California Lettuce Research Board

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Title: Insect Management for Central Coast Lettuce

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Objective:
To evaluate the efficacy of registered and potential pesticides for pest management on lettuce
(1) Aphids.
(2) Thrips

(1) Managing Aphids on Romaine Lettuce

Materials and Methods

Experimental Design. A field study was conducted in a romaine field of a grower-cooperator in Salinas, California during 2007. Romaine seeds, *Lactuca sativa*, were seeded 2 inches apart in rows on 40-inch beds. The plants were thinned to 8 inches apart in rows and the plots were prepared for the study on July 5. The trial was conducted on 14 plots of 40-inch beds by 30 feet long in a randomized complete block design with four replications. The 14 treatments, including 12 chemical treatments, an untreated control, and a grower's standard treatment were: (1) Movento (3.0 fl oz/A) + Dyne-Amic 0.25% v/v, (2) Movento (5.0 fl oz/A) + Dyne-Amic 0.25% v/v, (3) Provado 1.6F (3.75 fl oz/A) + Dyne-Amic 0.25% v/v, (4) GWN-1997 (6.5 fl oz/A) + Dyne-Amic 0.25% v/v, (5) GWN-1997 (19.5 fl oz/A) + Dyne-Amic 0.25% v/v, (6) GWN-2100 (3.1 oz/A) + Dyne-Amic 0.25% v/v, (7) Assail 30SG (4.0 oz/A) + Dyne-Amic 0.25% v/v, (8) Platinum 2SC (11.0 fl oz/A), (9) A15452B (13.7 fl oz/A), (10) Pirimor (4.0 oz/A), (11) Pirimor (8.0 oz/A), (12) Pirimor (4.0 oz/A) + Sylgard 2 fl oz/A), (13) Untreated control, and (14) Grower's standard treatment.

All chemicals required for the 12 treatments were applied at 30 psi by using a Hand Held Sprayer Units (R & D Sprayers, Opelousas, LA) with a single flat fan nozzle per seedline in an equivalent of 65 gals of water per acre. On July 6 and 23, the required chemicals were applied on the plants of treatments (1) to (7) and (10) to (12). On July 6, the required chemicals of treatments (8) and (9) were applied once on the crown of the plant-line in the test plots.

Aphid Populations. Insect populations in the study were sampled on July 9 (3DAT, 1st application), July 13 (7DAT, 1st application), July 17(11DAT, 1st application), July 20 (14DAT, 1st application), July 27 (4DAT, 2nd application), July 31 (7DAT, 2nd application), and August 7 (14DAT, 2nd application), 2007. On each sampling date five plants were sampled randomly from each plot and bagged individually and returned to the laboratory in Salinas for direct aphid counts.

Data Analyses. The means of aphids per plant in each treatment of each replication on each sampling date were calculated. The calculated means of aphids per plants in each treatment were used for data analyses. Aphid numbers for each insecticide application and the pooled data of the two insecticide applications were analyzed by the Analyses of Variance and Tukey's multiple comparison procedure (SAS Institute 2002) among treatments.

Results and Discussion

Aphid Populations. The aphid species observed on lettuce during the study were: lettuce aphid, *Nasonovia ribisnigri* (Mosley) and green peach aphid, *Myzus persicae* (Sulzer) (Homoptera: Aphididae). More than 4,000 aphids were counted from all the samples collected during the study; however, 95.3% was lettuce aphids and 4.7% was green peach aphids.

Data analyses. The means of aphids per plant in each treatment of each replication during each sampling date were calculated and were used for the statistical analyses. The data were pooled and analyzed for each insecticide application (Tables 1 and 2) and pooled for the two insecticide applications of the study (Table 3). Although the data for the two aphid species were analyses separately and the results are listed on the Tables, it seems that the green peach aphid density was relatively low during the trial and did not have great impacts on the study. Hence, the following discussion is focusing on the pooled data of the two aphid species.

The results of the pooled data of the first application showed that the aphid numbers in all the chemical treatments were significantly lower than those of the untreated plots (Table 1: LSD = 4.6, $F = 19.72$, df = 13, $P < 0.0001$). However, the results of the pooled data of the second application showed that the aphid numbers in all the chemical treatments were also significantly lower than those of the untreated plots (Table 2: LSD = 5.39, $F = 52.97$, df = 13, $P < 0.0001$).

Moreover, the results for the pooled data for both first and second applications are listed on Table 3. The results indicated that the aphid numbers on the treated plots were significantly lower than those of the untreated plots during the study (LSD = 3.9, $F = 52.08$, df = 13, $P < 0.0001$). The results demonstrated that the chemicals conducted in this trail were effectively managing the aphid populations on romaine plants. In addition, no phytotoxicity of the tested chemicals was observed on plants during the study.

Table 1. Treatments, rates of applications, and means of aphids on plants of all sampling days (3, 7, 11, and 14DAT) for the first treatment (2007)

Treatment	Pesticide	Rates	Mean ± SEM [ab]		
			Lettuce aphid	Green peach aphid	Pooled
1	Movento Dyne-Amic	3.0 oz/A 0.25% v/v	0.3 ± 0.25 c	0.04 ± 0.03	0.34 ± 0.26 b
2	Movento Dyne-Amic	5.0 oz/A 0.25% v/v	0.2 ± 0.12 c	0.03 ± 0.03	0.23 ± 0.13 b
3	Provado 1.6F Dyne-Amic	3.75 fl oz/A 0.25% v/v	0.4 ± 0.16 c	0.0 ± 0.0	0.4 ± 0.16 b
4	GWN-1997 Dyne-Amic	6.5 fl oz/A 0.25% v/v	1.31 ± 0.7 bc	0.04 ± 0.03	1.35 ± 0.71 b
5	GWN-1997 Dyne-Amic	19.5 fl oz/A 0.25% v/v	0.88 ± 0.4 bc	0.06 ± 0.06	0.94 ± 0.41 b
6	GWN-2100 Dyne-Amic	3.1 oz/A 0.25% v/v	3.78 ± 1.7 b	0.01 ± 0.01	3.39 ± 1.7 b
7	Assail 30SG Dyne-Amic	3.1 oz/A 0.25% v/v	0.21 ± 0.11 c	0.08 ± 0.04	0.29 ± 0.12 b
8	Platinum 2SC	11.0 fl oz/A	0.39 ± 0.12 c	0.03 ± 0.03	0.41 ± 0.12 b
9	A15452B	13.7 fl oz/A	0.66 ± 0.39 c	0.03 ± 0.03	0.69 ± 0.4 b
10	Pirimor	4.0 oz/A	0.15 ± 0.07 c	0.0 ± 0.0	0.15 ± 0.07 b
11	Pirimor	8.0 oz/A	0.21 ± 0.11 c	0.05 ± 0.04	0.26 ± 0.12 b
12	Pirimor Sylgard	4.0 oz/A 2.0 fl oz/A	0.53 ± 0.26 c	0.01 ± 0.01	0.54 ± 0.27 b
13	Untreated	NA	16.13 ± 2.99 a	0.23 ± 0.12	16.35 ± 2.97 a
14	Grower's standard	NA	0.61 ± 0.22 c	0.06 ± 0.05	0.68 ± 0.22 b
	LSD		4.61	0.21	4.6
	F		19.16	1.64	19.72
	P > F		<0.0001	0.07	<0.0001

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).

Table 2. Treatments, rates of applications, and means of aphids on plants of all sampling days (4, 7, and 14DAT) for the second treatment (2007)

Treatment	Pesticide	Rates	Mean ± SEM [ab]		
			Lettuce aphid	Green peach aphid	Pooled
1	Movento Dyne-Amic	3.0 oz/A 0.25% v/v	0.48 ± 0.17 b	0.05 ± 0.04 bc	0.53 ± 0.2 b
2	Movento Dyne-Amic	5.0 oz/A 0.25% v/v	0.13 ± 0.06 b	0.07 ± 0.03 bc	0.2 ± 0.06 b
3	Provado 1.6F Dyne-Amic	3.75 fl oz/A 0.25% v/v	0.43 ± 0.13 b	0.02 ± 0.02 c	0.45 ± 0.13 b
4	GWN-1997 Dyne-Amic	6.5 fl oz/A 0.25% v/v	2.38 ± 0.71 b	0.52 ± 0.19 ab	2.9 ± 0.88 b
5	GWN-1997 Dyne-Amic	19.5 fl oz/A 0.25% v/v	2.07 ± 0.69 b	0.27 ± 0.13 bc	2.33 ± 0.76 b
6	GWN-2100 Dyne-Amic	3.1 oz/A 0.25% v/v	3.08 ± 1.74 b	0.2 ± 0.08 bc	3.28 ± 1.73 b
7	Assail 30SG Dyne-Amic	3.1 oz/A 0.25% v/v	0.55 ± 0.15 b	0.08 ± 0.06 bc	0.63 ± 0.14 b
8	Platinum 2SC	11.0 fl oz/A	0.48 ± 0.17 b	0.01 ± 0.05 bc	0.58 ± 0.18 b
9	A15452B	13.7 fl oz/A	0.3 ± 0.15 b	0.12 ± 0.07 bc	0.42 ± 0.17 b
10	Pirimor	4.0 oz/A	0.93 ± 0.59 b	0.17 ± 0.08 bc	1.1 ± 0.59 b
11	Pirimor	8.0 oz/A	2.13 ± 0.65 b	0.18 ± 0.08 bc	2.32 ± 0.63 b
12	Pirimor Sylgard	4.0 oz/A 2.0 fl oz/A	2.37 ± 0.66 b	0.33 ± 0.17 bc	2.7 ± 0.64 b
13	Untreated	NA	30.58 ± 3.39 a	0.98 ± 0.16 a	31.57 ± 3.44 a
14	Grower's standard	NA	0.67 ± 0.17 b	0.02 ± 0.02 c	0.68 ± 0.17 b
	LSD		5.29	0.48	5.39
	F		51.82	6.72	52.97
	P > F		<0.0001	<0.0001	<0.0001

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).

Table 3. Treatments, rates of applications, and means of aphids on plants of all sampling days for the first and second treatments (2007)

Treatment	Pesticide	Rates	Mean ± SEM [ab]		
			Lettuce aphid	Green peach aphid	Pooled
1	Movento Dyne-Amic	3.0 oz/A 0.25% v/v	0.38 ± 0.16 b	0.04 ± 0.02 b	0.42 ± 0.17 b
2	Movento Dyne-Amic	5.0 oz/A 0.25% v/v	0.17 ± 0.0b	0.04 ± 0.02 b	0.21 ± 0.07 b
3	Provado 1.6F Dyne-Amic	3.75 fl oz/A 0.25% v/v	0.41 ± 0.11 b	0.01 ± 0.01 b	0.42 ± 0.11 b
4	GWN-1997 Dyne-Amic	6.5 fl oz/A 0.25% v/v	1.77 ± 0.5 b	0.24 ± 0.09 b	2.01 ± 0.56 b
5	GWN-1997 Dyne-Amic	19.5 fl oz/A 0.25% v/v	1.39 ± 0.38 b	0.15 ± 0.07 b	1.54 ± 0.42 b
6	GWN-2100 Dyne-Amic	3.1 oz/A 0.25% v/v	3.25 ± 1.2 b	0.09 ± 0.04 b	3.34 ± 1.2 b
7	Assail 30SG Dyne-Amic	3.1 oz/A 0.25% v/v	0.36 ± 0.09 b	0.08 ± 0.03 b	0.44 ± 0.09 b
8	Platinum 2SC	11.0 fl oz/A	0.43 ± 0.1 b	0.06 ± 0.03 b	0.49 ± 0.11 b
9	A15452B	13.7 fl oz/A	0.51 ± 0.23 b	0.06 ± 0.03 b	0.57 ± 0.24 b
10	Pirimor	4.0 oz/A	0.49 ± 0.26 b	0.07 ± 0.04 b	0.56 ± 0.27 b
11	Pirimor	8.0 oz/A	1.04 ± 0.33 b	0.11 ± 0.04 b	1.14 ± 0.34 b
12	Pirimor Sylgard	4.0 oz/A 2.0 fl oz/A	1.31 ± 0.36 b	0.15 ± 0.08 b	1.46 ± 0.37 b
13	Untreated	NA	22.32 ± 2.6 a	0.55 ± 0.12 a	22.87 ± 2.64 a
14	Grower's standard	NA	0.64 ± 0.14 b	0.04 ± 0.03 b	0.68 ± 0.14 b
	LSD		3.84	0.26	3.9
	F		51.64	6.2	52.08
	P > F		<0.0001	<0.0001	<0.0001

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).

(2) Managing Thrips on Romaine Lettuce

Materials and Methods

Experimental Design. A field study was conducted in a romaine field of a grower-cooperator adjacent to an onion field in Greenfield, California during 2007. Romaine seeds, *Lactuca sativa*, were seeded 2 inches apart in rows on 80-inch beds. The plants were thinned to 8 inches apart in rows and the plots were prepared for the study on July 26. The trial was conducted on 11 plots of 80-inch beds by 20 feet long in a randomized complete block design with four replications. The 11 treatments, including 9 chemical treatments, an untreated control, and a grower's standard treatment were: (1) Assail 30SG (4.0 oz/A) + Silwet L77 at 0.125% v/v, (2) Assail 30SG (3.0 oz/A) + Up-Cyde 2.5EC (4.0 fl oz/A) + Silwet L77 at 0.125% v/v, (3) Assail 30SG (3.0 oz/A) + Bifenture 2EC (4.0 fl oz/A) + Silwet L77 at 0.125% v/v, (4) Bifenture 2EC (5.0 fl oz/A) + Silwet L 77 at 0.125% v/v, (5) F6113 (10.0 fl oz/A) + Silwet L77 at 0.125% v/v, (6) F2700 (4.0 fl oz/A) + Silwet L77 at 0.125% v/v, (7) F2700 (4.0 fl oz/A) + Beleaf 50SG (2.8 oz/A) + Silwet L77 at 0.125% v/v, (8) Radiant 1SC (6.0 fl oz/A) + Silwet L77 at 0.125% v/v, (9) Radiant 1SC (8.0 fl oz/A) + Silwet L77 at 0.125% v/v, (10) Untreated control, and (11) Grower's standard treatment. All chemicals required for the treatments were applied at 30 psi by using a Hand Held Sprayer Units (R & D Sprayers, Opelousas, LA) with a single flat fan nozzle per seedline in an equivalent of 65 gals of water per acre. On July 28 and August 7, the required chemicals were applied on the plants in the test plots.

Insect Populations. Insect populations in the study were sampled on July 31 (3DAT, 1st application), August 3 (6DAT, 1st application), August 10 (3DAT, 2nd application), August 14 (7DAT, 2nd application), and August 21 (14DAT, 2nd application), 2007. On each sampling date five plants were sampled randomly from each plot and bagged individually and returned to the laboratory in Salinas for insect counts. In the lab the plants sampled were washed with water individually in a large funnel and insects were collected by a filter beneath the funnel. The filter was examined under a microscope for insect counts.

Data Analyses. The means of insects per plant in each treatment of each replication on each sampling date were calculated. The calculated means of insects per plant in each treatment were used for data analyses. Insect numbers of each insecticide application and the pooled data of the two insecticide applications were analyzed by the Analyses of Variance and Tukey's multiple comparison procedure (SAS Institute 2002) among treatments.

Results and Discussion

Insect Populations. The insect species observed on lettuce during the study were thrips and aphids. Randomly examined some collected thrips under the microscope, all the thrips were belonged to the Family Thripidae, which may include the western flower thrips, *Frankliniella occidentalis* (Pergande); onion thrips, *Thrips tabaci* Lindeman; and greenhouse thrips, *Heliothrips haemorrhoidalis* (Bouché). However, the aphids observed in the samples were lettuce aphid, *Nasonovia ribisnigri* (Mosley) and green peach aphid, *Myzus persicae* (Sulzer) (Homoptera: Aphididae).

Data analyses. The means of thrips and aphids per plant in each treatment of each replication during each sampling date were calculated and were used for the statistical analyses. The pooled data were analyzed for each insecticide application (Tables 4, 5, and 6) and pooled for the two insecticide applications of the study (Table 7).

The statistical results of the first insecticide application are listed on Table 4. The results showed that the thrips numbers in all chemical treatments were significantly lower than those of the untreated (Table 4: LSD = 3.08, $F = 11.22$, df = 10, $P < 0.0001$); however, thrips were observed on all the plants collected.

The statistical results of the pooled data of the first two sampling dates (3DAT and 7DAT) and all the sampling dates (3DAT, 7DAT, and 14DAT) of the second insecticide application are listed on Tables 5 and 6, respectively. The results showed that the thrips numbers in all chemical treatments of the pooled data of 3DAT and 7DAT of the second application were significantly lower (Table 5: LSD = 5.16, $F = 10.43$, df = 10, $P < 0.0001$) than those of the untreated. However, the thrips numbers in all chemical treatments of the pooled data of all sampling dates were not significantly different (Table 6: LSD = 26.72, $F = 1.01$, df = 10, $P = 0.44$) than those of the untreated control. It seems that the tested chemicals may not be effective on the 14DAT or a large number of thrips were migrated onto the romaine lettuce between the 7DAT and 14 DAT. Hence, the data of the 14DAT of the second application would not be considered for further analyses.

Moreover, the thrips numbers in all chemical treatments of the pooled data of the 3DAT and 6DAT of the first application and the 3DAT and 7DAT of the second application were significantly lower (Table 7: LSD = 3.67, $F = 12.84$, df = 10, $P < 0.0001$) than those of the untreated control. On a whole, the results of the study seem indicating that thrips were migrated from the onion field adjacent to the test plots, treatments has to be applied on the plots every 7-10 days in suppressing the thrips numbers to a tolerant level on the romaine lettuce.

During the study the aphids found on plants were relatively low, thus the numbers of the two species of aphids were pooled in each sampling date for statistical analyses. Although the results of the statistical analyses of aphids were significantly different (Table 7: LSD = 1.67, $F = 6.53$, df = 10, $P < 0.0001$) among treatments during the study, the actual numbers of aphids on plants were relatively low (Table 7: on an average less than 3 aphids per plant) and it seems that the aphids did not have great impacts on the study. Furthermore, no phytotoxicity of the tested chemicals was observed on plants during the study.

Table 4. Treatments, rates of applications, and means of thrips and aphids on plants of all sampling dates (3 and 6DAT) for the first treatment (2007)

			Mean ± SEM [ab]	
Treatment	Pesticide	Rates	Thrips	Aphids
1	Assail 30SG	4.0 oz/A	4.90 ± 0.49 bc	0.35 ± 0.15 b
	Silwet L77	0.125% v/v		
2	Assail 30 SG	3.0 oz/A	4.18 ± 0.77 bc	0.45 ± 0.19 ab
	Up-Cyde	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
3	Assail 30 SG	3.0 oz/A	5.45 ± 0.83 b	0.35 ± 0.14 b
	Bifenture 2 EC	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
4	Bifenture 2 EC	5.0 fl oz/A	4.50 ± 0.68 bc	1.30 ± 0.45 ab
	Silwet L77	0.125% v/v		
5	F6113	10.0 fl oz/A	3.65 ± 0.85 bcd	1.25 ± 0.30 ab
	Silwet L77	0.125% v/v		
6	F2700	4.0 fl oz/A	4.38 ± 0.66 bc	1.20 ± 0.46 ab
	Silwet L77	0.125% v/v		
7	F2700	4.0 fl oz/A	2.95 ± 0.87 bcd	0.43 ± 0.18 ab
	Beleaf 50SG	2.8 oz/A		
	Silwet L77	0.125% v/v		
8	Radiant 1SC	6.0 fl oz/A	1.83 ± 0.54 cd	1.28 ± 0.36 ab
	Silwet L77	0.125% v/v		
9	Radiant 1SC	8.0 fl oz/A	0.95 ± 0.11 d	0.88 ± 0.30 ab
	Silwet L77	0.125% v/v		
10	Untreated	NA	9.45 ± 0.62 a	1.85 ± 0.44 a
11	Grower's standard	NA	3.48 ± 0.39 bcd	0.13 ± 0.06 b
	LSD		3.08	1.44
	F		11.22	3.23
	P > F		<0.0001	0.0016

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).

Table 5. Treatments, rates of applications, and means of thrips and aphids on plants of the first two sampling dates (3 and 7DAT) for the second treatment (2007)

			Mean ± SEM [ab]	
Treatment	Pesticide	Rates	Thrips	Aphids
1	Assail 30SG	4.0 oz/A	9.88 ± 1.43 b	0.45 ± 0.22 b
	Silwet L77	0.125% v/v		
2	Assail 30 SG	3.0 oz/A	9.18 ± 1.51 b	0.23 ± 0.11 b
	Up-Cyde	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
3	Assail 30 SG	3.0 oz/A	9.40 ± 1.46 b	0.55 ± 0.32 b
	Bifenture 2 EC	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
4	Bifenture 2 EC	5.0 fl oz/A	7.98 ± 1.08 bc	0.73 ± 0.44 ab
	Silwet L77	0.125% v/v		
5	F6113	10.0 fl oz/A	7.10 ± 1.06 bc	0.53 ± 0.37 b
	Silwet L77	0.125% v/v		
6	F2700	4.0 fl oz/A	6.05 ± 0.94 bc	0.58 ± 0.18 b
	Silwet L77	0.125% v/v		
7	F2700	4.0 fl oz/A	5.28 ± 0.83 bc	0.60 ± 0.27 b
	Beleaf 50SG	2.8 oz/A		
	Silwet L77	0.125% v/v		
8	Radiant 1SC	6.0 fl oz/A	3.98 ± 0.46 c	0.35 ± 0.12 b
	Silwet L77	0.125% v/v		
9	Radiant 1SC	8.0 fl oz/A	3.10 ± 0.38 c	0.98 ± 0.30 ab
	Silwet L77	0.125% v/v		
10	Untreated	NA	16.18 ± 1.29 a	1.95 ± 0.40 a
11	Grower's standard	NA	7.18 ± 0.99 bc	0.18 ± 0.08 b
	LSD		5.16	1.32
	F		10.43	2.98
	P > F		<0.0001	0.0032

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).

Table 6. Treatments, rates of applications, and means of thrips and aphids on plants of all sampling dates (3, 7 and 14DAT) for the second treatment (2007)

			Mean ± SEM [ab]	
Treatment	Pesticide	Rates	Thrips	Aphids
1	Assail 30SG	4.0 oz/A	24.27 ± 6.56	0.32 ± 0.15 b
	Silwet L77	0.125% v/v		
2	Assail 30 SG	3.0 oz/A	23.15 ± 6.20	0.17 ± 0.08 b
	Up-Cyde	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
3	Assail 30 SG	3.0 oz/A	21.10 ± 5.43	0.37 ± 0.22 b
	Bifenture 2 EC	4.0 fl oz/A		
	Silwet L77	0.125% v/v		
4	Bifenture 2 EC	5.0 fl oz/A	20.40 ± 5.60	0.50 ± 0.31 b
	Silwet L77	0.125% v/v		
5	F6113	10.0 fl oz/A	18.98 ± 5.30	0.35 ± 0.25 b
	Silwet L77	0.125% v/v		
6	F2700	4.0 fl oz/A	22.03 ± 6.99	0.43 ± 0.13 b
	Silwet L77	0.125% v/v		
7	F2700	4.0 fl oz/A	16.60 ± 5.09	0.42 ± 0.19 b
	Beleaf 50SG	2.8 oz/A		
	Silwet L77	0.125% v/v		
8	Radiant 1SC	6.0 fl oz/A	13.70 ± 4.21	0.30 ± 0.09 b
	Silwet L77	0.125% v/v		
9	Radiant 1SC	8.0 fl oz/A	12.07 ± 3.92	0.72 ± 0.23 ab
	Silwet L77	0.125% v/v		
10	Untreated	NA	33.70 ± 7.55	1.58 ± 0.31 a
11	Grower's standard	NA	19.50 ± 5.42	0.13 ± 0.06 b
	LSD		26.72	0.94
	F		1.01	3.90
	P > F		0.44	<0.0001

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the $P = 0.05$ level (LSD).

Table 7. Treatments, rates of applications, and means of thrips and aphids on plants of the first two sampling dates for the first (3 and 6DAT) and second (3 and 7DAT) treatments (2007)

			Mean ± SEM [ab]	
Treatment	Pesticide	Rates	Thrips	Aphids
1	Assail 30SG Silwet L77	4.0 oz/A 0.125% v/v	7.39 ± 1.12 b	0.40 ± 0.15 b
2	Assail 30 SG Up-Cyde Silwet L77	3.0 oz/A 4.0 fl oz/A 0.125% v/v	6.68 ± 1.20 b	0.34 ± 0.13 b
3	Assail 30 SG Bifenture 2 EC Silwet L77	3.0 oz/A 4.0 fl oz/A 0.125% v/v	7.43 ± 1.10 b	0.45 ± 0.20 b
4	Bifenture 2 EC Silwet L77	5.0 fl oz/A 0.125% v/v	6.24 ± 0.88 bc	1.01 ± 0.36 ab
5	F6113 Silwet L77	10.0 fl oz/A 0.125% v/v	5.38 ± 0.91 bcd	0.89 ± 0.28 b
6	F2700 Silwet L77	4.0 fl oz/A 0.125% v/v	5.21 ± 0.69 bcd	0.89 ± 0.29 b
7	F2700 Beleaf 50SG Silwet L77	4.0 fl oz/A 2.8 oz/A 0.125% v/v	4.11 ± 0.75 bcd	0.51 ± 0.18 b
8	Radiant 1SC Silwet L77	6.0 fl oz/A 0.125% v/v	2.90 ± 0.51 cd	0.81 ± 0.25 b
9	Radiant 1SC Silwet L77	8.0 fl oz/A 0.125% v/v	2.03 ± 0.39 d	0.93 ± 0.24 b
10	Untreated	NA	12.81 ± 1.28 a	1.90 ± 0.33 a
11	Grower's standard	NA	5.33 ± 0.81 bcd	0.15 ± 0.06 b
	LSD		3.67	0.97
	F		12.84	5.16
	P > F		<0.0001	<0.0001

[a] Mean ± SEM of four replications.

[b] Mean within a column followed by the same letter are not significantly different at the *P* = 0.05 level (LSD).