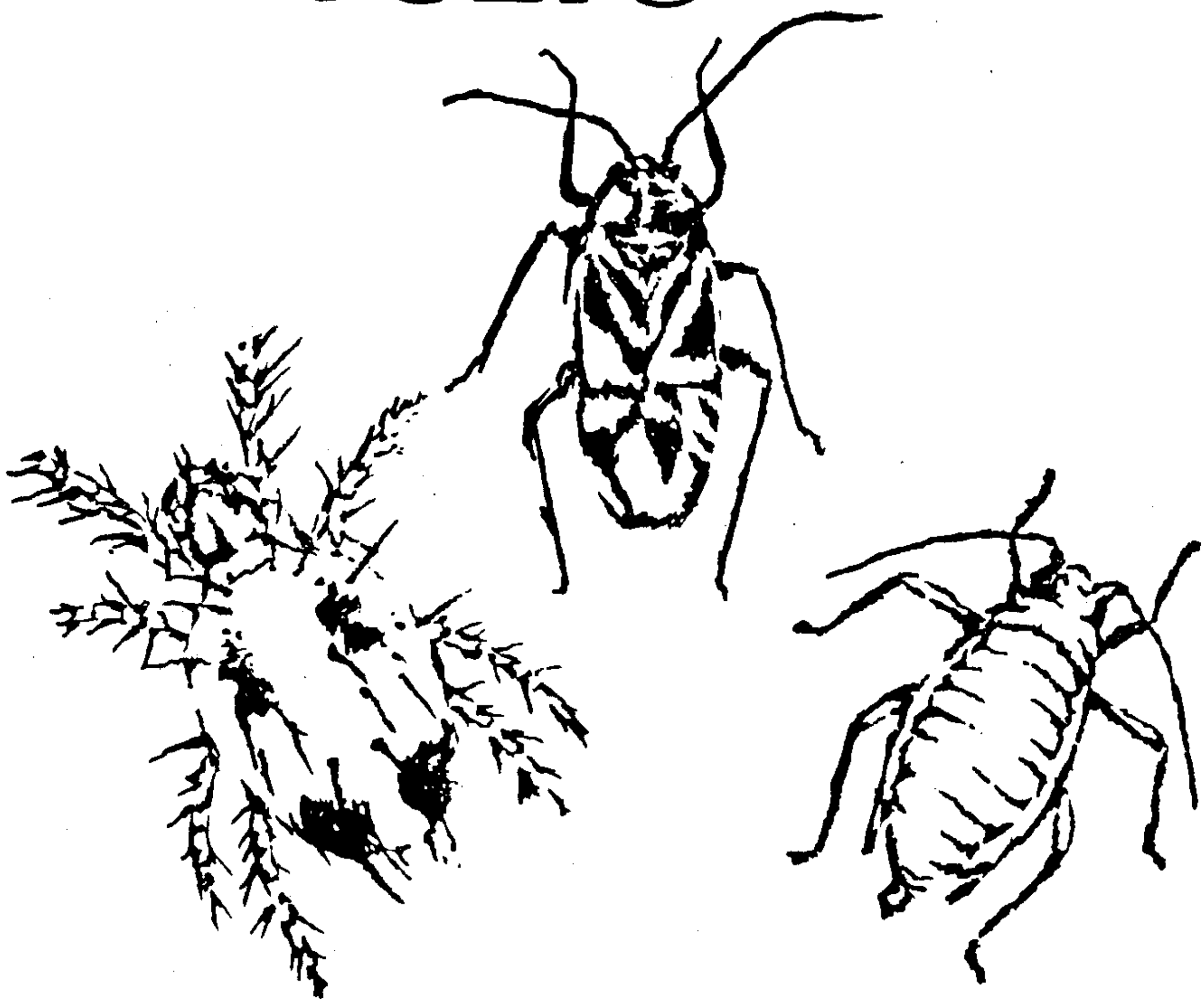
A PROGRESS REPORT OF

INSECT STUDY RESULTS



IN SEED ALFALFA 1985

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Research on Insects Affecting

Seed Alfalfa 1985

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Introduction

During 1984 there were no new insecticides available for evaluation in alfalfa seed production. However, in 1985 two new insecticides, an older insecticide and a new acaricide, were available for testing. The two new insecticides were also reported to have acaricidal properties. These insecticide-acaricide materials were Capture® (bifenthrin) also known as FMC 54800, a pyrethroid, and AGB-6162 or Thuringiensin® (β-Exotoxin of Bacillus thuringiensis) developed by Abbott Laboratories. The older insecticide was Curacron® (profenofos), an organophosphate product of Ciba-Geigy. The new acaricide was Apollo® (clofentezine) developed by Nor Am Co. Other promising materials that have had some field evaluation in seed alfalfa but required further study were cypermethrin (Ammo®, Cymbush®) and fluvalinate (Spur®, Mavrik®).

A second part of our work over the past 14 years has been an annual survey conducted at harvest in commercial fields in which seed samples are hand-stripped from plants ahead of the harvester and analyzed for damage by lygus bugs, stink bugs and the seed chalcid. Water damaged, immature green seed and other damage is also recorded in the survey. In 1985, 130 commercial fields were sampled in the major seed producing areas of Fresno, Kings and Imperial Counties. Growers participated in taking many of the field samples but the analyses were done in the laboratory at Davis. The continuity of such data over time provides excellent background information on the effectiveness of commercial insect control practices and can alert the industry, as well as individual growers, to problems that are affecting the quality and yield of seed.

Research objectives for 1985 were to 1) evaluate new insecticides, acaricides, and combinations of these materials for control of lygus bugs, aphids and spider mites; 2) conduct surveys at harvest time with growers' cooperation and participation to ascertain the amount and type of insect damage to alfalfa seed; and 3) prepare an annual report to inform growers, seedsmen and elements of allied industries of the status of the problems and the results and progress of the research.

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Insecticide Evaluation Experiments

During 1985, two separate experiments were conducted in which eight insecticides, two acaricides, one insecticide combination, and five insecticide-acaricide combinations were evaluated for control of lygus bugs, the spotted alfalfa aphid, pea aphid, beet armyworm and spider mites. Experiment 1 consisted of seven 5 acre plots and experiment 2 consisted of five 5 acre plots to which the chemicals were applied. The treatments utilized in each plot comprised a season-long program for control of the various pest insects as they occurred. Pest insect populations were monitored weekly and treatments were applied when populations of the various species reached economic levels. As in experiments conducted in prior years, the results are categorized and reported according to species within each of the experiments.

Lygus bugs

Experiment 1

The following insecticides and combinations were evaluated for control of lygus bugs. Monitor® (methamidophos), Ammo® (cypermethrin), Thuringiensin® β-Exotoxin of B. thuringiensis), Carzol® (formetanate), Spur® (fluvalinate), Capture® (bifenthrin), Curacron® (profenofos), Lorsban® (chlorpyrifos), Monitor + Comite® (propargite), Lorsban + Comite, Ammo + Comite, Thiodan® (endosulfan) + methomyl, Comite + Thiodan + methomyl. Comite was included in the combinations to control spider mites. Thiodan + methomyl was applied to control the spotted alfalfa aphid, and Lorsban was used to control pea aphid and the beet armyworm. The effects of the latter two treatments on lygus bug populations were also noted. The materials were all applied as foliar sprays at 10 gallons per acre by aircraft at night, usually from 11:00 p.m. to 2:00 a.m. The lygus bug populations were sampled with a standard insect sweeping net taking 10 two sweep samples in north and south areas of each plot for a total of 20 sweeps per plot per sample date. Lygus bug adults and nymphs were recorded separately, but an average number of lygus bugs per sweep was calculated for each plot for each sample date. The insecticides were evaluated on the basis of pre- and posttreatment counts. The alfalfa variety, DK-135, used in Experiment 1 was reported to be resistant to the spotted alfalfa aphid.

On May 4, twenty-four days before the insecticide evaluations were begun, the major portion of the field (grower's portion) was treated with Monitor 0.5 lb AI/acre + Comite 1.69 lb AI/acre as a clean-up treatment prior to introducing honey bee pollinators. The 35 acre experimental area received only Comite to control a spider mite infestation. The experimental insecticides were all applied for the first time on May 30 when lygus bug populations in the various plots ranged from 6.1 to 11.5 bugs per sweep and averaged 8.0. The results of this experiment are shown in Table 1.

Monitor was the standard with which the various experimental materials were compared. It was applied first at a rate of 0.5 lb AI/acre in combination with Comite, 1.69 lb AI/acre. This treatment resulted in 99% reduction of the lygus bug population five days after application and populations remained below pre-treatment level for 26 days. A second application (6/26), applied without Comite, reduced the lygus bug population 95% six days after application. Thirteen days after this application the lygus bug population was below a treatment level of

8-10 bugs/sweep, but a heavy infestation of spotted alfalfa aphid occurred which was controlled with Thiodan 1.0 lb AI/acre + methomyl 0.5 lb AI/acre. This treatment reduced the lygus bug population approximately 70% and it remained below treatment level (8-10 bugs/sweep) for 13 days when an infestation of beet armyworm (6/sweep) occurred. This infestation was treated with Lorsban 0.5 lb AI/acre + Comite 1.69 lb AI/acre. The lygus bug population was not reduced by this treatment, but it remained below a treatment level of 8-10 bugs/sweep for the remainder of the season.

Ammo was first applied at 0.1 lb AI/acre combined with Comite 1.69 lb AI/acre. This treatment reduced the lygus bug population 97% under pretreatment level five days after application and populations remained below pretreatment level for 26 days after application. The second application of Ammo (6/26), applied alone, reduced the lygus bug population 88% six days after application. Thirteen days after this treatment the lygus bug population (2.3 bugs/sweep) was well below a treatment level, but an infestation of spotted alfalfa aphid occurred which was treated with Thiodan 1.0 lb AI/acre + methomyl 0.5 lb AI/acre. This treatment reduced the lygus bug population 65% and it remained below treatment level for 13 days when an infestation of beet armyworms (7/sweep) occurred. This infestation was treated with Lorsban 0.5 lb AI/acre + Comite 1.69 lb AI/acre. This treatment further reduced the lygus bug population for seven days and, although it later increased, it remained below treatment level for the remainder of the season.

Thuringiensin applied at 0.10 lb AI/acre on May 30 reduced the lygus bug population 69% five days after application. Lygus bug numbers reached a treatment level of 8.2 bugs per sweep 26 days after application. A second application of Thuringiensin (6/26) at 0.1 lb AI/acre reduced the lygus bug population 57% six days after application and it remained below treatment level for 13 days when an infestation of spotted alfalfa aphid occurred which was treated with Thiodan + methomyl combination. This treatment reduced the lygus bug population 94% and it remained below treatment level for 25 days when an infestation of beet armyworms (12/sweep) occurred. This infestation was treated with Lorsban + Comite which reduced the lygus bug population approximately 65% seven days after application and it remained below treatment level for the remainder of the season.

Carzol was applied three times at 0.75 lb AI/acre on May 30, June 19, and July 3. The reduction in lygus bug populations varied from 48% to 90% six days after application and averaged approximately 75%. Populations reached pretreatment levels within 14 to 19 days after application.

Spur was applied twice at 0.15 lb AI/acre on May 30 and June 26. The first application reduced the lygus bug population 97%. Twenty-six days after this application populations exceeded the pretreatment level and the second application did not reduce the lygus bug population which continued to increase. This plot was treated with Monitor 0.5 lb AI/acre + Comite 1.69 lb AI/acre which reduced lygus bug numbers 96% and the population remained below a treatment level of 8-10 bugs/sweep for 27 days. A beet armyworm infestation occurred (8/sweep) which was controlled with Lorsban on July 31. This treatment reduced the lygus bug population 37% six days after application.

Capture was applied three times at 0.10 lb AI/acre on May 30, July 3, and

August 7. Lygus bug populations were reduced 99% to 100% six days after application and they remained below treatment levels (8-10 bugs/sweep) for periods of from 30 to 34 days. Beet armyworms did not occur in this plot.

Curacron was applied three times at 1.0 lb AI/acre on May 30, June 12 and June 26. The first application reduced the lygus bug population only 14% seven days after application, and at 14 days the population exceeded the treatment level of 8-10 bugs/sweep. The second and third applications resulted in population reductions of 77% and 63%, respectively, seven days after application, but 14 days after application populations again exceeded treatment levels. A combination of Ammo + Thiodan + methomyl was applied on July 10. This combination reduced the lygus bug population 97% and the population remained at levels of 0.4 to 2 bugs/sweep for the remainder of the season (34 days).

Experiment 2

Experiment 2 was established primarily to evaluate acarcides, but as was the case in Experiment 1, these and other materials were also evaluated for control of lygus bugs. The acaricidal materials were Comite and Apollo® (clofentezine). Insecticide-acaricides were Capture and Thuringiensin. Insecticides were Monitor, Ammo and Lorsban. As in Experiment 1, the materials were all applied as foliar sprays by aircraft at 10 gallons per acre at night. The sampling procedure for lygus bugs was the same as that in Experiment 1. The 25 acre experimental area in this field was treated with an early application of Monitor at 0.5 lb AI/acre on May 13 to control lygus bugs. Each experimental material was applied to a five acre plot in this area on June 5. The effects of the materials on lygus bug populations are shown in Table 2.

Other than the May 13 application, Monitor was applied once at 0.5 lb AI/acre to two of the five plots on June 19 and to one of the plots on July 3. These treatments reduced lygus bug populations 89% to 98% six days after application and populations remained below treatment levels of 8-10 bugs/sweep for 14 to 27 days.

Ammo was applied twice to three of the plots and once to one of the plots on July 9, August 13 and August 20. Lygus bug population reductions resulting from these treatments ranged from 97% to 100% six-seven days after application. Most of these evaluations were terminated 12 to 14 days after application because in plots where the first treatments were applied (July 9), pea aphid populations occurred that were controlled with Lorsban 0.5 lb AI/acre. This treatment reduced lygus bug populations from 44% to 75% seven days after application. However, lygus bug populations reached treatment levels of 8-10 bugs/sweep within 13 to 28 days (average 19 days) after application.

Capture was applied three times at 0.1 lb AI/acre on June 5, July 3 and August 20. Lygus bug populations were reduced 100% six days after application. Twenty-seven days after the first application lygus bug populations were still far below a treatment level of 8-10 bugs/sweep (1.4 bugs/sweep), but spider mites had reached a level (19.8/trifoliate leaf), where control was necessary. The second application of Capture was made to control spider mites, but lygus bug populations were also reduced and remained below treatment level for 48 days. The third application of Capture resulted in 100% reduction of the lygus bug population for the 14 days remaining in the experiment which was terminated on September 3.

Thuringiensin was applied three times at 0.1 lb AI/acre on June 5, June 26 and August 7. The June 5 application reduced the lygus bug population 80% under pretreatment levels six days after application and it remained below pretreatment levels for 20 days. However, spider mite populations increased rapidly and the second application of Thuringiensin was made to control the mites. This treatment reduced the lygus bug population approximately 54% 13 days after application, but the population exceeded the pretreatment level 20 days after application and exceeded treatment levels of 8-10 bugs/sweep 26 days after application. At this time (July 17) Comite was applied to control spider mites and on July 23 it was necessary to apply Lorsban 0.5 lb AI/acre to control an infestation of pea aphid. This treatment reduced the lygus bug population 65% six days after application, but within 13 days lygus bug numbers exceeded the 8-10 bug/sweep treatment level. Thuringiensin was applied for the third time on August 7. This application reduced the lygus bug population 90% six days after application, but within 13 days the population reduction was only 50% (7.3 bugs/sweep). An application of Ammo on August 20 reduced the lygus bug population 97% seven days after application and no further treatments were needed for the remainder of the season.

In summary, the materials that were most effective in controlling lygus bugs were Monitor, Ammo and Capture. There was virtually no difference in performance among these materials. The first application of all three resulted in approximately 99% reduction of the lygus bug population and populations remained below treatment levels for 26 to 34 days. The residual period during which lygus bugs were controlled with Capture appeared to be about seven days more than with Monitor or Ammo, but further tests should be conducted.

Thuringiensin also appeared to be effective in controlling lygus bugs. The initial population reductions were not as high as with the previous materials, but residual control was obtained for approximately 20 to 26 days. Carzol and Spur gave good initial control with the first application holding lygus bug populations below treatment levels for 19 and 26 days, respectively. However, the second application of Carzol resulted in only approximately 48% reduction of lygus bugs and the treatment was effective for only 13 days. The second application of Spur did not result in any lygus bug reductions.

Curacron only reduced lygus bug populations 14 to 77% and residual control was short, varying from 7 to 14 days.

Aphids

Data on control of aphids were obtained for all materials evaluated for lygus bug control. Aphid populations were sampled weekly with a D-Vac suction Machine (50 square foot samples from each plot on each sampling date). The effects of the treatments were based on pre- and postreatment counts.

Experiment 1

The alfalfa variety in Experiment 1, Table 3, was DK-135, supposedly resistant to the spotted alfalfa aphid (SAA). However, heavy infestations of SAA developed in certain of the experiment plots. The heaviest infestation occurred in the plot that had received two applications of Monitor at

0.5 lb AI/acre on May 30 and June 26. Within 26 days after the May 30 application SAA populations were established and honeydew deposits were present on lower leaves in the plants. Within six days after the second application of Monitor on June 26, the SAA population had increased more than 10-fold and at 13 days after the June 26 application the population had almost doubled again, severe plant damage was occurring and honeydew production was heavy. This increase in SAA population following the application of Monitor has been observed many times in the past with certain alfalfa varieties reported to be resistant to SAA. Monitor appears to affect the plant in some still unknown way so that instead of being resistant to SAA, the plants become highly susceptible. This phenomenon also occurred in this experiment where Thuringiensin was applied and, to a lesser degree, where Ammo and Curacron were applied. There was also some establishment of SAA populations where Carzol was applied. SAA also occurred in plots treated with Spur and Capture but at very low numbers. These materials did not appear to predispose the plants to SAA infestation and may have also exhibited some direct control of the aphid populations, at least SAA populations were very low in these plots and did not require special treatment. Where high populations of SAA occurred, they were effectively controlled with a combination of Thiodan 1.0 lb AI/acre + methomyl 0.5 lb AI/acre. This treatment reduced SAA populations approximately 99% and populations remained very low for the remainder of the season.

Pea aphid populations were generally low throughout the various treatments in Experiment 1. Highest infestations occurred where Thuringiensin and Carzol were applied.

Experiment 2

The alfalfa variety in Experiment 2, Table 4, was A-54 apparently highly resistant to SAA but susceptible to the pea aphid. Although occasional SAA were taken in samples, significant populations of this species did not develop in any of the experimental plots. However, pea aphids were generally prevalent throughout the experimental area. Pea aphid populations began to increase in the experimental area on June 26 and occurred in moderate numbers in some plots through July and as late as August 20. The most effective insecticide in controlling pea aphid was Capture. Where this material was applied three times during the season, very few aphids occurred in weekly samples and the residual effectiveness of the treatment appeared to be long, perhaps up to 48 days or more. Lorsban generally reduced pea aphid populations 94% to 99% six days after application and populations remained below treatment levels for 21 to 28 days.

Ammo varied in its effect on pea aphid populations reducing them from 57% to 98% six days after application with populations exceeding pretreatment levels within 14 days.

Thuringiensin appeared to have no effect on reducing pea aphid populations. Pea aphids continued to increase following application of this material.

In summary, Capture and Lorsban were the most effective materials evaluated for control of the pea aphid.

Beet armyworm

Beet armyworm infestations occurred in Experiment 1 on July 22 in plots that had been treated twice with Monitor, Ammo, Thuringiensin, Carzol and Spur. With the exception of Spur, each of these plots had also received an application of Thiodan + methomyl on July 10 to control an infestation of SAA. The number of beet armyworms per sweep in each of the treatments were as follows: Monitor 6, Ammo 7, Thuringiensin 12, Carzol 8, Spur 8. The infestation in these plots was controlled with Lorsban 0.5 lb AI/acre applied on July 23. This treatment reduced the worm populations 95% to 100% and no further treatments were required.

Plots treated with Capture and Curacron in this experiment had very low beet armyworm populations, 0.9/sweep for Capture and 0.5/sweep for Curacron. No special treatment was required to control worms in these plots.

The grower portion of the field which had received two applications of Monitor and one of Carzol had a worm population of 2.2/sweep on July 22. This infestation was controlled with Lorsban on July 23.

Spider mites

In addition to specific acaricides, the insecticides and combinations evaluated in season-long lygus bug control experiments were also evaluated for acaricidal activity.

Experiment 1 was established to evaluate materials for lygus bug control but spider mite populations were monitored in each of the experimental plots. In sampling spider mite populations in all plots, 50 trifoliate leaves showing evidence of mites were selected from each plot on each sampling date. The acaricidal evaluations are based on pre- and posttreatment counts.

Comite was applied to the entire 35 acre experimental area on May 4 before the lygus bug trials began. The experimental insecticides were first applied on May 30, and at this time Comite was combined with Monitor and Ammo. Thuringiensin, Carzol, Spur, Capture, and Curacron were each applied without an acaricide. As the field had been previously treated with Comite, spider mite populations were generally low in the various plots and ranged from 2.3 to 6.0 mites and 0.1 to 0.6 eggs per trifoliate leaf. The results of this experiment are shown in Table 5.

Comite combined with Ammo or Monitor reduced the spider mite populations 82% to 83% five days after application and populations remained below pretreatment levels for 38 days. The lowest mite and egg population levels occurred 12 days after application. There were no differences in spider mite control with these two combinations.

Thuringiensin applied on May 30 reduced the spider mite population approximately 52% five days after application and spider mite populations remained below the pretreatment level for 26 days, but the egg population was not reduced and continued to increase. A second application of Thuringiensin on June 26 did not reduce the numbers of mites or eggs and they continued to increase during 25 days after application, finally reaching levels of 15 mites and 19 eggs per trifoliate leaf. A combination of Comite + Lorsban applied on June 23 reduced mites and eggs 98% to levels of 0.3 mites and 0.1 egg per trifoliate leaf seven days after application and populations were virtually zero 21 days after this application.

Carzol applied on May 30 reduced mite numbers 37% five days after application but did not reduce the numbers of eggs which continued to increase. Nineteen days after Carzol was applied, spider mite populations averaged 5.9 mites and 8.5 eggs per trifoliate leaf. Second and third applications of Carzol on June 19 and July 3 did not reduce either mite or egg numbers which continued to increase, reaching levels of 19 mites and 14 eggs per trifoliate leaf six days after the July 3 application.

Spur applied on May 30 reduced the mite population approximately 85% six days after application, but did not reduce the numbers of eggs which continued to increase. The spider mite population remained below pretreatment level for 26 days. A second application of Spur on June 6 did not reduce the mite or egg population and the plot was treated with a combination of Comite + Monitor which reduced the mite and egg population 93%, and populations remained low for the rest of the season (40+ days).

Capture applied on May 30 reduced the mite population 94% six days after application, and it was 83% below pretreatment level 33 days after application when Capture was applied for a second time on June 3 to control lygus bugs. This application further reduced the mite population 83% six days after application, but the mites began to increase 27 days after application. A third application of Capture on August 7 to control lygus bugs virtually eliminated the mites for the remainder of the experiment.

Curacron was applied three times at 14 day intervals on May 30, June 12 and June 26 to control lygus bugs. These treatments resulted in the virtual elimination of spider mites and eggs. Although Curacron resulted in high mite and egg mortality, it is difficult to compare its residual effectiveness with the other materials because of the short interval between applications.

In Experiment 2, Table 6, four compounds plus one acaricide combination were evaluated specifically for control of spider mites. These materials were Comite, Comite + Sulfur, Apollo, Thuringiensin, and Capture. The entire 25 acre experimental area in this trial was treated with Monitor without acaricide on May 13 to control lygus bugs. The acaricides were all applied for the first time on June 5. As no acaricide had been applied previously to these plots, spider mite populations were much higher than in Experiment 1 where Comite had been applied prior to the insecticide trials. Pretreatment populations ranged from 4.8 to 9.7 mites and 17.5 to 36.2 eggs per trifoliate leaf.

Comite applied for the first time on June 5 did not reduce the numbers of mites or eggs. Thirteen days after this application the mite population had increased approximately 4-fold over pretreatment levels and the numbers of eggs had more than doubled. An application of Monitor on June 19 reduced the mite and egg population 44%. A second application of Comite on June 26 further reduced the mite population 62% six days after application, and the population remained below pretreatment level for 27 days.

Ammo applied on July 9 to control lygus bugs did not appear to affect the mite populations but Lorsban applied on July 23 to control pea aphids reduced the mite populations 91% and they remained below pretreatment levels for 14 days.

A combination of Comite + Sulfur (80% wettable) was applied on June 5 and compared with the Comite alone. This treatment also failed to reduce the mite and egg populations. The combination was no more effective than Comite alone. Monitor applied on June 19 to control lygus bugs in this plot reduced the mite population 29% and the eggs 81% six days after application. An application of Comite without Sulfur on June 26 reduced the mite and egg populations approximately 76% and they remained below pretreatment level for 27 days. An application of Lorsban on July 23 reduced the mite population 33% seven days after application, but populations increased 14 and 21 days after application.

Apollo applied on June 5 only reduced the mite population 27% and the egg population approximately 70% six days after application. However, 13 days after application the mite population was three times the pretreatment level and egg numbers were double the pretreatment level. Twenty days after application the mite population had increased 8-fold (59.5 mites/trifoliate leaf) over pretreatment, and egg numbers were approximately double the pretreatment level (63/trifoliate leaf). A second application of Apollo on July 2 reduced the mite population approximately 40% and the eggs 70% six days after application, but the numbers of mites remaining (36/trifoliate leaf and 19 eggs) caused heavy damage to the foliage. An application of Comite + Monitor on July 7 reduced the mites 84% six days after application and 96% 13 days after application.

Lorsban applied on July 31 to control pea aphid further reduced the mite population 27%, but 13 days after application the spider mites had increased 3-fold, and egg numbers approximately 6-fold. An application of Ammo + Comite on August 13 virtually eliminated the mite population for the remainder of the season (14 days).

Capture applied on May 5 reduced the mite and egg population 95% and 98%. Populations remained below pretreatment levels for 13 days. Twenty days after application the mite population was approximately double the pretreatment level and egg numbers were slightly above the pretreatment level. A second application of Capture on July 3 reduced the mite and egg populations approximately 98% and they were 92% below pretreatment levels 13 days after application. Through an error this plot was treated on July 17 with Comite, thus precluding further evaluation of Capture. This application reduced the mite population 94% and the population was virtually eliminated for 34 days. A final application of Capture on August 20 for lygus bug control resulted in total elimination of the mites.

Thuringiensin applied on June 5 only reduced the mite population 38% and the eggs 70% six days after application. Thirteen days after application the mite population exceeded the pretreatment level, and 20 days after application the mite population had increased approximately 6-fold (55.4 mites/trifoliate leaf) over pretreatment. A second application of Thuringiensin on June 26 reduced the mite population 82% six days after application, but the population was increasing 13 days after application. Although some initial reduction occurred, the remaining mite populations were above tolerable levels and the plot was treated with Comite on July 17, which reduced the mite population approximately 78%. Lorsban applied on July 23 further reduced the population to low levels for the remainder of the season.

In summary, of the materials evaluated for spider mite control Comite generally appeared to be effective, although its performance was erratic. Where control was obtained, the treatment was effective for 21 to 38 days. The greatest population reductions with this material usually occurred 12 to 14 days after application. Comite appeared to be least effective where large populations of mites and eggs were present. The second application of Comite was often more effective than the first. The combining of Sulfur with Comite did not enhance its performance.

Capture appears to be nearly as effective as Comite, providing residual control for 14 to 21 days or more. It also appeared to be more effective where mite populations were relatively low.

Curacron was not included in the acaricide trial, but where it was applied to control lygus bugs it gave excellent control of mites, although it was only evaluated for effectiveness up to 14 days after application. It may have a longer residual effect against spider mites and should receive further evaluation. Spur controlled spider mites for 26 days following the first application for lygus bug control in Experiment 1, but the second application gave no mite control. Thuringiensin, Apollo, and Carzol did not control spider mite infestations in these experiments.

Effects of Insecticides on Predatory and Parasitic Species

An attempt was made to obtain data in Experiments 1 and 2 on the effects of the various insecticides on the following group of predatory and parasitic organisms: Geocoris (big-eyed bugs), Nabis (damsel bugs), Orius (minute pirate bugs), lacewings, lady beetles, Collops beetles, parasitic wasps and spiders. The plots were sampled weekly with a D-Vac suction machine (50 square foot samples from each plot on each sampling date). Unfortunately, it was not possible to obtain pretreatment counts before the insecticides were applied in either of the experiments. Therefore, it is difficult to evaluate the impact of the insecticides on the predatory and parasitic insect populations. As can be seen in Tables 7 and 8, when weekly counts were begun, populations of beneficial species were extremely low and they remained low throughout the season.

The most abundant predatory insect species was Orius, the minute pirate bug. In general, Thuringiensin and Lorsban appeared to have a less adverse impact on Orius populations than the other insecticides. Orius also appeared to survive to some extent in the plot treated with Spur. Geocoris were present in plots treated with Thuringiensin, but were virtually eliminated with the other insecticides. Monitor, Carzol, Capture, Curacron and Thiodan + methomyl were all highly lethal to the predatory and parasitic species.

Overall, the beneficial insect populations were devastated by the insecticide applications.

Insect Damage in Seed Samples Taken at Harvest Time in Commercial Alfalfa Seed Fields

Samples of seed pods were hand stripped before commercial harvest from 130 alfalfa seed fields, 4 in the Firebaugh area, 13 from Mendota, 26 from Tranquility, 30 near San Joaquin, 21 from Five Points, 4 from Huron, 6 from Westhaven, 23 from Corcoran, and 3 from El Centro. The seeds were hand threshed and lightly cleaned in a clipper seed cleaner. An average of 1700 to 1900 seeds were examined from each field for damage caused by lygus bugs, the alfalfa seed chalcid and stink bugs. In addition to insect damage, the seeds were also examined for water damaged and immature green seed at the time of harvest. The results are shown in Table 9.

Lygus bug damaged seed is the most severe problem evident in these survey results. Thirty-two fields (24.6%) of the 130 fields sampled had 6% or more of lygus bug damaged seed. Fifteen fields (11.5%) showed 10% or more damage by Lygus. This indicates that there were problems in certain fields with the timing and perhaps selection of materials applied for control of lygus bugs.

Seeds from individual fields showing lygus bug injury ranged from 1.5% to 23.2%. Fields with the highest percentages of lygus bug damage were in the Imperial Valley (El Centro). However, the data for the Imperial Valley may not be indicative of the area as a whole, as only three fields were sampled but two of the three had lygus damage levels of 16.3 and 23.2%. Of the fields surveyed in the San Joaquin Valley, 13 showed percentages of seeds damaged by lygus bugs that ranged from 10.1 to 22.6. Within the San Joaquin Valley, fields with the highest percentages of lygus bug damage were in the Tranquility-San Joaquin areas. Individual fields with lygus bug damaged seed that exceeded 10% occurred in Tranquility, San Joaquin, Five Points, Huron, Westhaven, and El Centro. The overall average of seeds showing lygus bug injury in each of the areas was Firebaugh 5.2%, Mendota 3.9%, Tranquility 6.0%, San Joaquin 6.1%, Five Points 4.5%, Huron 9.2%, Westhaven 5.6%, Corcoran 4.2%, and El Centro 15.6%. The overall average of lygus bug damaged seed for the nine areas was 6.7%.

In general the percentages of seeds showing lygus bug damage were higher in all areas in 1985 than in 1984, with the exception of Corcoran where percentages of lygus bug damaged seed were the same or very slightly lower in 1985, 4.2% vs. 4.3% in 1984. In the Firebaugh, San Joaquin and Five Points areas where data have been maintained for several years, overall percentages of seeds damaged by lygus bugs in 1985 were 5.2, 6.1 and 4.5, respectively. These percentages compare with 3.8, 5.0 and 4.2 for these respective areas in 1984.

Chalcid damage was second to lygus bugs as a problem in the fields surveyed. The percentages of chalcid damaged seed in samples from individual fields in the nine areas ranged from 0 to 15.7. Two fields showed chalcid damage in excess of 10% and nine fields of the 130 surveyed sustained chalcid damage levels of 4% or more. Overall, seed chalcid damage for the Firebaugh area averaged 4.8%, Mendota 0.8%, Tranquility 1.3%, San Joaquin 0.4%, Five Points 1.0%, Huron 1.5%, Westhaven 2.7%, Corcoran 1.2%, and El Centro 15.6%.

Overall chalcid damage in the Firebaugh area was about 2.5 times higher in 1985 than in 1984. This was due in part to one field in the area that sustained 10.3% damage. The percentages of chalcid damaged seed for the San Joaquin and Five Points areas in 1985 were about the same as in 1984. The percentages of chalcid damaged seed for the Firebaugh, San Joaquin and Five Points areas for the years 1976 through 1985 are shown graphically in Figure 1. An overall summary of chalcid damage for all Fresno County fields surveyed from 1958 through 1985 is shown in Figure 2.

Since the chalcid problem appears to be limited to just a few fields, it would seem that it can be corrected with improved clean-up and clip back management procedures.

Stink bug populations were low throughout the seed producing areas. Overall percentages of seeds damaged by stink bugs in the areas ranged from 0.1 to 0.9 and the nine area average was 0.3%.

Summary and Conclusions

During 1985, two separate experiments were conducted in which eight insecticides, two acaricides, one insecticide combination and five insecticide-acaricide combinations were evaluated for control of lygus bugs, the spotted alfalfa aphid, the pea aphid, beet armyworm, and spider mites. In season-long trials the most effective materials evaluated for lygus bug control were Monitor, Ammo, and Capture. There was little difference in performance among these materials. The first application of all three resulted in approximately 99% reduction of the lygus bug population. Where Monitor and Ammo were applied, lygus bug populations remained below treatment levels for 20 to 26 days. Populations remained below treatment levels for 30 to 34 days following the application of Capture. Ammo and Capture are not currently registered for use on seed alfalfa; but if they were to be used, it would appear that season-long control might be achieved with no more than three applications. An effective acaricide should be included with Ammo, but Capture, in addition to controlling lygus bugs, also controlled spider mites, the pea aphid and beet armyworms.

Thuringiensin appeared to be effective in controlling lygus bugs. Initial population reductions were not as high as with the previous materials but lygus bug populations remained below treatment levels for 20 to 26 days after application of Thuringiensin.

Carzol and Spur resulted in good initial control of lygus bugs, the first application holding lygus bug populations below treatment levels for 19 and 26 days, respectively. However, the second application of Carzol resulted in only approximately 48% reduction of lygus bugs and the treatment was effective for only 13 days. A second application of Spur did not result in any reduction of lygus bug numbers.

Curacron only reduced lygus bug populations 14% to 77%, and populations reached or exceeded treatment levels within 7 to 14 days.

The alfalfa varieties grown in the two experimental fields were both supposedly resistant to the spotted alfalfa aphid. However, in Experiment 1, variety DK-135, heavy infestations of SAA developed in plots that received two applications of Monitor. Heavy honeydew production and severe plant damage occurred. This increase in SAA population following the application of Monitor has been observed on numerous occasions with certain alfalfa varieties reported to be resistant to SAA. Monitor appears to affect the plant in some still unknown way so that instead of being resistant to SAA, treated plants become highly susceptible. This phenomenon also occurred in this experiment where Thuringiensin was applied and to a lesser degree where Ammo and Curacron were applied. There was also some establishment of SAA where Carzol was applied. SAA also occurred in plots treated with Spur and Capture but at very low numbers. These materials did not appear to predispose the plants to SAA infestation and may have also exhibited some direct control of the aphid populations. Where high populations of SAA occurred, they were effectively controlled with a combination of Thiodan 1.0 lb AI/acre + methomyl 0.5 lb AI/acre.

Pea aphids were most abundant in Experiment 2 where the alfalfa variety was A-54, apparently highly resistant to SAA but susceptible to pea aphid. Capture was the most effective material in controlling the pea aphid. The residual effectiveness of this material appeared to be long, perhaps up to 48 days. Lorsban was also highly effective with pea aphid populations remaining below treatment levels for 21 to 28 days after application. Ammo varied in its effect on pea aphid populations, but populations generally exceeded pretreatment levels within 14 days after application. Thuringiensin appeared to have no effect on reducing pea aphid populations, and aphids continued to increase following application of this material.

Beet armyworm infestations occurred in Experiment 1 in plots that had been treated twice with Monitor, Ammo, Thuringiensin, Carzol, and Spur. Plots treated with Capture and Curacron in this experiment had very low beet armyworm populations. Beet armyworm infestations were effectively controlled with Lorsban.

Of the materials evaluated for spider mite control, Comite generally appeared to be effective although its performance was erratic. Where control was obtained, the treatment was effective for 21 to 38 days. The greatest population reductions with this material usually occurred 12 to 14 days after application. Comite appeared to be least effective where large populations of mites and eggs were present. The second application was often more effective than the first. The combining of Sulfur with Comite did not enhance its performance.

Capture appeared to be equally as effective or perhaps more effective than Comite providing residual control of spider mites for 14 to 21 days or more. It also appeared to be more effective where mite populations were relatively low.

Curacron was not included in the acaricide trial but where it was applied to control lygus bugs it gave excellent control of spider mites, although it was only evaluated for effectiveness up to 14 days after application. It may have a longer residual effect against spider mites and should receive further evaluation.

Spur controlled spider mites for 26 days following the first application for lygus bug control in Experiment 1, but the second application gave no mite control.

Thuringiensin, Apollo and Carzol resulted in little or no control of spider mite infestations in these experiments.

Samples of seed pods were hand stripped before commercial harvest from 130 alfalfa seed fields representing nine areas within West Fresno, Kings and Imperial Counties. An average of 1700 to 1900 seeds were examined from each field for damage caused by lygus bugs, the alfalfa seed chalcid, and stink bugs. In addition to insect damage, the seeds were also examined for water damaged and immature green seed at the time of harvest.

Lygus bug damaged seed was the most severe problem evident in the survey results. Thirty-two fields (24.6%) of the 130 fields sampled had 6% or more of lygus bug damaged seed and fifteen fields (11.5%) showed 10% or more damage by lygus bugs. Seeds from individual fields showing lygus bug injury ranged from 1.5% to 23.2%. Of the fields surveyed in the San Joaquin Valley, 13 showed percentages of seeds damaged by lygus bugs that ranged from 10.1 to 22.6. Fields with the highest percentages of lygus bug damage in the San Joaquin Valley were in the Tranquility - San Joaquin areas.

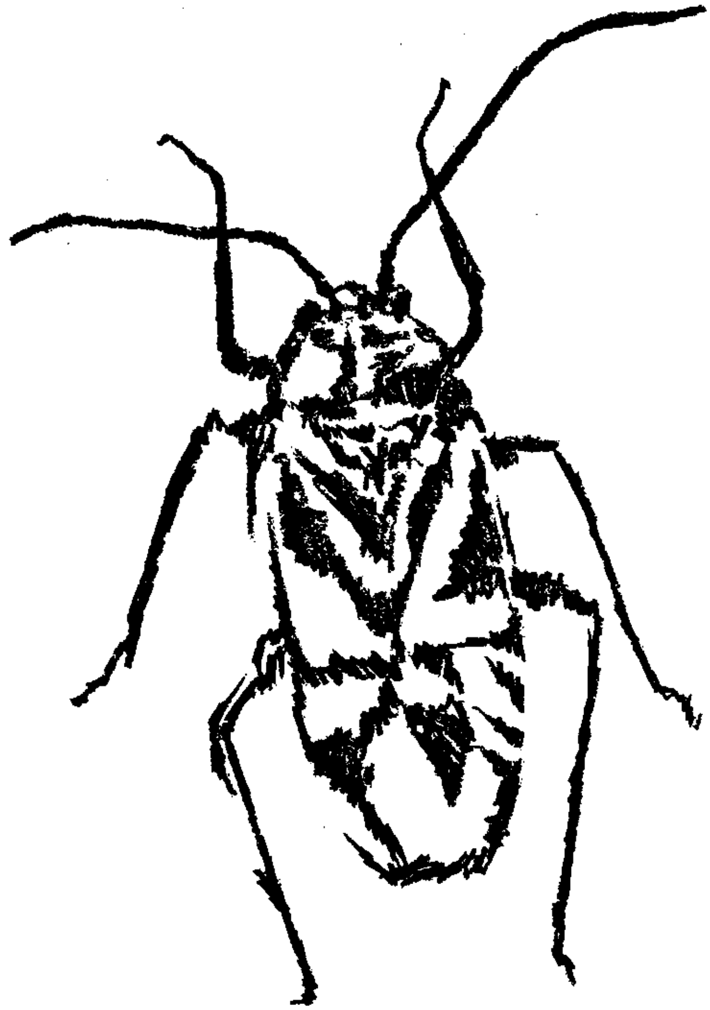
In general, the percentages of seeds showing lygus bug damage were higher in all areas in 1985 than in 1984, with the exception of Corcoran where percentages of lygus bug damaged seed were the same or slightly lower in 1985.

Overall averages of seeds showing lygus bug injury in each of the nine areas was Firebaugh 5.2%, Mendota 3.9%, Tranquility 6.0%, San Joaquin 6.1%, Five Points 4.5%, Huron 9.2%, Westhaven 5.6%, Corcoran 4.2%, and El Centro 15.6%. The overall average of lygus bug damaged seed for the nine areas was 6.7%.

The high levels of lygus bug damaged seed in certain fields indicate that there were problems with the timing and perhaps selection of insecticides applied for control of lygus bugs.

Chalcid damage was second to lygus bugs as a problem in the fields surveyed. The percentages of chalcid damaged seed in samples from individual fields in the nine areas ranged from 0 to 15.7. Two fields showed chalcid damage in excess of 10% and nine fields of the 130 surveyed sustained chalcid damage levels of 4% or more. Overall seed chalcid damage for the Firebaugh area averaged 4.8%, Mendota 0.8%, Tranquility 1.3%, San Joaquin 0.4%, Five Points 1.0%, Huron 1.5%, Westhaven 2.7%, Corcoran 1.2%, and El Centro 15.6%. Overall chalcid damage in the Firebaugh area was about 2.5 times higher in 1985 than in 1984. This was due in part to one field in the area that sustained 10.3% damage. An unusually early clip back in this field may have contributed to the heavy infestation. Since the chalcid problem appears to be limited to relatively few fields, it would seem that it can be corrected with improved clean-up and clip back management procedures.

Stink bug populations were low throughout the seed producing areas. Overall percentages of seeds damaged by stink bugs in the areas ranged from 01. to 0.9 and the nine area average was 0.3%.



LYGUS

Table 1 - Lygus bug populations in seed alfalfa plots treated by aircraft for lygus bug and spider mite control. Experiment 1. Firebaugh, California, 1985.

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Number of lygus bugs per sweep[3] Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
Comite	(5-4)	1.69								
			24	4.2	2.8	2.9	1.6	7.3	11.5	
Monitor + Comite	(5-30)	0.50 + 1.69								
			5	0.1	0.0	0.0	0.0	0.0	0.1	99.1
			12	0.0	0.6	0.2	0.0	0.8	0.8	93.0
			19	0.3	0.3	2.6	2.3	5.2	5.5	52.2
			26	4.1	2.2	2.7	0.8	5.7	9.8	14.8
Monitor	(6-26)	0.50								
			6	0.1	0.3	0.1	0.0	0.4	0.5	94.9
			13	0.2	0.7	1.2	0.2	2.1	2.3	76.5
Thiodan + Methomyl	(7-10)	1.00 + 0.50								
			6	0.3	0.0	0.0	0.4	0.4	0.7	69.6
			13	0.1	0.1	0.5	0.0	0.6	0.7	69.6
Lorsban + Comite	(7-23)	0.50 + 1.69								
			7	0.1	0.1	0.3	0.4	0.8	0.9	0.0
			14	0.2	0.3	1.9	0.0	2.2	2.4	0.0
			21	0.0	0.0	0.2	0.2	0.4	0.4	42.8
Comite	(5-4)	1.69								
			Pre	1.2	3.2	2.7	0.9	6.8	8.0	
Ammo + Comite	(5-30)	0.10 + 1.69								
			5	0.1	0.0	0.0	0.0	0.0	0.1	98.8
			12	0.0	0.4	0.1	0.0	0.5	0.5	93.8
			19	0.6	0.1	1.9	1.7	3.7	4.3	46.3
			26	3.8	1.5	1.0	0.5	3.0	6.8	15.0
Ammo	(6-26)	0.10								
			6	0.0	0.4	0.4	0.0	0.8	0.8	88.2
			13	0.1	0.6	1.1	0.5	2.2	2.3	66.2
Thiodan + Methomyl	(7-10)	1.00 + 0.50								
			6	0.2	0.0	0.4	0.2	0.6	0.8	65.2
			13	0.3	0.3	0.6	0.0	0.9	1.2	47.8
Lorsban + Comite	(7-23)	0.50 + 1.69								
			7	0.0	0.0	0.1	0.1	0.2	0.2	83.3
			14	0.1	0.1	1.5	0.0	1.6	1.7	0.0
			21	0.1	0.2	0.5	0.7	1.4	1.5	0.0

Table 1 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat- ment[2]	Number of lygus bugs per sweep[3] Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
Comite	(5-4)	1.69								
			Pre	0.8	1.4	2.7	1.2	5.3	6.1	
Thurin- giensin	(5-30)	0.10								
			5	0.7	0.2	0.6	0.4	1.2	1.9	68.9
			12	0.0	1.1	0.2	0.0	1.3	1.3	78.7
			19	1.0	0.5	2.3	0.7	3.5	4.5	26.2
			26	1.3	2.6	3.6	0.7	6.9	8.2	0.0
Thurin- giensin	(6-26)	0.10								
			6	0.5	2.7	0.2	0.1	3.0	3.5	57.3
			13	0.1	1.0	0.6	0.0	1.6	1.7	79.3
Thiodan + Methomyl	(7-10)	1.00 + 0.50								
			6	0.1	0.0	0.0	0.0	0.0	0.1	94.1
			13	0.1	0.3	1.3	0.0	1.6	1.7	0.0
Lorsban + Comite	(7-23)	0.50 + 1.69								
			7	0.0	0.0	0.2	0.4	0.6	0.6	64.7
			14	0.1	0.0	0.5	0.0	0.5	0.6	64.7
			21	0.0	0.0	0.0	0.1	0.1	0.1	94.1
Comite	(5-4)	1.69								
			Pre	0.7	2.5	2.2	0.8	5.5	6.2	
Carzol	(5-30)	0.75								
			5	0.1	0.3	0.0	0.2	0.5	0.6	90.3
			12	0.5	1.0	0.5	0.7	2.2	2.7	56.5
			19	1.0	0.7	3.6	1.4	5.7	6.7	0.0
Carzol	(6-19)	0.75								
			6	0.6	1.5	0.8	0.6	2.9	3.5	47.8
			13	0.7	3.0	3.6	0.7	7.3	8.0	0.0
Carzol	(7-3)	0.75								
			6	0.1	0.0	0.2	0.7	0.9	1.0	87.5
Comite + Thiodan + Methomyl	(7-10)	1.69 + 1.00 + 0.50								
			6	0.1	0.0	0.1	0.0	0.1	0.2	80.0
			13	0.2	0.1	0.3	0.1	0.5	0.7	30.0
			20	0.2	0.2	0.2	0.3	0.7	0.9	10.0
			27	0.4	0.1	1.2	0.9	2.2	2.6	0.0
Capture	(8-7)	0.10								
			6	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Table 1 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat-ment[2]	Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
Comite	(5-4)	1.69								
			Pre	1.1	2.6	2.3	1.0	5.9	7.0	
Spur	(5-30)	0.15								
			6	0.0	0.1	0.1	0.0	0.2	0.2	97.1
			12	0.4	0.4	0.2	0.6	1.2	1.6	77.1
			19	1.4	0.5	1.2	0.4	2.1	3.5	50.0
			26	1.3	3.2	2.2	1.1	6.5	7.8	0.0
Spur	(6-26)	0.15								
			6	0.3	4.7	3.7	0.7	9.1	9.4	0.0
Monitor + Comite	(7-3)	0.50 + 1.69								
			6	0.2	0.0	0.1	0.1	0.2	0.4	95.7
			13	0.5	0.4	0.0	0.1	0.5	1.0	89.4
			20	0.4	0.6	3.7	0.4	4.7	5.1	45.7
			27	1.2	2.4	2.5	2.1	7.0	8.2	12.8
Lorsban	(7-31)	0.50								
			6	2.3	0.1	0.3	2.5	2.9	5.2	36.6
			13	0.8	0.0	0.1	0.0	0.1	0.9	89.0
Comite	(5-4)	1.69								
			Pre	0.2	3.1	5.0	1.0	9.1	9.3	
Capture	(5-30)	0.10								
			6	0.0	0.0	0.1	0.0	0.1	0.1	98.9
			12	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			19	1.3	0.0	0.0	0.0	0.0	1.3	86.0
			26	0.9	0.9	0.3	0.0	1.2	2.1	77.4
			33	0.6	5.8	7.2	1.3	14.3	14.9	0.0
Capture	(7-3)	0.10								
			6	0.1	0.0	0.0	0.1	0.2	0.2	98.7
			13	0.3	0.0	0.1	0.2	0.3	0.6	96.0
			20	0.2	0.0	0.0	0.0	0.0	0.2	98.7
			27	0.4	1.1	1.0	0.6	2.7	3.1	79.2
			34	0.4	4.1	1.7	0.9	6.7	7.1	52.3
Capture	(8-7)	0.10								
			6	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Number of lygus bugs per sweep[3]

Table 1 - (continued)

Treatment[1] Insecticides	AI/ acre lb.	Days after treat-ment[2]	Number of lygus bugs per sweep[3] Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
Comite (5-4)	1.69								
		Pre	0.1	2.1	4.7	1.1	7.9	8.0	
Curacron (5-30)	1.00								
		7	0.4	0.6	3.0	2.9	6.5	6.9	13.8
		14	4.8	3.2	1.8	1.2	6.2	11.0	0.0
Curacron (6-12)	1.00								
		7	1.2	0.4	0.4	0.5	1.3	2.5	77.3
		14	3.1	3.0	2.5	0.3	5.8	8.9	19.1
Curacron (6-26)	1.00								
		7	0.3	2.4	0.0	0.3	2.7	3.0	66.3
		14	1.4	6.5	17.9	0.7	25.1	26.5	0.0
Ammo + Thiodan (7-10) + Methomyl	0.10 + 1.00 + 0.50								
		6	0.1	0.0	0.1	0.7	0.8	0.9	96.6
		13	0.9	0.2	0.9	0.2	1.3	2.2	91.7
		20	0.1	0.0	0.1	0.8	0.9	1.0	96.2
		27	0.3	0.0	0.0	0.1	0.1	0.4	98.5
		34	0.1	0.0	0.3	0.3	0.6	0.7	97.4

Table 1 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat- ment[2]	Number of lygus bugs per sweep[3] Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
				Grower Program						
Monitor		0.50								
+	(5-4)	+								
Comite		1.69								
			24	0.1	1.1	5.5	1.2	7.8	7.9	
			31	1.1	2.7	8.6	5.8	17.1	18.2	
Comite	(6-7)	0.75								
			4	8.2	1.0	3.3	4.8	9.1	17.3	
Monitor		0.75								
+	(6-15)	+								
Systox		0.38								
			3	0.3	0.1	0.1	0.0	0.2	0.5	97.1
			10	0.4	2.5	1.5	0.0	4.0	4.4	74.6
Comite	(6-29)	1.69	17	0.0	0.3	0.0	0.0	0.3	0.3	98.3
			24	0.1	0.8	0.6	0.3	1.7	1.8	89.6
Thiodan		1.00								
+	(7-10)	+								
Methomyl		0.50								
			6	0.2	0.0	0.0	0.5	0.5	0.7	61.1
			13	0.2	0.8	1.6	0.1	2.5	2.7	0.0
			20	0.3	1.2	2.3	3.1	6.6	6.9	0.0
Carzol		0.75								
+	(8-2)	+								
Lorsban		0.50								
			4	0.4	0.0	0.0	0.0	0.0	0.4	94.2
			11	0.3	0.0	0.0	0.1	0.1	0.4	94.2

[1] Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol and methomyl were 92% soluble powder and 80% wettable powder respectively, while the other insecticides were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated in parentheses.

[2] Counts were initiated on May 28, 24 days after the entire field was treated with Monitor + Comite with the exception of the 7 experimental plots which were treated with Comite.

[3] Average of 20 sweeps (10-2 sweep samples) per treatment on each sampling date.

Table 2 - Lygus bug populations in seed alfalfa plots treated by aircraft for lygus bug and spider mite control. Experiment 2. Firebaugh, California, 1985.

Treatment[1]			Days after treatment[2]	Number of lygus bugs per sweep[3]						
Insecticides		AI/ acre lb.		Adults	Nymphs Small	Nymphs Medium	Nymphs Large	Nymphs Total	Adults + Nymphs	% Reduct.
Monitor	(5-13)	0.75								
			22	0.2	1.4	0.9	0.0	2.3	2.5	
Comite	(6-5)	1.69	29	0.8	0.6	0.3	0.9	1.8	2.6	
			36	2.8	1.2	5.2	3.9	10.3	13.1	
Monitor	(6-19)	0.50								
			6	0.7	0.4	0.3	0.0	0.7	1.4	89.3
Comite	(6-26)	1.69	13	0.6	5.3	1.6	0.3	7.2	7.8	40.5
			20	1.5	4.7	3.4	7.8	13.9	15.4	0.0
Ammo	(7-9)	0.10								
			6	0.1	0.2	0.0	0.1	0.3	0.4	97.4
			12	0.9	1.3	0.3	0.0	1.6	2.5	83.8
Lorsban	(7-23)	0.50								
			7	0.3	0.0	0.0	0.3	0.3	0.6	76.0
			14	0.4	0.4	0.0	0.0	0.4	0.8	68.0
			21	0.3	0.3	1.5	0.8	2.6	2.9	0.0
			28	0.7	3.2	3.4	1.6	8.2	8.9	0.0
Ammo		0.10								
+	(8-20)	+								
Comite		1.69								
			7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Monitor	(5-13)	0.75								
			22	0.0	2.2	0.7	0.0	2.9	2.9	
Comite		1.69	29	1.2	0.4	0.5	1.0	1.9	3.1	
+	(6-5)	+	36	2.6	1.6	4.3	3.4	9.3	11.9	
Sulfur		7.50								
Monitor	(6-19)	0.50								
			6	0.0	0.2	0.0	0.0	0.2	0.2	98.3
Comite	(6-26)	1.69	13	0.2	6.7	0.3	0.1	7.1	7.3	38.7
			20	0.6	1.8	2.7	4.5	9.0	9.6	19.3
Ammo	(7-9)	0.10								
			7	0.0	0.2	0.0	0.1	0.3	0.3	96.9
			14	0.8	1.8	0.4	0.2	2.4	3.2	66.7
Lorsban	(7-23)	0.50								
			7	0.1	0.6	0.0	0.1	0.7	0.8	75.0
			14	1.3	2.6	0.1	0.0	2.7	4.0	0.0
			21	0.0	3.2	5.2	3.6	12.0	12.0	0.0
Ammo		0.10								
+	(8-13)	+								
Comite		1.69								
			7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			14	0.0	0.0	0.0	0.1	0.1	0.1	99.2

Table 2 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat- ment[2]	Number of lygus bugs per sweep[3] Adults	Nymphs Small	Medium	Large	Total	Adults + Nymphs	% Reduct.
Monitor	(5-13)	0.75								
			22	0.0	1.4	1.2	0.0	2.6	2.6	
Apollo	(6-5)	0.25								
			6	0.2	0.0	0.0	0.2	0.2	0.4	84.6
			13	2.1	0.0	0.9	0.8	1.7	3.8	0.0
			20	1.5	2.9	2.6	3.0	10.0	11.5	0.0
Apollo	(6-26)	0.25								
			6	1.8	24.2	4.3	1.4	29.9	31.7	0.0
Monitor + Comite	(7-3)	0.05 + 1.69								
			6	0.4	0.0	0.0	0.7	0.7	1.1	96.6
			13	1.4	0.9	0.0	0.0	0.9	2.3	92.7
			20	1.1	0.4	0.3	0.1	0.8	1.9	94.0
			27	0.0	1.6	0.0	0.2	1.8	1.8	94.3
Lorsban	(7-31)	0.50								
			6	0.5	0.5	0.0	0.0	0.5	1.0	44.4
			13	0.0	3.6	3.8	2.1	9.5	9.5	0.0
Ammo + Comite	(8-13)	0.10 + 1.69								
			7	0.0	0.0	0.0	0.1	0.1	0.1	98.9
			14	0.0	0.1	0.4	0.0	0.5	0.5	94.7
Monitor	(5-13)	0.75								
			22	0.0	1.7	0.7	0.0	2.4	2.4	
Capture	(6-5)	0.10								
			6	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			13	0.4	0.0	0.0	0.0	0.0	0.4	83.3
			20	0.6	0.0	0.0	0.0	0.0	0.6	75.0
			27	0.5	0.7	0.0	0.2	0.9	1.4	41.7
Capture	(7-3)	0.10								
			6	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			13	0.2	0.0	0.0	0.0	0.0	0.2	85.7
Comite	(7-17)	1.69	20	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			27	0.5	0.0	0.0	0.0	0.0	0.5	64.3
			34	0.7	1.8	0.3	0.0	2.1	2.8	0.0
			41	1.0	1.2	0.2	0.3	1.7	2.7	0.0
			48	2.3	1.2	5.8	2.5	9.5	11.8	0.0
Capture	(8-20)	0.10								
			7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			14	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Table 2 - (continued)

Insecticides		AI/ acre lb.	Days after treatment[2]	Adults	Nymphs: Small	Nymphs: Medium	Nymphs: Large	Nymphs: Total	Adults + Nymphs	% Reduct.
Monitor	(5-13)	0.50								
			22	0.0	1.9	0.6	0.0	2.5	2.5	
Thurin-giensin	(6-5)	0.10								
			6	0.1	0.4	0.0	0.0	0.4	0.5	80.0
			13	0.1	0.1	0.8	0.4	1.3	1.4	44.0
			20	0.1	1.2	0.0	0.0	1.2	1.3	48.0
Thurin-giensin	(6-26)	0.10								
			6	0.4	0.9	0.0	0.0	0.9	1.3	0.0
			13	0.1	0.5	0.0	0.0	0.5	0.6	53.8
			20	0.0	1.8	1.7	0.4	3.9	3.9	0.0
Comite	(7-17)	1.69	26	0.1	4.0	6.0	2.6	12.6	12.7	0.0
Lorsban	(7-23)	0.50								
			6	2.9	0.9	0.0	0.7	1.6	4.5	64.6
			13	1.0	8.0	4.8	0.8	13.6	14.6	0.0
Thurin-giensin	(8-7)	0.10								
			6	0.3	1.1	0.0	0.1	1.2	1.5	89.7
			13	1.0	2.7	3.6	0.0	6.3	7.3	50.0
Ammo	(8-20)	0.10								
			7	0.0	0.0	0.0	0.2	0.2	0.2	97.3

Treatment[1]; Number of lygus bugs per sweep[3]

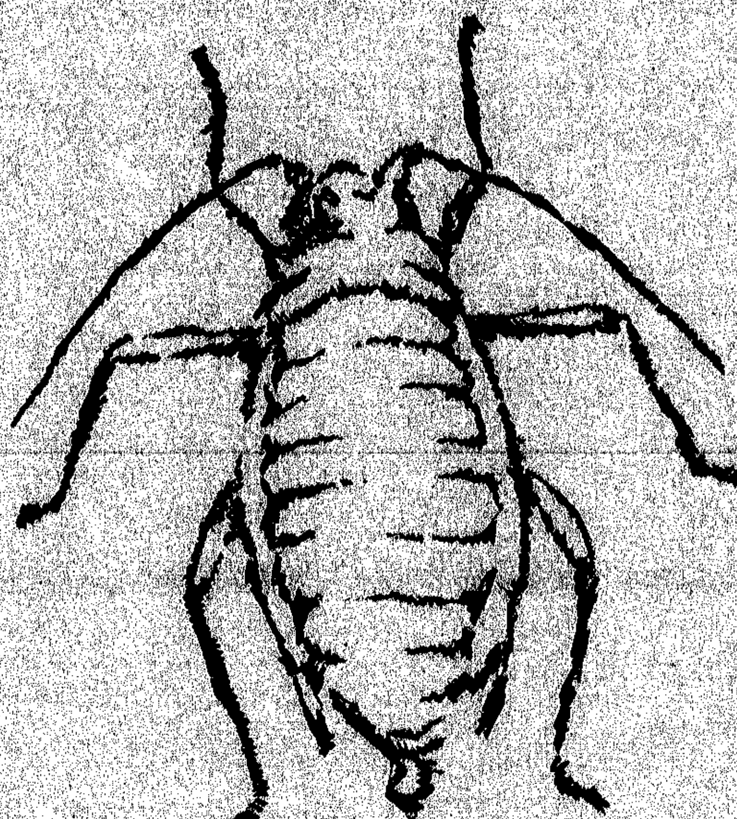
Grower Program

Insecticides		AI/ acre lb.	Days after treatment[2]	Adults	Nymphs: Small	Nymphs: Medium	Nymphs: Large	Nymphs: Total	Adults + Nymphs	% Reduct.
Monitor + Comite	(5-13)	0.75 + 1.69								
			22	0.0	1.7	0.6	0.0	2.3	2.3	
Comite	(6-7)	1.69	29	0.9	0.9	0.4	0.7	2.0	2.9	
			36	1.1	1.4	3.2	4.1	8.7	9.8	
Monitor + Comite	(6-19)	0.50 + 1.69								
			6	0.1	0.0	0.0	0.0	0.0	0.1	99.0
			13	0.0	1.0	0.1	0.0	1.1	1.1	88.8
Carzol	(7-7)	0.75								
			2	0.0	0.0	0.0	0.2	0.2	0.2	81.8
			9	0.6	0.7	0.0	0.1	0.8	1.4	0.0
			16	0.0	0.4	0.3	0.2	0.9	0.9	18.1
Lorsban	(7-23)	0.50								
			7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
			14	0.0	0.4	0.1	0.3	0.8	0.3	66.7
			21	0.5	0.0	0.2	0.3	0.5	1.0	0.0
			28	4.0	4.2	4.4	1.2	9.8	13.8	0.0
			35	4.8	5.8	10.8	5.2	21.8	26.6	0.0

[1] Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol and sulfur were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated in parentheses.

[2] Counts were initiated on June 4, 22 days after the entire field was treated with Monitor + Comite with the exception of the 5 experimental plots which were treated with Monitor.

[3] Average of 20 sweeps (10-2 sweep samples) per treatment on each sampling date.



APHIDS

Table 3 - Aphid populations in aphid resistant seed alfalfa plots treated by aircraft for lygus bug and spider mite control. Experiment 1. Firebaugh, California, 1985.

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Comite	1.69	May 4			
Monitor + Comite	0.50 + 1.69	May 30			
			26	1634	4
Monitor	0.50	June 26			
			6	17483	0
			13	28484	0
Thiodan + Methomyl	1.00 + 0.50	July 10			
			6	14	1
			13	77	0
Lorsban + Comite	0.50 + 1.69	July 23			
			7	11	1
			14	38	0
			21	30	1
Comite	1.69	May 4			
Ammo + Comite	0.10 + 1.69	May 30			
			26	354	1
Ammo	0.10	June 26			
			6	901	5
			13	4616	8
Thiodan + Methomyl	1.00 + 0.50	July 10			
			6	1	6
			13	0	0
Lorsban + Comite	0.50 + 1.69	July 23			
			7	4	0
			14	11	3
			21	8	1

Table 3 - (continued)

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Comite	1.69	May 4			
Thuringiensin	0.10	May 30			
			26	91	3
Thuringiensin	0.10	June 26			
			6	1173	34
			13	14550	134
Thiodan	1.00				
+	+	July 10			
Methomyl	0.50				
			6	5	3
			13	0	0
Lorsban	0.50				
+	+	July 23			
Comite	1.69				
			7	8	0
			14	19	2
			21	0	1
Comite	1.69	May 4			
Carzol	0.75	May 30			
Carzol	0.75	June 19			
			6	173	7
			13	573	300
Carzol	0.75	July 3			
			6	256	88
Comite	1.69				
+	+				
Thiodan	1.00	July 10			
+	+				
Methomyl	0.50				
			6	10	0
			13	4	1
			20	29	0
			27	46	2
Capture	0.10	August 7			
			6	0	0

Table 3 - (continued)

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Comite	1.69	May 4			
Spur	0.15	May 30			
			26	18	0
Spur	0.15	June 26			
			6	8	13
Monitor + Comite	0.50 + 1.69	July 3			
			6	28	4
			13	3	0
			20	5	0
			27	24	39
Lorsban	0.50	July 31			
			6	9	0
			13	0	1
Comite	1.69	May 4			
Capture	0.10	May 30			
			26	16	1
			33	41	14
Capture	0.10	June 3			
			6	12	0
			13	1	0
			20	3	1
			27	0	0
			34	2	2
Capture	0.10	August 7			
			6	0	1

Table 3 - (continued)

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Comite	1.69	May 4			
Curacron	1.00	May 30			
Curacron	1.00	June 12			
			14	26	2
Curacron	1.00	June 26			
			7	92	2
			14	2828	12
Ammo + Thiodan + Methomyl	0.10 + 1.00 + 0.50	July 10			
			6	5	0
			13	15	0
			20	30	0
			27	24	1
			34	21	0
		Grower Program			
Monitor + Comite	0.50 + 1.69	May 4			
Carzol	0.75	June 7			
Monitor + Systox	0.75 + 0.38	June 15			
			10	131	13
Comite	1.69	June 29			
			4	474	51
			11	5252	182
Thiodan + Methomyl	1.00 + 0.50	July 10			
			7	6	2
			14	27	36
			21	337	103
Carzol + Lorsban	0.75 + 0.50	August 2			
			4	37	9
			11	19	13

Table 3 - (continued)

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1 Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol and methomyl were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated.

2 D-Vac samples were initiated on July 25.

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

4 Alfalfa variety DK-135 resistant to spotted alfalfa aphids.

Table 4 - Aphid populations in seed alfalfa plots treated by aircraft for lygus bug, spider mite and aphid control. Experiment 2. Firebaugh, California, 1985.

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Monitor	0.75	May 13			
Comite	1.69	June 5			
Monitor	0.50	June 19			
			6	20	6
Comite	1.69	June 26			
			13	1	25
			20	7	174
Ammo	0.10	July 9			
			7	4	75
			14	26	2527
Lorsban	0.50	July 23			
			7	2	15
			14	2	494
			21	0	1797
			28	0	4264
Ammo + Comite	0.10 + 1.69	August 20			
			7	0	434
Monitor	0.75	May 13			
Comite + Sulfur	1.69 + 7.50	June 5			
Monitor	0.50	June 19			
			6	0	0
Comite	1.69	June 26			
			13	0	1
			20	1	25
Ammo	0.10	July 9			
			7	8	48
			14	2	610
Lorsban	0.50	July 23			
			7	1	34
			14	0	54
			21	1	324
Ammo + Comite	0.10 + 1.69	August 13			
			7	0	4
			14	0	23

Table 4 - (continued)

Treatment[1]				Number per 50 D-vac Samples[3]	
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Spotted alfalfa aphid[4]	Pea aphid
Monitor	0.75	May 13			
Apollo	0.25	June 5			
			20	0	2
Apollo	0.25	June 26			
			6	0	1
Monitor + Comite	0.50 + 1.69	July 3			
			6	0	2
			13	15	23
			20	0	384
Thuringiensin	0.10	July 23			
			7	1	1097
Lorsban	0.50	July 31			
			6	1	763
			13	0	723
Ammo + Comite	0.10 + 1.69	August 13			
			7	0	17
			14	0	8
Monitor	0.75	May 13			
Capture	0.10	June 5			
			20	19	1
			27	0	6
Capture	0.10	July 3			
			6	0	1
			13	5	22
Comite	1.69	July 17			
			6	0	0
			13	0	1
			20	0	1
			27	0	0
			34	2	13
Capture	0.10	August 20			
			7	0	1
			14	0	0

Table 4 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per 50 D-vac Samples[3] Spotted alfalfa aphid[4]	Pea aphid
Monitor	0.75	May 13			
Thuringiensin	0.10	June 5			
			20	0	0
Thuringiensin	0.10	June 26			
			6	4	6
			13	8	96
			20	11	654
Comite	1.69	July 17			
			6	28	5037
Lorsban	0.50	July 23			
			7	10	20
			14	3	42
Thuringiensin	0.10	August 7			
			6	23	278
			13	70	977
Ammo	0.10	August 20			
			7	3	272
Grower Program					
Monitor + Comite	0.75 + 1.69	May 13			
Comite	1.69	June 7			
Monitor + Comite	0.50 + 1.69	June 19			
			6	0	2
			13	6	5
Carzol	0.75	July 7			
			2	6	5
			9	8	31
			16	14	248
Lorsban	0.50	July 23			
			7	3	1
			14	2	4
			21	1	10
			28	5	29
			35	5	27

Table 4 - (continued)

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[1] Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol and sulfur were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated.

[2] Counts were initiated on July 25.

[3] 2-25 suck D-Vac samples per treatment on each sampling date.

[4] Alfalfa variety A-54 resistant to spotted alfalfa aphids.

Table 5 - Spider mite populations in seed alfalfa plots treated by aircraft for spider mite and lygus bug control. Experiment 1. Firebaugh, California, 1985.

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Comite	1.69	May 4			
			24	2.9	0.1
Monitor + Comite	0.50 + 1.69	May 30			
			5	0.5	0.5
			12	0.2	0.3
			19	1.5	1.2
			26	0.4	1.0
Monitor	0.50	June 26			
			6	1.1	3.4
			13	2.1	8.9
Thiodan + Methomyl	1.00 + 0.50	July 10			
			6	3.2	4.5
			13	12.3	11.8
Lorsban + Comite	0.50 + 1.69	July 23			
			7	1.0	0.1
			14	0.0	0.0
			21	0.0	0.1
Comite	1.69	May 4			
			24	3.8	0.3
Ammo + Comite	0.10 + 1.69	May 30			
			5	0.7	0.5
			12	0.2	0.1
			19	0.7	0.8
			26	0.3	1.3
Ammo	0.10	June 26			
			6	1.8	2.4
			13	3.0	8.2
Thiodan + Methomyl	1.00 + 0.50	July 10			
			6	2.1	3.3
			13	5.6	12.7
Lorsban + Comite	0.50 + 1.69	July 23			
			7	0.6	0.3
			14	0.1	0.1
			21	0.0	0.0

Table 5 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Comite	1.69	May 4			
			24	2.3	0.1
Thuringiensin	0.10	May 30			
			5	1.1	0.6
			12	0.9	1.0
			19	1.1	2.0
			26	1.3	7.1
Thuringiensin	0.10	June 26			
			6	6.6	10.1
			13	2.6	11.6
Thiodan	1.00				
+	+	July 10			
Methomyl	0.50				
			6	14.8	18.6
			13	13.2	18.8
Lorsban	0.50				
+	+	July 23			
Comite	1.69				
			7	0.3	0.1
			14	0.0	0.1
			21	0.0	0.1
Comite	1.69	May 4			
			24	6.0	0.6
Carzol	0.75	May 30			
			5	3.8	2.7
			12	1.1	2.4
			19	5.9	8.5
Carzol	0.75	June 19			
			6	7.3	25.8
			13	16.9	23.7
Carzol	0.75	July 3			
			6	19.2	14.7
Comite	1.69				
+	+				
Thiodan	1.00	July 10			
+	+				
Methomyl	0.50				
			6	2.0	1.7
			13	1.1	4.4
			20	0.7	1.8
			27	1.2	4.9
Capture	0.10	August 7			
			6	0.0	0.1

Table 5 - (continued)

Treatment[1]					
Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Comite	1.69	May 4			
			24	5.5	0.5
Spur	0.15	May 30			
			6	0.8	0.6
			12	0.2	0.1
			19	1.3	5.9
			26	0.9	6.8
Spur	0.15	June 26			
			6	1.4	6.5
Monitor + Comite	0.50 + 1.69	July 3			
			6	0.1	0.1
			13	0.1	0.3
			20	0.4	4.5
			27	0.3	2.5
Lorsban	0.50	July 31			
			6	1.4	7.0
			13	0.8	2.5
Comite	1.69	May 4			
			24	3.5	0.4
Capture	0.10	May 30			
			6	0.2	0.1
			12	0.4	0.8
			19	1.0	3.8
			26	0.1	0.3
			33	0.6	0.7
Capture	0.10	June 3			
			6	0.1	0.2
			13	0.1	0.5
			20	0.1	0.6
			27	1.0	6.4
			34	2.2	8.7
Capture	0.10	August 7			
			6	0.1	0.1

Table 5 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Comite	1.69	May 4			
			24	3.4	0.3
Curacron	1.00	May 30			
			7	0.0	0.0
			14	0.6	0.0
Curacron	1.00	June 12			
			7	0.6	1.1
			14	0.0	0.0
Curacron	1.00	June 26			
			7	0.1	0.2
			14	0.1	0.1
Ammo	0.10				
+	+				
Thiodan	1.00	July 10			
+	+				
Methomyl	0.50				
			6	0.0	0.0
			13	0.1	0.1
			20	0.1	0.1
			27	1.1	5.2
			34	1.5	9.0

Table 5 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
		Grower Program			
Monitor + Comite	0.50 + 1.69	May 4			
			24	3.1	0.1
			31	2.2	3.0
Carzol	0.75	June 7			
			4	1.0	5.5
Monitor + Systox	0.50 + 0.38	June 15			
			3	0.2	0.5
			10	0.1	0.3
Comite	1.69	June 29			
			4	0.3	2.1
			11	0.1	0.6
Thiodan + Methomyl	1.00 + 0.50	July 10			
			7	0.2	0.9
			14	0.2	0.4
			21	2.4	7.0
Carzol + Lorsban	0.75 + 0.50	August 2			
			4	0.7	1.8
			11	0.3	4.7

[1] Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol and methomyl were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated.

[2] Counts were initiated on May 28, 24 days after the entire field was treated with Monitor + Comite with the exception of the 7 test plots which were treated with Comite.

[3] 50 trifoliate leaves showing mite damage were examined from each treatment on each sampling date.

Table 6 - Spider mite populations in seed alfalfa plots treated by aircraft for spider mite and lygus bug control. Experiment 2. Firebaugh, California, 1985.

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Monitor	0.75	May 13			
			Pre	7.3	17.5
Comite	1.69	June 5			
			6	13.1	17.6
			13	29.0	36.9
Monitor	0.50	June 19			
			6	16.2	20.5
Comite	1.69	June 26			
			6	6.2	5.3
			13	1.8	1.1
Ammo	0.10	July 9			
			7	0.6	1.8
			14	6.8	3.1
Lorsban	0.50	July 23			
			7	0.6	0.4
			14	0.7	2.4
			21	4.8	19.5
			28	3.5	2.6
Ammo + Comite	0.10 + 1.69	August 20			
			7	0.6	0.9
Monitor	0.75	May 13			
			Pre	4.8	24.0
Comite + Sulfur	1.69 + 7.50	June 5			
			6	7.6	17.5
			13	53.2	103.2
Monitor	0.50	June 19			
			6	38.0	19.1
Comite	1.69	June 26			
			6	9.1	5.6
			13	2.5	2.2
Ammo	0.10	July 9			
			7	0.8	2.6
			14	0.6	3.5
Lorsban	0.50	July 23			
			7	0.4	3.4
			14	1.4	2.1
			21	5.0	47.7
Ammo + Comite	0.10 + 1.69	August 13			
			7	5.7	5.9
			14	0.1	0.3

Table 6 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Monitor	0.75	May 13			
			Pre	7.1	36.2
Apollo	0.25	June 5			
			6	5.2	10.8
			13	22.7	61.3
			20	59.5	63.0
Apollo	0.25	July 2			
			6	36.0	19.0
Monitor + Comite	0.50 + 1.69	July 7			
			6	5.7	4.7
			13	1.5	6.1
			20	2.9	6.3
			27	1.1	2.4
Lorsban	0.50	July 31			
			6	0.8	2.5
			13	2.5	14.5
Ammo + Comite	0.10 + 1.69	August 13			
			7	0.4	1.4
			14	0.0	0.0
Monitor	0.75	May 13			
			Pre	8.7	26.6
Capture	0.10	June 5			
			6	0.4	0.5
			13	2.8	8.6
			20	15.2	33.0
			27	19.8	18.4
Capture	0.10	July 3			
			6	0.5	2.2
			13	1.6	3.7
Comite	1.69	July 17			
			6	0.1	0.4
			13	0.0	0.0
			20	0.0	0.0
			27	0.1	0.0
			34	0.1	0.1
Capture	0.10	August 20			
			7	0.0	0.1
			14	0.0	0.0

Table 6 - (continued)

Treatment[1] Insecticides	AI/acre lb.	Dates of application	Days after treatment[2]	Number per leaf[3] Mites	Eggs
Monitor	0.75	May 13			
			Pre	9.7	18.6
Thuringiensin	0.10	June 5			
			6	6.0	4.9
			13	13.0	18.8
			20	55.4	25.0
Thuringiensin	0.10	June 26			
			6	10.0	7.5
			13	11.6	19.7
			20	14.2	44.3
Comite	1.69	July 17			
			6	3.2	4.5
Lorsban	0.50	July 23			
			6	0.2	0.1
			13	0.4	0.1
Thuringiensin	0.10	August 7			
			6	0.0	0.0
			13	0.1	0.3
Ammo	0.10	August 20			
			7	0.1	0.1
		Grower Program			
Monitor + Comite	0.75 + 1.69	May 13			
			22	7.2	23.0
Comite	1.69	June 7			
			4	16.8	52.2
			11	35.6	39.6
Monitor + Comite	0.50 + 1.69	June 19			
			6	33.8	8.2
			13	3.8	2.8
Carzol	0.75	July 7			
			2	2.6	4.1
			9	0.8	4.2
			16	1.7	4.3
Lorsban	0.50	July 23			
			7	0.8	0.4
			14	0.8	0.9
			21	0.9	7.3
			28	2.8	3.6
			35	3.0	3.2

Table 6 - (continued)

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1 Plot size: Each treatment program consisted of 5 acres (165' x 1320'). Carzol was a 92% soluble powder. The sulfur used in combination with Comite was an 80% wettable powder, while the other insecticides were emulsifiable concentrates. Sprays were applied at 10 GPA. All plots were treated before 2:00 a.m. on the dates indicated.

2 Counts were initiated on June 4, 22 days after the entire field was treated with Monitor + Comite with the exception of the 5 test plots which were treated with Monitor.

3 50 trifoliate leaves showing mite damage were examined from each treatment on each sampling date.

PREDATORS & PARASITES

Table 7 - Predator and parasite populations in seed alfalfa plots treated by aircraft for lygus bug, spider mite and aphid control. Experiment 1. Firebaugh, California, 1985.

Treatment[1] Insecticides		AI/acre lb.	Days after treatment[2]	Number per 50 D-Vac Samples[3] Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Comite	(5-4)																		
Monitor + Comite	(5-30)	0.50 + 1.69																	
			26	3	2	0	0	35	41	1	0	2	0	0	0	0	0	7	33
Monitor	(6-26)	0.50																	
			6	0	3	0	0	11	1	0	0	0	0	0	0	0	0	3	12
			13	4	0	0	0	5	2	0	0	2	0	0	0	2	0	15	10
Thiodan + Methomyl	(7-10)	1.00 + 0.50																	
			6	0	1	0	0	0	0	0	0	2	6	0	0	1	0	12	16
			13	1	0	0	0	0	0	3	19	1	4	0	0	15	0	5	59
Lorsban + Comite	(7-23)	0.50 + 1.69																	
			7	1	0	0	0	0	0	0	0	2	4	0	0	6	0	1	46
			14	0	0	0	0	0	0	0	1	1	6	0	0	5	1	5	16
			21	1	0	0	0	0	0	0	0	1	0	0	0	3	0	0	5

Table 7 - (continued)

Treatment[1]			Days after treat-ment[2]	Number per 50 D-Vac Samples[3]																	
										Lacewings											
		AI/ acre		Geocoris		Nabis		Orius		Brown		Green		Coccinellidae		Collops		Parasitic	
Insecticides		lb.		A	N	A	N	A	N	A	L	A	L	A	L	A	L	wasps	Spiders
Comite	(5-4)	1.69																	
Ammo + Comite	(5-30)	0.10 + 1.69																	
			26	24	21	1	1	22	67	0	0	0	0	0	0	0	0	12	30
Ammo	(6-26)																		
			6	8	46	0	0	23	4	0	0	0	0	0	0	1	0	26	12
			13	4	41	0	4	44	4	0	0	0	0	0	0	2	0	14	14
Thiodan + Methomyl	(7-10)	1.00 + 0.50																	
			6	0	0	0	0	0	0	1	0	0	2	0	0	1	0	6	7
			13	0	2	0	0	1	0	0	0	0	8	0	0	6	0	3	35
Lorsban + Comite	(7-23)	0.50 + 1.69																	
			7	2	0	0	0	0	0	0	4	0	9	0	0	3	0	0	20
			14	2	0	0	0	0	0	0	0	1	6	0	0	3	0	0	5
			21	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	1

Table 7 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Number per 50 D-Vac Samples[3] Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Comite	(5-4)	1.69																	
Thurin-giensin	(5-30)	0.10																	
			26	3	22	3	1	39	15	0	0	0	0	0	0	0	0	9	40
Thurin-giensin	(6-26)	0.10																	
			6	21	63	0	3	53	13	0	0	0	0	0	0	1	0	3	14
			13	3	25	0	7	25	7	0	0	1	0	0	0	0	0	10	19
Thiodan + Methomyl	(7-10)	1.00 + 0.50																	
			6	1	0	0	1	5	0	1	0	1	5	0	0	1	0	3	39
			13	1	0	0	7	4	0	0	1	2	15	0	0	4	1	2	127
Lorsban + Comite	(7-23)	0.50 + 1.69																	
			7	4	2	0	0	0	0	0	0	0	20	0	0	0	0	2	28
			14	0	0	0	0	0	0	0	0	0	7	0	0	3	2	0	26
			21	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	10

Table 7 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Number per 50 D-Vac Samples[3] Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Comite	(5-4)	1.69																	
Carzol	(5-30)	0.75																	
Carzol	(6-19)	0.75																	
			6	0	1	0	0	0	8	0	0	0	0	0	0	0	0	0	18
			13	0	1	0	2	64	3	0	0	0	0	0	0	0	0	5	30
Carzol	(7-3)	0.75																	
			6	0	3	0	0	4	0	0	0	0	0	0	0	1	0	0	22
Comite + Thiodan + Methomyl	(7-10)	1.69 + 1.00 + 0.50																	
			6	0	0	0	0	0	0	0	0	1	2	0	0	0	0	4	24
			13	1	0	1	0	1	0	0	0	1	15	0	0	4	5	2	62
			20	0	0	0	0	3	0	0	0	1	7	0	2	0	1	0	22
			27	3	0	0	0	7	9	0	0	0	7	0	0	1	0	0	2
Capture	(8-7)	0.10																	
			6	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0	4

Table 7 - (continued)

Treatment[1]			Days after treatment[2]	Number per 50 D-Vac Samples[3]																
										Lacewings										
		AI/ acre lb.		Geocoris		Nabis		Orius		Brown		Green		Coccinellidae		Collops		Parasitic wasps	Spiders
Insecticides				A	N	A	N	A	N	A	L	A	L	A	L	A	L		
Comite	(5-4)	1.69																	
Spur	(5-30)	0.15																	
			26	7	14	0	1	11	140	0	0	0	2	0	0	0	0	5	30
Spur	(6-26)	0.15																	
			6	1	11	1	2	44	17	0	0	0	3	0	0	0	0	1	16
Monitor + Comite	(7-3)	0.50 + 1.69																	
			6	2	3	0	0	9	0	0	0	1	0	0	0	0	0	2	13
			13	0	1	0	0	11	0	0	0	3	1	0	0	1	1	7	21
			20	0	1	0	0	8	0	0	0	7	5	0	0	5	4	2	68
			27	0	1	0	0	18	1	0	0	1	6	0	0	3	0	7	23
Lorsban	(7-31)	0.50																	
			6	1	0	0	0	34	0	0	0	0	11	0	0	2	0	1	18
			13	0	1	0	0	18	1	0	0	2	4	0	0	0	0	2	19

Table 7 - (continued)

Treatment[1]				Number per 50 D-Vac Samples[3]															
										Lacewings									
		AI/ acre	Days after treat-	Geocoris		Nabis		Orius		Brown		Green		Coccinellidae		Collops		Parasitic	
Insecticides		lb.	ment[2]	A	N	A	N	A	N	A	L	A	L	A	L	A	L	wasps	Spiders
Comite	(5-4)	1.69																	
Capture	(5-30)	0.10																	
			26	3	2	0	0	5	37	0	0	0	0	0	0	0	0	2	3
			33	9	5	0	0	81	21	0	0	0	0	0	0	0	0	2	10
Capture	(7-3)	0.10																	
			6	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	10
			13	1	0	0	0	5	0	0	0	3	0	0	0	2	1	3	9
			20	2	1	0	0	10	0	0	0	2	11	0	0	1	4	2	24
			27	1	0	0	0	4	2	0	0	0	18	0	0	2	0	3	9
			34	3	0	0	0	9	7	0	0	1	8	0	0	0	0	5	16
Capture	(8-7)	0.10																	
			6	1	0	0	0	0	0	0	1	0	6	0	0	0	0	8	14

Table 7 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat- ment[2]	Number per 50 D-Vac Samples[3] Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Comite	(5-4)	1.69																	
Curacron	(5-30)	1.00																	
Curacron	(6-12)	1.00																	
			14	1	0	0	0	2	16	0	0	0	0	0	0	0	0	2	53
Curacron	(6-26)	1.00																	
			7	2	0	0	0	7	1	0	0	0	0	0	0	0	0	3	51
			14	0	1	0	1	2	5	0	0	0	0	0	0	0	0	0	56
Ammo + Thiodan + Methomyl	(7-10)	0.10 + 1.00 + 0.50																	
			6	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	14
			13	0	0	0	0	0	0	0	1	1	5	0	0	0	1	2	32
			20	0	0	0	0	1	0	0	0	1	8	0	0	0	0	2	56
			27	2	0	0	0	4	0	0	0	2	4	0	0	0	0	1	25
			34	3	0	0	0	8	2	0	1	2	7	0	0	0	0	0	14

Table 7 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
				Number per 50 D-Vac Samples[3]															
Grower Program																			
Monitor + Comite	(5-4)	0.50 + 1.69																	
Carzol	(6-7)	0.75																	
Monitor + Systox	(6-15)	0.75 + 0.38																	
			10	1	0	1	0	0	2	0	0	0	0	0	0	0	0	3	53
Comite	(6-29)	1.69																	
			4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	84
			11	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	74
Thiodan + Methomyl	(7-10)	1.00 + 0.50																	
			6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	5	180
			13	1	0	0	1	1	0	0	0	2	9	0	0	1	0	7	661
			20	1	0	0	0	0	0	0	0	2	4	0	0	3	0	8	427
Carzol + Lorsban	(8-2)	0.75 + 0.50																	
			4	0	0	0	0	0	0	0	1	2	10	0	0	2	0	0	86
			11	1	0	0	0	7	0	0	0	14	15	0	0	5	1	1	223

Table 7 - (continued)

[1] Plot size: Each treatment program was 5 acres (165' x 1320'). Carzol and methomyl were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. Plots treated before 2:00 a.m. on the dates indicated in parentheses.

[2] D-Vac samples were initiated on June 25.

[3] 2-25 suck D-Vac samples per treatment on each sampling date.

Table 8 - Predator and parasite populations in seed alfalfa plots treated by aircraft for lygus bug and spider mite control. Experiment 2. Firebaugh, California, 1985.

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
				Number per 50 D-Vac Samples[3]															
Monitor	(5-13)	0.50																	
Comite	(6-5)	1.69																	
Monitor	(6-19)	0.50																	
			6	0	9	0	1	3	1	0	0	1	2	0	0	0	0	3	40
Comite	(6-26)	1.69																	
			13	4	1	0	0	13	3	0	0	0	0	0	0	0	1	1	43
			20	3	2	0	0	13	5	0	0	3	1	0	0	0	1	8	96
Ammo	(7-9)	0.10																	
			6	1	0	0	0	2	0	1	0	0	0	0	0	0	0	0	16
			12	0	0	0	1	7	0	0	0	3	5	0	0	1	0	6	65
Lorsban	(7-23)	0.50																	
			7	0	0	0	0	5	0	0	0	1	4	0	0	0	0	2	42
			14	1	0	0	0	19	5	0	0	17	12	0	0	2	0	1	31
			21	2	0	0	0	29	5	0	0	10	8	0	0	1	0	2	15
			28	3	1	0	0	19	6	0	0	7	14	0	0	3	0	0	2
Ammo + Comite	(8-20)	0.10 + 1.69																	
			7	3	1	0	0	13	9	0	0	0	6	0	0	1	0	1	7

Table 8 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Monitor	(5-13)	0.75																	
Comite + Sulfur	(6-5)	1.69 + 7.50																	
Monitor	(6-26)	0.50																	
			6	0	2	0	4	7	1	0	0	0	0	0	0	0	0	0	49
Comite	(6-26)	1.69																	
			13	2	6	0	2	58	4	0	0	0	0	0	0	0	0	3	76
			20	0	0	0	0	15	3	0	0	8	0	0	0	0	0	3	52
Ammo	(7-9)	0.10																	
			7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10
			14	1	0	0	0	4	0	0	0	0	7	0	0	1	0	3	102
Lorsban	(7-23)	0.50																	
			7	0	0	0	0	5	0	0	0	0	11	0	0	0	0	3	41
			14	1	0	0	0	17	11	0	0	0	9	0	0	2	0	6	26
			21	4	0	1	0	30	11	0	1	2	13	0	0	1	0	3	12
Ammo + Comite	(8-13)	0.10 + 1.69																	
			7	0	1	0	0	1	1	0	0	0	8	0	0	0	0	0	2
			14	1	0	0	0	39	0	0	0	0	7	0	0	0	0	0	0

Table 8 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Number per 50 D-Vac Samples[3] Geocoris		Nabis		Orius		Lacewings Brown		Lacewings Green		Coccinellidae		Collops		Parasitic wasps	Spiders
				A	N	A	N	A	N	A	L	A	L	A	L	A	L		
Monitor	(5-13)	0.75																	
Apollo	(6-5)	0.25	20	5	7	0	3	40	31	0	0	0	0	0	0	0	0	8	52
Apollo	(6-26)	0.25	6	8	23	0	6	145	67	0	0	0	0	0	0	0	0	2	43
Monitor + Comite	(7-3)	0.50 + 1.69	6	0	1	0	1	5	1	0	0	0	1	0	0	0	0	0	43
			13	1	0	0	0	8	0	0	0	10	1	0	0	0	0	1	26
			20	1	1	0	0	11	0	0	0	1	0	0	0	2	0	2	55
			27	1	2	0	1	6	15	0	0	0	9	1	2	6	0	8	61
Lorsban	(7-31)	0.50	6	2	1	0	3	14	12	0	0	3	15	1	4	3	0	2	8
			13	0	0	0	0	39	27	0	0	9	5	0	6	3	0	3	17
Ammo + Comite	(8-13)	0.10 + 1.69	7	0	0	0	1	4	1	0	0	2	7	0	0	1	0	0	1
			14	2	1	0	0	21	0	0	0	1	9	0	0	0	0	0	6

Table 8 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treatment[2]	Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
Monitor	(5-13)	0.75																	
Capture	(6-5)	0.10																	
			20	1	3	0	0	1	2	0	0	0	0	0	0	0	0	1	2
			27	2	7	0	3	40	13	0	0	0	0	0	0	0	0	0	12
Capture	(7-3)	0.10																	
			6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
			13	0	0	0	0	3	7	0	0	5	4	0	0	0	0	0	14
Comite	(7-17)	1.69																	
			20	1	0	0	0	19	0	0	2	0	8	0	0	1	0	5	11
			27	0	0	0	0	23	0	0	1	3	3	0	0	1	0	2	8
			34	2	0	0	0	14	11	0	0	2	5	0	0	1	0	4	4
			41	0	1	0	0	86	25	0	0	5	11	0	0	0	0	3	6
			48	8	0	0	0	76	22	0	0	4	8	0	0	0	0	1	5
Capture	(8-20)	0.10																	
			7	0	0	0	0	19	2	0	0	3	12	0	0	1	0	1	1

Table 8 - (continued)

Treatment[1]			Days	Number per 50 D-Vac Samples[3]															
										Lacewings									
		AI/ acre	after treat-	Geocoris		Nabis		Orius		Brown		Green		Coccinellidae		Collops		Parasitic	
Insecticides		lb.	ment[2]	A	N	A	N	A	N	A	L	A	L	A	L	A	L	wasps	Spiders
Monitor	(5-13)	0.75																	
Thurin-giensin	(6-5)	0.10	20	1	2	0	0	22	7	0	0	0	0	0	0	0	0	1	35
Thurin-giensin	(6-26)	0.10	6	5	24	0	0	29	19	0	0	1	0	0	0	0	0	0	44
			13	2	17	0	1	19	11	0	0	5	1	0	0	0	0	3	69
			20	3	6	0	1	9	21	0	0	5	3	0	0	0	0	5	27
			27	14	88	1	53	165	94	0	2	1	8	0	0	1	0	5	11
Lorsban	(7-23)	0.50	7	0	0	0	9	48	10	0	1	1	15	1	1	4	0	1	133
			14	6	4	0	21	25	63	0	0	9	9	0	0	2	1	7	33
Thurin-giensin	(8-7)	0.10	6	4	0	0	15	132	70	0	0	15	5	0	1	2	0	8	61
			13	4	5	0	5	67	152	0	0	6	7	0	0	1	0	0	18
Ammo	(8-20)	0.10	7	6	25	0	2	67	20	0	0	2	3	0	0	3	1	0	10

Table 8 - (continued)

Treatment[1] Insecticides		AI/ acre lb.	Days after treat- ment[2]	Geocoris A	Geocoris N	Nabis A	Nabis N	Orius A	Orius N	Lacewings Brown A	Lacewings Brown L	Lacewings Green A	Lacewings Green L	Coccinellidae A	Coccinellidae L	Collops A	Collops L	Parasitic wasps	Spiders
				Number per 50 D-Vac Samples[3]															
Grower Program																			
Monitor + Comite	(5-13)	0.75 + 1.69																	
Comite	(5-7)	1.69																	
Monitor + Comite	(6-19)	0.50 + 1.69																	
			6	0	3	0	1	0	2	0	0	0	0	0	0	0	0	0	36
			13	0	0	0	0	5	0	0	0	1	0	0	0	0	0	1	36
Carzol	(7-7)	0.75																	
			2	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	15
			9	0	0	0	0	1	1	0	0	2	0	0	0	0	0	1	22
			16	0	0	0	0	14	2	0	0	1	1	0	0	0	0	2	41
Lorsban	(7-23)	0.50																	
			7	0	0	0	0	2	1	0	0	3	13	0	2	3	0	2	42
			14	0	0	0	0	6	2	0	0	0	11	0	0	3	0	9	6
			21	0	0	0	0	31	3	0	0	5	9	0	0	1	0	1	12
			28	1	1	0	0	11	35	0	0	4	21	0	0	1	1	0	5
			35	7	9	1	0	35	40	0	0	6	8	0	0	3	0	0	5

Table 8 - (continued)

[1] Plot size: Each treatment program was 5 acres (165' x 1320'). Carzol and sulfur were 92% soluble powder and 80% wettable powder respectively, while the other materials were emulsifiable concentrates. Sprays were applied at 10 GPA. All pl were treated before 5:00 a.m. on the dates indicated in parentheses.

[2] Counts were initiated on June 25th.

[3] 2-25 suck D-Vac samples per treatment on each sampling date.

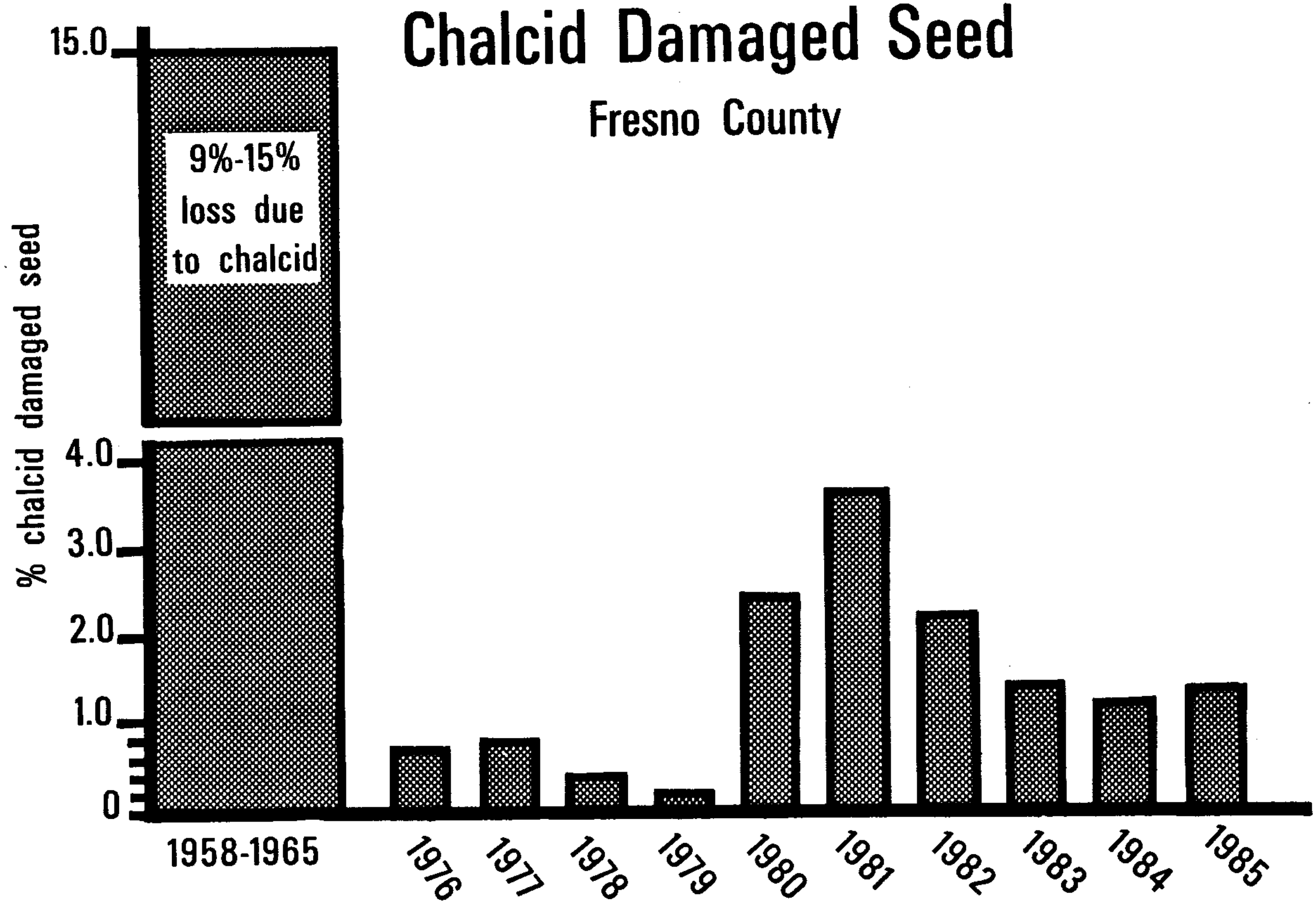

Figure 2. Average annual percentages of chalcid damaged seed from hand stripped samples taken from commercial alfalfa seed fields throughout Fresno County.

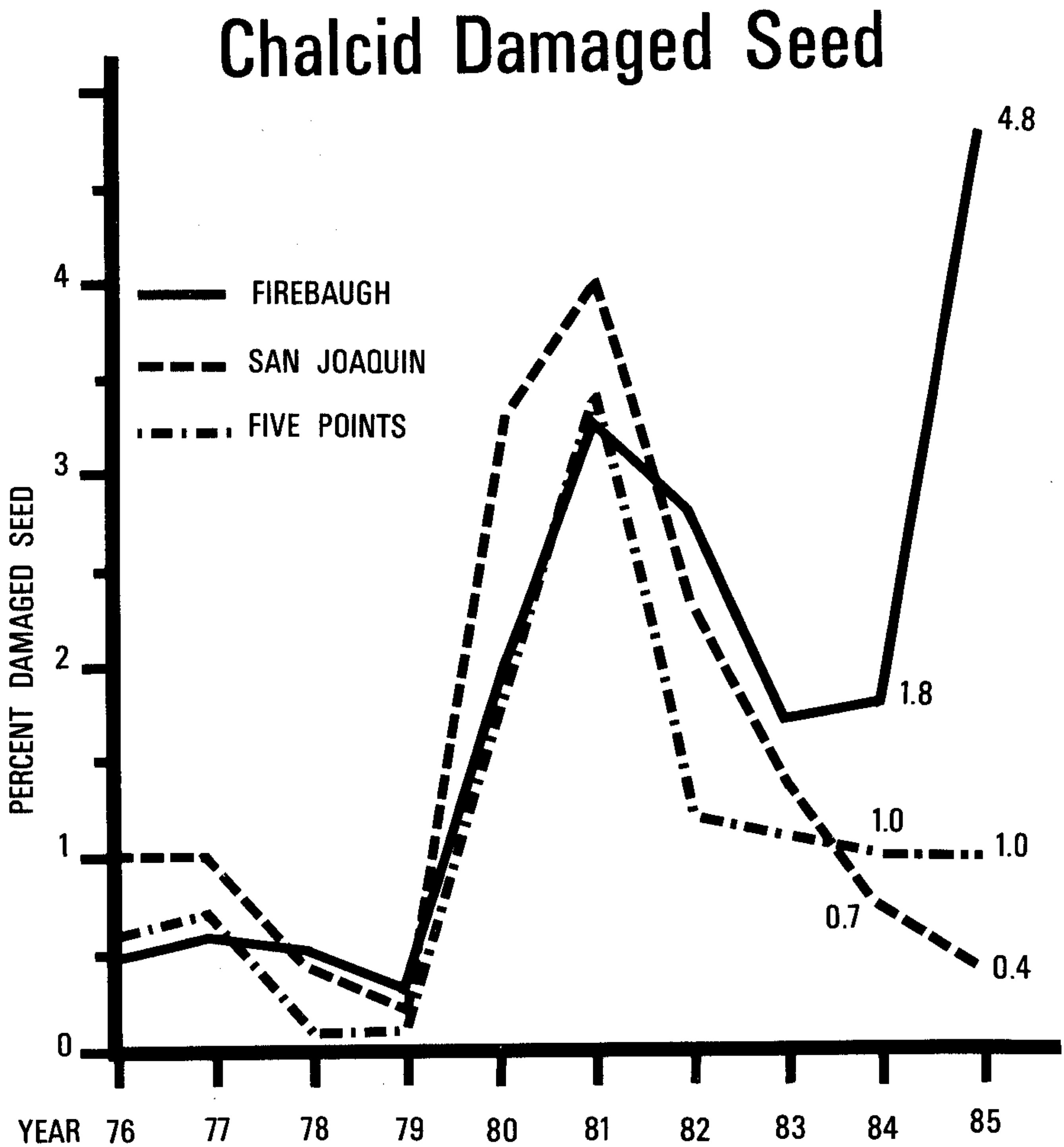

Figure 1. Average annual percentages of chalcid damaged seed from hand stripped samples taken from commercial alfalfa seed fields in the Firebaugh, San Joaquin and Five Points areas from 1976 to 1985.

Table 9 - Percentages of good and defective seeds in samples from 130 commercial seed fields surveyed for chalcid damaged seed. Fresno, Kings, and Imperial Counties, California, 1985.

Field Number and Location	Variety	Seed Exam[1]	Good Seed	% Defective Seeds					
				Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
1 Firebaugh	Pioneer 581	1789	87.5	1.7	7.0	0.2	0.2	3.4	0.0
2 Firebaugh	DK-135	1709	92.5	3.4	3.3	0.1	0.2	0.4	0.1
3 Firebaugh	Prospera	1792	80.3	10.3	6.5	0.1	1.1	1.6	0.1
4 Firebaugh	A-54	1613	88.0	3.8	4.1	0.1	3.5	0.3	0.2
--- Average	---	1726	87.1	4.8	5.2	0.1	1.3	1.4	0.1
1 Mendota	Moapa 69	1767	95.7	1.5	2.3	0.0	0.2	0.3	0.0
2 Mendota	Moapa 69	1692	96.5	0.3	2.4	0.1	0.2	0.4	0.1
3 Mendota	Moapa 69	1533	86.8	1.7	9.0	0.2	1.5	0.7	0.1
4 Mendota	Moapa 69	1878	94.5	0.4	4.0	0.1	0.3	0.6	0.1
5 Mendota	Moapa 69	1882	94.9	1.4	3.2	0.0	0.3	0.2	0.0
6 Mendota	Moapa 69	2060	95.0	0.2	3.1	0.1	0.6	1.0	0.0
7 Mendota	Moapa 69	1966	96.0	0.3	3.2	0.1	0.1	0.2	0.1
8 Mendota	Moapa 69	1745	94.3	0.4	3.4	0.1	1.6	0.0	0.2
9 Mendota	Moapa 69	1754	95.1	1.3	2.5	0.2	0.2	0.6	0.1
10 Mendota	Apollo II	1740	95.4	0.2	3.5	0.4	0.1	0.4	0.0
11 Mendota	Apollo II	1891	92.2	0.7	5.0	0.2	1.5	0.2	0.2
12 Mendota	Apollo II	1589	91.2	2.1	5.5	0.5	0.3	0.4	0.0
13 Mendota	Common	1878	94.0	0.1	3.8	0.1	1.8	0.1	0.1
--- Average	---	1798	94.0	0.8	3.9	0.1	0.5	0.4	0.3
1 Tranquility	Moapa 69	1789	93.3	1.1	4.7	0.1	0.1	0.7	0.0
2 Tranquility	Moapa 69	1744	94.0	1.0	3.8	0.1	0.1	1.0	0.0
3 Tranquility	Moapa 69	1982	92.7	0.6	6.0	0.1	0.1	0.5	0.0
4 Tranquility	Moapa 69	1771	90.7	1.3	5.1	0.2	1.8	0.8	0.1
5 Tranquility	Moapa 69	1741	95.6	0.1	3.2	0.1	0.7	0.2	0.1

Table 9 - (continued)

Field Number and Location	Variety	Seed Exam[1]	Good Seed	% Defective Seeds: Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
6 Tranquility	Moapa 69	1597	96.1	0.2	2.3	0.0	1.1	0.2	0.1
7 Tranquility	Moapa 69	1493	73.2	0.1	22.6	1.9	1.0	0.5	0.7
8 Tranquility	Moapa 69	1536	94.3	0.6	3.9	0.7	0.5	0.0	0.0
9 Tranquility	Moapa 69	1879	83.2	2.6	11.6	0.2	1.7	0.6	0.1
10 Tranquility	CUF-101	1532	93.0	0.7	4.8	0.2	0.2	0.8	0.3
11 Tranquility	CUF-101	1705	95.9	0.2	2.4	0.2	0.5	0.8	0.0
12 Tranquility	CUF-101	1664	96.2	0.4	2.6	0.2	0.5	0.1	0.0
13 Tranquility	CUF-101	1510	95.3	1.0	3.4	0.0	0.1	0.0	0.2
14 Tranquility	Riley	1501	89.1	5.6	3.6	0.5	0.1	1.0	0.1
15 Tranquility	Riley	1598	93.4	0.5	5.1	0.3	0.3	0.3	0.1
16 Tranquility	Riley	1269	95.0	0.7	3.9	0.1	0.0	0.2	0.1
17 Tranquility	FM-300	1863	92.2	1.4	3.8	0.6	1.6	0.2	0.2
18 Tranquility	Advantage	1830	86.7	0.3	8.0	0.6	3.5	0.8	0.1
19 Tranquility	Advantage	1683	82.8	2.3	9.0	0.4	4.6	0.9	0.0
20 Tranquility	DK-187	1717	90.6	0.2	4.7	0.3	3.2	1.0	0.0
21 Tranquility	DK-187	1711	86.7	5.8	6.5	0.1	0.2	0.5	0.2
22 Tranquility	A-54	1649	79.5	2.6	14.6	1.0	2.1	0.1	0.1
23 Tranquility	Granada	1642	94.0	1.6	3.8	0.2	0.2	0.2	0.0
24 Tranquility	Jubilee	1797	93.7	1.1	4.4	0.1	0.1	0.6	0.0
25 Tranquility	Baron	1532	88.9	0.7	10.1	0.2	0.0	0.1	0.0
26 Tranquility	Common	1775	96.3	0.2	2.6	0.0	0.1	0.8	0.0
--- Average	---	1674	90.9	1.3	6.0	0.3	0.9	0.5	0.1
1 San Joaquin	CUF-101	1537	96.5	0.1	2.6	0.1	0.2	0.4	0.1
2 San Joaquin	CUF-101	1591	85.6	0.1	11.8	0.2	1.8	0.5	0.0
3 San Joaquin	CUF-101	1718	94.0	0.1	3.4	0.4	0.8	1.3	0.0
4 San Joaquin	CUF-101	1599	96.1	0.0	3.2	0.2	0.3	0.0	0.2
5 San Joaquin	CUF-101	1629	86.4	0.3	12.8	0.3	0.1	0.0	0.1
6 San Joaquin	CUF-101	1736	86.3	2.1	7.5	0.3	2.9	0.9	0.0

Table 9 - (continued)

Field Number	and Location	Variety	Seed Exam[1]	Good Seed	% Defective Seeds: Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
7	San Joaquin	CUF-101	1677	94.0	0.3	3.8	0.1	0.4	1.3	0.1
8	San Joaquin	CUF-101	1707	90.9	0.5	5.6	0.2	2.5	0.3	0.0
9	San Joaquin	CUF-101	1662	92.7	0.0	3.4	0.2	2.2	0.8	0.7
10	San Joaquin	Moapa 69	1699	95.9	0.2	2.9	0.2	0.5	0.2	0.1
11	San Joaquin	Moapa 69	1639	94.2	0.1	5.2	0.1	0.1	0.3	0.0
12	San Joaquin	Moapa 69	1986	96.6	0.1	2.7	0.0	0.3	0.3	0.0
13	San Joaquin	Moapa 69	1664	94.1	1.1	3.7	0.1	0.3	0.7	0.0
14	San Joaquin	F-104	1747	94.6	0.1	3.9	0.1	1.1	0.2	0.0
15	San Joaquin	F-104	2001	81.6	0.7	11.6	1.9	0.3	3.9	0.0
16	San Joaquin	FM-102	1753	73.1	0.1	12.8	1.0	12.9	0.1	0.0
17	San Joaquin	Advantage	1957	93.5	0.0	4.3	0.1	0.0	2.0	0.1
18	San Joaquin	Advantage	1659	90.6	0.5	5.6	0.1	1.8	1.2	0.2
19	San Joaquin	Apollo II	1796	88.4	1.4	8.1	0.6	0.2	1.2	0.1
20	San Joaquin	Apollo II	1545	87.8	0.3	8.7	0.2	2.7	0.2	0.1
21	San Joaquin	CW-938	2026	94.8	0.1	4.7	0.2	0.1	0.1	0.0
22	San Joaquin	CW-239	1811	94.8	0.3	3.9	0.1	0.1	0.6	0.2
23	San Joaquin	CW-140	1727	95.4	0.5	2.6	0.0	0.4	0.8	0.3
24	San Joaquin	G-7730	1858	89.9	1.2	8.7	0.1	0.0	0.1	0.0
25	San Joaquin	H-134	1752	78.7	0.9	15.4	0.2	0.1	4.7	0.0
26	San Joaquin	LL-3110K	1720	91.2	0.0	3.7	0.1	2.0	2.9	0.1
27	San Joaquin	Mercury/NAPB 93	1773	95.0	0.2	4.3	0.0	0.3	0.0	0.2
28	San Joaquin	Pierce	1584	93.9	0.7	3.9	0.2	0.3	0.8	0.2
29	San Joaquin	DK-187	2028	89.3	0.3	8.9	0.4	0.0	0.9	0.2
30	San Joaquin	CW-100	1897	95.8	0.7	2.9	0.1	0.3	0.1	0.1
---	Average	---	1749	91.1	0.4	6.1	0.3	1.2	0.8	0.1
1	Five Points	CUF-101	1666	91.8	0.8	5.2	0.1	0.2	1.8	0.1
2	Five Points	CUF-101	1725	95.5	0.1	3.8	0.1	0.1	0.3	0.1
3	Five Points	G-2815	1608	96.7	0.4	2.5	0.1	0.0	0.3	0.0

Table 9 - (continued)

Field Number	and Location	Variety	Seed Exam[1]	Good Seed	% Defective Seeds: Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
4	Five Points	CW-239	2028	86.5	0.1	12.3	0.8	0.1	0.1	0.1
5	Five Points	Olds 88	1689	96.1	0.6	2.8	0.2	0.0	0.2	0.1
6	Five Points	CW-252	1953	97.1	0.0	2.4	0.0	0.0	0.5	0.0
7	Five Points	MDBM	1695	90.1	5.3	3.9	0.2	0.1	0.4	0.0
8	Five Points	MDBM	1817	88.6	3.5	5.9	0.0	0.1	1.8	0.1
9	Five Points	Moapa 69	1670	97.6	0.0	1.7	0.1	0.1	0.5	0.0
10	Five Points	Moapa 69	1767	96.3	0.7	1.5	0.1	1.1	0.0	0.3
11	Five Points	Advantage	1872	91.6	4.0	3.6	0.4	0.2	0.0	0.2
12	Five Points	Advantage	1889	95.1	0.1	4.2	0.2	0.1	0.3	0.0
13	Five Points	FM-230	1631	93.8	0.1	4.3	0.4	0.1	1.0	0.3
14	Five Points	Trumpetor	1621	95.1	1.3	3.2	0.1	0.1	0.1	0.1
15	Five Points	DK-135	1757	94.7	0.4	4.0	0.2	0.1	0.6	0.0
16	Five Points	Apollo II	1671	94.7	0.3	4.1	0.0	0.2	0.7	0.0
17	Five Points	G-2185	1783	96.1	0.4	3.1	0.2	0.1	0.1	0.0
18	Five Points	Common	1706	81.6	1.4	16.8	0.1	0.0	0.1	0.0
19	Five Points	Common	1627	94.9	0.1	3.9	0.3	0.4	0.4	0.0
20	Five Points	Common	1821	95.3	0.3	3.6	0.1	0.4	0.2	0.1
21	Five Points	Common	1846	96.6	0.5	2.3	0.1	0.4	0.1	0.0
---	Average	---	1754	93.6	1.0	4.5	0.2	0.2	0.4	0.1
1	Huron	Endure	1970	88.0	3.4	7.1	0.2	0.1	1.2	0.0
2	Huron	WL-320	1753	77.7	0.3	19.1	0.2	2.2	0.4	0.1
3	Huron	UC Cibola	1613	92.6	0.0	5.5	0.0	1.2	0.4	0.3
4	Huron	Magnum	1746	90.2	2.4	5.2	0.0	1.7	0.3	0.2
---	Average	---	1771	87.1	1.5	9.2	0.1	1.3	0.6	0.2

Table 9 - (continued)

Field Number	and Location	Variety	Seed Exam[1]	Good Seed	% Defective Seeds: Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
1	Westhaven	MDBM	1762	94.5	2.1	2.5	0.1	0.1	0.7	0.0
2	Westhaven	MDBM	1835	88.2	3.7	4.2	0.3	0.5	2.9	0.2
3	Westhaven	MDBM	1807	94.7	0.7	3.5	0.1	0.1	0.8	0.1
4	Westhaven	CUF-101	1522	88.0	3.4	5.5	0.1	0.3	2.5	0.2
5	Westhaven	CUF-101	1565	87.2	4.0	7.0	0.1	0.2	1.3	0.2
6	Westhaven	Magnum	1987	84.9	2.3	10.9	0.2	0.1	1.5	0.1
---	Average	---	1746	89.6	2.7	5.6	0.2	0.2	1.6	0.1
1	Corcoran	532	1920	91.9	1.1	4.8	0.2	0.5	1.5	0.0
2	Corcoran	532	1733	91.5	3.3	3.8	0.1	0.3	1.0	0.0
3	Corcoran	532	1943	94.0	0.2	2.9	0.1	0.7	2.1	0.0
4	Corcoran	532	1801	93.2	0.3	3.9	0.3	0.4	1.8	0.1
5	Corcoran	532	1761	94.7	0.5	3.4	0.1	0.5	0.6	0.2
6	Corcoran	532	1828	93.2	0.3	3.1	0.0	2.1	1.3	0.0
7	Corcoran	532	1798	85.5	0.5	7.8	0.1	3.4	2.7	0.0
8	Corcoran	581	2084	93.7	0.2	2.5	0.1	3.1	0.4	0.0
9	Corcoran	Magnum	2085	91.7	1.4	4.7	0.1	0.6	1.5	0.0
10	Corcoran	Magnum	1833	93.3	0.6	3.0	0.0	2.0	1.0	0.1
11	Corcoran	Magnum	2183	95.6	0.5	2.7	0.0	0.2	1.0	0.0
12	Corcoran	Pi 526	2018	93.6	0.4	3.2	0.0	0.2	2.3	0.3
13	Corcoran	Pi 532	1878	93.4	1.6	3.7	0.0	0.3	0.9	0.1
14	Corcoran	Pi 526	1974	92.7	0.4	2.9	0.2	1.7	2.1	0.0
15	Corcoran	Apollo	1922	90.1	0.8	5.5	0.0	3.4	0.2	0.0
16	Corcoran	Apollo	1963	94.5	0.7	4.3	0.0	0.3	0.2	0.0
17	Corcoran	WL-312	1913	84.9	1.6	5.7	0.1	6.5	1.2	0.0
18	Corcoran	WL-316	2017	91.6	0.5	5.2	0.1	1.5	1.0	0.1
19	Corcoran	WL-320	2067	95.5	0.1	3.5	0.0	0.5	0.4	0.0
20	Corcoran	Peak	1902	91.4	3.8	2.6	0.1	0.9	1.1	0.1
21	Corcoran	Southern Special	1717	88.0	2.7	6.6	0.0	0.6	2.1	0.0

Table 9 - (continued)

Field Number and Location		Variety	Seed Exam[1]	Good Seed	% Defective Seeds: Chalcid	Lygus bug	Stink bug	Water damage	Green	Other damage
22	Corcoran	Spectrum	2188	90.4	1.5	6.6	0.2	0.2	1.0	0.1
23	Corcoran	Decathalon	1561	89.1	4.2	3.3	0.0	0.4	2.9	0.1
---	Average	---	1917	91.8	1.2	4.2	0.1	1.3	1.3	0.1
1	El Centro	---	1763	61.2	15.7	16.3	0.8	0.6	5.2	0.2
2	El Centro	---	1964	88.2	0.4	7.2	1.0	0.2	3.0	0.0
3	El Centro	---	1758	66.7	6.4	23.2	0.9	1.2	1.1	0.5
---	Average	---	1828	72.0	7.5	15.6	0.9	0.7	3.1	0.2

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

The contents of this report should not be interpreted as recommendations by the University of California. Insect control recommendations are published by the University of California and can be obtained from Cooperative Extension Offices.

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.

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

Ammo® (cypermethrin)

Apollo® (clofentezine)

Capture® (bifenthrin)

Carzol® (formetanate)

Comite® (propargite)

Curacron® (profenofos)

Lorsban® (chlorpyrifos)

Methomyl

Monitor® (methamidophos)

Spur® (fluvalinate)

Sulfur

Systox® (demeton)

Thiodan® (endosulfan)

Thuringiensin® (β-Exotoxin of *B. thuringiensis*)

These experiments were conducted in the San Joaquin Valley where the honey bee is the principal pollinator. We have no information concerning the effects of these insecticides and programs on leafcutting or alkali bees.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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