

Thrips Management In Lettuce

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Introduction:

The western flower thrips, *Frankliniella occidentalis*, is a common pest in lettuce grown in the low desert region, and can cause serious economic losses to growers. Two trials was conducted to evaluate the efficacy of commercial and experimental insecticides for thrips control in iceberg lettuce and Romaine lettuce.

Materials and Methods:

Site location:	University of California Desert Research and Extension Center 1004 Holton Road El Centro, CA 92243
Host Crop:	Iceberg Lettuce and Romaine Lettuce
Variety:	EBLIN and Fresh/Heart, respectively
Planting date:	November 3, 2008
First irrigation:	November 5, 2008
Soil type:	Holtville silty clay, wet
Cultural practices:	40" raised beds with 2 seed-lines / bed Sprinkler irrigated to emergence Furrow irrigated for remainder of season Herbicide: Prefar 4E @ 5 qt / acre; Nov. 5, 2008
Experimental Design:	Randomized complete block (both experiments)
Replication and Units:	4 replicates of 50' x 13.3' (4 beds/plot)
Applications:	
In-Furrow:	Injected 2" below seed using 25.9 gpa
Band-Drench	Band sprayed at base of plant using 12 gpa; 30 psi
Foliar:	
Equipment:	Tractor mounted sprayer 3 nozzles (TJ-60 1103VS) / bed
Rate:	57 gallons / acre (36 psi)

See below for insecticides, rates application dates for each experiment below:

Table 1. List of Treatments and Rates for Thrips Control in Iceberg Lettuce, 2008/09.

Treatment	Oz/acre	Amt/4 gal	Treatment date	Plot numbers
1. Check	-----	-----	-----	7, 11, 23, 33
2. Venom 20 SG* f/b Mustang	20.0 f/b 3.4	87.7 gm 7.1 ml	3 Nov 23, 30 Jan, 6 Feb	8, 18, 22, 35
3. Ecozin Plus*** fb Requiem	15.0 fb 64.0	31.3 ml 133.4 ml	23 Jan, 6 Feb 30 Jan	9, 17, 25, 30
4. Lannate LV	24.0	50.0 ml	23, 30 Jan, 6 Feb	4, 12, 26, 36
5. Success fb Requiem	10.0 fb 64.0	19.3 ml 133.4 ml	23 Jan, 6 Feb 30 Jan	6, 14, 21, 28
6. Radiant	7.0	14.6 ml	23, 30 Jan, 6 Feb	5, 15, 19, 31
7. Success fb Lannate LV	10.0 fb 24.0	20.9 ml 50.0 ml	23 Jan, 6 Feb 30 Jan	2, 10, 27, 34
8. Durivo**	13.0	25.2 ml/3l	13 Jan	3, 16, 20, 32
9. HGW86 10 SE	13.4	27.9 ml	23, 30 Jan, 6 Feb	1, 13, 24, 29

* At Plant soil injection. ** Band drench at base of plants. *** Buffered to pH 5.5. MSO @ 0.25% v/v (37.9 ml/4 gal) added to each foliar spray mixture.

Table 2. List of Treatments and Rates for Thrips Control in Romaine Lettuce, 2008/09.

Treatment	Oz/acre	Amt/4 gal	Treatment date	Plot numbers
1. Untreated Control	-----	-----	-----	7, 11, 23, 33
2. Venom 20 SG* f/b Mustang f/b Lannate LV	20.0 f/b 3.4 f/b 24.0	87.7 gm 7.1 ml 50.0 ml	3 Nov 23 Jan, 6 Feb 30 Jan	8, 18, 22, 35
3. Success + Ecozin Plus***	10.0 + 12.0	20.9 ml 25.0 ml	23, 30 Jan, 6 Feb	9, 17, 25, 30
4. Radiant	7.0	14.6 ml	23, 30 Jan, 6 Feb	4, 12, 26, 36
5. Lannate LV f/b Radiant	24.0 f/b 7.0	50.0 ml 14.6 ml	23, 30 Jan, 6 Feb	6, 14, 21, 28
6. Orthene 97 + Ecozin Plus****	24.0 + 12.0	48.0 gm 25.0 ml	23, 30 Jan, 6 Feb	5, 15, 19, 31
7. Rimon 0.83 EC f/b Radiant	12.0 f/b 7.0	25.0 ml 14.6 ml	23 Jan, 6 Feb 30 Jan	2, 10, 27, 34
8. Durivo**	13.0	25.2 ml/3l	13 Jan	3, 16, 20, 32
9. HGW86 10 SE	13.4	27.9 ml	23, 30 Jan, 6 Feb	1, 13, 24, 29

*At Plant soil injection. **Band drench at base of plants. ***Buffered to pH 7.0. ****Buffered to pH 5.5. MSO @ 0.25% v/v (37.9 ml/4 gal) added to each foliar spray mixture.

Evaluations:

Iceberg lettuce evaluations were conducted on 12, 26, 30 January, 5, 12 and 19 February 2009 and for Romaine lettuce on 13, 27, 30 January, 5, 12, and 23 February 2009. During each evaluation, 5 lettuce plants were examined and the number of western flower thrips found was recorded (Tables 3 and 4).

Harvest data was collected from 13.1 row feet of each plot (0.001 acre) and for each experiment on 19 February for iceberg lettuce and on 23 February for Romaine lettuce. The number of marketable naked heads recorded, as well as the number of culls caused by extensive thrips damage. The total number and weight of marketable heads was recorded. The percent of heads considered marketable due to lack thrips damage was also determined (Tables 5 and 6).

Statistical analysis:

Raw data were analyzed using ANOVA and means separated using Least Significant Difference Test ($P=0.05$). Log ($X+1$) transformations were used, as needed, with de-transformed means presented in tables.

Results and Discussion:

All of the test products were effective in significantly reducing ($P=0.05$) populations of western flower thrips, compared to the untreated check plots for both the iceberg and Romaine lettuce experiments (Tables 3 and 4). In the iceberg lettuce experiment, Vemon followed by Mustang and Radiant were the most effective treatments and HGW86 10 SE was the least efficacious with significantly more thrips than the aforementioned treatments for the average over the experiment (Table 3). In the Romaine experiment, Success + Ecozin Plus the most effective treatment and Durivo was the least efficacious with significantly more thrips than Success + Ecozin Plus for the average over the experiment (Table 4).

All of the test products produced more market quality heads, higher percentages of marketable heads and fewer thrips damaged heads than the untreated check plots for both the the iceberg and Romaine lettuce experiments (Tables 5 and 6). In the iceberg lettuce experiment, plots treated with Radiant and Success followed by Requiem had the highest yields, significantly more than Durivo and Vemon followed by Mustang (Table 5). In the Romaine experiment, plots treated with Orthene 97 + Ecozin Plus and plots treated with Rimon 0.83 EC followed by Radiant had the highest percentages of market quality heads, but there were no differences among the treatments for numbers of marketable heads or weight of market heads.

Not surprisingly, treatment that included Radiant, Success, Mustang or Lannate performed well against western flower thrips as they have in earlier experiments in 2005 and 2006 and are used as industry standards. Ecozin Plus and Requiem look promising for thrips control in lettuce. Durivo and HGW86 10 SE may also become useful thrips control insecticides for lettuce growers. HGW86 is cyazypyr, an experimental compound under development by DuPont.

Table 3. All Stages of Western Flower Thrips per Five Plants in Iceberg Lettuce, 2008/09.

Treatment	Oz/acre	12 Jan	26 Jan	30 Jan	5 Feb	12 Feb	19 Feb ^z	Average
Check	-----	89.25	89.25 a	185.00 a	44.00 a	47.25 a	26.09 a	80.25 a
Venom 20 SG f/b Mustang	20.0 f/b 3.4	61.75	20.75 b	46.50 d	12.50 bc	11.00 b	1.21 c	25.75 d
Ecozin Plus fb Requiem	15.0 fb 64.0	82.75	26.75 b	48.50 d	7.50 c	9.50 b	4.18 bc	30.00 cd
Lannate LV	24.0	67.25	30.75 b	48.75 d	16.00 bc	7.75 b	4.14 bc	29.13 cd
Success fb Requiem	10.0 fb 64.0	57.75	35.25 b	70.00 d	14.75 bc	13.25 b	2.98 bc	32.38 c
Radiant	7.0	51.75	32.00 b	48.50 d	13.75 bc	6.75 b	2.22 bc	25.96 d
Success fb Lannate LV	10.0 fb 24.0	82.00	35.25 b	106.25 c	18.00 b	11.25 b	4.38 bc	43.71 c
Durivo	13.0	67.25	38.50 b	57.75 d	17.25 bc	10.75 b	3.56 bc	32.58 c
HGW86 10 SE	13.4	83.00	33.25 b	137.50 b	16.75 bc	14.25 b	6.86 b	48.67 b

Means within columns followed by the same letter are not significantly different; LSD, $P=0.05$.

^zLog transformed data used for analysis; back transformed means shown in the table.

Table 4. All Stages of Western Flower Thrips per Five Plants in Romaine Lettuce, 2008/09.

Treatment	Oz/acre	13 Jan	27 Jan	30 Jan	5 Feb	12 Feb	23 Feb	Average
Check	-----	36.50	44.75 a	53.50 a	46.00 a	44.25 a	232.25 a	76.21 a
Venom 20 SG f/b Mustang f/b Lannate LV	20.0 f/b 3.4 f/b 24.0	21.75	10.75 b	16.00 bc	12.75 bc	10.25 b	68.50 b	23.33 bc
Success + Ecozin Plus	10.0 + 12.0	26.75	12.50 b	17.50 bc	5.252 c	10.50 b	26.00 c	16.42 c
Radiant	7.0	31.25	10.50 b	25.25 b	14.75 bc	9.50 b	44.50 bc	22.63 bc
Lannate LV f/b Radiant	24.0 f/b 7.0	25.00	15.75 b	20.00 bc	15.75 bc	6.00 b	48.25 bc	21.79 bc
Orthene 97 + Ecozin Plus	24.0 + 12.0	35.00	19.00 b	15.25 c	12.25 bc	10.00 b	31.75 c	20.54 bc
Rimon 0.83 EC f/b Radiant	12.0 f/b 7.0	33.50	12.75 b	17.50 bc	16.25 bc	7.50 b	46.75 bc	22.38 bc
Durivo	13.0	33.00	10.75 b	22.00 bc	28.50 b	16.25 b	42.50 bc	25.50 b
HGW86 10 SE	13.4	33.50	11.75 b	23.25 bc	18.25 bc	11.00 b	38.50 bc	22.71 bc

Means within columns followed by the same letter are not significantly different; LSD, $P=0.05$.

Table 5. Numbers of Thrips Damaged, Market, and kg Market Heads per 0.001 acre, and Percentages of Market Heads for Plants in Iceberg Lettuce, 2008/09.

Treatment	Oz/acre	Thrips damage	Market heads	Kg market heads	% Market heads
Check	-----	10.00 a	17.75 d	12.04 c	64.51 d
Venom 20 SG f/b Mustang	20.0 f/b 3.4	7.75 a	19.25 cd	13.03 c	72.06 cd
Ecozin Plus fb Requiem	15.0 fb 64.0	6.00 ab	21.50 bcd	15.29 abc	78.61 bc
Lannate LV	24.0	6.50 ab	22.50 abc	14.67 abc	77.56 bcd
Success fb Requiem	10.0 fb 64.0	1.75 c	25.25 ab	17.78 a	93.26 a
Radiant	7.0	2.50 bc	25.25 ab	17.99 a	91.03 ab
Success fb Lannate LV	10.0 fb 24.0	0.75 c	26.25 a	16.99 ab	97.25 a
Durivo	13.0	7.50 a	19.75 cd	13.94 bc	72.74 cd
HGW86 10 SE	13.4	3.25 bc	23.50 abc	14.90 abc	88.01 ab

Means within columns followed by the same letter are not significantly different; LSD, $P=0.05$.

Table 6. Numbers of Thrips Damaged, Market, and kg Market Heads per 0.001 acre, and Percentages of Market Heads for Plants in Romaine Lettuce, 2008/09.

Treatment	Oz/acre	Thrips damage	Market heads	Kg market heads	% Market heads
Check	-----	10.75 a	15.75 b	7.38	59.34 d
Venom 20 SG f/b Mustang f/b Lannate LV	20.0 f/b 3.4 f/b 24.0	5.25 bc	21.00 a	8.68	80.21 bc
Success + Ecozin Plus	10.0 + 12.0	4.00 cd	23.50 a	10.37	86.58 ab
Radiant	7.0	5.00 bc	21.50 a	9.71	80.92 bc
Lannate LV f/b Radiant	24.0 f/b 7.0	3.00 cd	22.50 a	10.78	88.09 ab
Orthene 97 + Ecozin Plus	24.0 + 12.0	1.25 d	23.25 a	11.13	94.80 a
Rimon 0.83 EC f/b Radiant	12.0 f/b 7.0	4.75 bc	22.25 a	9.55	82.56 bc
Durivo	13.0	8.00 ab	21.50 a	7.85	72.91 c
HGW86 10 SE	13.4	2.75 cd	23.00 a	9.58	89.40 ab

Means within columns followed by the same letter are not significantly different; LSD, $P=0.05$.