ALMOND BOARD OF CALIFORNIA, FINAL PROJECT REPORT

Project No. 89-E3 - Chemical Control of Ants in Almonds

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Objectives: (1) Lorsban® 4E was expected to be registered soon in California for ant control in addition to granular diazinon. We demonstrated in 1987 that an EC formulation of Lorsban applied to the berms at 200 GPA reduced the activity of the ants on the berm as rated by the number of nests with ants moving in/out of the entrance. However, we were unable to show an actual reduction of damage to the nuts when applied at 40 GPA. The objective of this project is to further evaluate the spray volume needed for effective control. A second objective is to determine if adequate damage reduction can be obtained from berm sprays alone or must the treatment be applied to both berms and middles. We also wish to get some preliminary data on the activity of bait formulations applied early in the season for ant control. However, this will depend on availability of material and cooperation of manufacturers.

(2) Lorsban 4EC was not registered for ant control in 1989 and Pounce® 3.2EC was registered for ant control. The Pounce registration was based on very limited data. Because of this, a new objective was added to the study. It will be a comparison of Pounce versus Lorsban effectiveness in ant control for almond orchards.

Interpretive Summary:
The following trials were conducted on a flood-irrigated orchard of Non-pareil and Merced varieties. The soil in the experimental area is mainly Delhi sand with some Hesperia sandy loam around the edges. 70% of the nests in the experimental area were in the middles and 30% were on the berms.

LORSBAN vs POUNCE COMPARISON

Pounce 3.2EC was given a 24-c label this spring for the control of ants in almond orchards. Our studies which included Pounce during the 1988 season were inconclusive for assessing ant control. We established the following trial to provide a comparison of the efficacy of Pounce EC with Lorsban EC for the control of ants in almond orchards.

The following treatments were applied:

No.	Treatment	Lbs, a.i.	GPA
1	Lorsban 4E	4 lbs ai	100
2	Pounce 3.2E	0.4 lbs ai	100
3	Water		100

The plots consisted of the space between two rows x three trees. One large, active colony of southern fire ants (*Solenopsis xyloni*) was located approximately in the center of the plot and marked. The experiment was replicated four times in a randomized complete block design. They were treated 26-June. Treatments as listed were applied over the entire plot area. Treatments were applied with a tractor mounted boom spray rig using flat fan nozzles.

250 undamaged, shelled almonds per plot were put down on 28-June, two days after treatment. The almonds were placed on the ground approximately two feet from the active ant colony and covered with a wire mesh (1/2" x 1") screen to prevent birds from removing the nuts. The nuts were picked up on 3-July, placed in paper bags and placed in a freezer to prevent further ant feeding. They were later examined for ant damage. A subjective rating of ant activity within the plots was done at the time the nuts were picked up. Activity was the amount of ants working in the pile of nuts or around the colony.

A second batch of 250 nuts/plot were placed in the plots on 10-July and picked up on 14-July. A second subjective rating of activity was done at that time. A third subjective rating of ant activity was done on 26-July.

Results are shown in the following table:

	% damage		Activity Rating[2/]		
Treatments	3-July	14-July	3-July	14-July	26-July
Lorsban	0.2 a[1/]	2.6a	1.0a	1.0a	1.0a
Pounce	0.03a	15.4ab	2.0 b	3.3 b	3.3 b
Water	43.5 b	37.6 b	3.3 c	3.5 b	3.5 b

[1/]Numbers followed by the same letter are not significantly different (DMRT=0.05).
[2/]Rating: 1= no activity, 2= slight activity, 3= moderate activity, 4=high activity.

Statistically, both Lorsban and Pounce were equally effective in reducing ant damage at the first evaluation (Fig. 1). However, Pounce was not significantly different from either the check or Lorsban at the second week's damage evaluation, while Lorsban was lower than the check. The activity ratings indicate that Pounce does not reduce the numbers of ants as well as Lorsban does and this difference holds for up to three weeks after the application (Fig. 2). It is known that permethrin, the active ingredient in Pounce, has a high degree of repellency to a number of insects. Perhaps this repellency accounts for much of the reduction in initial damage, but it is questionable that it can maintain low damage levels for more than a couple of weeks.

SPRAY VOLUME TRIAL

The objectives of this study were to determine the optimum spray volume of water to apply with Lorsban for effective ant control, and to determine if berm application alone will effectively reduce damage or if broadcast coverage over the entire orchard floor is required.

Treatments consisted of Lorsban 4E at the rate of 1.0 lb active ingredient per treated acre applied in the following volumes of water:

No.	GPA	Target
1.	25	Broadcast
2.	50	Broadcast
3.	100	Broadcast
4.	200	Broadcast
5.	100	Berms only
6.	—	Untreated

Plot size and design were the same as discussed in the above trial except that the treatments were replicated six times.

Treatments were applied on 5-Aug. and the first batch of 250 shelled nuts/plot were put down on 8-Aug. They were picked up on 15-Aug., on which date the crop of Non-pareils was harvested. 100 harvested nuts per plot from around previously identified active nests were picked up for evaluation of ant damage on 23-Aug. Ant activity was rated at that time. A second batch of 250 nuts/plot was placed on the plots 28-Aug. and collected for examination 11-Sept.

Results are shown in the following table and in Fig. 3:

	Avg % damage			Activity[2/]
	Shelled nuts	Harvested nuts	Shelled nuts	
Treatment	15-Aug	23-Aug	11-Sept	23-Aug
25	1.5a[1/]	1.1a	5.1a	1.7ab
50	0.9a	0.2a	3.4a	1.0a
100	0.6a	0.1a	4.8a	1.3a
200	0.2a	0.6a	2.3a	1.7ab
100	10.7 b	10.8 b	10.4a	1.7ab
Check	16.3 b	2.8a	8.2a	2.7 b

[1/]Numbers followed by the same letter are not significantly different (DMRT=0.05).
[2/]Rating: 1= no activity, 2= slight activity, 3= moderate activity, 4=high activity.

All spray rates reduced ant damage at the first sampling 10 days after the treatments were applied with the exception of the berm only spray. Nests that were in the middles of some plots in that treatment were unaffected by the spray and continued to forage. By the second sample, that of the harvested nuts 8 days after harvest and nearly three weeks after treatment, the berm sprayed plots still had significantly higher damage than the broadcast treatments. However, damage in the check plot had dropped to the same level as the broadcast treated plots despite the activity being higher. The third sample of nuts was done over 5 weeks after the treatment. That sample was taken to determine if the treatments would last long enough to reduce damage in the Merced pollinator variety. Variability in ant numbers and distribution had increased by then to such an extent that no statistical differences could be seen.

Previous studies have indicated that the amount of active ingredient per acre is more significant than the amount of spray volume. This trial demonstrates that significant reduction in damage can be seen with low spray volume, although a trend of further reduction at higher rates can be seen. However, it is questionable how long control can be maintained with lower volume.

Berm sprays alone do not seem to offer adequate damage reduction, particularly in those orchards with light soil where a high percentage of ant activity is in the middle of the row. Perhaps, in orchards with heavy soil which remains saturated for several days after irrigation, berm sprays may be effective where ants are concentrated on the berms. Growers must survey their orchards to determine where the ants are located before making a decision.

COMPARISON OF ALMOND DAMAGE BY SEVERAL ANT SPECIES

There are several species of ants which reside in most almond orchards. The southern fire ant (*Solenopsis xyloni*) is probably the most damaging species along with the pavement ant (*Tetramorium caespitum*). We wished to determine the extent to which other species of ants commonly occurring in almond orchards cause damage to almond nuts as compared to the southern fire ant.

Four active nests each of the following four species of ants were selected: southern fire ant (*Solenopsis xyloni*), bicolored pyramid ant (*Conomyrma bicolor*), California harvester ant (*Pogonomyrmex californicus*), and a field ant species (*Formica* sp.). The nests were selected to be as isolated from the other species as possible; generally they were about 20 feet from any other active nests. 250 undamaged almond meats were placed on the ground approximately two feet from the active nests. The nuts were then covered with a wire mesh cage to prevent removal of the nuts by birds. The nuts were placed on the ground 29-June. Four days later, 3-July, the nuts were removed, placed in paper bags and placed in a freezer to prevent further ant damage and then examined for the amount of damage present.

A fifth species of ant, the thief ant (*Solenopsis molesta*) was found to be feeding on almonds that were placed near some of the pyramid ant and field ant nests. The thief ant nests were very indistinct and were not detected when the nuts were placed on the plots. No pyramid ants, field ants or harvester ants were observed to be feeding on or active around the nuts when they were picked up. Fire ants were observed to be very active around and heavily feeding on the nuts.

Results are shown in the following table:

SPECIES	Mean % Damage
Southern Fire Ant	29.3a[1/]
Bicolored Pyramid Ant	6.0 b
Formica sp.	5.5 b
California Harvester Ant	11.9 b

[1/]Numbers followed by the same letter are not significantly different (DMRT=0.05).

Southern fire ant causes significantly higher damage to almonds than the other species tested (Fig. 4). The amount of damage found in this trial is likely to be greatly exaggerated as compared to normal harvest conditions because of the methodology used. Therefore the damage caused by the other species should be practically non-existent. Certainly it should be too low to consider a treatment. This is important to consider when monitoring the orchard for potential ant damage. The bicolored pyramid ant superficially looks like the southern fire ant. A hand-lens is required to distinguish the two. Growers must be sure of the species in their orchards before they can accurately evaluate the need for treatment.

Fig. 1

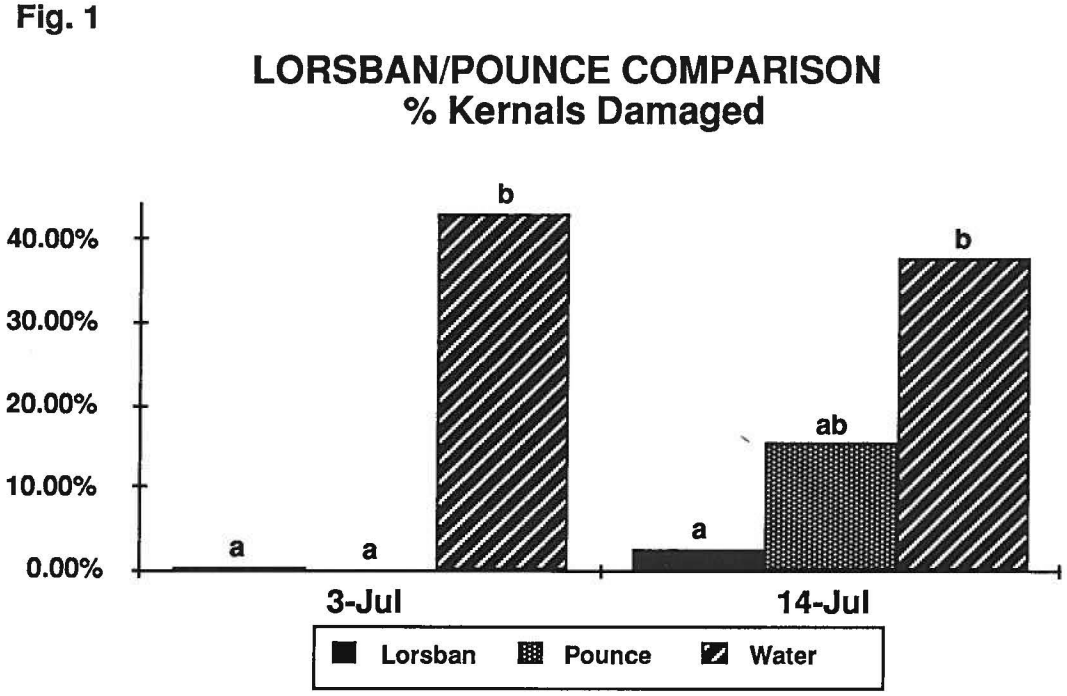
LORSBAN/POUNCE COMPARISON
% Kernals Damaged
40.00%
30.00%
20.00%
10.00%
0.00%
a
a
b
a
ab
b
3-Jul
14-Jul
Lorsban
Pounce
Water

Fig. 2

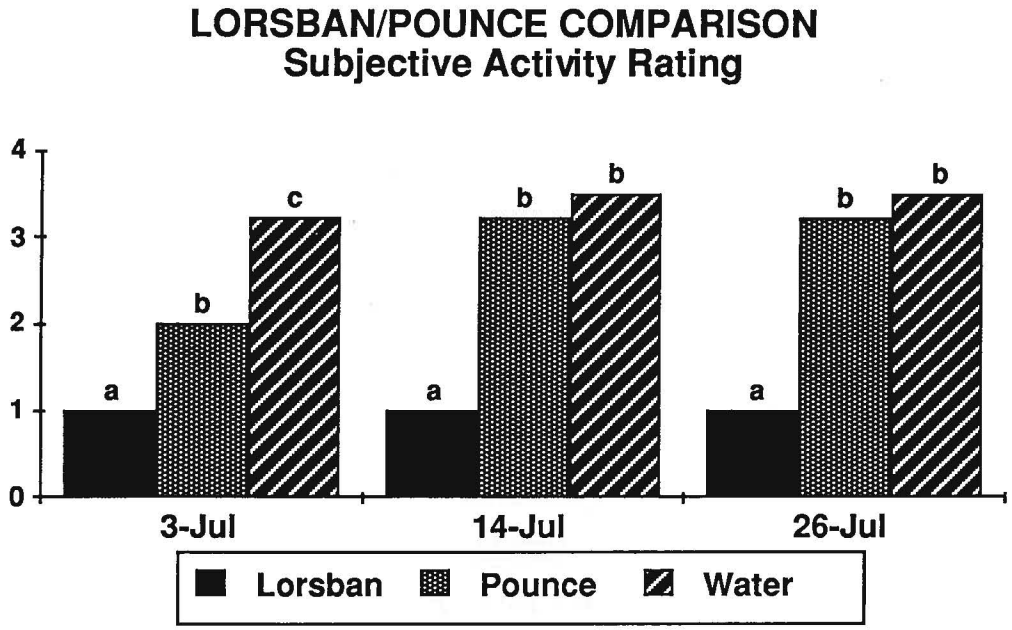
LORSBAN/POUNCE COMPARISON
Subjective Activity Rating
4
3
2
1
0
a
b
c
a
b
b
a
b
b
3-Jul
14-Jul
26-Jul
Lorsban
Pounce
Water

Fig. 3

SPRAY VOLUME COMPARISON

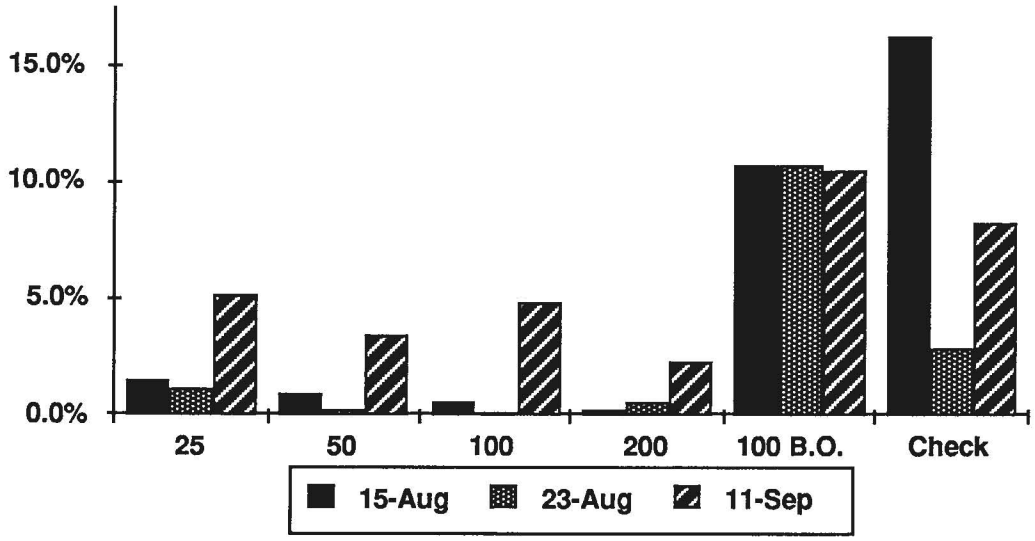

Fig. 4

SPECIES DAMAGE COMPARISON