

# Insecticidal Effects on Cowpea Aphids and their Parasitoids, Blue Alfalfa Aphids, and Alfalfa Weevils in 2002

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## Abstract

Twenty-nine insecticide treatments were applied on Feb. 7, 2002, to evaluate the effects of chemistry and rates on cowpea aphids and associated parasitic wasps. Data were also able to be collected on blue alfalfa aphids and alfalfa weevil larvae. At seven days post treatment fewest cowpea aphids were noted in plots treated with Furadan, the 3.84 oz./acre rate of WarriorT, and several of the higher rates of Lorsban 4E. Organophosphate insecticides had fewer cowpea aphids on the whole than did pyrethroid insecticides. All insecticide treatments had significantly fewer parasitic wasps than the untreated check, although these populations may correspond to aphid populations. All insecticide treatments had fewer blue alfalfa aphids early in the study, with very good control noted from the 3.84 oz./acre rate of WarriorT and the combination of 8 oz. of Lorsban 4E + 2 oz./acre of Baythroid 2. Treatments containing Baythroid 2 had the fewest blue alfalfa aphids at 44 days post treatment. Treatments which had at least 70% fewer weevils than the untreated check at 12 days post treatment included Furadan, all treatments that included any formulation of Baythroid, and the high rates of WarriorT and Pounce 3.2 EC, and the 0.088 rate of F1785 50DF.

## Introduction

Cowpea aphids (*Aphis craccivora*) are a rather recent pest problem in low desert alfalfa production. Several studies in the low desert (Natwick 1999; Natwick and Lopez, 2000; Palumbo and Tickes, 2000) have evaluated the effects of some insecticides against this pest, and differing insecticides in each study were documented as effective. These studies have not included data for the effects of the insecticides on the beneficial wasps that are an important aspect of cowpea aphid management however, nor the effects of insecticide rates for overall cowpea aphid management in alfalfa.

This study was initiated to gather data on the rate and chemistry effects of various alfalfa insecticides on cowpea aphids and their parasitoids in low desert alfalfa.

## Methods and Materials

An alfalfa field beginning its third year of production (variety = Cibola) located northeast of Blythe, CA, was utilized for this experiment. Applications were made during the late afternoon and early evening of Feb. 7, 2002. Treatments were applied with a backpack CO<sub>2</sub> sprayer calibrated to deliver 22.1 gpa at 20 psi with four T-Jet 8002 nozzles. All 29 insecticide treatments had the surfactant R-11 (Wilbur-Ellis Co.) added at the rate of 1 oz./gallon. Treatments were replicated four times in a randomized complete block design. Plots were 6 ft. wide x 25 ft. long. Plants averaged slightly more than 11 inches in height at time of application.

Difficulty was encountered with application of three treatments as CO<sub>2</sub> to the sprayer was not fully on, thereby resulting in reduced gallonage and only about 1/2-2/3 of the actual material being applied as is listed on the tables (these treatments are marked with \* in the tables). The treatments which had this difficulty were both rates (2.7 and 4 oz/acre) of F0570 0.8 EC, and the combination of Lorsban 4E at 4 oz./acre + Dimethoate 400 at 4 oz./acre.

Alfalfa was sampled at 4, 7, 12, 15 days after application for cowpea aphids and associated parasitoids. Alfalfa was also sampled at 44 days post treatment for longevity effects of treatments on alfalfa weevils and blue alfalfa aphids. Sampling consisted of making 10 three foot sweeps/plot with a 15 inch diameter sweep net. Net contents were then transferred to a plastic container, containers marked with appropriate plot data and returned to the laboratory, and then frozen. Insects were later separated, speciated, counted and recorded.

Plant heights were obtained on Feb. 21 and March 12. Twelve heights/plot were measured and average plant height/plot calculated. Treatment means of the various insects and plant heights were statistically analyzed with Fishers least significant difference (Statgraphics for Windows, Manugistics Inc.)

## Results

The spring of 2002 was colder than normal with several freezing nights causing frost injury to alfalfa standing in fields. The below freezing temperatures were also thought to be responsible for causing insect populations to last longer and others to appear later in the winter season than normal.

### Cowpea Aphids

Populations of cowpea aphids remained fairly constant during the first week after treatment (Table 1). Aphid numbers in the untreated check declined by over 70% between seven and 12 days post treatment. This was in great part due to the parasitic wasps which were very active. At time of treatments cowpea aphids tended to be on the lower parts of alfalfa stems in part due to cool temperatures and had not yet fully colonized the uppermost part of the alfalfa plants.

At four days post treatment fewest cowpea aphids were noted in the 8 oz. rate of Lorsban 4E (77.8% control), followed by 2 oz. rate of this product (74.6% control), Furadan 4F and both rates (1.5 and 2.25 pints) of Malathion 57 (71.2-71.9% control), and the 3 pt/acre rate of Lannate LV (70.4% control). Fewer cowpea aphids were noted in plots treated with organophosphate chemistries than in those treated with pyrethroid chemistries when comparing insecticide chemistry classes on this sampling date. Rate responses (higher rates and fewer cowpea aphid numbers) were noted for several of the pyrethroid insecticides (WarriorT, Ambush 2E).

At seven days after treatment, each treatment averaged at least 50% fewer cowpea aphids than the untreated check with the exception of the 0.088 lb/acre rate of F1785 50DF (37.5%) although the higher rate (0.176 lb./acre) of this product provided slightly greater than 70% reduction. F1785 is a nicotinoid chemistry (proposed active ingredient name is flonicamid), and these insecticides from this class of insecticides have not been as effective as most other insecticide classes for aphid control in alfalfa (Rethwisch et al., 1992; Rethwisch et al., 2002).

A number of treatments had greater than 80% reduction when compared with the untreated check at seven days after application. These treatments (and reduction in aphid numbers compared with the untreated check) were the 1.5 pint/acre rate of Lorsban 4E ( 82.9% fewer aphids), Lorsban 4E at 1 pint/acre (84.3%), Furadan 4F at 1 pint/acre (83.1%), Lorsban 4E at 8 oz in combination with Baythroid 2 at 2 oz./acre (83.0), WarriorT at 3.84 oz./acre (82.4%), Malathion 57 at 2.25 oz/acre (81.1%) and Dimethoate 400 at 16 oz./acre (80.2%).

At 12 days after application, only three treatments had 70+% fewer aphids than the untreated check. These treatments were Furadan (77.9%), 4 oz/acre of Lorsban 4E (72.4%) and Lorsban 4E at 2 oz./acre (70.0%). By 15 days post treatment aphid numbers in the untreated plots were about 50% of that noted at 12 days after application and were reduced in all plots by a somewhat equal percentage as wasp activity and numbers greatly exceeded that of cowpea aphids.

### Cowpea Aphid Parasitic Wasps

Numbers of parasitic wasps increased throughout the experiment (Table 2), being roughly 20x higher at 15 days after treatment than at four days post application. The wasp species involved has not yet been determined, but is

expected to be either *Lysiphlebus testaceipes* or *Diaeretiella rapae*, but could be a combination of the two species.

At four days post treatment the highest mean number of wasps (13.5/10 sweeps) was in the untreated check, although this was not significantly different than a number of insecticide treatments. Some treatments did reduce parasitoid numbers. Treatments with at least 60% reduction in wasp numbers included the highest two rates (1.5 pints and 1 pint/acre) of Lorsban 4E (75.9% and 66.7% reduction respectively), the high (4 oz. rate) of F0570 0.8EW (77.8%), Furadan (70.4%), the high rate of Malathion 57 (68.5%), and both rates (8 oz and 16 oz) of Dimethoate 400 (64.8 % and 63.0% respectively). Rate effects (higher rates and fewer parasitic wasps) were most evident from chemistries containing zeta-cypermethrin (F0570 0.8EC, 0.8EW).

At seven days post treatment the insecticide with the largest differences in wasps numbers noted due to differences in rates was F1785 50DF. This chemistry is supposedly a systemic selective aphicide and was not expected to have any direct effect on parasitic wasps. The low rate (0.088 lbs) of this product had almost as many parasitic wasps (20.25) as did the untreated check. The high rate averaged approximately 50% fewer wasps than the untreated check however, and had fewer/equal numbers of wasps as many insecticides.

The wasp numbers at this sample date may be more an indication of aphid numbers than direct insecticidal effect. Aphid numbers in the two F1585 treatments were also significantly different, with aphid numbers in the 0.088 rate second highest overall on this sample date, with only the untreated check having more. These data indicate that the insecticides themselves had an indirect effect on the parasitic wasps at this sample date rather than a direct reduction as the wasp populations appear to be somewhat associated with aphid numbers. Higher aphid populations would be producing more honeydew which the adult parasitic wasps may be utilizing as an attractant clue and utilizing as a food source.

More clarity for differences in wasp numbers may have occurred if large plots had been utilized for experimentation (rather than the small plots in this experiment) as this would have reduced potential interplot movement of wasps. Alfalfa bordering ends of each plot also was untreated.

Numbers of parasitic wasps increased by a factor of about 3.5x between 7-12 days post treatment. Highest average number of wasps at 12 days post treatment were in treatments containing Baythroid 20WP, which had numerically more wasps than plots receiving equal amounts of active ingredient of Baythroid 2. Some insecticide treatments (Ambush 2E, both formulations of F0570 0.08) indicated rate responses for although similar numbers of aphids were noted, fewer wasps were noted in the high rates of these insecticides. This was not true for all insecticides however.

Between 12 and 15 days after treatment, wasp numbers again increased overall by a factor of approximately 2.5. High numbers of wasps were noted in all treatments by this sample date with no definitive effect noted for any particular insecticide treatment. Significantly more wasps were noted in the untreated check than in any of the treatments, however, the untreated check also had significantly more aphids than any treatment.

#### *Blue Alfalfa Aphids*

Blue alfalfa aphid numbers (Table 3) were very low during the first 15 days of the study, but sufficient populations existed for meaningful data to be obtained. All insecticide treatments had significantly fewer blue alfalfa aphid at 4, 7 and 15 days post treatment (but not 12 days) than the untreated check. Pyrethroid insecticides had numerically fewer blue alfalfa aphids at 4 days post treatment than did organophosphate insecticides, which was the opposite trend noted for cowpea aphids on this sample date. Higher rates of insecticides generally had numerically fewer blue alfalfa aphids than did the corresponding low rates of the same insecticides at 4 days post treatment. Insecticide treatments with at least 89% control at 7 days post treatment included the 3.84 oz./acre rate of WarriorT (100% control), both rates of Ambush 2E (12.8 oz./acre = 94.6%, 6.4 oz = 90.5%), Baythroid 20WP (93.2%), and Lorsban 4E at 8 oz./acre (94.6 %) and 1.5 pints (95.9%), and the combination of Lorsban 4E at 8 oz./acre + Baythroid 2 at 2 oz./acre (93.2%).

Because of low populations at 12 days post treatment, few differences were noted. At 15 days post treatment all insecticides had significantly fewer aphids than the untreated check. Significant reductions for insecticide rate effects were noted from higher rates of WarriorT and Pounce, with the high rates of both insecticides having at least 82.5% fewer blue alfalfa aphids than the untreated control and the fewest of all treatments.

At 44 days post treatment effects of insecticides were not as easily noted. Fewest blue alfalfa aphids were present in treatments containing Baythroid 2, which had significantly less aphids than in corresponding treatments of Baythroid 20WP. The reason for these differences is unclear at the present time. Treatments in addition those containing Baythroid 2 that had statistically fewer aphids than the untreated check on this sample date included both rates of WarriorT, the high rate of Pounce 3.2, and both rates of Ambush 2E.

#### *Alfalfa Weevil Larvae*

Numbers of alfalfa weevil larvae were very low at the beginning of this trial. By 12 days post treatment, numbers had increased to allow some comparisons. Although numbers of alfalfa weevils in most plots were low, no weevil larvae were noted in plots treated with Furadan, both rates of WarriorT, or the 4 oz./acre rate of Pounce (Table 4).

Alfalfa weevil populations continued to increase and were more evident at 15 days post treatment, although numbers were still quite low with only 0.7/sweep noted in the untreated check. Treatments which had at least 70% fewer weevils than the untreated check on this sample date included Furadan, all treatments that included any formulation of Baythroid, and the high rates of WarriorT and Pounce 3.2 EC, and the 0.088 rate of F1785 50DF.

The combination treatment of Lorsban 4E at 8 oz/acre + Baythroid 2 had the fewest weevil larvae at 44 days post treatment, followed by the 3.84 oz/acre rate of WarriorT and the 4 oz/acre rate of F0570 0.8EW. Several treatments had significantly more alfalfa weevil larvae than the untreated check on this sample date however, including all rates of Lorsban 4E less than 1.5 pints/acre, the high rate of Dimethoate 400, the high rate of F1785 50DF, and the high rate of Lannate LV. The reason why the high rates of some chemistries had higher rates of alfalfa weevil larvae cannot be ascertained from the data gathered in this experiment.

#### *Alfalfa heights*

Alfalfa heights were not significantly different than the untreated check on either sample date.

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**Table 1. Cowpea aphids in 10 three foot sweeps of alfalfa treated Feb. 7, 2002, Blythe, CA.**

Treatment	Rate per acre		Days post treatment			
	Product	Lbs Active Ingrid.	4	7	12	15
Furadan 4F	1 pint	0.5	113.5 abc	67.25 a	25.25 a	9.00 a
Lorsban 4E	2 oz	0.0625	102.0 ab	88.75 a-d	34.25 abc	21.75 d--i
Lorsban 4E	4 oz	0.125	160.0 a--g	91.00 a-d	31.50 ab	19.50 d-g
Lorsban 4E	8 oz	0.25	89.25 a	81.00 abc	44.50 a--f	18.25 c-f
Lorsban 4E	1 pint	0.5	145.0 a-f	62.75 a	49.00 a--g	17.00 b-e
Lorsban 4E	1.5 pints	0.75	146.5 a-f	68.25 a	40.75 a--e	20.25 d--h
Lorsban 4E + Baythroid 2	8 oz 2 oz	0.25 0.03125	144.50 a-f	67.25 a	56.25 c--h	27.75 i
Lorsban 4E + Baythroid 20WP	8 oz 2.5 oz	0.25 0.03125	125.00 abc	80.50 abc	45.50 a--f	17.25 b-e
Baythroid 2	2.4 oz	0.0375	137.75 a--f	142.25 cde	72.00 gh	19.75 d--h
Baythroid 20WP	3 oz	0.0375	285.5 h	140.50 b-e	79.75 h	13.25 abc
Malathion 57	1.5 pts	0.9375	115.75 abc	90.50 a-d	49.50 a--g	17.50 b-e
Malathion 57	2.25 pts	1.406	113.00 abc	75.25 ab	37.25 a--e	25.75 hi
Dimethoate 400	8 oz	0.25	189.50 a---h	82.75 abc	45.75 a--f	19.50 d-g
Dimethoate 400	1 pt	0.5	141.25 a--f	78.75 abc	37.75 a--e	24.00 f-i
* Dimethoate 400 + * Lorsban 4E	4 oz 4 oz	0.125 0.125	197.50 a---h	104.25 a-d	36.75 a-d	24.00 f-i
Lannate LV	1.5 pts	0.45	124.40 a--e	96.57 a-d	54.72 b---h	23.04 e--i
Lannate LV	3 pts	0.9	119.16 abc	68.26 a	44.97 a--f	23.78 f-i
Ambush 2E	6.4 oz	0.1	240.75 d--h	138.00 b-e	59.50 d--h	24.5 ghi
Ambush 2E	12.8 oz	0.2	128.5 a-d	125.50 a--e	41.25 a--e	22.75 e--i
Pounce 3.2 EC	4 oz	0.1	179.25 a---h	140.75 b-e	44.00 a--f	19.0 c--h
Pounce 3.2 EC	8 oz	0.2	176.75 a---h	150.25 de	70.75 gh	11.75 ab
Warrior T	2.56	0.2	248.25 fgh	122.25 a--e	57.5 c--h	24.00 f--i
Warrior T	3.84	0.3	198.75 a---h	70.00 a	48.25 a---g	16.00 bcd
F 0570 0.8 EW	2.7 oz	0.017	147.00 a--f	126.25 a--e	61.50 e-h	24.75 ghi
F 0570 0.8 EW	4 oz	0.025	190.25 a---h	119.75 a--e	60.25 d-h	20.75 d-h
* F 0570 0.8 EC	2.7 oz	0.017	147.00 a--f	182.00 e	39.25 a--e	17.00 b-e
* F 0570 0.8 EC	4 oz	0.025	223.00 c--h	140.75 b-e	42.75 a--f	19.50 d-g
F1785 50 DF	0.088 lb	0.044	204.50 b--h	249.00 f	67.25 fgh	16.00 bcd
F1785 50 DF	0.178 lb	0.088	270.50 gh	117.5 a--e	39.00 a--e	21.25 d--i
Untreated check	-----	-----	402.25 i	398.50 h	114.00 i	57.75 j

Means in columns followed by the same letter are not significantly different at the  $p < 0.05$  level of probability (Fishers LSD test).

**Table 2. Cowpea aphid parasitoids in 10 three foot sweeps of alfalfa treated Feb. 7, 2002, Blythe, CA.**

Treatment	Rate per acre		Days post treatment			
	Product	Lbs. Active Ingredient	4	7	12	15
Furadan 4F	1 pint	0.5	4.00 de	11.25 cd	32.25 e	138.00 a-d
Lorsban 4E	2 oz	0.0625	6.25 b-e	12.25 bcd	37.00 de	117.00 abc
Lorsban 4E	4 oz	0.125	6.50 b-e	13.50 bcd	50.50a-e	111.75 ab
Lorsban 4E	8 oz	0.25	9.25 a--e	8.00 d	40.00 cde	142.5 b-e
Lorsban 4E	1 pint	0.5	4.50 de	12.50 bcd	47.00a-e	117.25 abc
Lorsban 4E	1.5 pints	0.75	3.25 e	11.25 cd	42.00 bcde	129.00 abc
Lorsban 4E + Baythroid 2	8 oz 2 oz	0.25 0.03125	7.00 a-e	12.25 bcd	50.75a-e	150.75 c-f
Lorsban 4E + Baythroid 20WP	8 oz 2.5 oz	0.25 0.03125	9.00 a-e	15.50 bcd	69.75a	130.25 abc
Baythroid 2	2.4 oz	0.0375	8.00 a-e	10.25 cd	45.50a-e	143.00 b-e
Baythroid 20WP	3 oz	0.0375	7.25 a-e	17.00 abc	70.00a	170.00 def
Malathion 57	1.5 pts	0.9375	6.00 b-e	9.25 cd	45.25a-e	104.00 a
Malathion 57	2.25 pts	1.406	4.25 de	11.75 cd	49.25a-e	121.00 abc
Dimethoate 400	8 oz	0.25	4.75 cde	10.25 cd	52.50a-e	139.25 a-d
Dimethoate 400	1 pt	0.5	5.00 b-e	9.75 cd	39.00 de	133.50 abc
* Dimethoate 400 + * Lorsban 4E	4 oz 4 oz	0.125 0.125	7.50 a-e	12.75 bcd	67.25ab	119.25 abc
Lannate LV	1.5 pts	0.45	11.16 a-d	15.89 abcd	52.98a-e	151.19 c-f
Lannate LV	3 pts	0.9	8.10 a-e	15.27 bcd	45.01 b-e	143.48 b-e
Ambush 2E	6.4 oz	0.1	8.25 a-e	13.00 bcd	61.50a-d	115.75 abc
Ambush 2E	12.8 oz	0.2	8.75 a-e	16.5 abc	36.00 de	139.75 a--e
Pounce 3.2 EC	4 oz	0.1	6.00 b-e	12.25 bcd	36.25 de	106.00 a
Pounce 3.2 EC	8 oz	0.2	6.00 b-e	12.5 bcd	37.00 de	120.00 abc
Warrior T	2.56	0.2	5.25 b-e	9.50 cd	32.25 e	175.25 ef
Warrior T	3.84	0.3	10.25 a-d	7.50 d	48.00a-e	120.5 abc
F 0570 0.8 EW	2.7 oz	0.017	8.00 a-e	11.25 cd	50.50a-e	139.25 a-d
F 0570 0.8 EW	4 oz	0.025	3.00 a-e	10.25 cd	31.00 e	180.75 f
* F 0570 0.8 EC	2.7 oz	0.017	11.50 abc	13.50 bcd	65.00abc	149.50 c-f
* F 0570 0.8 EC	4 oz	0.025	5.75 b-e	11.50 cd	43.00 b-e	105.25 a
F1785 50 DF	0.088 lb	0.044	11.75 ab	20.25 ab	47.00a-e	130.00 abc
F1785 50 DF	0.178 lb	0.088	10.75 a-d	12.25 bcd	51.25a-e	126.00 abc
Untreated check	-----	-----	13.50 a	24.00 a	67.00ab	292.75 g

Means in columns followed by the same letter are not significantly different at the  $p < 0.05$  level of probability (Fishers LSD test).

**Table 3. Blue alfalfa aphids in 10 three foot sweeps of alfalfa treated Feb. 7, 2002, Blythe, CA.**

Treatment	Rate per Acre		Days After Treatment				
	Product	Lbs Active Ingred.	4	7	12	15	44
Furadan 4F	1 pint	0.5	1.25 abc	2.75 a--f	1.00 ab	4.75 a-d	122.25 ef
Lorsban 4E	2 oz	0.0625	4.75 bcd	7.00 ef	4.00 de	7.25 c-f	109.50 cde
Lorsban 4E	4 oz	0.125	3.50 a-d	5.00 a--f	0.75 ab	5.00 a-d	105.50 cde
Lorsban 4E	8 oz	0.25	3.50 a-d	1.00 abc	2.25 a-e	7.00 c-f	89.75 a--e
Lorsban 4E	1 pint	0.5	3.25 a-d	2.00 a--e	0.75 ab	4.00 abc	94.00 a--e
Lorsban 4E	1.5 pints	0.75	3.25 a-d	0.75 ab	2.25 a-e	5.00 a-d	115.25 de
Lorsban 4E + Baythroid 2	8 oz 2 oz	0.25 0.03125	1.00 ab	0.50 a	1.25 abc	7.00 c-f	61.75 a
Lorsban 4E + Baythroid 20WP	8 oz 2.5 oz	0.25 0.03125	2.00 a-d	3.25 a--f	1.25 abc	5.50 a--f	105.25 cde
Baythroid 2	2.4 oz	0.0375	2.25 a-d	4.50 a--f	2.75 b-e	4.75 a-d	69.25 ab
Baythroid 20WP	3 oz	0.0375	4.75 bcd	1.25 a-d	1.5 a-d	5.00 a-d	113.25 de
Malathion 57	1.5 pts	0.9375	2.75 a-d	4.50 a--f	0.75 ab	4.50 abc	100.25 b-e
Malathion 57	2.25 pts	1.406	4.00 a-d	6.50 def	1.5 a-d	7.00 c-f	108.75 cde
Dimethoate 400	8 oz	0.25	3.50 a-d	2.50 a--f	0.50 ab	9.25 ef	95.75 a--e
Dimethoate 400	1 pt	0.5	3.50 a-d	2.50 a--f	1.75 a-e	6.00 a--f	113.75 de
* Dimethoate 400 + * Lorsban 4E	4 oz 4 oz	0.125 0.125	5.75 d	6.00 b--f	1.5 a-d	6.25 a-f	156.75 fg
Lannate LV	1.5 pts	0.45	5.70 cd	5.14 a--f	2.56 a-e	6.24 a--f	180.93 g
Lannate LV	3 pts	0.9	2.98 a-d	7.51 f	2.06 a-e	5.05 a-d	149.25 fg
Ambush 2E	6.4 oz	0.1	4.50 a-d	1.75 a--e	1.5 a-d	7.25 c-f	83.25 a-d
Ambush 2E	12.8 oz	0.2	1.25 abc	1.00 abc	0.25 ab	7.00 c-f	80.00 a-d
Pounce 3.2 EC	4 oz	0.1	3.00 a-d	3.50 a--f	1.00 ab	8.75 cde	88.75 a--e
Pounce 3.2 EC	8 oz	0.2	2.50 a-d	4.50 a--f	0.00 a	2.50 ab	67.00 ab
Warrior T	2.56	0.2	1.75 a-d	2.75 a--f	2.00 a-e	9.50 f	74.00 abc
Warrior T	3.84	0.3	0.5 a	0.00 a	1.50 a-d	2.25 a	73.75 abc
F 0570 0.8 EW	2.7 oz	0.017	2.50 a-d	3.25 a--f	2.00 a-e	6.50 b--f	90.00 a--e
F 0570 0.8 EW	4 oz	0.025	0.75 ab	4.25 a--f	2.25 a-e	3.75 abc	92.25 a--e
* F 0570 0.8 EC	2.7 oz	0.017	4.25 a-d	6.25 c-f	4.25 e	5.25 a--e	99.50 b-e
* F 0570 0.8 EC	4 oz	0.025	2.50 a-d	3.00 a--f	2.00 a-e	6.50 b--f	88.75 a--e
F1785 50 DF	0.088 lb	0.044	4.25 a-d	6.75 ef	2.25 a-e	6.75 c-f	115.25 de
F1785 50 DF	0.178 lb	0.088	2.50 a-d	4.50 a--f	1.75 a-e	6.25 a--f	98.00 b-e
Untreated check	-----	-----	13.75 e	18.50 g	3.75 cde	14.50 g	123.75 ef

Means in columns followed by the same letter are not significantly different at the  $p < 0.05$  level of probability (Fishers LSD test).

**Table 4. Alfalfa weevil larvae in 10 three foot sweeps of alfalfa treated Feb. 7, 2002, Blythe, CA.**

Treatment	Rate per Acre		Days after treatment		
	Product	Lbs. Active Ingredient	12	15	44
Furadan 4F	1 pint	0.5	0.00a	2.00 abc	13.00 e--j
Lorsban 4E	2 oz	0.0625	0.50ab	4.25 a--f	20.75 k
Lorsban 4E	4 oz	0.125	1.75abc	3.75 a--f	19.75 jk
Lorsban 4E	8 oz	0.25	2.25abc	3.50 a--f	18.75 ijk
Lorsban 4E	1 pint	0.5	1.25abc	3.25 a--e	18.75 ijk
Lorsban 4E	1.5 pints	0.75	0.50ab	3.75 a--f	9.25 b--g
Lorsban 4E + Baythroid 2	8 oz 2 oz	0.25 0.03125	0.75abc	1.50 a	1.25 a
Lorsban 4E + Baythroid 20WP	8 oz 2.5 oz	0.25 0.03125	0.75abc	1.25 a	4.75 a-d
Baythroid 2	2.4 oz	0.0375	0.50ab	1.00 a	5.25 a-d
Baythroid 20WP	3 oz	0.0375	1.25abc	2.00 abc	6.50 a-e
Malathion 57	1.5 pts	0.9375	2.00abc	2.75 a-d	14.25 f--k
Malathion 57	2.25 pts	1.406	3.00 c	3.75 a--f	7.00 a--f
Dimethoate 400	8 oz	0.25	1.50abc	6.50 ef	14.75 g--k
Dimethoate 400	1 pt	0.5	2.50 bc	2.25 abc	19.50 jk
* Dimethoate 400 + * Lorsban 4E	4 oz 4 oz	0.125 0.125	0.50ab	3.50 a--f	11.75 d--i
Lannate LV	1.5 pts	0.45	1.81abc	6.47 def	15.00 g--k
Lannate LV	3 pts	0.9	0.72ab	5.52 c-f	18.00 h-k
Ambush 2E	6.4 oz	0.1	0.75abc	3.75 a--f	7.75 a--g
Ambush 2E	12.8 oz	0.2	0.50ab	1.75 ab	6.50 a--e
Pounce 3.2 EC	4 oz	0.1	0.00a	5.25 b--f	8.50 a--g
Pounce 3.2 EC	8 oz	0.2	0.25ab	1.75 ab	6.00 a--e
Warrior T	2.56	0.2	0.00a	4.00 a--f	4.00 abc
Warrior T	3.84	0.3	0.00a	1.00 a	2.50 ab
F 0570 0.8 EW	2.7 oz	0.017	0.50ab	2.25 abc	6.50 a--e
F 0570 0.8 EW	4 oz	0.025	0.00a	2.75 a-d	2.75 ab
* F 0570 0.8 EC	2.7 oz	0.017	1.00abc	3.00 a--e	8.25 a--g
* F 0570 0.8 EC	4 oz	0.025	1.00abc	3.25 a--e	5.25 a-d
F1785 50 DF	0.088 lb	0.044	1.25abc	1.50 a	11.00 c--h
F1785 50 DF	0.178 lb	0.088	0.25ab	2.25 abc	18.50 h-k
Untreated Check.	-----	-----	2.50 bc	7.00 f	9.75 b--g

Means in columns followed by the same letter are not significantly different at the p<0.05 level of probability (Fishers LSD test).