Oil	1.5 ± 1.2	7.0 ± 3.4	2.8 ± 2.4	4.3 ± 2.0	2.0 ± 1.2
Stylet Oil 1% v/v	9.3± 6.2	8.3 ± 4.5	4.8 ± 1.9	3.3 ± 1.3	3.3 ± 2.0
Mustang 4 oz/acre + 1% v/v Stylet Oil	1.5 ± 1.2	2.3 ± 1.7	2.3 ± 1.7	5.0 ± 2.5	1.8 ± 0.9
P > F	0.56	0.25	0.36	0.94	0.82

Means within a column followed by the same letter are not significantly different at $p \leq 0.05$.
Fisher's least significant difference test was used to separate means.

Table 2. Densities of immature thrips per onion plant as influenced by insecticide treatments.

Treatment	Mean number of thrips per plant ± SE				
	Pre-treatment	7 DAT	14 DAT	21 (7) DAT	28 (14) DAT
Untreated control	28.0 ± 11.2	51.0 ± 33.4	30.5 ± 16.1	87.8 ± 36.8	41.3 ± 23.4
BYI 8330 150 OD 6 oz/acre + 0.5% v/v MSO	18.8 ± 7.2	26.8 ± 4.4	23.8 ± 11.8	34.5 ± 12.2	50.0 ± 20.9
BYI 8330 150 OD 8 oz/acre + 0.5% v/v MSO	16.8 ± 7.7	14.3 ± 4.5	7.0 ± 4.4	26.0 ± 9.3	8.0 ± 2.9
Success 5 oz/acre + 1% v/v Stylet Oil	15.3 ± 5.9	18.5 ± 10.6	5.3 ± 3.3	1.0 ± 0.6	10.5 ± 2.3
Diatect 3 lb/acre + 1% v/v Stylet Oil	25.3 ± 8.4	29.8 ± 9.1	44.8 ± 21.2	21.3 ± 14.1	9.8 ± 3.7
Safer's Insecticidal Soap 2.5 oz/gal + 2% v/v Neem Oil	37.8 ± 21.3	22.5 ± 6.4	39.3 ± 30.7	27.0 ± 14.7	28.8 ± 8.5
Stylet Oil 1% v/v	45.5± 24.5	24.8 ± 17.1	38.8 ± 23.2	19.0 ± 9.1	45.8 ± 16.4
Mustang 4 oz/acre + 1% v/v Stylet Oil	61.3 ± 24.4	8.5 ± 7.8	9.5 ± 3.9	32.0 ± 13.0	22.3 ± 16.9
P > F	0.31	0.64	0.47	0.06	0.28

Means within a column followed by the same letter are not significantly different at $p \leq 0.05$.
Fisher's least significant difference test was used to separate means.

Similar to immature counts, densities of onion thrips eggs were also variable and higher than adult counts, ranging from 12.3 to 364.3 per leaf during the trial (Table 3). Egg densities did not significantly differ among treatments before the trial began on August 10, but there was a large range in numbers per leaf (Table 3). On August 17 (7 DAT), all insecticides significantly lowered eggs densities as compared to the untreated control. This is surprising and doesn't fit with biologically-based reasoning since insecticides did not affect adult densities which should influence the numbers of eggs found in leaves. The most likely explanation is that although insecticides and their oil adjuvants did not reduce adult densities, they did deter oviposition. This explanation is not supported by egg counts on later dates as there was not similar

suppression of egg numbers following reapplication of Treatments 4-7 on August 24 (on 21 (7) DAT) and densities increased to highest levels in Diatect and Insecticidal Soap treatments on the final sample date, 28 (14) DAT (Table 3). Insecticides that caused the most consistent reduction in egg densities were BYI 8330 150 OD at 8oz/acre, Success, and Mustang.

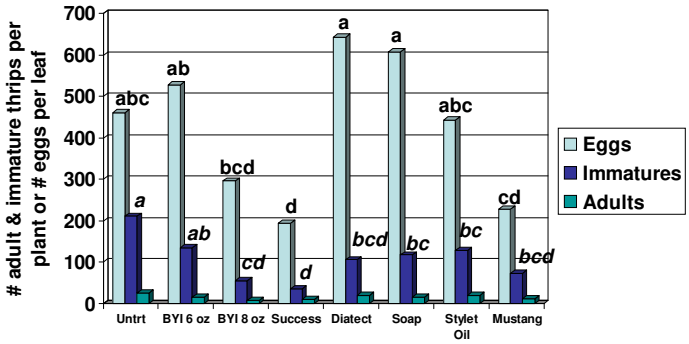
Table 3. Densities of thrips eggs per onion leaf as influenced by insecticide treatments.

Treatment	Mean number of thrips per plant ± SE				
	Pre-treatment	7 DAT	14 DAT	21 (7) DAT	28 (14) DAT
Untreated control	108.0 ± 51.6	120.3 ± 40.3a	95.8 ± 29.4	142.0 ± 76.5	102.8 ± 35.2 bc
BYI 8330 150 OD 6 oz/acre + 0.5% v/v MSO	78.3 ± 36.8	51.3 ± 16.9 b	91.0 ± 42.4	131.0 ± 27.1	254.8 ± 87.5 ab
BYI 8330 150 OD 8 oz/acre + 0.5% v/v MSO	56.5 ± 35.0	11.0 ± 1.7 b	78.3 ± 36.8	130.5 ± 45.7	75.8 ± 18.8 bc
Success 5 oz/acre + 1% v/v Stylet Oil	120.0 ± 62.8	19.0 ± 4.7 b	32.3 ± 10.7	46.0 ± 12.2	95.8 ± 39.5 bc
Diatect 3 lb/acre + 1% v/v Stylet Oil	45.3 ± 10.3	24.3 ± 10.4 b	153.0 ± 49.6	101.0 ± 16.7	364.3 ± 131.7 a
Safer's Insecticidal Soap 2.5 oz/gal + 2% v/v Neem Oil	37.3 ± 13.5	40.8 ± 11.4 b	24.0 ± 9.8	185.8 ± 41.7	356.5 ± 65.0 a
Stylet Oil 1% v/v	43.0 ± 18.5	52.8 ± 35.0 b	94.3 ± 28.7	193.3 ± 26.0	103.5 ± 17.5 bc
Mustang 4 oz/acre + 1% v/v Stylet Oil	12.3 ± 1.9	19.5 ± 5.9 b	38.8 ± 6.9	118.8 ± 20.4	50.0 ± 8.6 c
$P > F$	0.32	0.03	0.12	0.38	0.01

Means within a column followed by the same letter are not significantly different at $p \leq 0.05$.
Fisher's least significant difference test was used to separate means.

Cumulative densities of onion thrips immatures and eggs following application of insecticides showed greater differences among treatments. Cumulative numbers of immature thrips per plant were significantly reduced ($F = 4.34$, $p = 0.004$, df = 7, 31) in Success, BYI 8330 at 8 oz/acre, Mustang, Diatect, Insecticidal Soap, and Stylet Oil as compared to the Untreated Control (Fig. 1). Cumulative numbers of onion thrips eggs per leaf were significantly lowered ($F = 4.52$, $p = 0.003$, df = 7, 31) only in Success as compared to the Untreated Control (Fig. 1). There were no differences in numbers of cumulative adults among treatments.

Fig. 1. Cumulative number of thrips following insecticide treatments (7 to 28 DAT).



In conclusion, thrips densities per plant were highly variable and made it difficult to distinguish differences among treatments. Likely reasons are the relatively small size of plots (12 ft x 20 ft) and low number of plants sampled (2 plants per plot x 4 replicate blocks per treatment = 8 plants per treatment per date). Increasing plot and sample size may reduce data variability. Densities of adult onion thrips were not influenced by insecticide treatments, but densities of immatures and eggs were affected. Success, Mustang, and BYI 8330 at 8 oz/acre had the lowest cumulative numbers of eggs and immatures as compared to the other insecticides and the Untreated Control. Using an economic threshold of 20 immature thrips per plant, Success, BYI 8330 at 8 oz/acre and Mustang kept onion thrips densities below this threshold on most post-treatment dates. Finally, keep in mind that BYI 8330 treatments were applied only once and 21 and 28 DAT comparisons are being made to 7 and 14 DAT following the second application of Success, Mustang, and other insecticides.