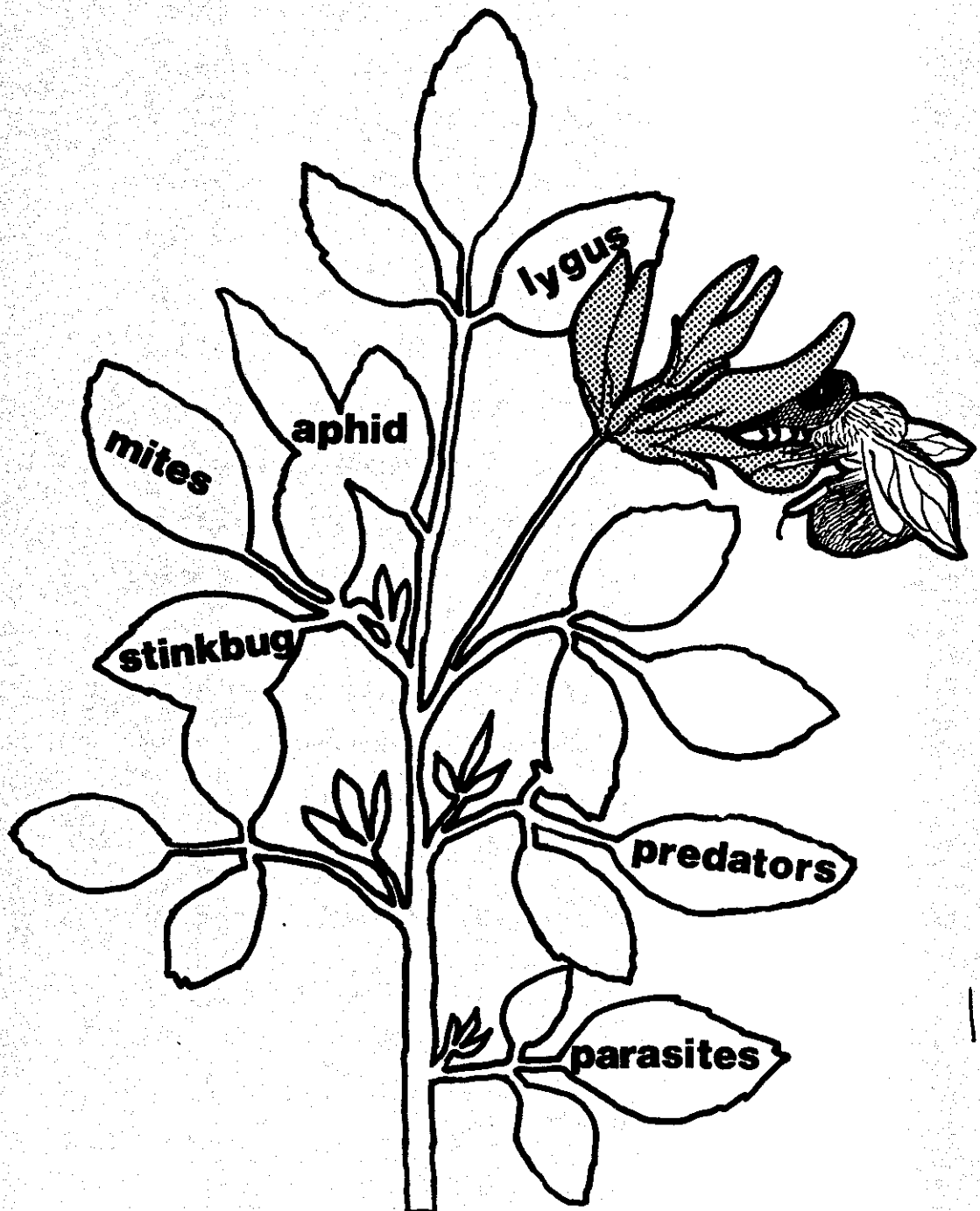
Sharon C. Mueller

A PROGRESS REPORT OF

INSECT STUDY RESULTS



1973

IN SEED ALFALFA

Acknowledgements

The work reported here was made possible by financial support of seed growers, chemical and seed companies, the Fresno County Pure Seed League, California Crop Improvement Association and the California Planting Cotton Seed Distributors. This support and cooperation is greatly appreciated.

The assistance of grower cooperators and chemical applicators who donated their time, equipment, and fields to conduct these experiments is deeply appreciated. Special thanks are due Don Darnell of Panoche Chemical Co., Bob Vance of Tri-Air, Wilbur Ellis Company and John Mallyon, James Irrigation District for their interest and many hours of work with these and past experiments concerning insect control in seed alfalfa.

The experiments and surveys were conducted in alfalfa seed fields of the following growers: John Nakamura, Joe Echeveste, Dominic and John Enrico, Mike Perez and Giffen Ranches, Inc. It was necessary in certain experimental areas to allow insect populations to remain untreated or to reach higher than recommended levels in order to obtain desired information on population trends or control effectiveness of pesticides. In doing so, growers experienced some losses in seed quality and quantity in certain of the experimental plots. We are grateful for their interest and these contributions in making it possible to conduct the experiments. The assistance of students, Lenny Vincent, Ben Simko and Michelle Yeargan in carrying out the various surveys and experiments is sincerely appreciated.

Research on Insects Affecting Seed Alfalfa 1973

O. G. Bacon[1], B. Sheesley[2], W. D. Riley[3] and R. H. James[3]

Introduction

This progress report summarizes research on insects affecting seed alfalfa conducted in Fresno County during 1973. It is our desire to fully inform seed growers and agribusiness cooperators of the research conducted with their generous and much appreciated support.

The contents of this summary should not be interpreted as recommendations of the University of California. Insect control recommendations are published by the University of California and can be obtained free of charge from the Farm and Home Advisors Office.

Common and/or manufacturer's names of insecticides are used in this report instead of the less familiar chemical terms, but no endorsement of products mentioned is intended. The rates of insecticides applied per acre are all expressed as active material per treated acre. Some of the chemicals included in the experiments reported are not registered for commercial use on seed alfalfa at this time.

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1 Entomologist, Department of Entomology, University of California, Davis.

2 Farm Advisor, Fresno County.

3 Staff Research Associates, Department of Entomology, University of California, Davis.

The common and/or manufacturer's names of insecticides mentioned in this report are as follows:

Carzol®	Pirimor®
Dibrom ®	Temik 10G®
dimethoate	TEPP
Dursban®	Thiodan®
Lannate®	Toxaphene®
Meta-Systox-R®	UniRoyal K840
Methyl Parathion®	Vydate®

Discussion of 1973 Research Results

Research was continued on the control of lygus bugs, aphids and spider mites and on the biology and population dynamics of the consperse stink bug and other insects affecting seed alfalfa. During 1973, five separate experiments were conducted in which eight insecticides and four insecticide combinations were evaluated for control of lygus bugs and the spotted alfalfa aphid. Detailed biological studies were conducted in several commercial seed fields. Although data were obtained on several insect species in each of the individual experiments the results are categorized and reported according to species rather than by individual experiment.

Lygus bugs

Six insecticides and four insecticide combinations were evaluated for control of lygus bugs in four separate experiments. The insecticides and combinations applied as foliar sprays by aircraft were Carzol®, Vydate®, Lannate®, Dursban®, UniRoyal K840, Carzol + Thiodan, Carzol + Vydate, Carzol + TEPP, and Carzol + UniRoyal K840. Temik was applied to

the soil as a granular formulation with a commercial shank applicator. The following briefly summarizes the results obtained with each of the materials in controlling lygus bugs.

Carzol applied at 0.5 lb. active ingredient per acre effectively controlled lygus bugs for 14+ days. As in experiments conducted in previous years, the use of Carzol alone stimulated increases in populations of the spotted alfalfa aphid. Vydate at 0.75 lb. AI/A resulted in excellent lygus bug control for approximately 21 days following application. Lygus bug control with Lannate at 0.75 lb. AI/A was approximately equal to that obtained with Carzol, and was effective for about 14 days. A second application of Lannate to the original plot was about as effective as the first. Dursban was not highly effective in controlling lygus bugs at rates of 0.5 and 1.0 lb. AI/A. Better results were obtained with the 1.0 lb. than with the 0.5 lb. rate but control was inadequate at the 1.0 lb. rate. Second applications of Dursban to the two plots at the original rates were not as effective as the first. These results with Dursban conflict with data obtained in 1972 when this material appeared to give excellent control of lygus bugs. UniRoyal K840 at 0.5 lb. AI/A appeared to have little or no controlling effect on lygus bug populations. Bug numbers were not reduced and populations increased substantially each week for two weeks following application. This was not unexpected for this material is a specific aphicide and does not appear to affect other insect species.

Because of aphid problems arising from the use of Carzol, combinations of Carzol 0.5 lb. AI/A with Vydate 0.75 lb. AI/A, TEPP 1.0 lb. AI/A, Thiodan 1.0 lb. AI/A, and UniRoyal K840 0.5 lb. AI/A were evaluated for

both lygus bug and aphid control. This experiment was conducted late in the season (mid August) and poor lygus bug control was obtained with Carzol in combination with TEPP, Thiodan and UniRoyal K840. Excellent control was obtained with the Carzol-Vydate combination but the active agent appeared to be the Vydate for there was no difference between the results obtained with the combination and a plot treated with Vydate alone at 0.75 lb. AI/A.

An experiment was conducted to evaluate the timing and repeated applications of a combination of Carzol 0.5 lb. AI/A + Thiodan 1.0 lb. AI/A for lygus bug control. Two 10 acre plots were utilized. After the initial treatment of both plots (June 5) one was to be retreated when total lygus bug counts (adults + nymphs) reached 6 bugs per sweep and the other when counts reached 12 bugs per sweep. These plots were designated A and B respectively. Because of travel schedules and the inability to predict lygus bug hatches it was difficult to adhere strictly to the predetermined treatment levels. During the season-long experiment the counts on two occasions in plot A (6 bugs/sweep) exceeded the predetermined 6 bug level before a treatment could be applied. On one occasion a level of 8.9 bugs per sweep occurred and on another the count reached 14.6 bugs per sweep. In Plot B similar problems occurred with counts on two occasions going as high as 16.1 and 16.8 before applications could be made. Plot A received 4 applications during the entire season ranging from 13 to 21 days apart. Plot B received 3 applications ranging from 27 to 34 days apart. Yield data were not taken at harvest in the two plots but six 2-quart samples of seed pods were hand stripped from each plot prior to harvest. Samples were hand threshed and lightly cleaned in a clipper seed cleaner. The seeds were then examined for

lygus bug injury, seed chalcid, stink bug and other damage. The percentage of good seeds in Plot A was 96.9 and in plot B 95.5. Seeds showing lygus bug injury in plot A (4 applications) represented 2.3% and in plot B (3 applications) 4.1% of the total seeds examined. Seeds damaged from other causes represented less than 1% in both treatments.

Temik was applied as 10% granules to the soil at a rate of 3.0 lbs. active ingredient per acre. Two methods of placement were used. In one 2 acre plot (Temik A) the granules were injected through two shanks 14 inches apart in every other furrow. In the other 2 acre plot (Temik B) two shanks were used per row 9 inches on each side of the plant row and approximately 6 inches deep. These plots did not receive any further insecticide treatments until after the experiment was terminated on August 15. The remainder of the field, approximately 6 acres, served as a check and did not receive any insecticide treatments until after August 15. Lygus bug control was poor in this experiment. The lygus bug populations in all treatments including the check dropped for a two week period after application of the Temik. Thereafter populations increased reaching pretreatment levels 27 to 30 days after treatment. Although lygus bug populations in the Temik plots 27 days after treatment were lower than in the check they were far above economic levels. Population peaks occurred from July 11 to 25 with total lygus counts (adults and nymphs) in the check ranging from approximately 126 to 147 bugs per sweep.

Although poor control was obtained with the Temik much valuable information was obtained in this experiment, especially in the large untreated check, relative to lygus bug population trends, and the populations of the entire complex of insects normally found to occur in the environment of untreated alfalfa seed fields. Although the generations of

lygus bugs overlapped the data obtained would indicate the presence of three generations. The first generation, consisting of adults and first and second instar nymphs, was well underway when the study began on May 15. This generation reached peak numbers on May 31. The second generation reached peak numbers July 11-18. Although populations declined in early August, there was evidence on August 15, when the study was terminated, that a third generation was building that would probably peak in early September. Adults maturing in mid to late September are known to undergo a brief reproductive diapause before entering the overwintering phase.

The very high populations of lygus bugs encountered in this study caused extreme damage to developing budsthat virtually eliminated all seed production in the check area. Four samples of the few seed pods produced were hand stripped from plants in each plot. These were hand threshed and lightly cleaned in a clipper seed cleaner. The seeds were then examined for lygus bug injury, seed chalcid, stink bug and other damage. The percentage of good seeds in the check was 44.2% and in the Temik plots A and B, 34.4% and 40.3% respectively of the total seeds examined.

Aphids

Data on control of aphids were obtained for all materials evaluated for lygus bug control. In addition, two separate experiments were conducted to evaluate the effectiveness of several new specific aphicides and Carzol + aphicide combinations for control of the spotted alfalfa aphid. Of the materials evaluated the most effective in controlling the spotted alfalfa aphid were Dursban and UniRoyal K840. In the lygus bug experiments, Lannate appeared to suppress the spotted alfalfa aphid populations. The aphids did not increase substantially above the relatively low pre treatment levels after the application of Lannate. Vydate also appeared to have a suppressing effect on the aphid populations although not as strong as

that observed with Lannate. The use of Carzol alone, as in previous years, resulted in rapid and large increases in spotted alfalfa aphid populations. Combining Thiodan 1.0 lb. AI/A with Carzol 0.5 lb. AI/A appeared to suppress the spotted alfalfa aphid in early season applications. However, this combination used later in the season, during late July and August, did not result in effective control of the spotted alfalfa aphid. In the treatment timing experiment for lygus bug control mentioned earlier, Carzol + Thiodan was not highly effective in suppressing spotted alfalfa aphid populations. Aphid populations, although moderately high, were lower in plot B treated on a 13 to 21 day schedule (6 lygus per sweep) than in plot A treated on a 27 to 34 day schedule (12 lygus per sweep). Despite the treatments in both plots spotted alfalfa aphid populations increased each week reaching sufficient levels by July 25 to cause stickiness of the plants. An application of TEPP, 1 lb. AI/A at this time was not highly effective and an additional application of Carzol + Thiodan on August 1 and August 8 to plots A and B respectively did not prevent the aphid populations from reaching extremely high levels.

In the special aphid control experiments Thiodan at 1.0 lb. AI/A and a combination of Carzol 0.5 lb. AI/A + Thiodan 1.0 lb. AI/A did not control the spotted alfalfa aphid. Combinations of TEPP 1.0 lb. AI/A + Carzol 0.5 lb. AI/A, and Vydate 0.75 lb. AI/A + Carzol 0.5 lb. AI/A held aphid populations below pre treatment levels for approximately 2 weeks. UniRoyal K840, 0.5 lb. AI/A and a combination of Carzol 0.5 lb. AI/A + UniRoyal K840 0.5 lb. AI/A were highly effective in reducing spotted alfalfa aphid populations and the treatments were effective for approximately 20 days after application.

A new aphicide, Pirimor (Pirimicarb) at rates of 1.0 lb. AI/A and 0.5 lb. AI/A did not control the spotted alfalfa aphid.

It was difficult to evaluate the effectiveness of Temik applied to the soil as a control for the spotted alfalfa aphid. Very low aphid populations occurred in the check as well as the treated areas for approximately 33 days after treating. Thereafter populations increased rapidly in both treatments and the check although the population increases in the Temik plots were somewhat less than in the check for 50 to 60 days after treatment. The spotted alfalfa aphid infestation became extremely severe in this experiment resulting in heavy deposits of honeydew and loss of lower leaves on the plants. The aphid population reached a peak on August 8.

Spider Mites

The effects of insecticide applications on spider mite populations were evaluated in three experiments.

Carzol applications and the Carzol-Thiodan combination generally resulted in excellent control of spider mites. While mites could be found in the Carzol plots the numbers were very low after treatment and they remained low for periods of 20 days or more. Repeated applications of Carzol + Thiodan in the insecticide timing experiment for lygus bug control held mite populations to very low levels.

Lannate, as applied for lygus bug control, resulted in increased populations of mites and mite eggs. A second application of Lannate accelerated the population increase.

Vydate did not control mites. A second application of Vydate over the first resulted in increased numbers of mites and eggs but the increases were not as great as those observed with Lannate.

Dursban at 1.0 lb. AI/A reduced mite populations by approximately 50%, and there were no significant population increases for 14 days after application. Dursban at 0.5 lb. AI/A had little effect in reducing the mite populations but did not appear to stimulate increases.

Spider mite populations were too low to make significant evaluations in the experiment where Temik was applied to the soil. Populations were low in the check as well as the treatments and they remained low in all areas throughout the duration of the experiment (69 days).

Consperse stink bug

Stink bug populations were monitored in five alfalfa seed fields on the west side of the San Joaquin Valley from May 15 to September 4. Populations were sampled at weekly intervals by using the "beating pan" technique developed in 1971 where five pan samples (25 row feet) were examined in each field on each sampling date. Generally very low populations were encountered in alfalfa seed fields during the entire 1973 crop season. Populations were sufficiently high to obtain data on seasonal population trends and to again correlate population levels with seed damage. Although populations were lower than in 1971 and 1972 the population trends were similar. As was observed in previous years, two generations of the stink bug occurred. Nymphs of the first generation (all second instars) were observed in 3 of the survey fields on May 15, 1973 when the study was begun. This coincided almost exactly with the appearance of early instar nymphs in 1972 when the first were observed on May 17.

Nymphs of the second generation began to appear on July 10 which coincided very closely with their appearance in 1971 and 1972 which was noted on July 6 and 5 respectively. As was observed in previous years the second generation was much larger than the first and reached population peaks in the various fields from July 24 through August 21.

As in previous years seed samples were hand harvested from each of the survey fields just prior to commercial harvest. The samples were taken from restricted locations in the fields where the stink bug counts had actually been made during the season. Seed from these samples were examined for sucking insect damage and other injuries. Damage attributed to the stink bug was in keeping with the low populations observed in the sampling areas and ranged from 0.14% to 0.53% averaging approximately 0.35%.

Because of the generally low stink bug populations in seed alfalfa fields no experiments were conducted with insecticides for their control. The populations were not sufficiently high over large enough areas to permit adequate insecticide evaluations. Stink bug numbers were extremely low in crops and areas bordering alfalfa seed fields; as a result no attempt other than general observations was made to investigate stink bug populations in these areas.

Effects of Insecticides on Beneficial Insect Species

In each of the lygus bug and aphid control experiments, data were obtained on the effects of the various insecticides on 8 or 9 groups of predatory arthropods. Much data were gathered and it is difficult to generalize, but it would appear that the materials having the least detrimental effects on these beneficial forms were the sprays of UniRoyal K840, Pirimor and the granular formulation of Temik. These insecticides were also the least effective in controlling lygus bugs. All of the other insecticides resulted in drastic reductions of the predatory species. Spiders appeared to be somewhat less affected by the sprays than the insect species, but repeated applications of Carzol + Thiodan virtually eliminated the spiders as well as the other beneficial species.

The opportunity occurred to study populations of predatory arthropods in the absence of insecticides in the 6 acre untreated check associated with the Temik experiment. The species were sampled with a D-Vac suction machine at weekly intervals from May 15 to August 15. The collections were placed in Berlese separatory funnels to remove the insects from plant debris taken in the samples. The insects were then counted and recorded. The following groups of insects were recorded as to numbers of adults and larvae or nymphs: lacewings, Orius (minute priate bugs), Nabis (damsel bugs), Geocoris (big eyed bugs), Collops beetles, Coccinellid beetles (lady beetles), Syrphid flies, parasitic wasps and spiders. The populations of each group occurring over the season are shown in graphs accompanying this report.

Predators occurring in the largest numbers throughout the period were Orius and Nabis. Lady beetles and Syrphid flies were extremely abundant at the beginning of the study in mid-May. The lady beetles virtually disappeared by mid June and remained low until about August 1 when larval populations began to increase. The syrphid fly population consisted entirely of adults and they disappeared about the last week in May.

It is interesting to note that although insecticides were not applied to the check area the predators and parasites were unable to cope with the lygus bug and spotted alfalfa aphid populations. These pest insects devastated the field.

LYGUS

Lygus bug populations in seed alfalfa plots treated with insecticide sprays applied by aircraft.
John Nakamura, Firebaugh, California, 1973.

Treatment 1/		Days after application 3/	Number of lygus bugs per sweep 4/		
Insecticide 2/	AI/ Acre Lb		Adults	Nymphs	Total
		Pre	5.6	21.1	26.7
		1	0.5	1.7	2.2
		3	1.6	1.2	2.7
Carzol plus	0.5	7	1.8	0.2	2.0
Thiodan	1.0	14	1.7	0.3	2.0
		21	2.2	8.2	10.4
		27	3.0	13.1	16.1
		Pre	7.4	23.8	31.2
		1	2.0	2.4	4.4
		3	1.0	1.0	2.0
Carzol	0.5	7	1.2	1.1	2.3
		14	1.2	0.9	2.2
		21	1.2	9.8	11.0
		Pre	11.2	24.6	35.8
		1	0.5	0.4	0.9
		3	0.5	0.3	0.8
		7	0.8	0.1	0.9
Vydate	0.75	14	1.2	0.3	1.5
		21	1.5	3.4	4.9
		5	0.1	0.2	0.3
		13	0.1	0.9	1.0
		Pre	8.0	21.3	29.3
		1	0.7	1.8	2.6
		3	1.0	0.9	1.9
		7	1.6	1.1	2.7
Lannate	0.75	14	2.5	4.3	6.8
		6	1.5	1.4	2.9
		12	1.5	0.8	2.3
		20	0.5	13.3	13.8
		Pre	10.0	24.6	34.7
		1	1.3	3.7	5.0
		3	3.9	2.9	6.9
Dursban	1.0	7	4.1	2.0	6.1
		14	3.9	13.6	19.6
		6	1.3	11.6	12.9

Treatment 1/		Days after application 3/	Number of lygus bugs per sweep 4/		
Insecticide 2/	AI/ Acre Lb		Adults	Nymphs	Total
		Pre	13.7	26.6	40.2
		1	2.9	3.9	6.8
		3	wet	wet	wet
Dursban	0.5	7	5.1	5.2	10.3
		14	6.3	19.3	25.6
		6	3.0	24.3	27.3

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Sprays applied at 10 GPA. Carzol was a 92% soluble powder while others were emulsifiable concentrates. All plots were treated June 5 from 4:15 to 5:45 A.M. The Lannate and the two Dursban plots were retreated June 20 from 4:30 to 5:00 A.M. The Vydate plot was retreated June 27 from 4:15 to 4:20 A.M.

3/ Pretreatment counts were made June 4.

4/ Average of 18 sweeps per treatment on each sampling date.

Lygus bug populations in seed alfalfa plots treated with insecticide sprays applied by aircraft.
John Nakamura, Firebaugh, California, 1973.

Treatment 1/		Days after application 3/	Number of lygus bug per 50 D-Vac samples 4/							
Insecticide 2/	AI/ Acre Lb		Adults	Nymphal Instars						Adults & Nymphs
				1	2	3	4	5	Total	
Carzol + Thiodan	0.5 1.0	Pre	42	1	4	10	23	27	65	107
		1	-	-	-	-	-	-	-	-
		3	12	1	0	1	0	1	3	15
		7	25	0	0	0	0	3	3	28
		14	21	0	3	1	0	0	4	25
		21	7	4	14	0	0	2	20	27
		27	4	8	28	0	0	0	36	40
Carzol	0.5	Pre	56	0	4	10	19	30	63	119
		1	-	-	-	-	-	-	-	-
		3	5	0	0	3	0	6	9	14
		7	3	0	0	0	0	2	2	5
		14	6	3	5	0	1	0	9	15
		21	16	2	7	3	6	4	22	38
Vydate	0.75	Pre	56	3	5	10	23	44	85	141
		1	14	0	0	0	0	6	6	20
		3	7	0	0	0	0	1	1	8
		7	4	1	0	0	0	0	1	5
		14	2	0	1	0	0	0	1	3
		21	-	-	-	-	-	-	-	-
		5	2	1	1	0	0	0	2	4
		13	3	1	1	4	2	1	9	12
Lannate	0.75	Pre	47	0	8	12	11	14	45	92
		1	8	0	0	0	0	7	7	15
		3	9	0	0	1	0	6	7	16
		7	10	2	1	0	0	1	4	14
		14	18	0	10	7	0	0	17	35
		6	-	-	-	-	-	-	-	-
		12	6	0	2	3	0	0	5	11
		20	2	2	30	9	6	5	52	54

Treatment 1/		Days after application 3/	Number of lygus bug per 50 D-Vac samples 4/							
Insecticide 2/	AI/ Acre Lb		Adults	Nymphal Instars						Adults & Nymphs
				1	2	3	4	5	Total	
Dursban	1.0	Pre	59	0	10	28	50	41	129	188
		1	17	0	2	3	2	24	31	48
		3	51	0	1	1	5	20	27	78
		7	42	4	5	0	0	5	14	56
		14	57	0	31	28	2	1	62	119
Dursban	0.5	Pre	64	1	15	15	30	42	103	167
		1	35	0	2	4	13	42	61	96
		3	-	-	-	-	-	-	-	-
		7	41	8	19	0	0	3	30	71
		14	67	9	37	45	3	0	94	161

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Sprays applied at 10 GPA. Carzol was a 92% soluble powder while others were emulsifiable concentrates. All plots were treated June 5 from 4:15 to 5:45 A.M. The Lannate and the two Dursban plots were retreated June 20 from 4:30 to 5:02 A.M. The Vydate plot was retreated June 27 from 4:15 to 4:20 A.M.

3/ Pretreatment counts were made June 4.

4/ 2-25 D-Vac samples taken in each plot on each sampling date.

Lygus bug populations in two seed alfalfa plots with treatment timing determined by different levels of lygus bug counts 1/.
John Nakamura, Firebaugh, California, 1973.

A: To be treated when counts reached 6 per sweep								B: To be treated when counts reached 12 per sweep							
Dates of applications 2/	Days after applications 3/	Number of lygus bug per sweep 4/						Dates of applications 2/	Days after applications 3/	Number of lygus bug per sweep 4/					
		Adults	Nymphs				Adults & Nymphs			Adults	Nymphs				Adults & Nymphs
			Small	Medium	Large	Total					Small	Medium	Large	Total	
	Pre	9.2	8.2	8.3	9.6	27.0	36.2		Pre	5.6	6.6	7.4	7.1	21.1	26.7
Jun 5	1	-	-	-	-	-	-	Jun 5	1	0.5	0.0	0.3	1.4	1.7	2.2
	7	-	-	-	-	-	-		7	1.8	0.0	0.0	0.2	0.2	2.0
	14	1.1	0.2	0.0	0.0	0.2	1.3		14	1.7	0.3	0.0	0.1	0.4	2.1
	21	2.2	4.8	1.8	0.1	6.7	8.9		21	2.2	3.3	3.7	1.2	8.2	10.4
Jun 27	5	0.8	0.7	0.1	0.2	0.9	1.7		27	3.0	9.1	1.6	2.4	13.1	16.1
	13	1.0	3.3	1.1	0.7	5.1	6.1	Jul 4	6	0.2	0.1	0.1	0.3	0.5	0.7
Jul 11	6	0.7	0.4	0.2	0.6	1.2	1.9		13	0.8	0.2	0.6	0.1	0.9	1.7
	13	2.2	0.1	0.7	0.2	1.1	3.3		20	1.4	0.2	0.2	0.3	0.7	2.1
	20	2.2	9.1	1.7	1.6	12.4	14.6		27	2.3	5.9	0.9	0.5	7.4	9.7
Aug 1	6	0.5	0.2	0.2	0.3	0.7	1.2		34	0.1	5.6	5.7	5.4	16.7	16.8
	14	0.2	0.7	0.3	0.1	1.1	1.3	Aug 8	6	0.7	0.1	0.0	1.1	1.2	1.9

1/ Each plot 10 acres (330' x 1320').

2/ Carzol 0.5 lb per acre plus Thiodan 1.0 lb per acre were applied by aircraft at 10 GPA on each treatment date. Both plots were treated with Tepp 1.0 lb per acre on July 25 because of spotted alfalfa aphid populations.

3/ Pretreatment counts were made June 4.

4/ Average of 18 sweeps per plot on each date.

Good and defective seeds in harvest samples from two seed alfalfa plots with treatment timing determined by different levels of lygus bug counts. John Nakamura, Firebaugh, California, 1973.

Plot 1/	Samples 2/	Good Seeds	Defective Seeds							Total Seeds
			Chalcid	Lygus	Stink bug	Shriv-eled	Water damaged	Green	Other	
	1	635	0	15	2	0	6	1	0	659
	2	657	0	22	0	0	5	3	0	687
A	3	695	1	13	0	1	3	0	1	714
	4	666	0	13	1	1	1	0	1	683
	5	665	0	19	1	0	2	0	0	687
	6	695	0	13	1	0	1	1	0	711
	Totals	4013	1	95	5	2	18	5	2	4141
	%	96.9	.02	2.3	.12	.05	.43	.12	.05	100
	1	668	0	30	0	0	2	0	0	700
	2	687	0	34	1	0	2	1	0	725
B	3	676	0	19	0	0	2	0	0	697
	4	647	0	30	1	0	2	0	0	680
	5	662	1	20	1	0	3	0	0	687
	6	640	0	36	1	0	2	0	0	679
	Totals	3980	1	169	4	0	13	1	0	4168
	%	95.5	.02	4.1	.10	0	.31	.02	0	100

1/ Each plot 10 acres (330' x 1320'). Plots were treated with Carzol 0.5 lb per acre plus Thiodan 1.0 lb per acre by aircraft at 10 GPA. Plot A was treated 4 times; June 5, June 27, July 11 and August 1, when lygus bug counts reached 6 per sweep. Plot B was treated 3 times; June 5, July 4, and August 8, when counts reached 12 per sweep (counts based on average of 18 sweeps per plot at weekly intervals).

2/ Six 2-quart samples of pods from each plot were hand stripped from plants prior to commercial harvest. Samples were hand threshed and lightly cleaned in a clipper seed cleaner. Counts based on four sub samples from each of the 2-quart samples.

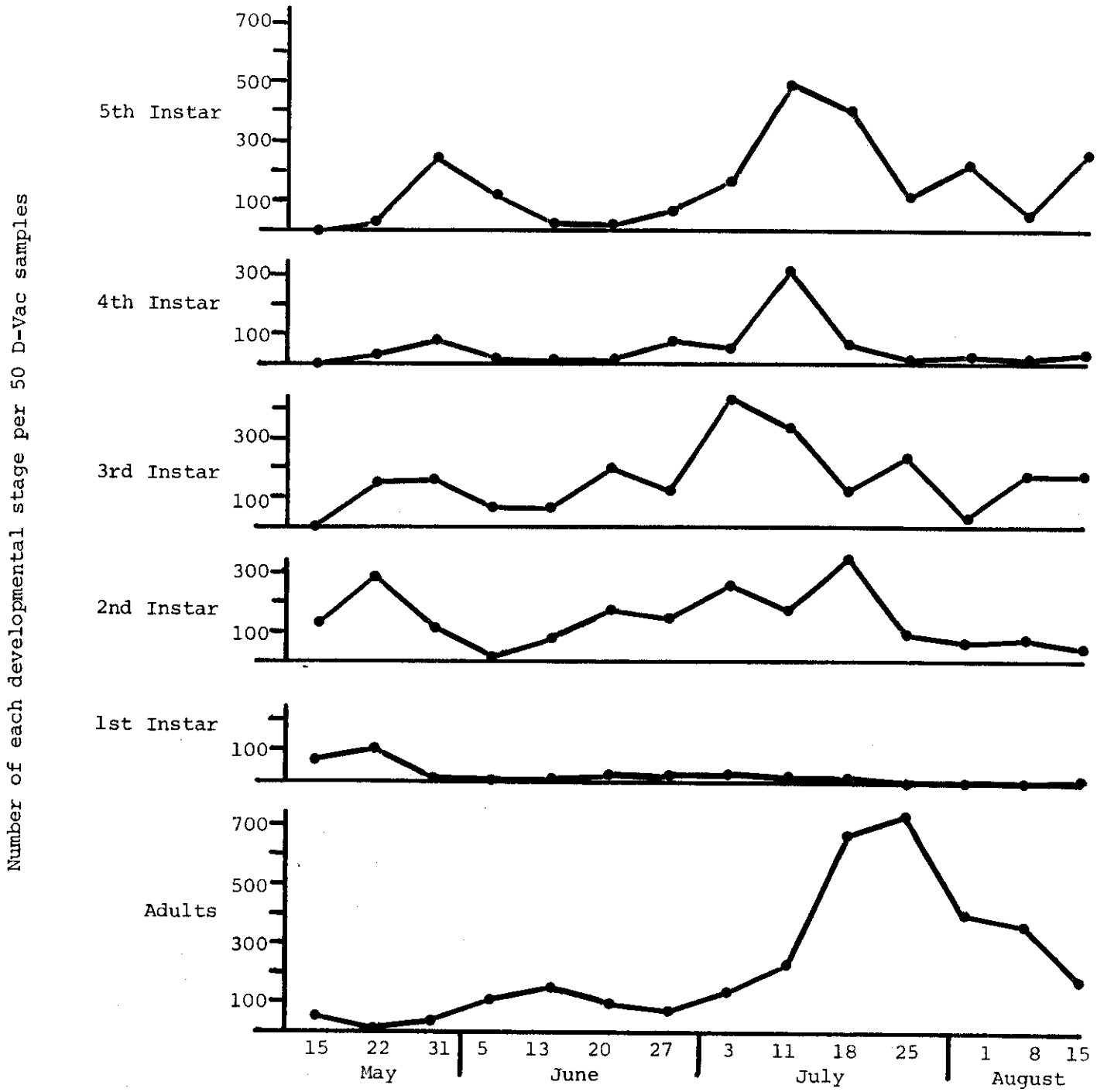
Lygus bug populations in seed alfalfa plots comparing two Temik treatments and an untreated check as shown by two sampling methods.
Giffen Inc., Cantua Ranch, Fresno County, California, 1973.

Date of Sample	Days after Treatment 1/	Number of lygus bugs per sweep 2/									Number of lygus bugs per 50 D-Vac samples 3/								
		Temik A			Temik B			Check			Temik A			Temik B			Check		
		A	N	Total	A	N	Total	A	N	Total	A	N	Total	A	N	Total	A	N	Total
May 15	Pre	-	-	-	-	-	-	-	-	-	39	17	56	55	138	193	61	216	271
22	Pre	-	-	-	-	-	-	-	-	-	11	189	200	17	437	454	14	599	613
31	Pre	2.2	29.7	31.9	2.3	35.5	37.8	2.9	34.1	37.0	43	371	414	41	599	640	44	609	653
June 5	5	2.9	11.8	14.7	2.4	6.8	9.2	6.1	15.4	21.5	80	129	209	91	139	230	113	219	332
13	13	6.1	5.0	11.1	5.7	3.1	8.8	10.9	10.7	21.6	72	127	199	85	65	150	146	192	338
20	20	3.4	14.9	18.3	5.8	6.9	12.7	6.9	21.2	28.2	52	241	293	72	70	142	98	439	537
27	27	3.9	22.6	26.5	2.9	16.5	19.4	4.7	31.2	35.9	81	323	404	56	196	252	76	463	539
July 3	33	9.9	26.2	36.1	5.3	35.5	40.8	9.3	53.2	62.5	153	647	800	96	697	793	137	942	1079
11	41	14.8	65.0	79.8	11.6	92.0	103.6	20.4	123.0	143.4	113	455	568	67	705	772	220	1367	1587
18	48	28.0	38.2	66.2	45.1	49.8	94.9	61.1	64.7	125.8	443	491	934	604	570	1174	679	932	1611
25	55	-	-	-	-	-	-	61.4	85.6	147.0	565	519	1084	664	338	1002	741	500	1241
Aug 1	62	-	-	-	-	-	-	20.9	26.7	47.6	258	320	578	272	296	568	402	396	798
8	69	-	-	-	-	-	-	35.4	42.1	77.6	174	634	808	290	510	800	358	394	752
15	76	-	-	-	-	-	-	20.4	52.6	73.0	334	908	1242	186	572	758	186	572	758

1/ Temik 10% granules were applied at 3.0# AI per acre with a 6 row commercial applicator on May 31 as follows: Temik A--two shanks 14" apart in every other furrow; Temik B--two shanks per row 9" on each side of center. All plots were sprinkler irrigated for 48 hours on June 1 and 2.

2/ Average of sweeps taken on each date; 18 per plot May 15 to July 3, 9 per plot July 11 to August 15.

3/ 5-10 D-Vac samples per plot on each sampling date.



Lygus bug populations in an untreated seed alfalfa plot. Giffen Inc., Cantua Ranch, Fresno County, California, 1973.

Good and defective seeds in harvest samples from seed alfalfa plots comparing two Temik treatments and an untreated check.
Giffen Inc., Cantua Ranch, Fresno County, California, 1973.

Plots 1/	Samples 2/	Good seeds	Defective seeds						Total seeds
			Chalcid	Lygus	Stink bug	shriveled	water damaged	Green	Other	
	1	361	9	267	12	0	1	16	0	666
	2	428	10	237	11	0	2	5	0	693
A	3	444	8	219	8	0	17	1	0	697
	4	538	7	211	7	1	2	4	0	770
	Totals	1771	34	934	38	1	22	26	0	2826
	%	62.7	1.2	34.4	1.3	.04	.78	.92	0	
	1	391	20	225	15	0	1	7	0	689
	2	368	5	295	16	0	3	8	0	695
B	3	377	3	318	16	0	1	16	0	731
	4	431	5	278	12	0	1	2	0	729
	Totals	1657	33	1146	59	0	6	33	0	2844
	%	55.1	1.2	40.3	2.1	0	.21	1.2	0	
	1	287	2	376	13	3	0	27	0	708
	2	296	1	365	17	0	0	4	0	683
Check	3	236	0	374	14	4	3	9	0	640
	4	374	3	262	23	1	0	4	0	667
	Totals	1193	6	1377	67	8	3	44	0	2698
	%	44.2	.22	51.0	2.5	.30	.11	1.6	0	

1/ Temik 10% granules were applied at 3.0 lb per acre with a 6 row commercial applicator as follows: Temik A--two shanks 14" apart in every other furrow; Temik B--two shanks per row 9" on each side of center. All plots were sprinkler irrigated for 48 hours on June 1 and 2.

2/ Four samples of pods from each plot were hand stripped from plants prior to commercial harvest. Samples were hand threshed and lightly cleaned in a clipper seed cleaner. Counts based on 4 subsamples from each of the threshed samples.

Lygus bug populations in seed alfalfa plots treated for aphid and lygus bug control. Aphid Experiment #2.
Mike Perez, Firebaugh, California, 1973.

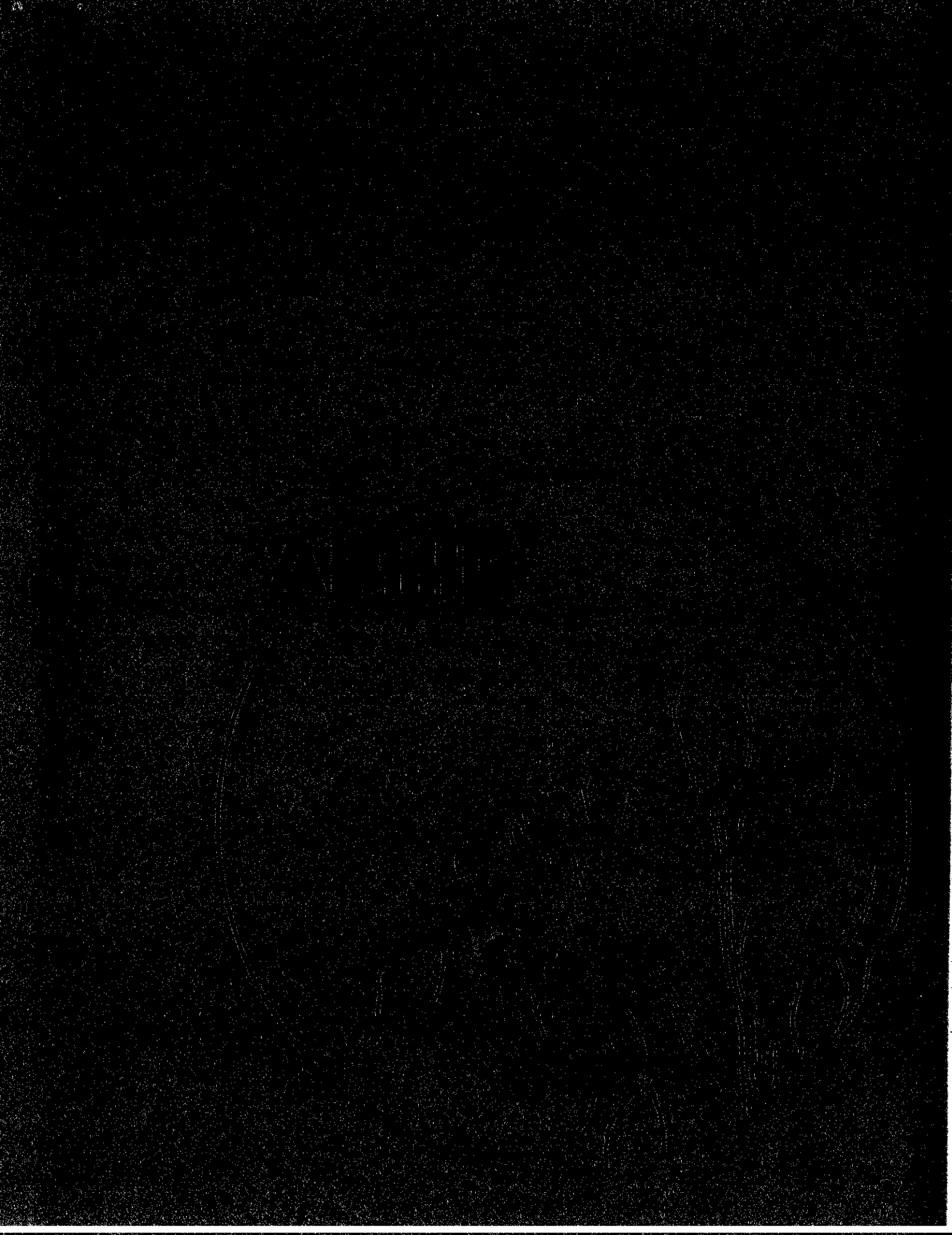
Treatment 1/		Days after application 3/	Number of lygus bugs per 50 D-Vac samples 4/							
Insecticide 2/	AI/ Acre lb		Adults	Nymphal Instars						Adults & Nymphs
				1	2	3	4	5	Total	
		Pre	20	0	6	20	18	18	62	82
Vydate +	0.75	6	2	0	0	0	0	0	2	2
Carzol	0.5	13	6	0	4	0	0	0	4	10
		20	8	0	6	5	4	1	16	24
		Pre	9	1	10	35	25	20	91	100
Vydate	0.75	6	9	0	0	0	0	0	0	9
		13	8	0	1	2	0	0	3	11
		20	12	0	2	4	3	4	13	25
		Pre	13	0	15	22	43	19	99	112
Tepp +	1.0	6	13	5	4	2	1	3	15	38
Carzol	0.5	13	24	7	73	22	4	2	108	132
Carzol	0.5	6	5	0	3	1	4	0	8	13
		Pre	18	1	8	16	20	13	58	76
Thiodan +	1.0	6	34	1	4	2	3	8	18	52
Carzol	0.5	13	46	2	54	17	1	1	75	121
Carzol	0.5	6	2	0	1	1	6	1	9	11
		Pre	14	1	12	11	27	15	66	80
UniRoyal K840 +	0.5	6	19	6	5	5	1	8	25	44
Carzol	0.5	13	38	6	124	34	6	1	171	209
Carzol	0.5	6	3	1	0	6	10	7	24	27
		Pre	11	0	10	21	36	12	79	90
UniRoyal K840	0.5	6	44	19	38	11	14	34	116	160
		13	98	28	263	87	30	8	416	514
Carzol	0.5	6	3	0	4	15	17	13	49	52

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Insecticides applied as spray by aircraft at 10 GPA from 4:50 to 6:00 A.M. August 15. The Tepp, Thiodan and K840 plots were treated again with Carzol 0.5 lb per acre 5:25 to 5:40 A.M. August 29 because of high lygus bug populations.

3/ Pretreatment samples were taken August 14.

4/ 2-25 D-Vac samples per treatment on each date.



Spotted alfalfa aphid and pea aphid populations in seed alfalfa plots treated with insecticides applied by aircraft to control lygus bugs. John Nakamura, Firebaugh, California, 1973.

Treatment 1/		Days after application 3/	Number of aphids per 50 D-Vac samples 4/	
Insecticide 2/	AI/Acre lb		S.A.A.	P.A.
Carzol plus Thiodan	0.5 1.0	Pre	24	0
		1	-	-
		3	140	0
		7	169	0
		14	89	0
		21	340	0
		27	655	0
Carzol	0.5	Pre	27	0
		1	-	-
		3	47	0
		7	459	1
		14	338	0
		21	6554	0
Vydate	0.75	Pre	42	0
		1	158	0
		3	256	0
		7	206	0
		14	59	0
		21	wet	wet
		5	74	0
		13	984	0
Lannate	0.75	Pre	26	1
		1	20	1
		3	20	0
		7	44	0
		14	8	0
		6	wet	wet
		12	11	0
		20	58	0
Dursban	1.0	Pre	16	1
		1	1	0
		3	1	0
		7	0	0
		14	1	0
		6	wet	wet

Treatment 1/		Days after application 3/	Number of aphids per 50 D-Vac samples 4/	
Insecticide 2/	AI/Acre lb		S.A.A.	P.A.
Dursban	0.5	Pre	19	0
		1	5	0
		3	wet	wet
		7	1	0
		14	1	0
		6	8	0

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Sprays applied at 10 GPA. Carzol was a 92% soluble powder while others were emulsifiable concentrates. All plots were treated June 5 from 4:15 to 5:45 A.M. The Lannate and the two Dursban plots were retreated June 20 from 4:30 to 5:00 A.M. The Vydate plot was retreated June 27 from 4:15 to 4:20 A.M.

3/ Pretreatment counts were made June 4.

4/ 2-25 D-Vac samples were taken in each plot on each sampling date.

Spotted alfalfa aphid populations in seed alfalfa plots comparing two Temik treatments and an untreated check.
Giffen Inc., Cantua Ranch, Fresno County, California, 1973.

Date of Samples	Days after treatment 1/	Number of aphids per 50 D-Vac samples 2/		
		Temik A	Temik B	Check
May 15	Pre	3	27	58
22	Pre	70	30	41
31	Pre	38	53	70
June 5	5	1	5	18
13	13	4	0	6
20	20	2	3	28
27	27	17	3	113
July 3	33	458	53	475
11	40	671	356	2,094
18	47	7,568	4,672	21,229
25	54	11,144	7,029	28,014
Aug 1	61	51,308	39,648	65,062
8	68	106,556	79,180	99,736
15	75	69,124	55,218	58,890

1/ Temik 10% granules were applied at 3.0# AI per acre with a 6 row commercial applicator on May 31 as follows: Temik A--two shanks 14" apart in every other furrow; Temik B--two shanks per row 9" on each side of center. All plots were sprinkler irrigated for 48 hours on June 1 and 2.

2/ 5-10 D-Vac samples per plot on each sampling date.

Spotted alfalfa aphid and pea aphid populations in two seed alfalfa plots with treatment timing determined by different levels of lygus bug counts 1/.
John Nakamura, Firebaugh, California, 1973.

A				B			
To be treated when lygus counts reached 6 per sweep 2/				To be treated when lygus counts reached 12 per sweep 2/			
Dates of applications 3/	Days after application 4/	Number of aphids/ 50 D-Vac samples 5/		Dates of applications 3/	Days after application 4/	Number of aphids/ 50 D-Vac samples 5/	
		S.A.A.	P.A.			S.A.A.	P.A.
	Pre	16	0		Pre	24	0
June 5	3	-	-	June 5	3	140	0
	7	-	-		7	169	0
	14	46	0		14	89	0
	21	411	0		21	340	0
June 27	5	35	0		27	655	0
	13	1,060	0	July 4	6	1,650	0
July 11	6	1,111	0		13	2,876	0
	13	1,225	0		20	2,485	0
	20	1,783	0		27	3,511	0
Aug. 1	6	5,090	0		34	10,546	0
	14	74,481	3	Aug. 8	6	29,600	0

1/ Each plot 10 acres (330' x 1320').

2/ Average of 18 sweeps per plot on each sampling date.

3/ Carzol 0.5 lb. per acre plut Thiodan 1.0 per acre were applied by aircraft at 10 GPA on each treatment date. Both plots were treated with Tepp 1.0 lb per acre on July 25 because of spotted alfalfa aphid populations.

4/ Pretreatment samples were taken June 4.

5/ 2-25 D-Vac samples per plot on each sampling date.

Spotted alfalfa aphid populations in seed alfalfa plots treated for aphid control. Aphid experiment #1.
Mike Perez, Firebaugh, California, 1973.

Treatment 1/		Number of aphids per 50 D-Vac samples 3/			
Insecticide 2/	AAI/ Acre lb	July 10 Pre	July 17 6 days	July 24 13 days 4/	July 31 20 days
Thiodan	1.0	29,122	24,597	very heavy	-
Vydate	0.75	26,174	6,477	medium	75,965
UniRoyal K840	0.5	57,373	1,141	very light	1,035
UniRoyal K840	0.25	30,839	5,212	light	1,270
Pirimor	1.0	42,752	17,005	heavy	-
Pirimor	0.5	12,750	35,929	very heavy	-

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Insecticides applied as spray by aircraft at 10 GPA from 4:05 to 5:25 A.M. July 11. The Thiodan and Pirimor plots were treated with Tepp 1.0 lb per acre on July 25.

3/ 2-25 D-Vac samples per treatment on each date.

4/ D-Vac samples were sticky and dry and aphids did not separate properly in berlese funnels. Sweep net estimates of aphid populations are shown.

Spotted alfalfa aphid populations in seed alfalfa plots treated for aphid and lygus bug control. Aphid Experiment #2.
Mike Perez, Firebaugh, California, 1973.

Treatment 1/		Number of aphids per 50 D-Vac samples 3/			
Insecticide 2/	AI/ Acre lb	Aug 14 Pre	Aug 21 6 days	Aug 28 13 days	Sept 4 20 days
Vydate + Carzol	0.75 0.5	3,737	784	3,062	7,376
Vydate	0.75	2,645	3,010	4,853	13,213
Tepp + Carzol	1.0 0.5	5,222	1,221	1,561	17,843
Thiodan + Carzol	1.0 0.5	7,863	10,373	30,507	63,561
UniRoyal K840 + Carzol	0.5 0.5	6,458	79	407	3,772
UniRoyal K840	0.5	4,608	37	86	802

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Insecticides applied as spray by aircraft at 10 GPA from 4:50 to 6:00 A.M. August 15. The Tepp, Thiodan and K840 plots were treated again with Carzol 0.5 lb per acre 5:25 to 5:40 A.M. August 29 because of high lygus bug populations.

3/ 2-25 D-Vac samples per treatment on each date.

Mite populations in seed alfalfa plots treated with insecticide sprays applied by aircraft to control lygus bugs.
John Nakamura, Firebaugh, California, 1973.

Treatment 1/		Dates of applications	Days after applications 3/	Average per leaf 4/	
Insecticides 2/	AI/Acre Lb			Mites	Eggs
Carzol plus Thiodan	0.5 1.0	Jun 5	Pre	6.93	6.91
			7	1.95	2.81
			14	0.85	1.89
			21	1.59	4.72
			27	1.01	2.24
Carzol	0.5	Jun 5	Pre	7.88	8.81
			7	2.71	6.96
			14	1.88	4.32
			21	wet	wet
Vydate	0.75	Jun 5	Pre	4.87	7.37
			3	7.48	6.71
			7	3.21	6.84
			14	3.19	9.92
			21	wet	wet
		Jun 27	5	5.35	8.89
			13	8.35	22.6
Lannate	0.75	Jun 5	Pre	4.65	8.81
			3	9.20	8.53
			7	6.13	11.4
			14	7.52	23.4
		Jun 20	6	wet	wet
			12	10.5	10.7
			20	22.9	29.4
Dursban	1.0	Jun 5	Pre	4.05	6.25
			3	2.64	3.10
			7	2.10	5.10
			14	1.56	5.57
Dursban	0.5	Jun 5	Pre	2.95	6.35
			3	wet	wet
			7	5.33	6.87
			14	3.21	8.41

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Sprays applied at 10 GPA. Carzol was a 92% soluble powder while others were emulsifiable concentrates. All plots were treated June 5 from 4:15 to 5:45 A.M. The Lannate and the two Dursban plots were retreated June 20 from 4:30 to 5:00 A.M. The Vydate plot was retreated June 27 from 4:15 to 4:20 A.M.

3/ Pretreatment counts were made June 4.

4/ 75 infested trifoliate leaves from each treatment were examined on each sampling date.

Mite populations in seed alfalfa plots comparing two Temik treatments and an untreated check.
Giffen Inc., Cantua Ranch, Fresno County, California, 1973.

Date of Sample	Days after treatment 1/	Average number of mites and mite eggs per trifoliate leaf 2/					
		Temik A		Temik B		Check	
		mites	eggs	mites	eggs	mites	eggs
May 31	Pre	0.01	0.31	0.00	0.01	0.03	0.21
June 13	13	0.00	0.13	0.00	0.00	0.04	0.03
20	20	0.13	0.07	0.00	0.01	0.01	0.01
27	27	0.41	0.13	0.00	0.00	0.00	0.00
July 3	33	0.07	1.13	0.01	0.00	0.44	1.21
11	41	0.16	0.65	0.51	0.49	0.03	0.03
18	48	0.49	0.35	0.00	0.00	0.20	0.76
25	55	0.68	1.65	0.49	0.32	0.92	2.35
Aug 1	62	0.40	0.27	0.00	0.00	1.51	1.96
8	69	1.68	2.96	0.13	0.17	1.57	4.07

1/ Temik 10% granules were applied at 3.0# AI per acre with a 6 row applicator on May 31 as follows: Temik A--two shanks 14" apart in every other furrow; Temik B--two shanks per row 9" on each side of center. All plots were sprinkler irrigated for 48 hours June 1 and 2.

2/ 75 infested trifoliate leaves examined from each plot on each sampling date.

Mite populations in two seed alfalfa plots with treatment timing determined by different levels of lygus bug counts 1/.
John Nakamura, Firebaugh, California, 1973.

A To be treated when lygus counts reached 6 per sweep 2/				B To be treated when lygus counts reached 12 per sweep 2/			
Dates of applications 3/	Days after application 4/	Average per leaf 5/ Mites	Eggs	Dates of applications 3/	Days after application 4/	Average per leaf 5/ Mites	Eggs
	Pre	5.73	7.88		Pre	6.93	6.91
June 5	7	-	-	June 5	7	1.95	2.81
	14	1.19	2.21		14	0.85	1.89
	21	0.65	3.63		21	1.59	4.72
June 27	5	0.63	1.56		27	1.01	2.24
	13	0.32	0.39	July 4	6	0.27	0.60
July 11	6	0.18	0.28		13	0.35	0.33
	13	0.08	0.05		20	0.20	0.55
	20	0.13	0.04		27	0.47	0.40
Aug. 1	6	0.07	0.15		34	0.47	3.27
	14	0.04	0.37	Aug. 8	6	0.19	0.12

1/ Each plot 10 acres (330' x 1320').

2/ Average of 18 sweeps per plot on each sampling date.

3/ Carzol 0.5 lb per acre plus Thiodan 1.0 lb per acre were applied by aircraft at 10 GPA on each treatment date. Both plots were treated with Tepp 1.0 lb per acre on July 25 because of spotted alfalfa aphid populations.

4/ Pretreatment samples were taken June 4.

5/ 75 infested trifoliate leaves from each plot were examined on each sampling date.

Predator and parasite populations in seed alfalfa plots treated with insecticide sprays by aircraft to control lygus bugs.
John Nakamura, Firebaugh, California, 1973.

Treatment 1/		Dates of application	Days after application 3/	Number of predators and parasites per 50 D-Vac samples 4/															
Insecticide 2/	AI/ Acre Lb			Orius		Geocoris		Nabis		Lacewing		Syrphid		Cocci-nellidae		Collops		Spiders	Par Wasps
				A	N	A	N	A	N	A	L	A	L	A	L	A	L		
			Pre	280	80	30	124	23	416	1	0	0	0	0	0	1	6	39	53
		Jun 5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carzol +	0.5		3	10	12	4	1	1	40	1	0	0	0	0	0	0	1	12	16
Thiodan	1.0		7	6	17	0	0	2	9	4	1	0	0	2	0	2	5	35	31
			14	8	3	0	2	3	10	1	1	0	0	0	0	0	1	20	10
			21	62	4	7	0	2	4	0	5	0	0	1	0	0	2	14	26
			27	33	51	2	1	2	4	6	25	0	0	0	14	2	8	30	2
			Pre	282	76	13	97	22	478	1	1	0	0	0	0	1	8	26	54
		Jun 5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carzol	0.5		3	11	2	2	7	2	34	0	1	0	0	4	0	1	0	12	13
			7	2	7	0	2	1	21	0	0	0	0	2	0	2	19	31	27
			14	18	15	1	1	0	28	2	1	0	0	0	0	0	2	26	4
			21	107	2	2	1	0	10	5	3	0	0	6	1	2	4	11	28
			Pre	264	80	32	54	23	443	3	2	0	0	0	0	2	1	21	49
		Jun 5	1	12	16	21	19	4	42	0	0	0	0	1	0	2	0	21	21
Vydate	0.75		3	10	6	17	18	1	8	0	1	0	0	3	0	1	1	12	23
			7	3	4	1	5	1	4	0	0	0	0	0	0	2	14	36	12
			14	7	8	0	0	0	12	1	0	0	0	0	0	0	1	31	11
			21 wet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Jun 27	5	3	7	3	1	0	0	0	10	0	0	0	3	0	5	47	0
			13	14	17	3	3	0	1	1	11	0	0	0	1	2	6	22	14

Treatment 1/		Dates of application	Days after application 3/	Number of predators and parasites per 50 D-Vac samples 4/															
				Orius		Geocoris		Nabis		Lacewing		Syrphid		Cocci-nellidae		Collops		Spiders	Par Wasps
Insecticide 2/	AI/ Acre Lb			A	N	A	N	A	N	A	L	A	L	A	L	A	L		
Lannate	0.75		Pre	244	88	32	79	27	393	2	3	0	0	0	0	3	5	47	78
		Jun 5	1	4	4	5	7	1	5	1	3	0	0	1	0	2	4	18	13
			3	12	15	34	46	0	1	0	0	0	0	2	0	3	1	17	21
			7	12	9	45	15	1	3	5	2	0	0	0	0	0	11	34	134
			14	16	9	16	8	3	22	0	0	0	0	0	0	0	1	45	19
		Jun 20	6 wet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			12	3	1	6	7	0	0	0	14	0	0	0	0	0	0	67	4
			20	3	6	0	11	1	3	0	22	0	0	0	1	3	3	19	6
Dursban	1.0		Pre	261	59	20	93	15	511	1	3	0	0	0	0	1	3	31	69
		Jun 5	1	4	4	5	7	1	5	1	3	0	0	1	0	2	4	18	13
			3	42	11	18	18	6	15	0	0	0	0	3	0	3	2	16	21
			7	7	17	14	0	3	26	3	3	0	0	2	0	1	5	11	57
			14	19	11	5	3	3	80	1	1	0	0	0	0	0	0	45	15
		Jun 20	6 wet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dursban	0.5		Pre	229	39	17	48	22	426	1	1	0	0	0	0	5	4	28	76
		Jun 5	1	6	23	19	15	0	30	3	3	1	0	0	0	7	1	21	37
			3 wet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			7	20	13	14	8	4	65	1	1	0	0	3	0	1	6	29	119
			14	54	32	23	11	11	96	0	3	0	0	0	0	1	0	56	26
		Jun 20	6 wet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Sprays applied at 10 GPA. Carzol was a 92% soluble powder while others were emulsifiable concentrates. All plots were treated June 5 from 4:15 to 5:45 A.M. The Lannate and the two Dursban plots were retreated June 20 from 4:30 to 5:00 A.M. The Vydate plot was retreated June 27 from 4:15 to 4:20 A.M.

3/ Pretreatment counts were made June 4.

4/ 2-25 D-Vac samples were taken in each plot on each sampling date.

Predator and parasite populations in seed alfalfa plots treated for aphid and lygus bug control.
Aphid experiment #2.
Mike Perez, Firebaugh, California, 1973.

Treatment 1/		Days after application 3/	Number of predators and parasites per 50 D-Vac samples 4/															
Insecticide 2/	AI/ acre lb		Orius		Geocoris		Nabis		Lacewing		Syrphid		Cocci-nellidae		Collops		Spiders	Par Wasps
			A	N	A	N	A	N	A	L	A	L	A	L	A	L		
		Pre	6	0	1	0	2	1	1	6	0	0	0	0	8	14	2	16
Vydate +	0.75	6	0	0	1	0	0	0	0	0	0	0	0	0	0	7	5	2
Carzol	0.5	13	3	0	0	0	0	0	4	2	0	0	0	0	0	21	1	5
		20	7	2	0	0	0	0	0	0	0	0	0	0	1	6	1	4
		Pre	8	1	1	0	0	0	2	5	0	0	0	0	7	9	0	30
Vydate	0.75	6	0	0	0	0	0	0	1	1	0	0	0	0	1	6	6	8
		13	7	3	1	0	0	0	7	1	0	0	0	0	2	24	2	11
		20	6	1	1	0	1	0	2	0	0	0	0	0	0	1	1	8
		Pre	13	5	4	0	0	0	6	6	0	0	0	0	4	17	4	58
Tepp +	1.0	6	2	2	0	0	0	0	2	12	0	0	0	0	2	9	10	9
Carzol	0.5	13	18	14	0	0	0	0	16	5	0	0	0	0	0	29	1	29
Carzol	0.5	6	3	1	0	0	0	0	0	5	0	0	0	0	8	3	0	5
		Pre	9	0	0	0	1	1	13	17	0	0	0	1	5	10	2	23
Thiodan +	1.0	6	2	7	1	0	0	0	10	5	0	0	0	0	4	2	6	6
Carzol	0.5	13	12	2	0	0	0	0	29	10	0	0	0	0	0	7	1	13
Carzol	0.5	6	8	3	0	0	0	0	1	4	0	0	0	0	8	1	0	1
		Pre	6	0	1	0	0	0	9	13	0	0	0	0	5	10	0	36
UniRoyal K840 +	0.5	6	1	4	0	0	0	0	6	5	0	0	0	0	0	4	2	13
Carzol	0.5	13	8	4	0	0	0	1	23	15	0	0	0	0	3	19	6	10
Carzol	0.5	6	3	10	0	0	0	0	4	6	0	0	0	0	4	3	1	0

Treatment 1/		Days after application 3/	Number of predators and parasites per 50 D-Vac samples 4/															
Insecticide 2/	AI/ acre		Orius		Geocoris		Nabis		Lacewing		Syrphid		Cocci-nellidae		Collops		Spiders	Par Wasps
			A	N	A	N	A	N	A	L	A	L	A	L	A	L		
		Pre	1	0	0	0	0	0	11	11	0	0	0	0	4	22	2	28
UniRoyal K840	0.5	6	3	6	0	0	0	0	7	4	0	0	0	0	2	4	2	9
		13	31	27	1	0	0	2	33	19	0	0	0	0	4	14	1	24
Carzol	0.5	6	9	14	0	0	0	0	0	11	0	0	0	0	3	23	1	0

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Insecticides applied as spray by aircraft at 10 GPA from 4:50 to 6:00 A.M. August 15. The Tepp, Thiodan and K840 plots were treated again with Carzol 0.5 lb per acre 5:25 to 5:40 A.M. August 29 because of high lygus bug populations.

3/ Pretreatments samples were taken August 14.

4/ 2-25 D-Vac samples per treatment on each date.

Predator and parasite populations in seed alfalfa plots treated for aphid control.
Aphid experiment #1.
Mike Perez, Firebaugh, California, 1973.

Treatment 1/		Days after application 3/	Number of predators and parasites per 50 D-Vac samples 4/															
Insecticide 2/	AI/ acre lb		Orius		Geocoris		Nabis		Lacewing		Syrphid		Cocci-nellidae		Collops		Spiders	Par Wasps
			A	N	A	N	A	N	A	L	A	L	A	L	A	L		
Thiodan	1.0	Pre	10	0	1	0	2	17	30	12	0	0	0	3	0	2	3	38
		6	71	5	0	0	0	0	50	9	0	0	0	5	0	0	9	63
		13*	3	14	0	0	1	0	19	3	0	0	0	2	1	1	0	22
Vydate	0.75	Pre	29	13	0	0	4	8	26	45	0	0	0	2	0	1	12	36
		6	17	1	0	0	0	0	7	11	0	0	0	0	0	1	19	25
		13*	8	4	1	0	0	0	13	8	0	0	0	0	2	1	12	5
		20	65	55	5	0	0	5	30	0	0	0	0	0	10	15	5	220
UniRoyal K840	0.5	Pre	38	7	0	0	0	15	6	31	0	0	0	2	1	0	11	45
		6	93	16	0	0	0	13	35	45	0	0	0	8	1	5	27	77
		13*	42	4	0	0	1	19	30	26	0	0	0	0	3	6	22	106
		20	215	150	0	0	25	55	10	40	0	0	5	0	10	0	20	120
UniRoyal K840	0.25	Pre	33	9	0	0	0	16	21	25	0	0	0	5	2	2	12	23
		6	105	43	0	0	0	5	65	21	0	0	0	13	1	1	24	132
		13*	50	151	2	0	1	25	41	28	0	0	2	1	3	5	27	95
		20	535	180	0	10	0	70	20	60	0	0	10	5	5	0	60	300
Pirimor	1.0	Pre	28	3	0	0	0	11	7	25	0	0	0	1	6	1	7	22
		6	54	10	0	0	1	3	50	5	0	0	0	4	1	2	20	57
		13*	3	25	0	0	2	0	9	17	0	0	3	17	0	0	3	81
Pirimor	0.5	Pre	42	10	1	0	2	12	4	17	0	0	0	0	7	1	18	28
		6	113	10	0	0	0	6	20	10	0	0	1	2	4	5	39	102
		13*	36	42	0	0	0	11	33	9	0	0	1	6	3	0	11	317

1/ Plot size: each treatment 5 acres (165' x 1320').

2/ Insecticides applied as spray by aircraft at 10 GPA from 4:05 to 5:25 A.M. July 11. The Thiodan and Pirimor plots were treated with Tepp 1.0 lb per acre on July 25.

3/ Pretreatment counts were made July 10.
* D-Vac samples were sticky and dry on this date and counts may be low due to poor survival.

4/ 2-25 D-Vac samples per treatment on each date.

Summer populations of consperse stink bugs in 5 seed alfalfa fields.
Fresno County, California, 1973.

Grower and Location	Number of stink bugs (adults and nymphs) per 25' of row 1/																
	May			June				July					August				Sept
	15	22	30	5	12	19	26	2	10	17	24	31	7	14	21	28	4
Echeveste & Elizaldi Sec. 2 Firebaugh, Calif.	2	16	7	1	-	2	2	-	12	15	48	74	55	0	1	1	-
John Nakamura Sec. 11 Firebaugh, Calif.	0	0	0	0	0	0	1	1	1	0	0	0	2	10	3	2	-
Mike Perez Sec. 10 Firebaugh, Calif.	5	1	1	1	0	0	2	1	10	4	3	13	13	26	110	56	20
Mike Perez Sec. 16 Firebaugh, Calif.	7	0	0	1	1	10	0	1	3	17	37	68	10	40	-	-	-
Enrico Farms Sec. 9 Firebaugh, Calif.	-	-	1	1	2	1	5	2	33	15	63	36	35	33	29	32	5

1/ 5 beating pan samples in each field on each date. The samples were field examined from May 15 to June 19; from June 26 to Sept 4, 24 hr berlese funnel separation in the laboratory was used.

Percentages of good and defective seeds in samples from 5 stink bug survey fields. 1973.

Grower	Dates Sampled	Total seeds examined 1/	Good seed	Defective seeds						
				Chalcid	Lygus	Stink bug	Shriveled	Water damaged	Green	Other
Echeveste & Elizaldi Sec. 2 Firebaugh, Calif.	Aug 29	3180	97.6	.22	1.3	.38	0.0	.31	.09	0.0
John Nakamura Sec. 11 Firebaugh, Calif.	Sept 4	2815	88.1	.14	11.2	.14	.04	.21	.14	0.0
Mike Perez Sec. 10 Firebaugh, Calif.	Sept 11	2939	84.6	3.3	11.3	.34	0.0	.34	1.0	.03
Mike Perez Sec. 16 Firebaugh, Calif.	Aug 21	3226	93.3	.50	5.6	.53	.03	.06	.09	0.0
Enrico Farms Sec. 9 Firebaugh, Calif.	Sept 11	3047	86.0	3.6	9.8	.39	0.0	.20	.03	0.0

1/ Four 2-quart samples of pods were hand stripped from plants prior to commercial harvest. Samples were hand threshed and lightly cleaned in a clipper seed cleaner. Counts based on four subsamples from each of the threshed 2-quart samples.

Spring and summer populations of consperse stink bug in seed alfalfa survey field #1.
Echeveste & Elizaldi, Section 2, Firebaugh, California, 1973.

Dates field sampled 1/	Number of stink bugs per 25' of row 2/									
	Adults			Nymphal instars						Total adults and nymphs
	Males	Females	Total	1	2	3	4	5	Total	
May 15 a/	0	0	0	0	2	0	0	0	2	2
22	0	2	2	0	11	3	0	0	14	16
30	0	0	0	0	6	1	0	0	7	7
June 5 b/	0	0	0	0	1	0	0	0	1	1
12	-	-	-	-	-	-	-	-	-	-
19	2	0	2	0	0	0	0	0	0	2
26 c/	0	2	2	0	0	0	0	0	0	2
July 2	-	-	-	-	-	-	-	-	-	-
10 d/	1	1	2	4	2	3	1	0	10	12
17 e/	0	1	1	0	5	4	4	1	14	15
24	0	0	0	5	21	9	10	3	48	48
31 f/	1	1	2	1	31	23	16	1	72	74
Aug 7	2	1	3	0	12	21	13	6	52	55
14 g/	0	0	0	0	0	0	0	0	0	0
21 h/	1	0	1	0	0	0	0	0	0	1
28	0	1	1	0	0	0	0	0	0	1

1/ Insecticide applications:
- a/ May 14. Dimethoate 0.5 lb per acre.
- b/ May 31. Carzol 0.5 lb per acre + Thiodan 1.0 lb per acre.
- c/ June 20. Dibrom 1.5 lb per acre + Toxaphene 4.0 lb per acre.
- d/ July 4. Lannate L 0.45 lb per acre + Toxaphene 4.0 lb per acre.
- e/ July 10. Lannate L 0.675 lb per acre.
- f/ July 27. Carzol 0.5 lb per acre + Lannate L 0.45 lb per acre.
- g/ August 8. Methyl Parathion 1.25 lb per acre.
- h/ August 20. Methyl Parathion 1.25 lb per acre.

2/ 5 beating pan samples on each date.

Spring and summer populations of consperse stink bug in seed alfalfa survey field #2.
John Nakamura, Section 11, Firebaugh, California. 1973.

Dates field sampled 1/	Number of stink bugs per 25' of row 2/									
	Adults			Nymphal instars						Total adults and nymphs
	Males	Females	Total	1	2	3	4	5	Total	
May 15	-	-	-	-	-	-	-	-	-	-
22	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
June 5 a,b/	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
19 c/	0	0	0	0	0	0	0	0	0	0
26	1	0	1	0	0	0	0	0	0	0
July 2	0	0	0	0	0	0	0	0	0	0
10 d/	0	0	0	0	1	0	0	0	1	1
17	0	0	0	0	0	0	0	0	0	0
24 e/	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
Aug 7 f/	0	0	0	1	1	0	0	0	2	2
14	0	3	3	0	6	0	1	0	7	10
21 g/	0	1	1	1	0	1	0	0	2	3
28	0	0	0	1	0	0	0	1	2	2

1/ Insecticide applications:
- a/ June 2. Dibrom 1.0 lb per acre + Toxaphene 4.0 lb per acre.
- b/ June 2. Temik 10% granules sidedressed 2.0 lb AI per acre.
- c/ June 13. Dibrom 1.5 lb per acre + Toxaphene 4.0 lb per acre.
- d/ July 3. Carzol 0.5 lb per acre + Thiodan 1.0 lb per acre.
- e/ July 19. Carzol 0.5 lb per acre + Thiodan 1.0 lb per acre.
- f/ August 1. Lannate L 0.45 lb per acre + Tepp 1.0 lb per acre.
- g/ August 16. Tepp 1.0 lb per acre.

2/ 5 beating pan samples on each date.

Spring and summer populations of consperse stink bug in seed alfalfa survey field #3.
Mike Perez, Section 10, Firebaugh, California, 1973.

Dates field sampled 1/	Number of stink bugs per 25' of row 2/									
	Adults			Nymphal instars						Total adults and nymphs
	Males	Females	Total	1	2	3	4	5	Total	
May 15 a/	2	1	3	0	2	0	0	0	2	5
22	0	1	1	0	0	0	0	0	0	1
30	0	1	1	0	0	0	0	0	0	1
June 5	0	1	1	0	0	0	0	0	0	1
12 b/	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	2	0	0	0	2	2
July 2 c,d/	0	0	0	0	0	1	0	0	1	1
10	0	1	1	7	1	1	0	0	9	10
17	0	0	0	0	0	2	1	1	4	4
24 e/	1	0	1	0	1	1	0	0	2	3
31 f/	0	3	3	7	3	0	0	0	10	13
Aug 7	1	2	3	5	4	0	0	1	10	13
14 g/	0	2	2	8	14	2	0	0	24	26
21	7	4	11	29	39	22	9	0	99	110
28 h/	6	5	11	8	17	4	5	11	45	56
Sept 4 i/	3	6	9	5	2	0	2	2	11	20

1/ Insecticide applications:
- a/ April 30. Temik 10% granules sidedressed 3.0 lb AI per acre.
- b/ June 9. Dibrom 1.5 lb per acre + Toxaphene 4.0 lb per acre.
- c/ June 28. Dibrom 1.5 lb per acre + Toxaphene 4.0 lb per acre.
- d/ June 30. Carzol 0.5 lb. per acre + Toxaphene 4.0 lb per acre.
- e/ July 20. Dylox 1.2 lb per acre.
- f/ July 27. Tepp 1.0 lb per acre + Toxaphene 4.0 lb per acre.
- g/ August 10. Carzol 0.5 lb per acre + Thiodan 1.0 lb per acre.
- h/ August 22. Dibrom 1.5 lb per acre.
- i/ August 29. Methyl Parathion 1.25 lb per acre.

2/ 5 beating pan samples on each date.

Spring and summer populations of consperse stink bug in seed alfalfa survey field #4.
Mike Perez, Section 16, Firebaugh, California, 1973.

Dates field sampled 1/	Number of stink bugs per 25' of row 2/									
	Adults			Nymphal instars						Total adults and nymphs
	Males	Females	Total	1	2	3	4	5	Total	
May 15 a/	1	0	1	0	6	0	0	0	6	7
22	0	0	0	0	0	0	0	0	0	0
30 b/	0	0	0	0	0	0	0	0	0	0
June 5 c/	0	0	0	0	0	1	0	0	1	1
12	0	0	0	0	0	0	0	1	1	1
19	4	0	4	3	0	0	0	3	6	10
26 d/	0	0	0	0	0	0	0	0	0	0
July 2	1	0	1	0	0	0	0	0	0	1
10 e/	0	0	0	0	3	0	0	0	3	3
17	1	2	3	0	14	0	0	0	14	17
24 f/	0	0	0	10	27	0	0	0	37	37
31	2	4	6	3	58	0	1	0	62	68
Aug 7	2	2	4	0	3	0	2	1	6	10
14 g/	7	4	11	0	3	2	16	8	29	40

1/ Insecticide applications:
- a/ May 8. Dimethoate 0.5 lb per acre.
- b/ May 29. Lannate 0.45 lb per acre.
- c/ June 5. Dibrom 1.5 lb per acre + Toxaphene 4.0 lb per acre.
- d/ June 22. Carzol 0.5 lb per acre + Thiodan 1.0 lb per acre.
- e/ July 6. Tepp 1.0 lb per acre.
- f/ July 18. Tepp 1.0 lb per acre + Toxaphene 4.0 lb per acre.
- g/ August 8. Tepp 1.0 lb per acre + Lannate L 0.45 lb per acre.

2/ 5 beating pan samples on each date.

Spring and summer populations of consperse stink bug in seed alfalfa survey field #5.
Enrico Farms, Section 4, Firebaugh, California, 1973.

Dates field sampled 1/	Number of stink bugs per 25' of row 2/									
	Adults			Nymphal instars						Total adults and nymphs
	Males	Females	Total	1	2	3	4	5	Total	
May 15 a/	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-
30	0	1	1	0	0	0	0	0	0	1
June 5 b/	0	0	0	0	1	0	0	1	1	1
12	1	0	1	0	0	1	0	0	1	2
19	1	0	1	0	0	0	0	0	0	1
26	1	1	2	0	0	0	3	0	3	5
July 2 c/	0	0	0	0	0	1	1	0	2	2
10	3	2	5	10	17	1	0	0	28	33
17	0	0	0	4	7	4	0	0	15	15
24	3	4	7	3	35	10	6	2	56	63
31 d/	2	1	3	2	21	3	6	1	33	36
Aug 7	5	3	8	0	8	3	9	7	27	35
14	4	10	14	0	8	4	5	2	19	33
21 e/	7	6	13	2	3	6	5	0	16	29
28	8	3	11	2	6	7	0	6	21	32
Sept 4	2	0	2	0	1	1	1	0	3	5

1/ Insecticide applications:
- a/ April 26. Temik 10% granules sidedressed 3.0 lb AI per acre.
- b/ May 31. Dylox 1.2 lb per acre + Meta Systox R 0.5 lb per acre.
- c/ June 29. Tepp 1.0 lb per acre + Toxaphene 4.0 lb per acre.
- d/ July 31. Carzol 0.5 lb per acre + Tepp 1.0 lb per acre.
- e/ August 15. Carzol 0.5 lb per acre + Tepp 1.0 lb per acre.

2/ 5 beating pan samples on each date.