Project No. 80-D4
(Continuation of Project No. 79-D3)

Cooperator:
University of California
Cooperative Extension Service
Department of Entomology
137 Giannini Hall
Berkeley, California 94720

Project Leader: Dr. C. S. Davis Phone (415) 642-5565

Project Manager: W. O. Reil Phone (916) 752-6694

Personnel: Toynette Johnson, Joe Profita, Beth Teviotdale, W. J. Moller

Project: Navel Orangeworm Research
Part 1 - Integrated Pest Management - Pilot Project
Part 2 - Control of Ceratocystis Canker

Part 1 - Integrated Pest Management - Pilot Project

Objectives: To develop a pilot project which eventually will be used as a basis for integraded pest management demonstration plots situated in all major almond growing areas. Integrated insect management in these plots will have as a primary component n.o.w. control and will also consider management of other insect pests (i.e., peach twig borer and oriental fruit moth) and mites.

Progress: The almond IPM project was started in 1978 to develop and demonstrate guidelines for improved orchard management of pests. The trials were continued in 1979 with six cooperators participating in the various almond growing districts of the state. Each grower provided an 80 to 100 acre orchard where specific chemicals and cultural practices were used during the growing season. Populations of navel orangeworm, peach twig borer, oriental fruit moth, phytophagous and predator mites were monitored. Besides the six major plots conducted statewide, a trial was conducted at Arbuckle on peach twig borer dormant control using various materials. A separate trial was also conducted at McFarland on ground applications of various spray chemicals for ant control, a trial at Chowchilla using various dormant treatments and other summer chemical treatments and at Chico using the chemical Supracide in comparison with the present recommended chemicals.

Plans: Continue working with almond grower cooperators in the major producing areas of the state to develop guidelines for implementation of an integrated pest management program. Test plots will modulate the n.o.w. control tools of sanitation, chemical sprays, and early and rapid harvest. Impact of n.o.w. control programs on other pests will be an important consideration. The purpose of these plots will be (1) devise the best management program or programs for each growing area and (2) demonstrate these programs in an effort to facilitate grower acceptance.

Part 2 - Control of Ceratocystis Canker

Objectives: To make a preliminary study of the causes and treatment of ceratocystis canker in conjunction with the IPM test plots.

Progress: Ceratocystis canker, caused by the fungus Ceratocystis fimbriata, has become a serious concern to an increasing number of almond growers in recent years. The disease weakens, or when severe, may kill limbs or whole trees. The fungus is known to infect bark wounds caused by machinery, most typically those made by harvesting equipment. Important aspects of the epidemiology of the disease, such as insect transmission, relation to soil moisture, and incubation periods are known, however, there is no effective control for ceratocystis canker other than avoiding injuries to the bark and harvesting on dry soil. Recently the disease has been found associated with pruning wounds and poling injuries.

Plans: (1) To develop a method of treating fresh bark injuries to prevent infection; (2) to test selected fungicides and biological agents (certain fungi) for efficacy in protecting wounded tissues; (3) to establish the longevity of cankers and their annual growth cycles as a foundation for pruning recommendations.

Almond Industry Participation	Part 1 - $15,000 Part 2 - 1,000 $16,000

80-D4

Pd

COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA

DAVIS, CALIFORNIA 95616

REPLY TO: Pomology Department

January 6, 1981

Mr. Dale Morrison
Almond Board of California
P. O. Box 15920
Sacramento, CA 95813

Dear Dale:

Enclosed are two copies of the 1980 Almond IPM report. Data from the plots where mummy counts were taken is still being analyzed and will be reported later. A summary combining 1980 data with previous collected data will also be forwarded later.

It is a pleasure to cooperate with the Almond Board of California on projects of mutual concern to the almond industry and to Cooperative Extension. Thank you for your strong support (both financial and advisory).

Sincerely,

Wilbur

Wilbur O. Reil
Staff Research Associate

WOR:jd

Enclosures

cc: Clarence Davis
Frank Zalom

University of California - Cooperative Extension

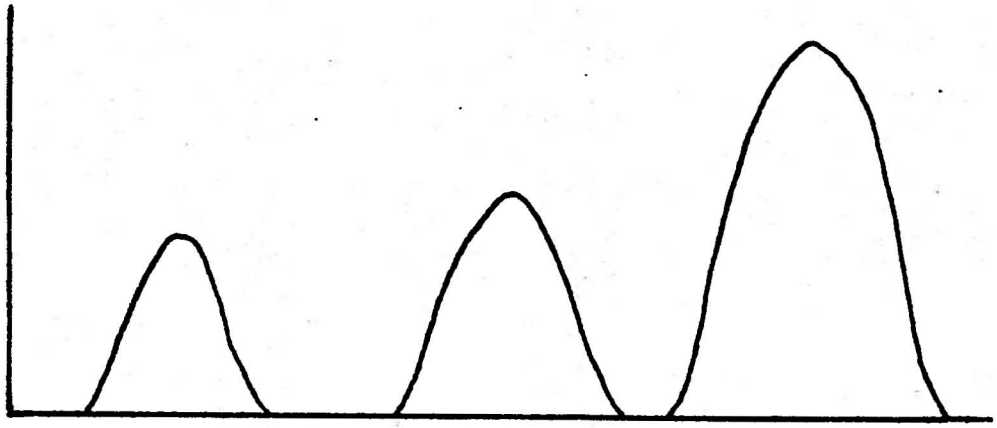
ALMOND INTEGRATED PEST MANAGEMENT PROJECT

Project Leader: Clarence S. Davis
Project Manager: Wilbur O. Reil

This was the third year of the Almond IPM Project funded by the Almond Board of California. The project was established to demonstrate guidelines for improved orchard management of pests where techniques were developed and to establish practices in those areas where no criteria had been accepted. The major emphasis this past year was directed toward three programs: (1) establish a correlation among mummies, NOW damage, and time of harvest; (2) continue to refine the use of egg traps for NOW population studies and improved timing of sprays; and (3) develop monitoring methods, define species, and find control measures for ants causing damage to almonds.

Although data is still being analyzed, it appears that the mummies during the winter need to be reduced below 10 per tree to achieve improved NOW control, assuming that there is very little bird activity following mummy removal. Damage is reduced proportionally to the decrease of mummies below 10 per tree. Excellent season-long control (0 to 3% of total rejects) was achieved on over 3,000 acres monitored where mummies had been cleaned to below two per tree. These sampled orchards had a past history of high damage.

The use of egg traps continue to be an aid toward timing spray applications and studying the seasonal cycle of NOW. As noted in earlier reports, NOW have three periods of egg laying during a growing season as shown in the diagram. The actual dates when activity occurs will vary between orchards



Stage of Nut Development	Fruit Set	Hull split	Harvest
Where Eggs Are Deposited	Mummies	Developing Nut Crop	Mature Crop

and seasons because of climatic and management practices. Removal of the mummies decreases the overwintering brood that lays eggs in April-May and also decreases the population at hull split because both the overwintering and spring brood are dependent on the mummies within the trees for survival. Chemical sprays have been shown to give approximately 50% control per application when timed to egg hatch. If the sprays are applied when the NOW eggs are not hatching, very poor control will occur. Early harvest decreases damage from NOW by removing the crop at the beginning of the third egg deposition period before appreciable damage occurs. Plots demonstrated that NOW damage can increase from 2% in late August to 40% in early October.

Ants continue to be a problem in some orchards, especially in the southern valley. Three species of ants have positively been identified as causing damage. They are the pavement ant, Argentine ant, and the southern fire ant. The latter is by far the most damaging and widespread, having been identified in orchards from Chico to Bakersfield. Presently, no chemical controls are registered, although a hull split spray for NOW seems to provide seasonal control. Guthion, Sevin or Imidan applied in late June or July have reduced damage below 2% and in most cases below 1%. Chemicals do not kill the queen; therefore, the problem will continue each year. Experimental plots using Lorsban and Diazinon granules appear promising in eliminating colonies.

Cooperative projects were conducted with Dr. Marjorie Hoy on predator mite release and establishment and on improving phytophagous mite monitoring and control using reduced rates of miticides. A project with Dr. John Labavitch evaluated the benefits of early harvest as well as refined harvest timing to tree physiology. Cooperative projects on both San Jose scale phermone trap evaluation and on comparison of almond press cake vs. wheat bran bait for NOW egg traps were conducted with Dr. Richard Rice.

Almond Early Harvest

Data collected in Fresno County during the summer of 1979 indicated that a thorough harvest (almost complete nut removal) could be made 2-3 weeks before nuts are dry on the tree. Tests indicated that early-harvested almonds are as large as those harvested later and could be hulled cleanly. An extensive taste panel study which tested roasted kernels indicated that there were no substantial detectable differences between early-harvested and more mature kernels.

During the summer of 1980 early harvest trials were run in four locations (Wasco, Fresno, Livingston, and Dayton). Effects of tree age on nut maturity and ease of harvest were examined by comparing harvests in young and old blocks at the Wasco and Dayton locations.

As for 1979, in Fresno County, nut removal at 100% hull-split was as good as for harvests two weeks later. However, 100% hull-split did not mark the time of the best nut removal in the other locations. In most cases the best nut removal did not occur until nuts were quite dry on the tree. Nevertheless, because insect damage increased steadily during the last few weeks nuts were on the tree (see the IPM report) an early harvest might be economically advantageous even though complete nut removal is not accomplished. In all locations, once 100% hull split was reached nuts on the ground dried within two weeks.

Younger blocks in Wasco and Dayton matured about one week later than older blocks. As a result on a given day the nut removal was less good in the younger block. If this is taken into account it should still be possible to harvest young trees early.

Tests planned for the 1981 season will seek to define culture practices which promote nut removal for early harvest.

John M. Labavitch

Early Harvest Trials

Demonstration trials were conducted on the effects of early harvest in cooperation with Dr. John Labavitch and several farm advisors in the state. The nut removal, maturity and quality evaluation will be reported by Dr. Labavitch. This report will discuss the results of Navel Orangeworm egg trap counts and infestation levels in the Wasco and Dayton trials. NOW was not a problem in the Livingston orchard, where there was also an early harvest trial.

The Wasco, Young Orchard consisted of a block of 6-year-old (7th leaf) almond trees planted on berms and irrigated by flooding the middles between the berm. The trees were vigorous and set a moderately heavy nut crop estimated to be about 1500 meat lbs/A. The orchard planting was two rows Nonpareils, then a pollenizer row of either Merced or Mission varieties. Also, the Nonpareil rows were interplanted with 3-year-old Thompson interplants. Nonpareil and Merced trees had less than 5 mummies per tree in June, 1980, but the Thompsons had not been harvested in 1979 and had over 50 mummies per tree. The population of NOW in mummies was low, being less than 10% of nuts infested in June. Normal harvest in past years had been in early September.

A total of 50 pairs of Nonpareil trees (north and south adjacent rows) were randomized into 10 replicates of 5 harvest dates. Harvest began on August 12 and was conducted at weekly intervals until Sept. 9. A shock wave shaker was used on the trunk to remove the crop. Two-five second shakes were maintained per tree during the entire trial.

A 100 nut sample was taken from each replicate on the date shook and on each suceeding week. Nuts remained on the ground after shaking for the duration of the experiment. The sampled nuts were then hand-cracked and examined and % infestation caused by Navel Orangeworm determined. The percent NOW damage is listed in Table 1.

Damage increased in the nuts on the ground at the same rate as nuts on the tree after the first week following shaking. After this 1 week period, very little increased damage occurred from NOW, showing that few if any eggs were being laid on nuts on the ground.

A NOW flight and egg deposition occurred during the entire sampling period because of the high pressure from the overwintering mummy population; but, had the crop been harvested on Aug. 12 and allowed to dry for 2 weeks, only 16% damage would have occurred instead of a 52% level on Sept. 9 (less than 1 month later). Graph 1 shows the NOW egg deposition in the Wasco young block. Egg deposition peaked on Aug. 18. There was a sharp increase in damage in 2 weeks following this flight. If the nuts had been harvested on Aug. 19, the crop would have had about 23.8% damage after 1 week's drying on the ground, whereas, it sustained 51.9% damage when harvested on Sept. 9. There was a 3.6% increase in nut removal during that same period. Using the figure of 50% of all damaged nuts removed in the harvest-hulling operation (1979 IPM report on evaluating grade differences), the grower would have had a net return

of $356 per acre by harvesting on Aug. 19 instead of 3 weeks later.

TABLE 1A

Harvest Date	% NOW Damage Sample	% NOW Damage Expected Loss in Delivered Crop	Estimated Crop 1500 lbs % Removed	Estimated Crop 1500 lbs lbs Delivered	Return/A@1.50 Base Price
Aug. 19	23.8	12	91.4	1371	1656
Sept. 2	51.9	26	96.0	1440	1300

The Wasco, Old Orchard consisted of a block of 14-year-old trees planted on berms with flood irrigation. The trees set a light crop, estimated to be approximately 800 lbs. meats per acre. The orchard planting contained two rows of Nonpareil with a single row of either Merced or Mission as pollenators. Over 35 mummies per tree were present on the trees in June with an average of 1 NOW per nut.

The trial was designed and conducted the same as the young orchard trial. An additional trial was also conducted on the Merced variety with 10-single tree replicates of 5 harvest dates starting on Sept. 9. Samples were taken from the Merceds and handled the same as the Nonpareils.

The Nonpareil NOW damage was already 36.8% in the first sample taken on Aug. 12. Samples harvested on Sept. 9 were 68.7%. Now damage increased in all samples for 1 week following shaking then remained at approximately the same percent damage level for the remainder of the trial (Table 2).

The Merced almonds showed 20.9% NOW damage on Sept. 9, the first sampling date (Table3). Damage increased each week up to 40.9% damage which occurred on Oct. 7. The percent nut removal was 98.8, 98.7,99.2, and 99.6%, respectively, on the first four sample dates. These percentages are all acceptable. On Oct. 7 the percentage dropped to 92.9 showing that the nuts were much harder to knock and would continue to be hard to knock had the trial continued. Merced variety almonds appear to knock easier when the nuts are not completely dry, but still have green hulls.

The egg trap counts (Graph 2) show the third flight started about Aug. 12 and NOW activity continued until after Sept. 11. The increased damage from Aug. 12 to Sept. 12 coincides directly to the increased egg laying activity and egg hatch.

The Dayton orchards consisted of a young (6-year-old) block of single row Nonpareils alternating with pollinizers of Peerless, Mission and Ne Plus Ultra and an old (11-year-old) block of single row Nonpareils alternating with Peerless and Mission. The trials were 7 replicates of 5 harvest dates as randomized pairs of trees down a single Nonpareil row. Both orchards set a light crop estimated at 600 meat pounds in the young orchard and 400 meat pounds in the old orchard. Single 100 nut samples were collected each week from each pair of trees that was harvested. Each week an additional treatment was harvested with a shock wave shaker using 2-7 second shakes per tree.

As shown in Table 4 and 5, both orchards showed considerable PTB damage occurring at hull split. Ant damage also occurred in the nuts on the ground during the trial. The Pavement ant was present in the orchard and caused damage as high as 2.7% the first week following shaking. After the nuts were completely dry, it appears that this species of ant might cease working the nuts. If this is true, damage from the Pavement ant might only be expected for 1 to 2 weeks following shaking. A slight amount of damage was caused by Oriental Fruit Moth (OFM). Some OFM larvae were actually found in the nuts. A percentage of the damage listed under PTB might have been caused by OFM. The feeding pattern appears somewhat similar although OFM makes a slightly deeper feeding channel and feeds more down the side of the kernal instead of on the suture and tip.

Table 6 shows that in the young block, the total of all insect damage increased from 7% to 15% from Aug. 14 to Sept. 11. This increase was mainly due to NOW damage. Although the egg deposition (Graph 4) was low, some activity in the week of Aug. 21-28 caused a corresponding increase in damage in late Aug. and Sept. Total insect damage increased in the nuts on the ground faster than the nuts left on the trees indicating the effect of ants feeding on the nuts after shaking.

The Dayton, old block showed that the first 3 sample dates had no increase of NOW damage in the nuts that were shaken on the same date harvested. There was very little egg deposition on traps before Aug. 21. The flight increased after this date and a corresponding increase in damage was noted in the Sept. 4 sample. The nuts remaining on the ground following shaking showed an increase of approximately 10% NOW damage and 12 to 23% total insect damage after one week on the ground. The data does not correspond to any insect trends. The only logical explanation after discussing the data with Terrell Salmon, Ext. Vertebrate Specialist, is that ground squirrels might be causing the increase. The old orchard is heavily infested with ground squirrels. Squirrels have been noted as having preferential selection of food. Perhaps, the ground squirrels are able to detect the presence of NOW or PTB damage in the nuts and only select sound nuts. The removal of these sound nuts leaves a higher percentage of damaged nuts in the orchard.

Conclusions

1. In orchards where potential damage from NOW is probable earlier harvested nuts will show less damage.

2. NOW egg traps indicate a major flight occurred in 1980 in late August and September. A corresponding increase in nut damage occurred after August 20 in Wasco and after August 28 in Dayton.

3. In one trial harvest on August 19 returned $356 per acre more to the grower than harvest on September 2.

4. Early harvest will not decrease damage from PTB.

5. Ant damage caused by the Pavement ant occurred in two trials. Damage was most severe in nuts on the ground following shaking of the earliest harvest dates.

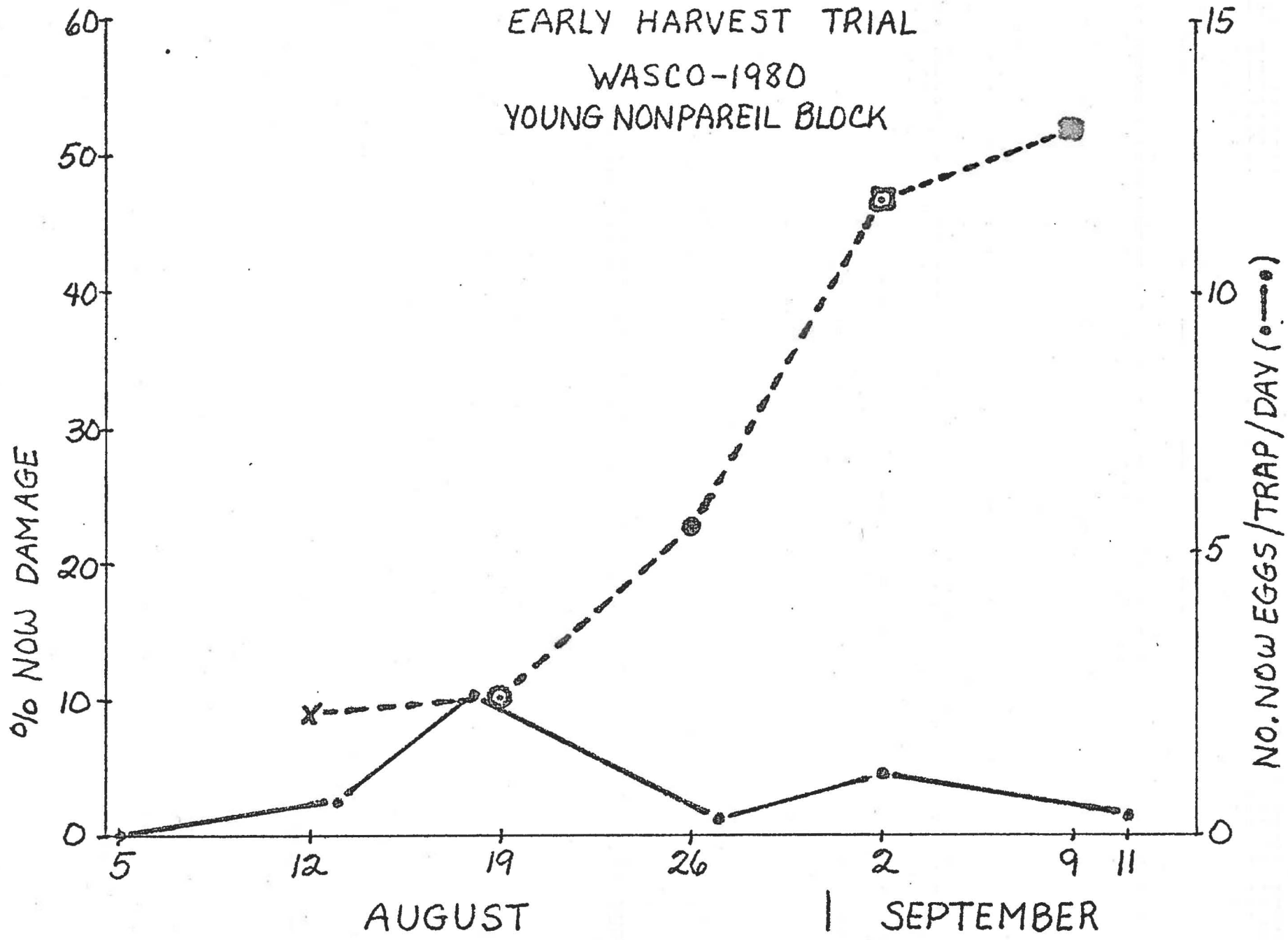
GRAPH 1

NOW DAMAGE AT DIFFERENT HARVEST DATES VS. EGG TRAP COUNTS

EARLY HARVEST TRIAL

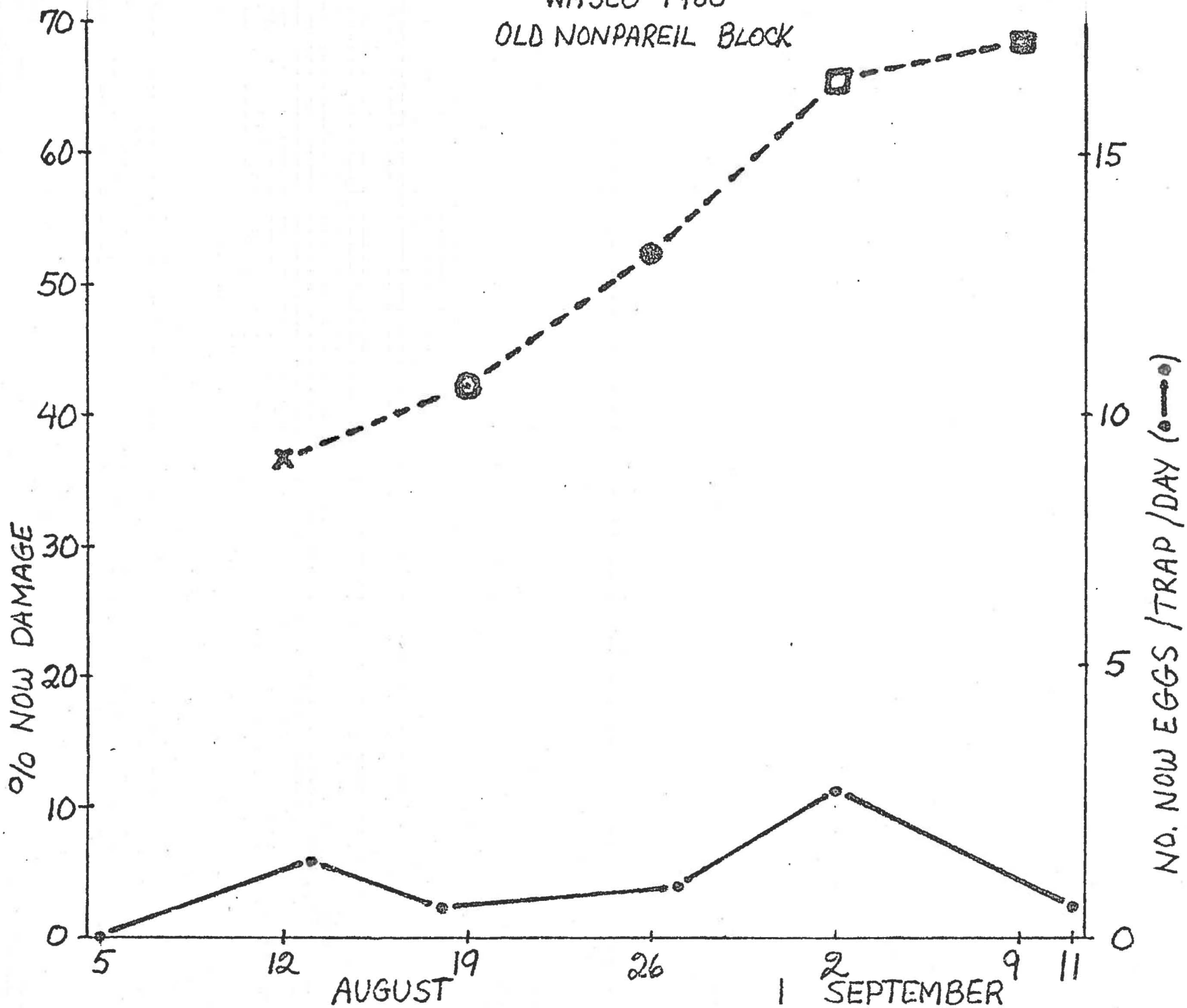
WASCO-1980

YOUNG NONPAREIL BLOCK



GRAPH 2

EARLY HARVEST TRIAL
WASCO - 1980
OLD NONPAREIL BLOCK



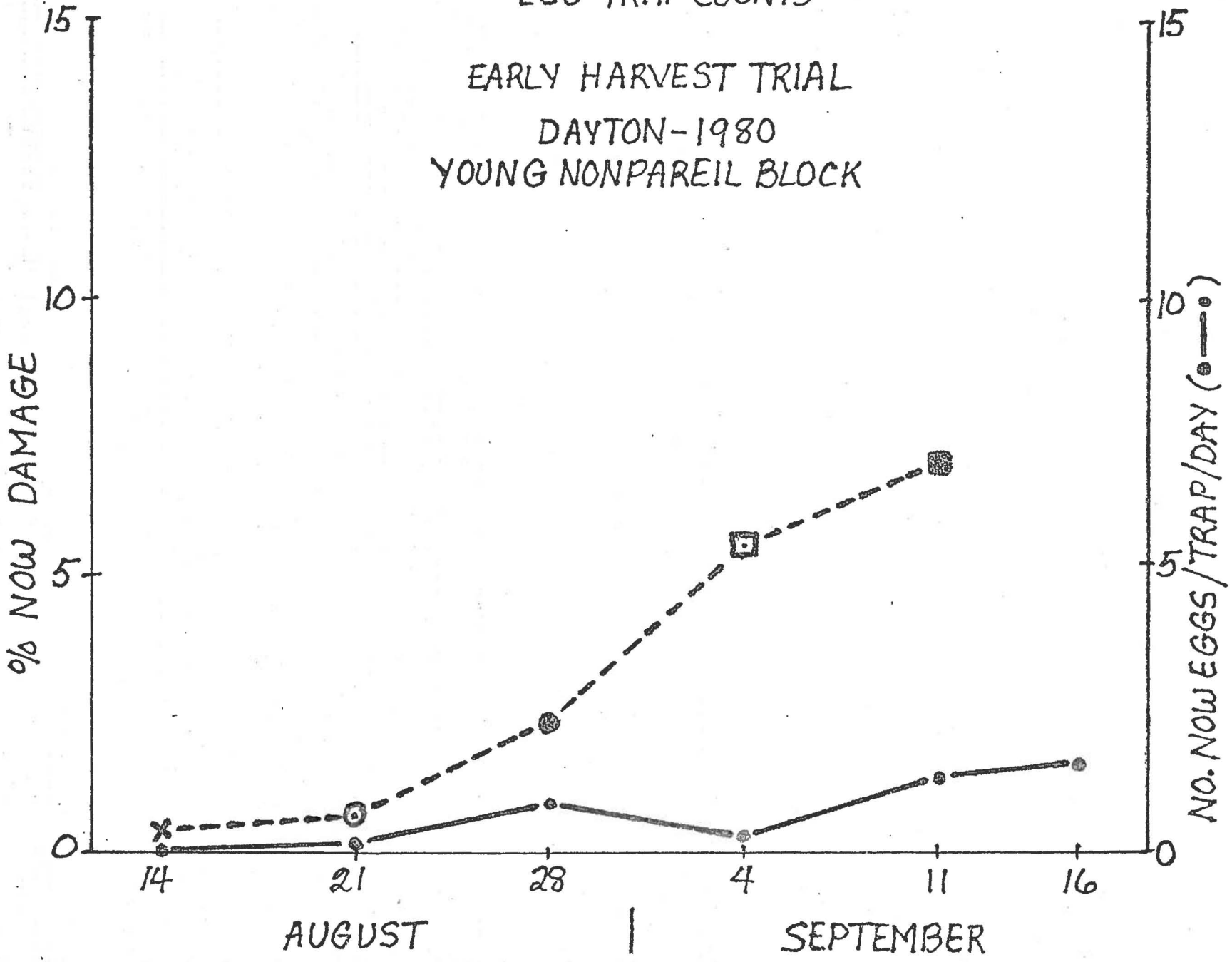
GRAPH 3

NOW DAMAGE AT DIFFERENT HARVEST DATES VS. EGG TRAP COUNTS

EARLY HARVEST TRIAL

DAYTON-1980

YOUNG NONPAREIL BLOCK



GRAPH 4

EARLY HARVEST TRIAL
DAYTON - 1980
OLD NONPAREIL BLOCK

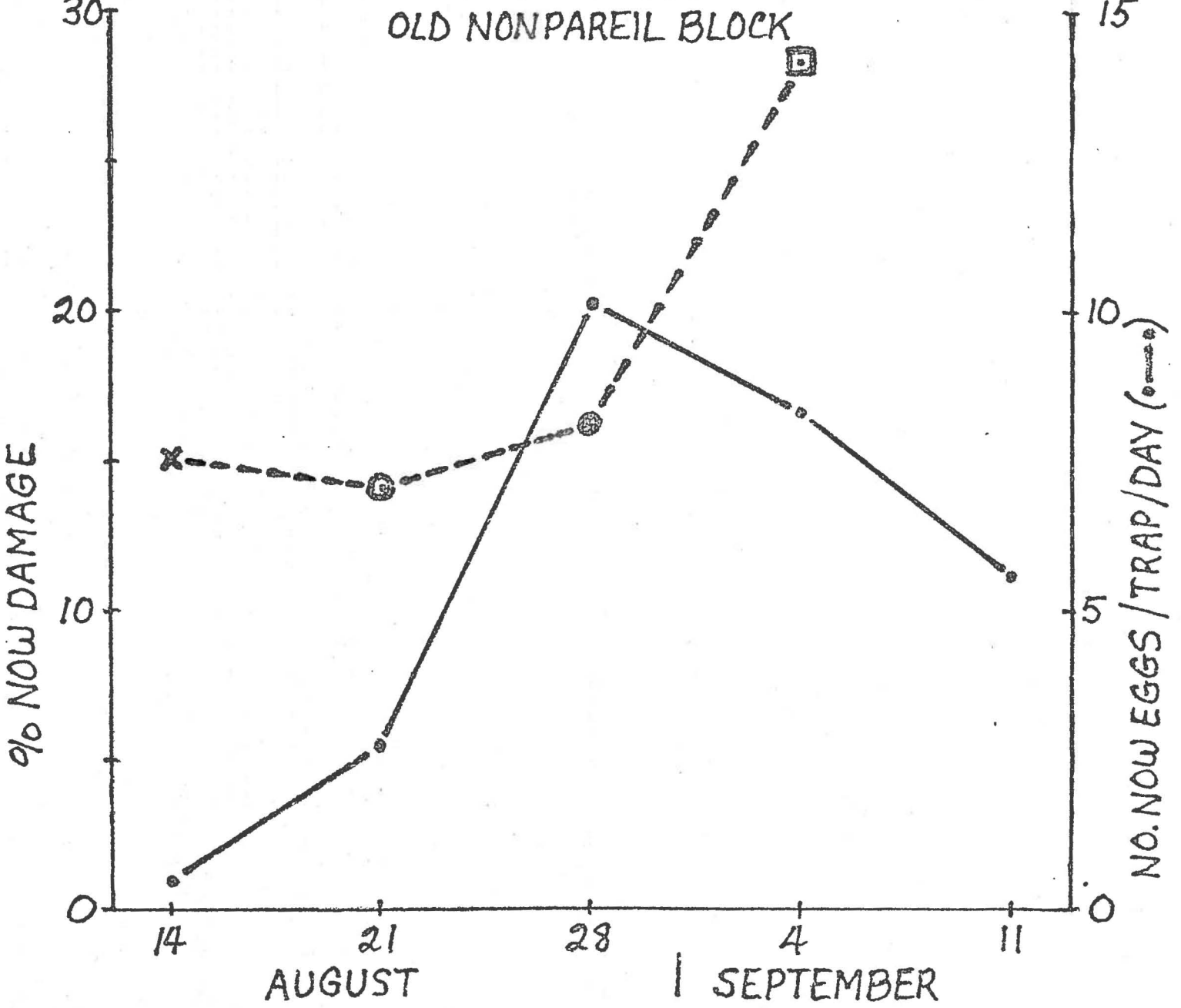


TABLE 1

WASCO - Young Block - 7th LEAF
Approximately 1500 lbs. Meats per Acre
% Navel Orangeworm Damage in Nonpareil Almonds Found in Nuts on Dates Shown

Color	Harvest Date	Date Sample Taken from Ground (% damage) 8/12	8/19	8/26	9/2	9/9
white	8/12	9.3	16.1	15.8	18.3	16.3
blue	8/19		10.2	23.8	29.4	24.1
yellow	8/26			22.9	34.2	42.0
red	9/2				47.1	44.5
fl pink	9/9					51.9

TREE COUNTS AND DATE OF HARVEST

Color	Date of Harvest	% Nut Removal
white	8/12	85.8
blue	8/19	91.4
yellow	8/26	92.0
red	9/2	94.2
fl pink	9/9	96.0

TABLE 2

WASCO - NONPAREIL VARIETY - 14-YEAR-OLD BLOCK - 1980
Approximately 800 lbs. Meats per Acre
% Navel Orangeworm Damage

Color	Harvest Date	Date Samples Taken from Ground (% damage) 8/12	8/19	8/26	9/2	9/9
white	8/12	36.8	49.4	49.4	54.3	51.0
blue	8/19		42.2	58.8	56.9	58.8
yellow	8/26			52.2	64.4	64.0
red	9/2				65.5	65.4
fl pink	9/9					68.7

TREE COUNTS AND DATE OF HARVEST

Color	Date of Harvest	% Nut Removal
white	8/12	89.1
blue	8/19	92.5
yellow	8/26	93.8
red	9/2	95.8
fl pink	9/9	94.4

TABLE 3

WASCO - MERCED VARIETY - 14-YEAR-OLD BLOCK - 1980
% Navel Orangeworm Damage

Color	Harvest Date	Date Sample Taken from Ground (% damage) 9/9	9/16	9/23	9/30	10/7
pink	9/9	20.9	23.9	24.9	24.7	25.2
blue	9/16		28.6	35.8	35.8	37.2
white	9/23			33.7	36.7	33.9
yellow	9/30				37.0	33.1
red	10/7					40.9

Ribbon Color	Date Shook	% Nut Removal	Nuts Remaining on Trees
pink	9/9	98.8	55.3
blue	9/16	98.7	58.5
white	9/23	99.2	34.8
yellow	9/30	99.6	17.7
red	10/7	92.9	328.0

TABLE 4

EARLY ALMOND HARVEST - 1980

Dayton - Nonpareil Variety

Young Orchard - 6 year old

DATE	CODE	NOW	PTB	ANT	OTHER
8-14-80	B	0.4	6.6	0	
8-21-80	B	1.1	4.1	2.7	
	R	0.7	4.6	0	0.1 (OFM)
8-28-80	B	0.6	5.7	2.3	
	R	3.0	9.7	0.4	
	O	2.3	7.4	0.1	
9-4-80	B	2.1	4.0	5.0	
	R	2.0	8.1	2.0	
	O	1.1	9.1	2.7	
	W	5.6	10.0	0.1	
9-11-80	B	1.0	5.3	3.1	
	R	6.6	5.9	4.6	
	O	4.0	8.6	2.6	
	W	5.1	12.3	3.7	
	Y	7.1	7.6	0.3	
9-16-80	B	5.0	4.4	4.7	
	R	5.3	4.1	5.7	0.3 (OFM)
	O	4.3	3.7	3.9	0.3 (OFM)
	W	5.9	6.3	0.7	0.4 (OFM)
	Y	11.3	5.3	0.3	0.1 (OFM)

TABLE 5

EARLY ALMOND HARVEST - 1980

Dayton - Nonpareil Variety

Old Orchard - 11 year old

DATE	CODE	NOW	PTB	ANT	OTHER
8-14-80	B	15.1	17.4	0	
8-21-80	B	24.1	17.6	1.9	
	R	14.1	12.6	0.3	0.1 (Earwig)
8-28-80	B	27.7	18.4	3.6	
	R	26.0	19.2	2.6	
	O	16.3	14.7	0	
9-4-80	B	22.5	22.8	5.0	
	R	24.3	20.6	1.7	
	O	27.7	14.9	1.0	
	W	28.3	10.7	0	

TABLE 6

Dayton - Nonpareil Variety - 6 year old Block
Approximately 600 lbs Meats per Acre

% Navel Orangeworm Damage

Color	Harvest Date	% Nut Removal	Date Samples Taken From Ground					
			8/14	8/21	8/28	9/4	9/11	9/16
Blue	8/14	79.5	0.4	1.1	0.6	2.1	1.0	5.0
Red	8/21	86.8		0.7	3.0	2.0	6.6	5.3
Orange	8/28	94.0			2.3	1.1	4.0	4.3
White	9/4	94.3				5.6	5.1	5.9
Yellow	9/11						7.1	11.3

Total of All Insect Damage

Color	Harvest Date	% Insect Damage					
		8/14	8/21	8/28	9/4	9/11	9/16
Blue	8/14	7.0	5.9	8.6	11.1	9.4	14.1
Red	8/21		5.4	13.1	12.1	17.1	15.4
Orange	8/28			9.8	12.9	15.2	12.2
White	9/4				15.7	21.1	13.3
Yellow	9/11					15.0	17.0

TABLE 7

Dayton - Nonpareil Variety - 11 year old Block
Approximately 400 lbs Meats per Acre

% Navel Orangeworm Damage

Color	Harvest Date	% Nut Removal	8/14	8/21	8/28	9/4
Blue	8/14	92.4	15.1	24.1	27.7	22.5
Red	8/21	96.4		14.1	26.0	24.3
Orange	8/28	98.1			16.3	27.7
White	9/4	97.5				28.3

Total of All Insect Damage

Color	Harvest Date	% Insect Damage 8/14	8/21	8/28	9/4
Blue	8/14	32.5	43.6	49.7	50.3
Red	8/21		27.1	47.8	46.6
Orange	8/28			31.0	43.6
White	9/4				39.0

Chico Almond IPM Plot

The 1980 Chico Almond IPM plot was quite different from plots of the last 2 years. General monitoring of insect pests, a comparison between almond press cake and wheat bran bait, and some chemical spray trials were conducted in a 100 acre orchard. The entire orchard was sprayed in the spring on May 8 with Guthion. On top of this spring treatment there were 6 different plots which consisted of 4-8 acre plots (summer sprays of Guthion on July 24, Guthion + Imidan on July 24 and 31, respectively, Imidan and Sevin on July 17 and 24, respectively, 1-2/3 acre check (no summer spray), and the grower treatment, the remaining acreage (summer sprays of Guthion on July 17 and alternate rows (one-half) applications of Sevin on July 28, August 12, September 3 and 10).

Monitoring Insects

Monitoring of San Jose Scale (SJS) began on March 4, 1980 while Oriental Fruit Moth (OFM), Navel Orangeworm (NOW) (wheat bran bait only), and Peach Twig Borer (PTB) monitoring began March 17, 1980.

NOW. A cooperative project with Dr. Richard Rice was conducted to compare almond press cake (residue from infested almonds after the oil has been removed) and the standard wheat bran bait (bran, water and glycerine). Bait traps (one of each treatment) were placed 3 trees apart with a total of 10 replicates. Each replicate was 3 rows apart and placed approximately 10 trees from each other. The wheat bran bait was changed twice weekly while the press cake bait was changed once a week. The press cake bait traps were placed in the orchard on May 2, 1980, a month later than the bran bait traps. There was an obvious difference in the amount of eggs per day deposited on the traps. Overall, the press cake had higher numbers of eggs deposited on the traps compared to the bran bait. (See Graph 1)

Again, as in 1978 and 1979, there were 3 definite peaks. The overwintering generation egg deposition extended from April 28 until June 25, a period of 8 weeks, and had a peak average of 15.6 eggs per day on May 19. Egg deposition of the first generation extending over a 5-week period, began on June 30, peaked on July 7 with 15.7 eggs per day and ended on August 7. NOW egg deposition of the third peak or second generation began on August 10, peaked on August 28 with 11.3 eggs per day and concluded on September 18.

PTB. There was a peak each month beginning in April as taken from the 6 trap sites for Peach Twig Borer. The first flight from April 18 to May 8 peaked on April 28; the second flight from May 19 to June 5 peaked on May 22; the third flight from June 9 to July 10 peaked on June 19; the fourth flight from July 14 to August 4 peaked on July 17; and the fifth flight from August 14 to October 10 peaked on August 28. Peak averages were 19.2, 20.7, 22.7, 7.0, and 8.7 per day for flights one through five, respectively.

OFM. One pheromone trap was placed in the orchard beginning on March 20, too late to monitor the start of the overwintering flight of OFM. In spite of this, there was a peak of 222.5 male moths per day on March 28 with the flight ending on May 5. The second flight or first generation extended from May 15 to June 26 with a peak of 16.7 moths per day on May 22. The flight of the second generation occurred on June 30 to July 21 and peaked on July 10 with 81.7 moths per day. The final flight or third generation of OFM began on August 4 and concluded on October 10 with a peak of 14.6 moths per day on September 4.

SJS. Four San Jose scale pheromone traps were monitored for a project in cooperation with Dr. Richard Rice to evaluate SJS pheromone traps. The first male scales (178 total of 4 traps) were caught on April 1 which began the first flight that ended on May 12. Although for the rest of the season the traps had very low numbers of male scale caught, populations and generations seemed to develop similar to those found in the San Joaquin Valley. There were catches on June 16 and June 30, a flight on July 14 to August 14, and a catch on October 3.

Monitoring Mites and Predators

Visual inspection of trees and leaves in the orchard were made weekly. With each application of spring and summer sprays (check excluded), Plictran® was also applied. Leaf samples were taken on August 1 and August 14. Except for the check there were no populations of mites. In the check low populations of 1.1 Pacific/Twospotted mites (all stages) per leaf were present on August 14; whereas, no predator mites were present. By August 21 the mites had "exploded" in the check area and the trees were beginning to defoliate. A miticide was applied and the mites were controlled.

Preharvest and Harvest Results

Four-100 nut samples of Nonpareils were taken from each treatment on August 8, September 4 and 11. The harvest samples of Nonpareils, consisting of 10-100 nut samples from each treatment, were taken on September 18 while samples (consisting of 4-100 nuts) of the pollenizers, Ne Plus and Thompson, were taken on October 3. The results are presented in Graph 5 and Table 1. The check, Sevin and Imidan treatments had more damage throughout the sampling periods than did the Guthion, Guthion/Imidan and grower treatments. Nevertheless, if harvest of each treatment had occurred 7 days earlier, there would have been considerably less NOW damage at harvest.

Conclusions

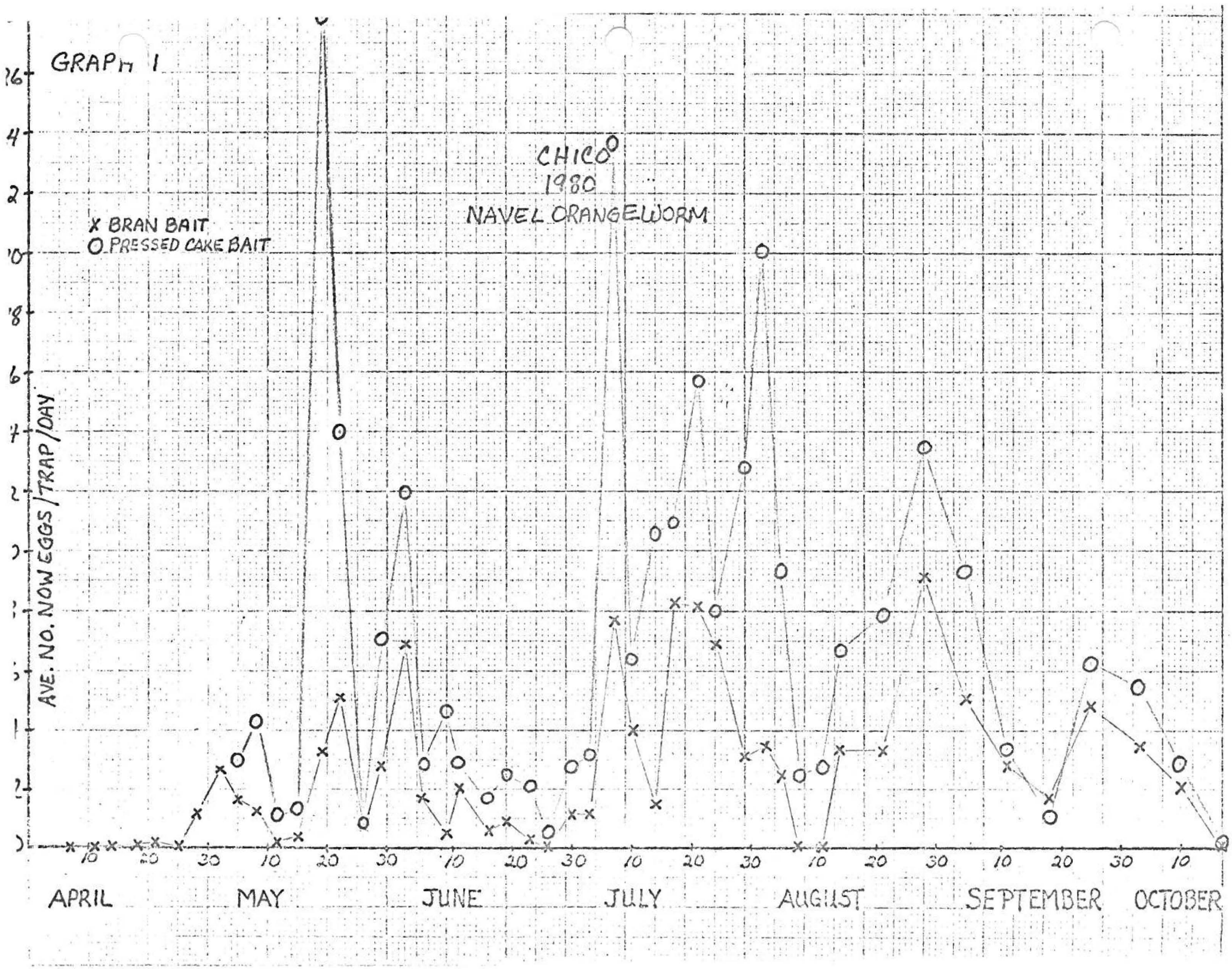
1. Again, as in 1978 and 1979 3 definite egg-laying broods of NOW were found. Thus, through monitoring the populations throughout the season, % NOW damage can be reduced with properly timed chemical treatments and/or early harvest.

2. The almond press cake bait was found to be more sensitive in attracting NOW females to lay more eggs on traps than the standard wheat bran bait.

3. SJS pheromone trap catches indicate flights of male scale occurring at approximately the same time as in the San Joaquin Valley and can be useful in determining the presence of a scale population.

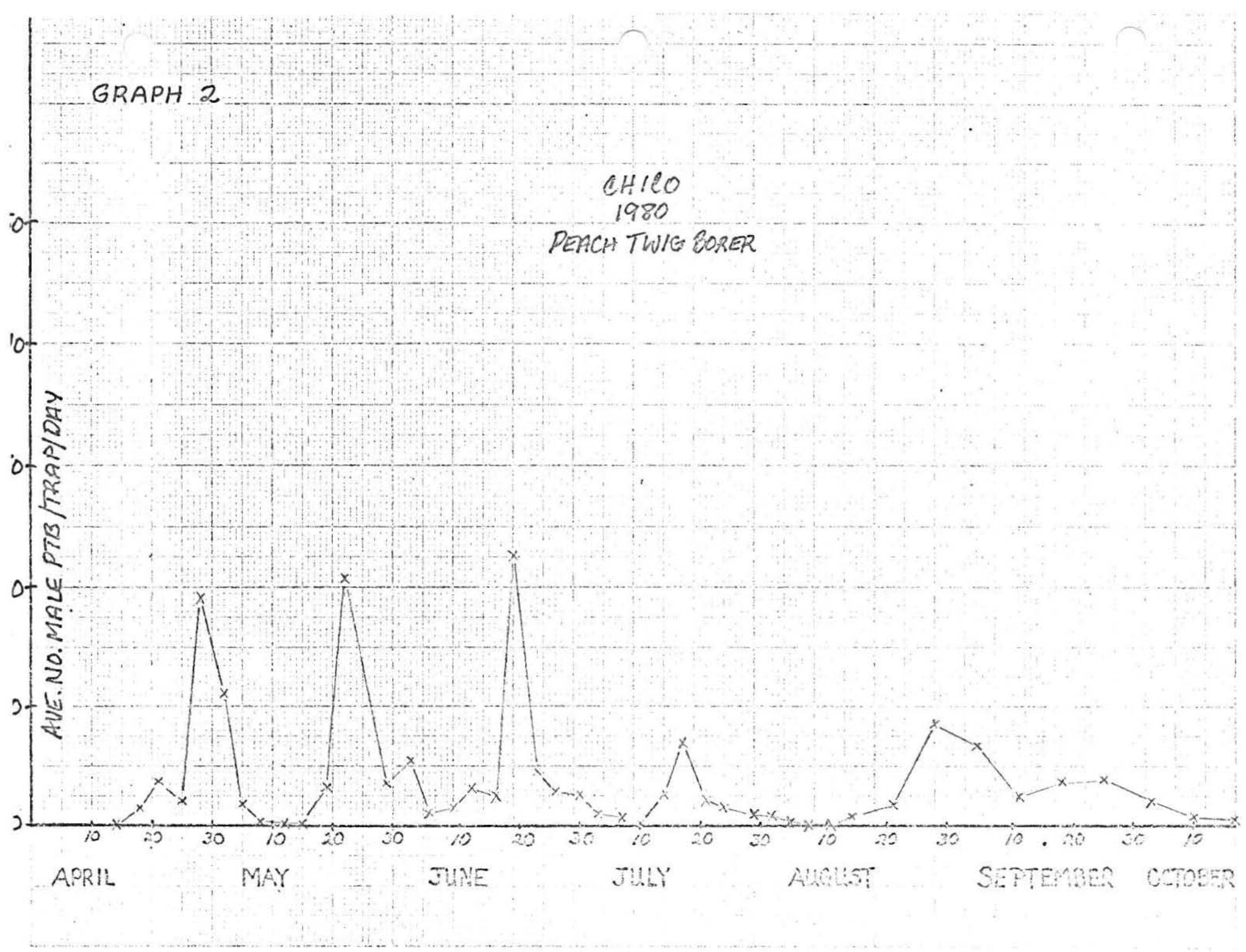
4. In this trial the Guthion treatment at hull split was superior to either Sevin or Imidan.

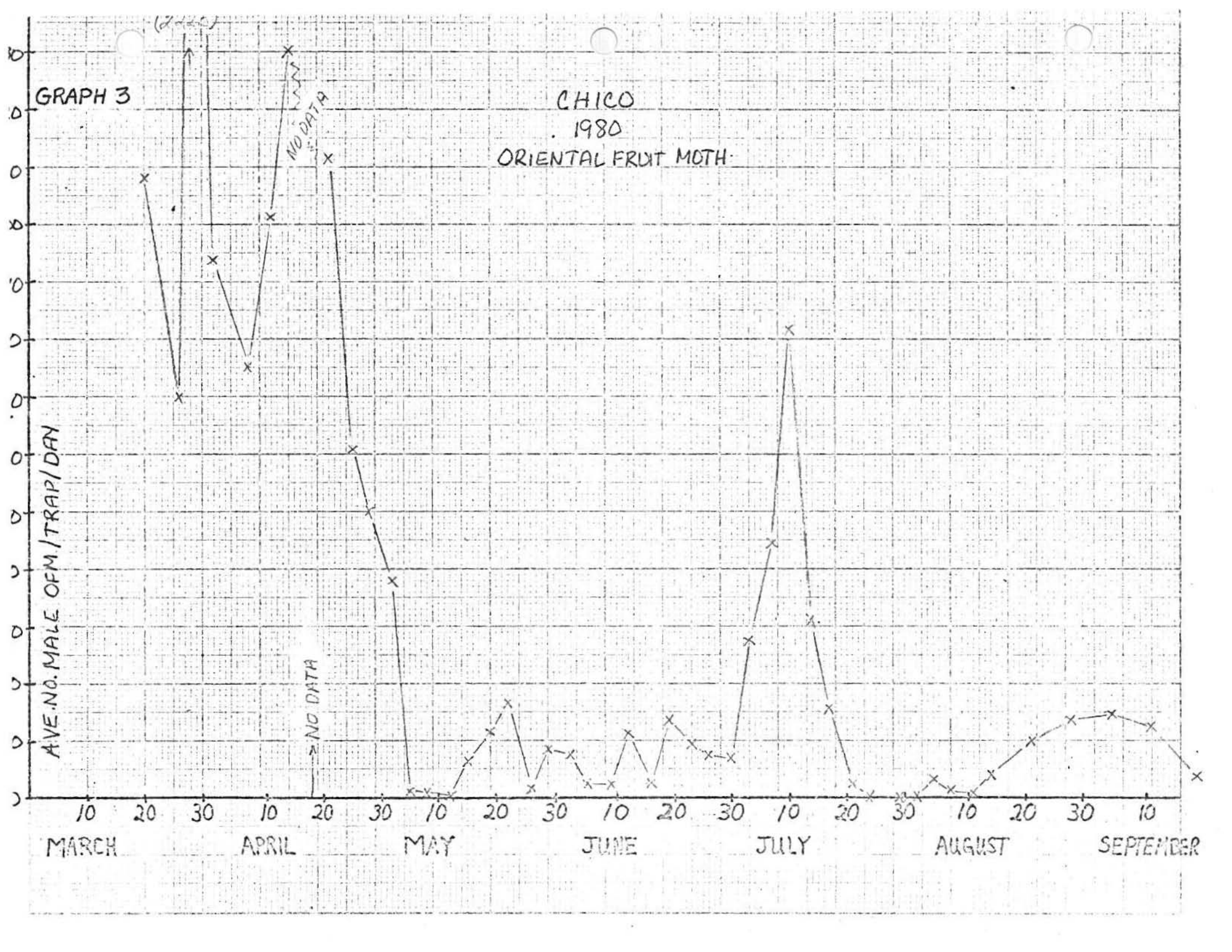
5. Early harvest of the crop can reduce the amount of NOW damage.


GRAPH 1
CHICO
1980
NAVEL ORANGEWORM
X BRAN BAIT
O PRESSED CAKE BAIT
AVE. NO. NOW EGGS / TRAP / DAY
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

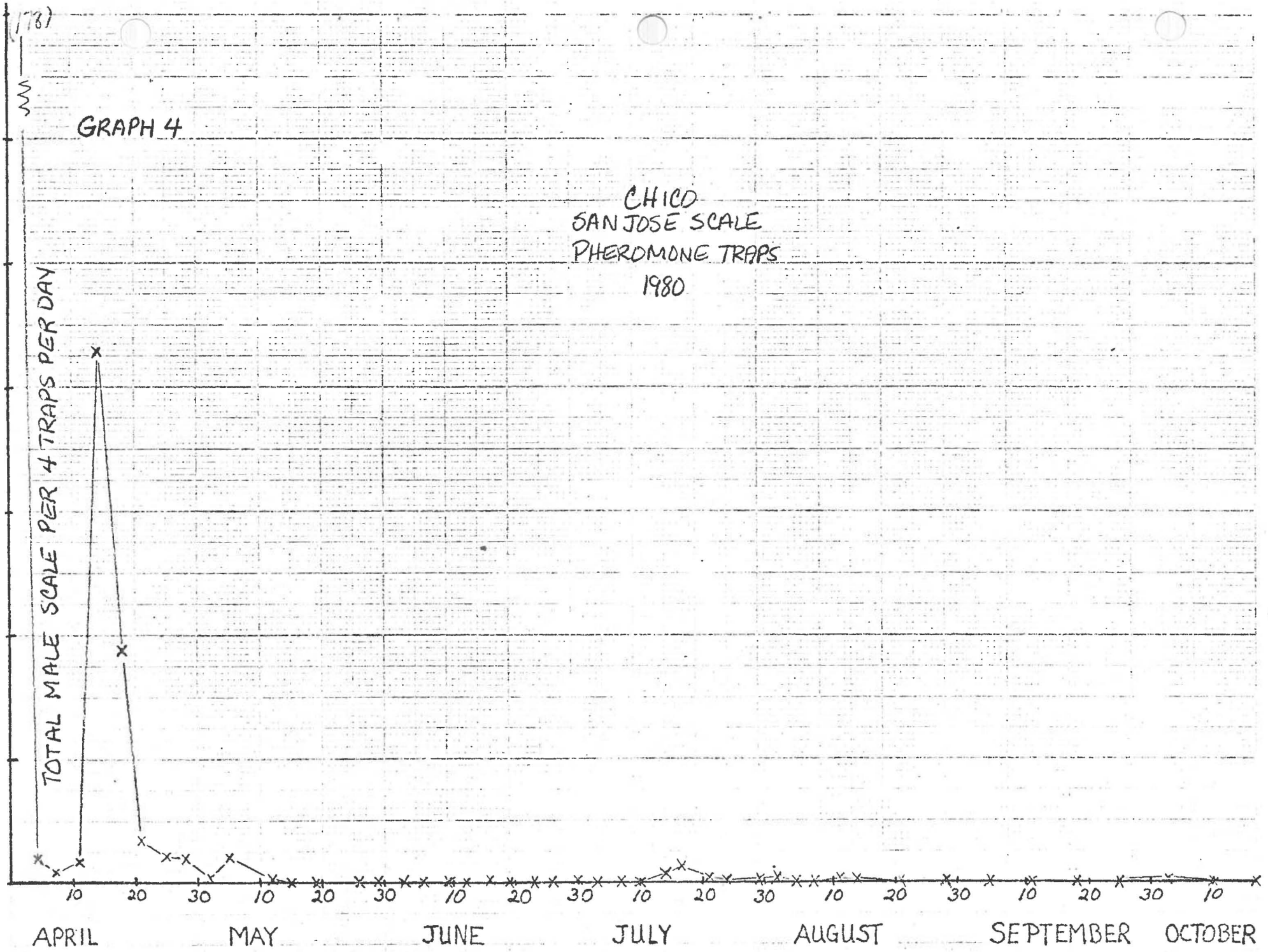
GRAPH 2

CHILO
1980
PEACH TWIG BORER




GRAPH 3
CHICO
1980
ORIENTAL FRUIT MOTH
NO DATA
NO DATA
AVE. NO. MALE OFM. / TRAP / DAY
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER

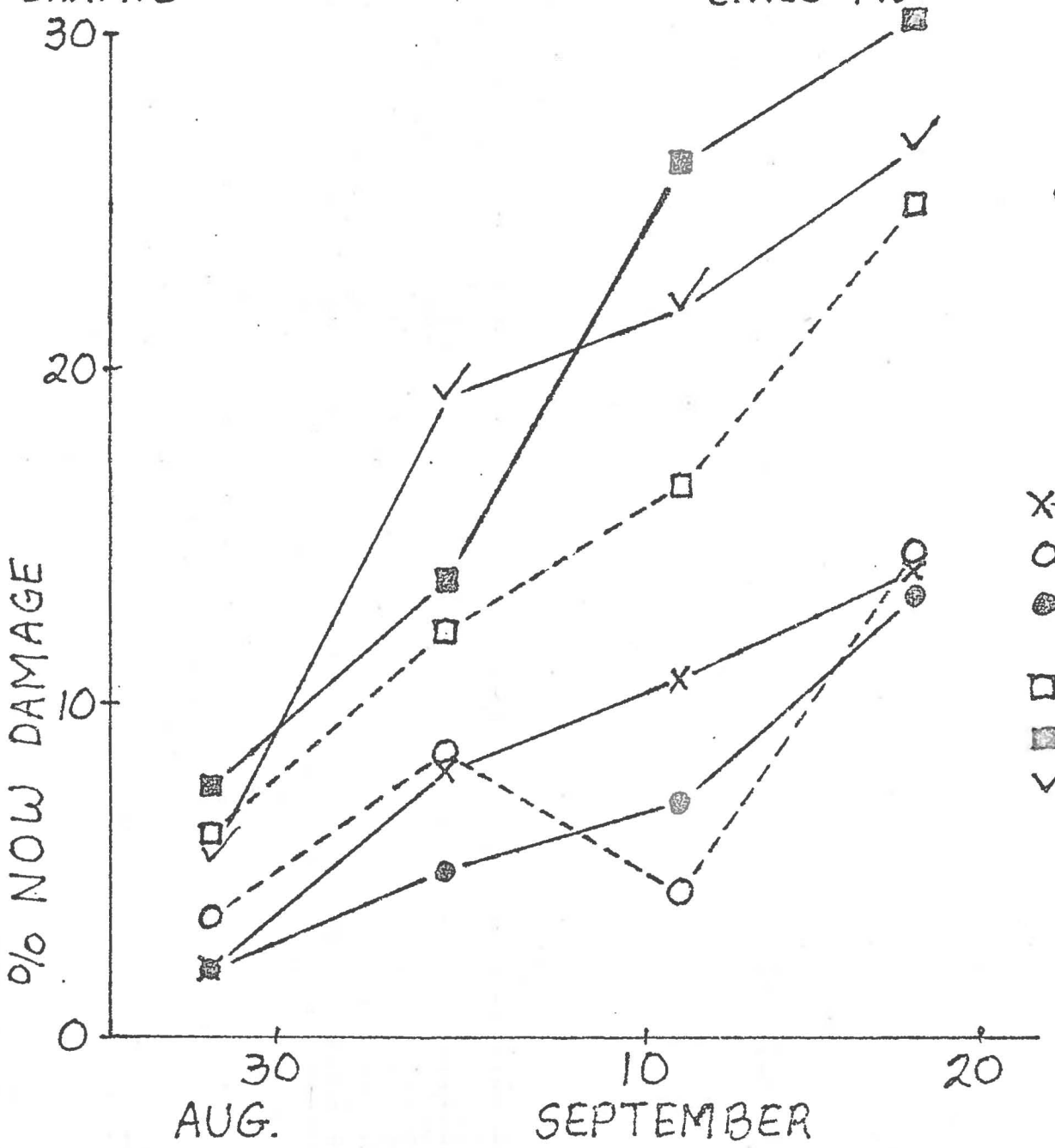
GRAPH 4


CHICO
SAN JOSE SCALE
PHEROMONE TRAPS
1980
TOTAL MALE SCALE PER 4 TRAPS PER DAY
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
20
30
10
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

NONPAREIL NUTS INFESTED WITH NAVEL ORANGEWORM

GRAPH 5

CHICO-1980



CHEMICALS USED:

GUTHION = G

IMIDAN = I

SEVIN = S

SPRAY DATES	MAY	JULY	AUG.	SEPT.
X—X	G	G		
O---O	G	G	I	
●—●	G	G	S	S
		(GROWER)		
□---□	G	I		
■—■	G	S		
✓—✓	G			

TABLE 1
Chico - 1980
% Navel Orangeworm Damage

Treatment	Nonpareil Preharvest Aug. 28	Sept. 4	Sept. 11	Nonpareil Harvest Sept. 18	Thompson Harvest Oct. 3	Ne Plus Harvest Oct. 3
Guthion	2.0	8.0	10.8	14.0	2.3	9.5
Guthion/Imidan	3.5	8.5	4.3	14.7	5.8	6.8
Guthion/Sevin/Sevin	2.0	5.0	7.0	13.3	2.3	7.8
Imidan	6.0	12.3	16.5	25.0	15.8	15.5
Sevin	7.5	13.8	26.3	30.5	12.5	15.3
Check	5.3	19.1	21.8	26.6	16.8	24.0
Avg.	4.4	11.1	14.5	20.7	9.3	13.2

% Damage

	PTB	ANT	PTB	ANT	PTB	ANT	PTB	ANT	PTB	ANT	PTB	ANT
Guthion	0	0	0	0.3	0	0	0.1	0	0	0	0	0.8
Guthion/Imidan	0	0	0	0	0	0	0.2	0	0	0	0	0
Guthion/Sevin/Sevin	0	0	0	0	0.3	0	0	0	0	0	0	0
Imidan	0	0	0	0.3	0	0	0	0	0	0	0	0
Sevin	0	0	0	0	0	0.5	0.1	0.1	0	0	0	0
Check	0	0	0.3	2.0	0	1.5	0.1	0	0	0	0	0
Avg.	0	0	0.05	0.43	0.05	0.33	0.08	0.02	0	0	0	0.13

TABLE 2

CHICO - 1980

PREDATORS FOUND IN TRAPS

Brown Lacewing (b) and Green Lacewing (g) Adults Caught in 6 PTB Pheromone Traps on Specified Dates (Weekly Totals)

3/26	4/2	4/11	4/18	4/25	5/2	5/8	5/15	5/22
1g	2g	1g	1b 1g	0	0	1b	1b	6b

5/29	6/5	6/12	6/19	6/26	7/3-8/7	8/14	8/21
2b	1b	4b 1g	16b 1g	3b 1g	0	1g	0

8/28	9/4	9/11	9/18	9/25	10/3
1b 1g	1g	0	1g	1g	2g

Lacewing Larvae (ℓ) and NOW Parasitic Wasps (pw) Found on 20 NOW Egg Bait Traps on Specified Dates

6/9	6/16	1/19	6/23	6/30	7/14	7/21	8/28
3pw	18pw	7pw	1ℓ 6pw	13pw	1ℓ	1ℓ	1pw

Manteca Almond IPM Plot

The Manteca orchard consists of 80 acres of 16-year-old trees planted on Hanford loamy sand. The orchard is on level ground and flood irrigated. Weed control is accomplished by spraying the tree rows and cultivating the row middles. The trees are uniform in size except for a dryer and less vigorous area of approximately 12 acres in the southwest corner. Pollenizers are Merced and Thompson which alternate between two rows of Nonpareils.

Orchard Sanitation

This orchard has historically been difficult to knock which leaves a high number of nuts on the tree. This number far exceeds the level on which NOW is able to reach damaging levels.

Monitoring Insects

NOW egg traps and Peach Twig Borer pheromone traps were placed in the orchard on March 21, 1980 with one trap station per 10 acres. A single Oriental Fruit Moth pheromone trap was also placed on March 21. Traps were read routinely once per week, but twice weekly during critical flight periods and the hotter months where NOW egg to larva period is only 4-5 days. All traps were removed on October 23. Refer to Graphs 1 and 2 for population data.

NOW. According to wheat bran baited traps, overwintering NOW females began egg deposition on April 11. Consistent egg deposition occurred between April 18 and April 28. Eggs laid during this period hatched the first week of May. Spring insecticide treatments would ordinarily be applied at this time but due to wet weather applications were delayed in several area orchards. In the IPM orchard the grower decided to delay treatment until mid-summer (hull split).

The first generation NOW flight was comparatively late and small. Hull split treatments were delayed to coincide with egg deposition. Guthion was applied on July 18. Sevin was applied on July 21 and 22.

The second generation NOW flight covered the month of September with significant increase in kernel damage after September 22.

Almond press cake baited traps were placed near the bran baited traps for comparison. Press cake is the mealy by-product after oil is extracted from cull nut meats. These traps consistently collected a greater number of eggs and are easier to service than the standard bran-baited traps.

PTB. Overwintering PTB males were initially trapped on April 11. Four distinct flight periods were observed during the season. Guthion or Sevin applied at hull split seemed to have little effect on PTB. As in 1979, the record of shoot strikes in San Joaquin County almonds was very low and scattered.

OFM. A single pheromone trap indicated the presence of this insect at a population level consistent with 1978 and 1979 records. There was no OFM damage to nuts observed during the sampling period.

Preharvest and Harvest Results

Nut samples were collected from Nonpareil trees 28, 21 and 14 days prior to harvest. Samples were also collected at harvest on October 6. Results are summarized in Table 1.

NOW damage in the Guthion and Sevin treated areas was approximately 50% of that in the checks for September 22 and October 6 samples. NOW damage for all treatments on September 22 was approximately 50% of that for October 6. If the crop had been knocked two weeks earlier, the damage would have been limited to 2-2-1/2% for the treated areas.

PTB damage was observed during the sampling period but is considered insignificant when compared to NOW. The decrease in PTB damage at harvest can be attributed to "masking" by NOW feeding.

Low Dosage Miticide

A major effort in 1980 was aimed at determining the effects of using a less than label dosage of Omite. Potential benefits of such a practice are: (1) lessened costs of materials; and (2) conservation of spider mite "food" for predators.

Omite 30W was applied with Sevin on July 21 and 22 at 5, 2 and 1 lbs./A rates. These treatments and a check were replicated 4 times in a 40 A block, one replicate consisting of 2-1/2 A. Four 30-leaf samples were collected from trees within each replicate from June 17 to November 24 at biweekly intervals. A mite brushing machine and dissection microscope were used to count samples in the laboratory. Table 2 summarizes the 1980 data.

Due to cooler than normal temperatures in early summer months, spider mite populations failed to increase until mid-August. Ordinarily, miticide treatments timed with hull split sprays are correct and enable a grower to prepare the orchard floor well in advance of harvest. Although the miticide was applied at the latest possible date, the effect on mite populations was minimal. By mid-September trees in all treatment areas, including grower applied Plictran, became webbed-over by Pacific Mites and were eventually defoliated. It appears that some "protection" was provided by the 5 lb rate in that Pacific Mite populations peaked later in these areas. The 5 lb rate also suppressed European Red Mites, but it should be noted that, other than leaf stippling, there was no damage caused by this mite in the orchard. Whereas, the 5, 2, and 1 lb Omite rates had no M. occidentalis (predator mites) on July 28, August 11, and August 25, the check samples had predator mites beginning August 11, 4 weeks before the appearance of any M. occidentalis in the 5, 2, and 1 lb Omite rates. The predator mites were slower to build up in the high rates of Omite because the spider mites (their food source) were reduced by the Omite residues. During the last 4 sample periods, there was a 77% and 50% increase in M.

occidentalis in the 2 lb. and 1 lb. treatments, respectively, compared to the 5 lb. Omite rate.

Sevin Formulations

Sevin sprayable and Sevin SL were each applied at hull split to four 2-1/2 acre replicates. Mite counts were made as previously described to determine the effect the formulation has on carbaryl-induced mite build-ups. Results are summarized in Table 2. There was no significant difference between these Sevin formulations.

Lacewing Monitoring

As in 1979, numbers of green and brown lacewings caught in pheromone sticky traps were recorded and are summarized in Table 3. Peak adult flight occurred in June. Offspring were observed in the orchard as mites builtup in August, but did not appear to provide appreciable control.

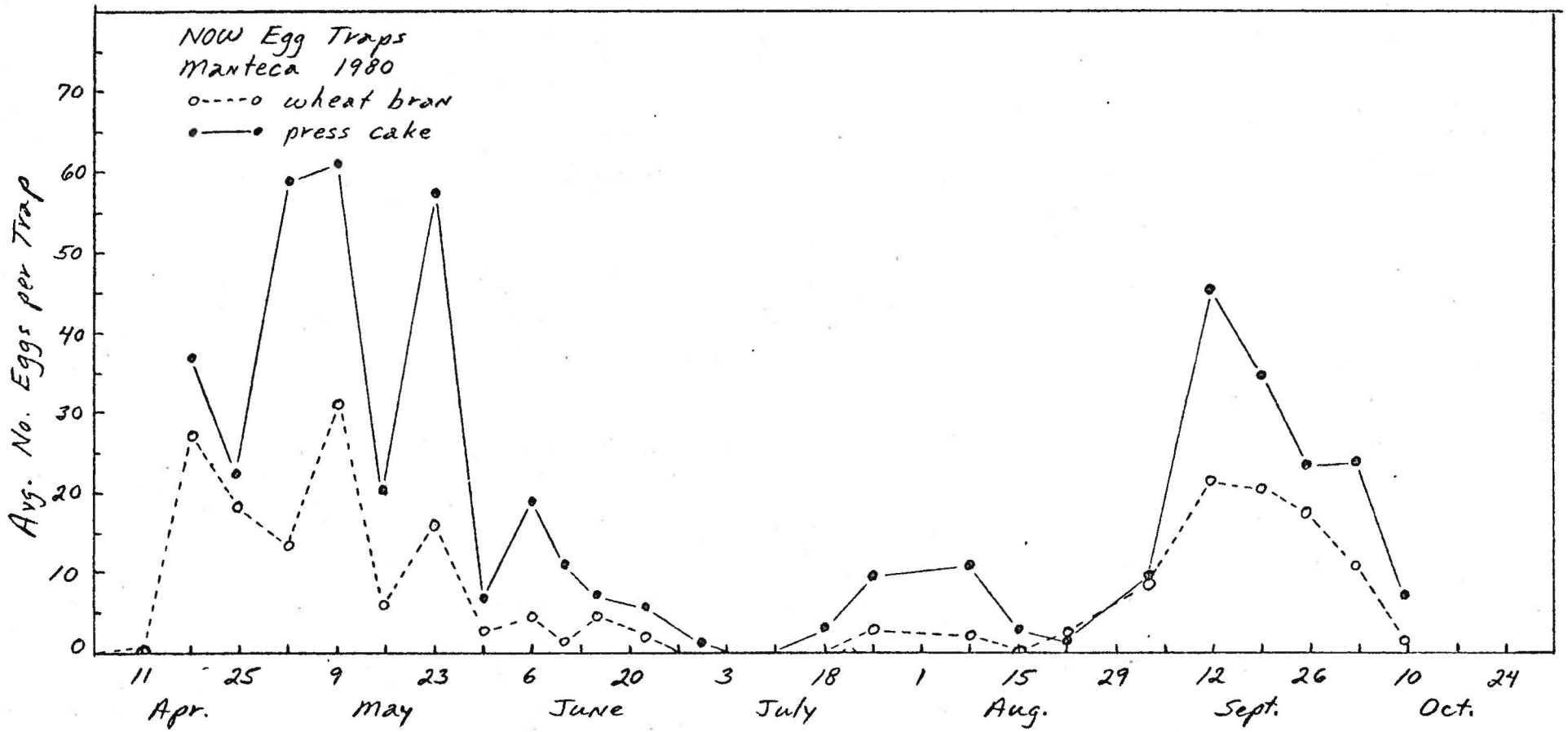
Conclusions

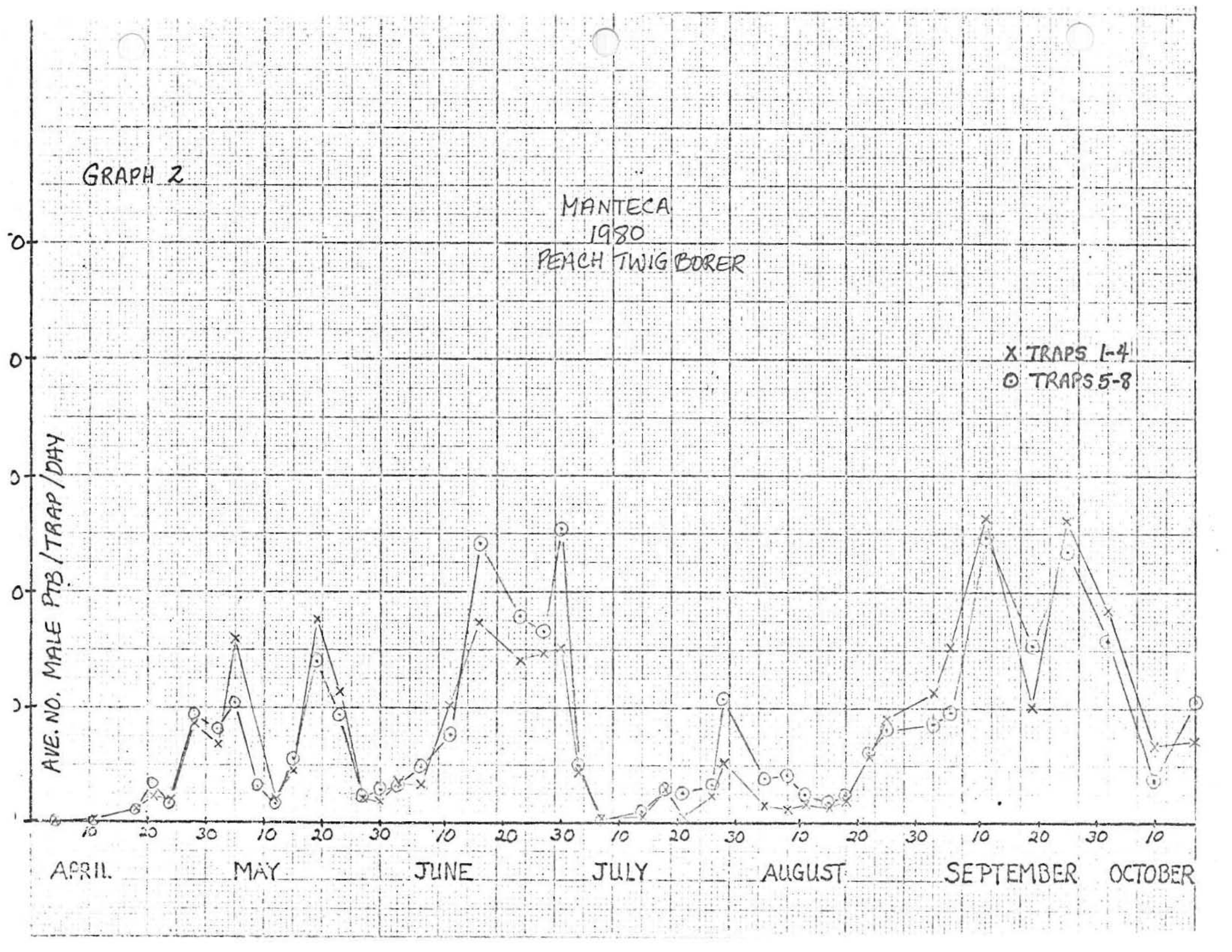
1. Orchard sanitation and early harvest are important cultural means of limiting NOW damage.

2. Insecticide treatments can decrease NOW damage by 40-50% when timed correctly.

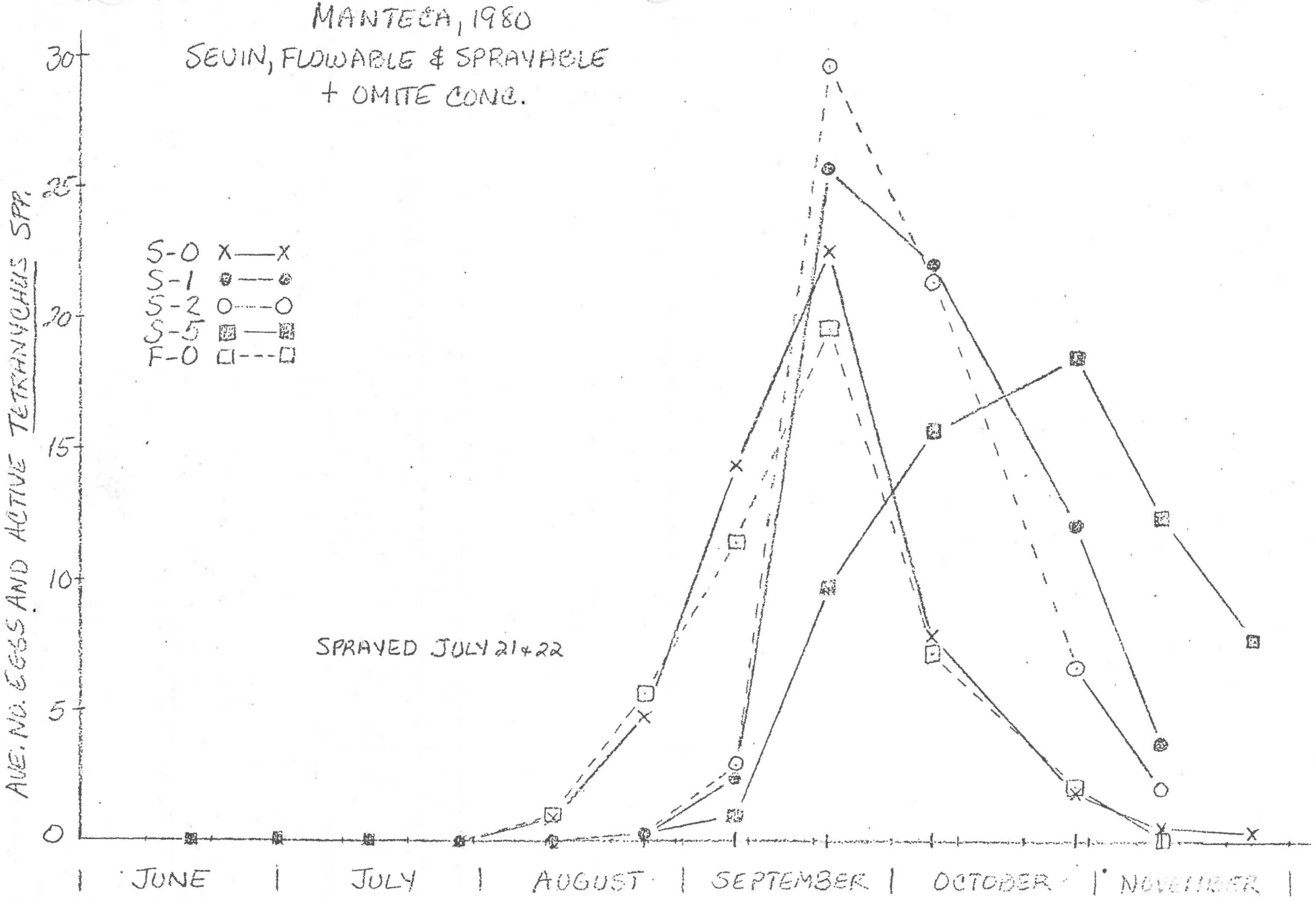
3. Low dosages of miticide continue to show promise in mite and predator management.

GRAPH 1


NOW Egg Traps
Manteca 1980
o----o wheat bran
•——• press cake
Avg. No. Eggs per Trap
0
10
20
30
40
50
60
70
11
25
9
23
6
20
3
18
1
15
29
12
26
10
24
Apr.
May
June
July
Aug.
Sept.
Oct.


GRAPH 2
MANTECA
1980
PEACH TWIG BORER
X TRAPS 1-4
⊙ TRAPS 5-8
AVE. NO. MALE PTB / TRAP / DAY
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

GRAPH 3


MANTECA, 1980
SEVIN, FLOWABLE & SPRAYABLE
+ OMITE CONC.
S-0
S-1
S-2
S-5
F-0
SPRAYED JULY 21 & 22
AVE. NO. EGGS AND ACTIVE TETRANYCHUS SPP.
0
5
10
15
20
25
30
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER

GRAPH 4

MANTECA, 1980
SEVIN, FLOWABLE & SPRAYABLE
+ OMITE @ ONE.

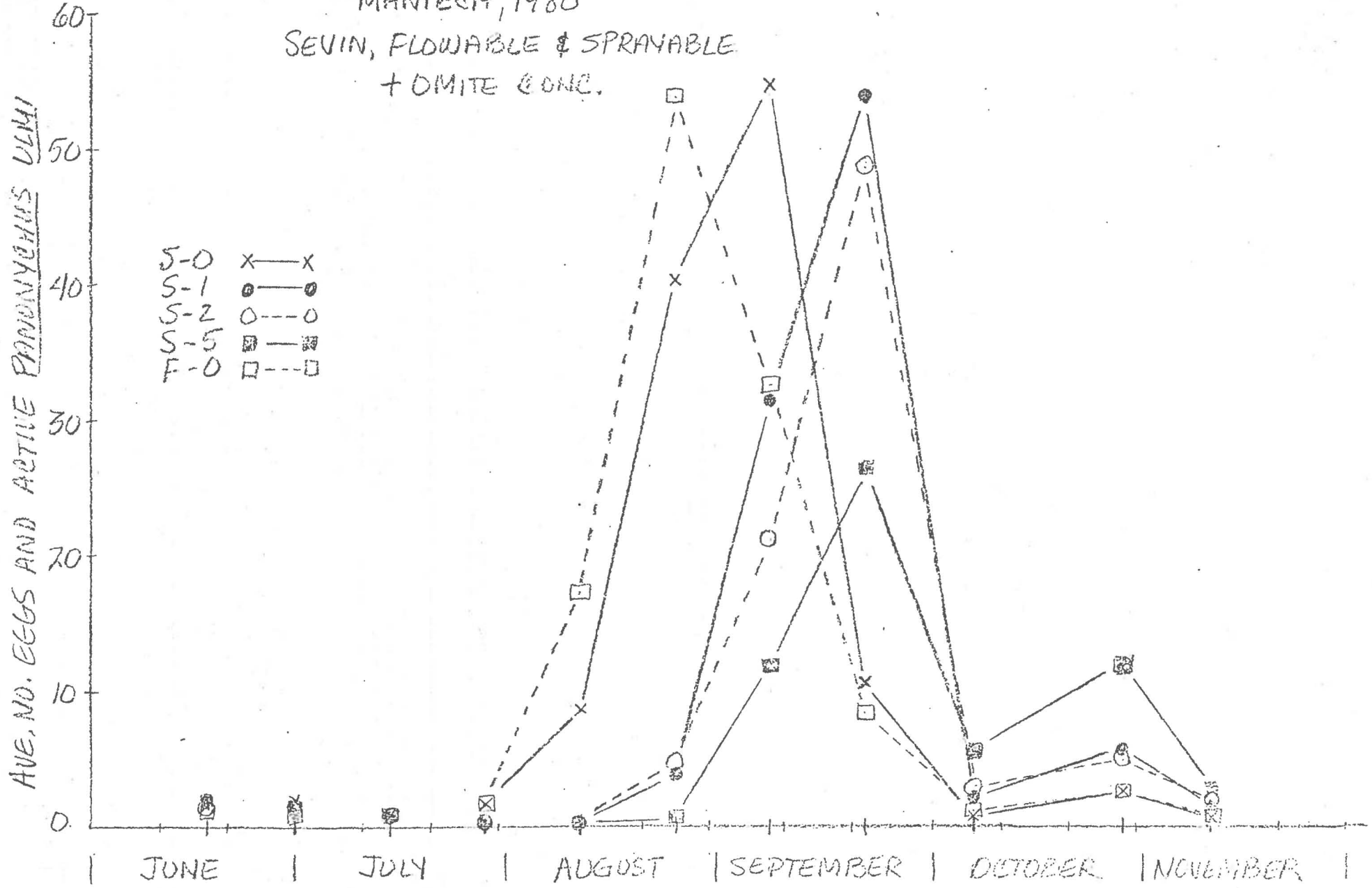


TABLE 1

MANTECA - 1980

PREHARVEST AND HARVEST*

TREATMENT	Sept. 8		Sept. 15		Sept. 22		Oct. 6	
	NOW	PTB	NOW	PTB	NOW	PTB	NOW	PTB
Sevin Spray I	5.5	0.3	3.0	0.3	4.3	0.3	5.0	0
II	2.5	0	1.3	0	1.3	0	3.8	0
III	0.5	0	2.0	0	2.3	0	6.8	0
IV	2.5	1.0	3.5	0.8	3.3	0	4.0	0
$\bar{X}$ of Reps.	2.75	0.33	2.45	0.28	2.8	0.8	4.9	0
Sevin SL I	1.3	0	1.5	0.3	2.3	0	6.3	0
II	0.5	0.3	1.5	0	0.8	0	3.0	0
III	3.8	0	2.8	0.3	1.5	0	3.0	0
IV	2.3	0.5	1.8	0.5	2.8	0	2.8	0
$\bar{X}$ of Reps.	1.98	0.2	1.9	0.28	1.85	0	3.78	0
Guthion	0.8	0.5	3.0	0.3	1.8	0	6.0	0
Check	2.8	0.5	3.8	0.3	4.0	0	10.5	0

* Mean for (4) 100 nut samples.

TABLE 2

Average number of spider mites (European red mite = ERM, T. pacificus and T. urticae = Tet. spp.) and M. occidentalis per leaf (all stages) in the Manteca IPM orchard treated with Omite - 1980.

	Mean mites per leaf on 16 trees[a/] treated with														
	5 lb.			2 lb.			1 lb.			Check-sprayable			Check-flowable		
Sample dates	ERM	Tet. spp.	M. occ.	ERM	Tet. spp.	M. occ.	ERM	Tet. spp.	M. occ.	ERM	Tet. spp.	M. occ.	ERM	Tet. spp.	M. occ.
June 17	1.788	.008	.004	1.310	.013	.016	1.914	0	.026	1.834	.004	.012	1.195	0	0
June 30	1.421	.016	.004	1.304	.012	.009	.914	.004	.013	.945	.008	.026	.890	0	.008
July 14	.758	.034	.004	.779	.004	.012	.501	.025	.004	.485	.055	.004	.601	.017	0
July 28	.213	0	0	.250	0	0	.139	0	0	.855	0	0	1.511	0	0
August 11	.062[b/]	0	0	.163[b/]	.004	0	.233[b/]	.017	0	8.800	.955	.004	17.300	.899	0
August 25	.563[b/]	.048	0	4.590[bc/]	.270	0	3.840[bc/]	.300	0	40.430	4.804	.008	53.900	5.700	.008
September 8	11.850[b/]	.96	.004	21.220[bc/]	2.940	.038	31.500[c/]	2.360	.008	53.880	14.470	.006	32.760	11.457	.044
September 22	26.840[b/]	9.840	.079	48.800[b/]	29.720	.310	54.00 [b/]	25.72	.300	9.618	22.596	.572	8.21	19.650	.640
October 6	11.780[b/]	15.720	.410	4.850[c/]	21.440	.830	5.700[c/]	22.080	.560	2.780	7.940	.620	2.583	7.350	1.00
October 28	5.580[b/]	18.470	.550	2.874	6.680	.659	2.038[c/]	12.030	.696	.963	1,880	.739	1.160	2.160	.603

a/ Sevin was applied on 7-21 to all trees. The test trees and one check received Sevin S ; one check received Sevin flowable.

b/ Numbers of mites significantly different ($P \leq .0.05$) from the check treated with Sevin S on this sample date. Data analyzed using Games and Howell t-modification for paired multiple comparisons with unequal variances.

c/ Numbers significantly different from the 5 lb. rate.

TABLE 3

MANTECA - 1980

Brown Lacewing (b) and Green Lacewing (g) Adults Caught in 8 PTB Pheromone Traps on Specified Dates

3/28-4/18	4/21	4/24	4/28	5/2	5/5	5/9	5/12	5/15
0	1g	2b	1b 1g	2b	1b	0	2b	4b

5/19	5/23	5/27	5/30	6/2	6/6	6/11	6/16	6/23
2b 1g	2b 1g	7b 1g	11b	9b	29b	11b 7g	21b 10g	38b 11g

6/27	6/30	7/3	7/7	7/11	7/18	7/21-8/15	8/18	8/22
26b 6g	5b 2g	1g	5b 5g	2b	1g	0	1g	0

8/25	9/2	9/5	9/11	9/19	9/25	10/2	10/9	10/17
0	1g	0	0	1g	1g	1g	0	0

10/23
2b 1g

McFarland IPM Plot

The McFarland IPM plot is composed of two 40 acre square blocks. The trees are 8 years old with Nonpareil, Mission and Thompson varieties. The 2 blocks were monitored for NOW and PTB. The NOW population was very low in 1978 and 1979, therefore 20 acres of this plot was devoted to control measures for the Southern Fire Ant. The orchard floor is maintained by strip chemical weed control in the tree row with the cover crop chopped between the rows.

Monitoring Insects

NOW egg traps and PTB traps were placed in the orchard on April 22, 1980. The last reading was made on October 28.

NOW. Mummy counts during the winter showed an average of 103 mummy nuts per acre throughout the 80 acres. The egg traps showed no activity until July 8. (See Graph 1). A brief, very light deposition of eggs occurred from July 8-16. Beginning August 1 another deposition period began. Eggs were laid fairly consistently until the end of October, but the peak rate was only 2.2 eggs per day. The trees were knocked on August 28 and the Nonpareils graded 0.3% on August 28 and on September 6, 2.27% NOW damage. No chemical sprays were applied for NOW.

PTB. PTB as shown in Graph 2 had moderate activity in the spring flight. Moths flew from April 28 until early June. A mid-summer flight with a pronounced peak occurred from June 20 to July 10. A third flight began in September and went until mid-October. PTB damage was below 0.1%.

Ants. The Southern Fire ant, Solenopsis xyloni, is the predominant species of ant in this orchard. It has been a major problem and caused damage in both 1978 and 1979. Most of the damage occurs after the nuts are knocked from the trees and are drying on the ground. Some damage can occur on the tree. Ground applications of materials were made in an attempt to provide control for the ants without disturbing other insects and mites in the orchard.

A preliminary test plot was applied on May 22. This was a small trial where 5 materials were each applied to an area equivalent to 2 trees. A 2-gallon Hudson pressure sprayer was used to apply all materials except for the one granular material which was hand broadcasted. The five materials tested were Imidan, Guthion, Sevin and Lorsban (all spray) and Lorsban granular. This preliminary trial indicated that the two Lorsban materials looked the most promising. From this trial methods of plot layout and evaluation were determined. Individual ant hills were not marked and locating them became a problem at evaluation time.

A 20-acre plot was designed and materials were applied on July 8 and July 29. The plot was designed to have 4 replicates with each treatment rep being 2x10 trees (each material was applied over 80

trees on about 1 acre). Each area was surveyed for ant colonies before it was treated. The number of colonies was recorded and each colony was marked with a golf tee next to the colony and a colored flag in the tree above the colony. This double marking system made the colonies easier to find and evaluate, especially after mowing and harvest equipment went through the field and knocked loose some of the golf tees.

The spray material was applied with a 2-gallon Hudson sprayer and the granular materials were applied with an Ortho Whirlybird. Five plots were applied on July 8 - Lorsban spray at 1 gallon per acre, Lorsban 15 G at 20 lb. per acre, Diazinon 14 G at 20 lb. per acre, Diazinon 14 G as a spot treatment (treated only hills) and a check area. On July 29 4 more treatments were made - Diazinon 14 G at 20 lb. per acre and 40 lb. per acre, and Sevin 20 G at 20 lb. per acre and 40 lb. per acre. No plots were double treated.

Visual observations were made at two different times during the season. The first observation was made on August 7, one and a half weeks after the second application. The colonies were rated and assigned a numerical value: 0 if the colony was dead or had no activity, 0.5 if the colony was weak and very little activity was found, and 1.0 if the colony was active. The behavior of the Southern Fire Ant made this a viable rating system since the ants will boil out of the ground to protect the nest if the nest is jarred or disturbed. The number of new colonies in an area was recorded on October 21 to determine reinfestation of treated areas.

Harvest samples of the nuts in treated areas were collected and evaluated. Four one-hundred-nut samples were taken from each of the 4 reps for a total of 1,600 nuts per treatment. The nuts were collected 9 days after they were knocked.

The results of both the visual observations and nut samples show that Lorsban and Diazinon (late treatment) gave good control. Some control was obtained by the other treatments. It is speculated that the Lorsban will kill the colonies, including the queen, while the other materials kill the workers and reduce the colony size temporarily. If this is correct, the early application Diazinon treatment did not give as good of control as the later application because the worker force had a chance to rebuild after the July 8 treatment. Table 1 shows the results of the visual ratings, the number of new colonies found and the damage to the nuts at harvest.

Another aspect of this project was to work out a method of evaluating for the presence of ants and establish threshold levels. Several methods of evaluation were tried. Timed walks through an orchard counting all hills observed gave mixed results. Walks less than 3 minutes gave very poor results because of the limited area covered. Longer walks gave better results but problems occurred such as walking into trees and tripping over sprinklers. Ant mounds can vary in size from 1/4 inch round and 1/2 inch high to 4-6 inches round and 4-6 inches high, depending on soil conditions. In a given period of time one would have to walk slower and look more carefully for smaller hills, than the larger hills.

TABLE 1

MCFARLAND ANT TRIAL - 1980

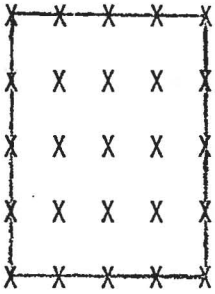
NONPAREIL NUTS

MATERIALS APPLIED TO ORCHARD FLOOR

Material	Amt/A	Date Applied	Visual Rating 8/7/80	No. of New Active Colonies	No. of Nuts Damaged in 1,600 Nuts*
Lorsban 15G	20 lb	July 8	.02	0	18
Lorsban Spray	1 gal	July 8	.03	1	17
Diazinon 14G	20 lb	July 29	.07	0	18
Diazinon 14G	40 lb	July 29	.03	0	25
Diazinon 14G	20 lb	July 8	.26	3	41
Diazinon 14G	Spot	July 8	.14	39	86
Sevin 20G	20 lb	July 29	.27	41	50
Sevin 20G	40 lb	July 29	.54	28	87
Check	----	------	.60	49	112

*Harvested 9/3/80.

The most successful method to survey for colonies found was to pick 5 locations in an orchard and count all ant hills in an area of 4X4 trees in each location.



This method allows a thorough search for ant activity regardless of size of hills. Tentative population criteria based on the limited data available show that 15 to 20 hills per acre counted in June will cause about 2% damage at harvest if no control measures are applied.

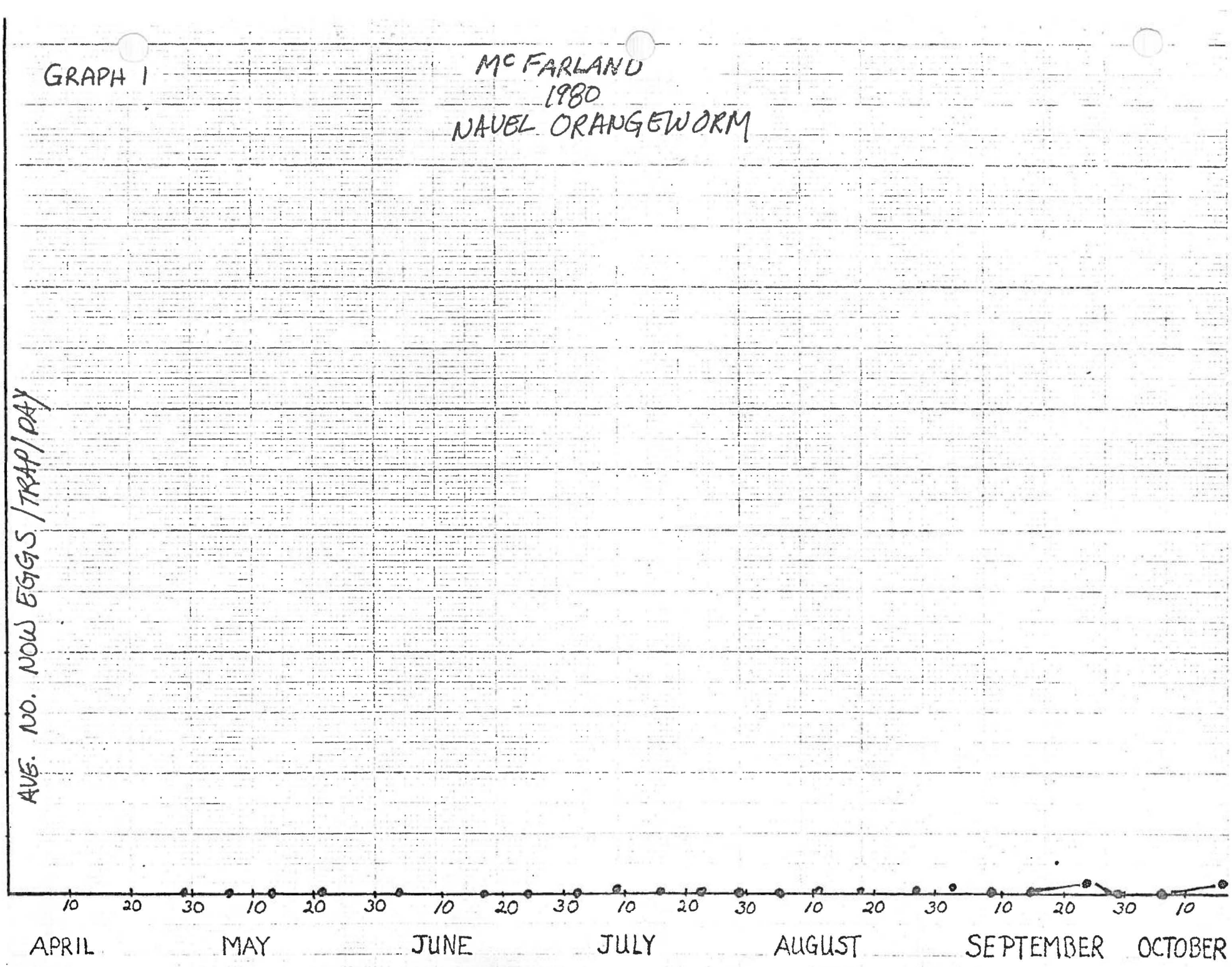
No chemicals are currently registered for ant control in almond orchards, therefore, no specific recommendations can be made. Summer sprays of Guthion, Sevin or Imidan applied at hull split have provided suppression and reasonable control of Southern Fire Ant. Trials in 1978 and 1979 showed that chemical (foliar application) sprays for Navel Orangeworm gave approximately 83% ant control when applied in June or July.

Material	% Almond Kernels Damaged by Ants	
	1978	1979
Sevin	1.3	1.4
Imidan	1.4	-
Guthion	-	1.3
Check	5.9	9.8

Observations have shown that where Guthion has been applied as a spray in early May, ants can still be a major problem. In all sprays being applied for NOW control the effect on ants is only seasonal, therefore, it can be assumed that only the workers are being suppressed by foliar sprays. The colony will regain strength and cause problems in the future.

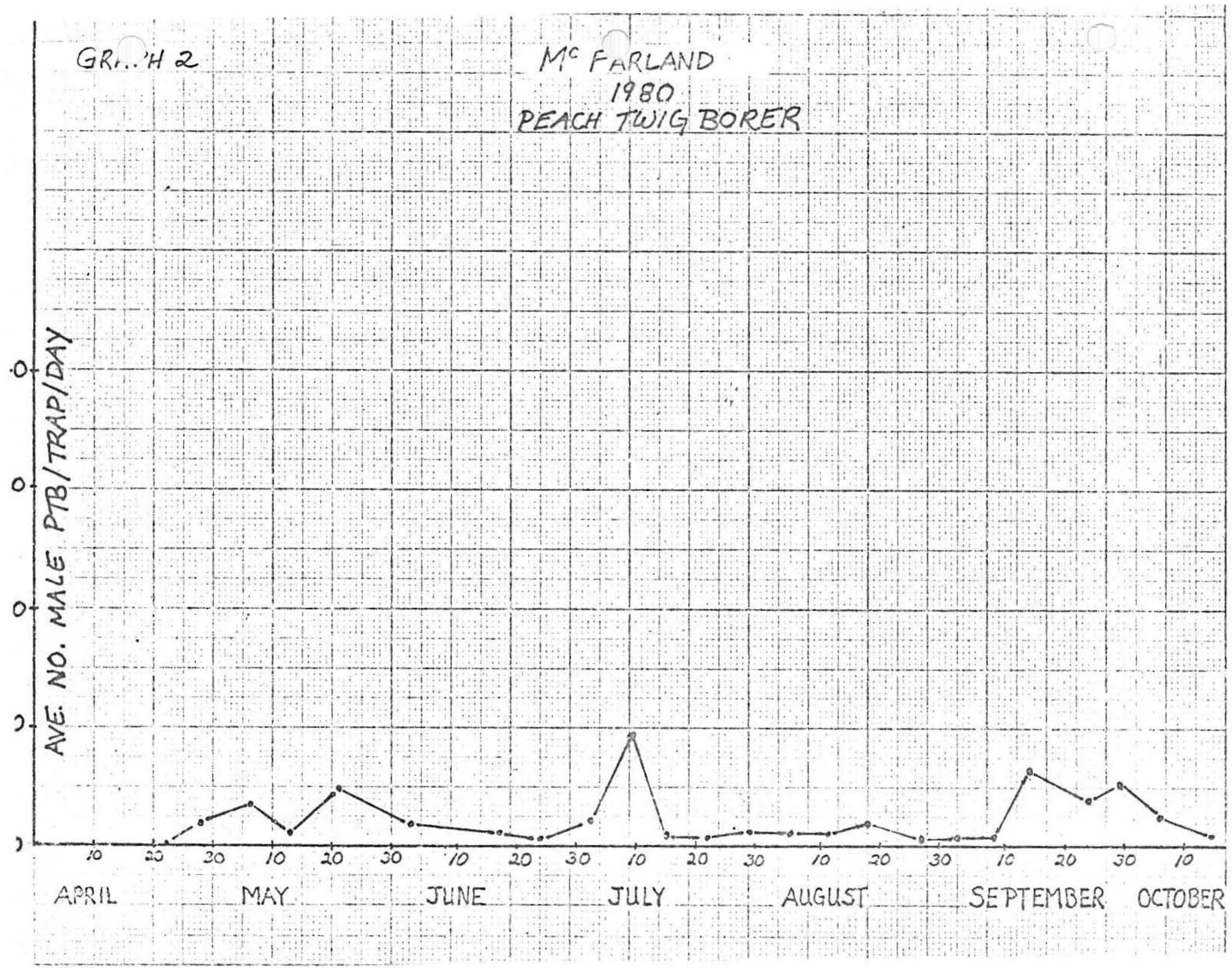
GRAPH 1

McFARLAND
1980
NAVEL ORANGEWORM



GR..'H 2

Mc FARLAND
1980
PEACH TWIG BORER



Bakersfield IPM Orchard

Projects on low dosage miticide applications and on release of carbaryl-resistant Metaseiulus occidentalis were conducted in cooperation with Dr. Marjorie Hoy. Her report to the Almond Board will summarize these joint projects.

An additional trial was conducted on the effectiveness of sprays applied at harvest time for protection of varieties planted as pollenizers for Nonpareil which are harvested later than Nonpareil. Materials used were a synthetic pyrethroid (Ambush) and Diazinon. One hundred eighty acres were randomized into two replicates of three treatments. The Merced variety was planted every sixth row. The helicopter flew directly over only the Merced row when making the application on September 4. The rate applied was based on an application to every row but only 1/6 the area receiving spray.

Table 1 summarizes the data. There were no statistical differences between any of the treatments although both chemicals appeared to give some NOW control. The time between application and harvest was only 8 days. Had the trial lasted longer, greater differences might have occurred.

The sprays in the Merced trial were applied on September 4. A special use permit was issued for Ambush (aerial application) the previous week; therefore, the trial could not have been applied earlier. Considerable egg laying occurred throughout September but some activity had already occurred before the trial. Considerable egg laying also occurred near the end of September and early October.

Graph 1 shows the NOW egg trap counts in the IPM orchard. This orchard where the miticide trials were conducted was managed the same as the orchard sprayed with Ambush and Diazinon. Both orchards as well as the orchard between them had received a spray of Guthion in May and an early hull split (1%) spray of Sevin. Mummy counts taken in February, 1980, showed that the orchard where the traps were placed and the sprayed orchard had an average of 534 and 460 mummies per acre, respectively. Results from the NOW egg traps, therefore, was somewhat comparable. Cultural and farming practices were the same between the two orchards. The NOW had three periods of egg deposition during the season. The first period, from April 28 until June 2, had a peak on May 6. The second period started July 2 and continued until July 30. The final egg laying period started August 16 and continued until mid-October.

Although Peach Twig Borer traps indicated moths present, the number caught was very low. No damage was found at harvest from PTB which could have also been predicted from the trap counts.

Table 1

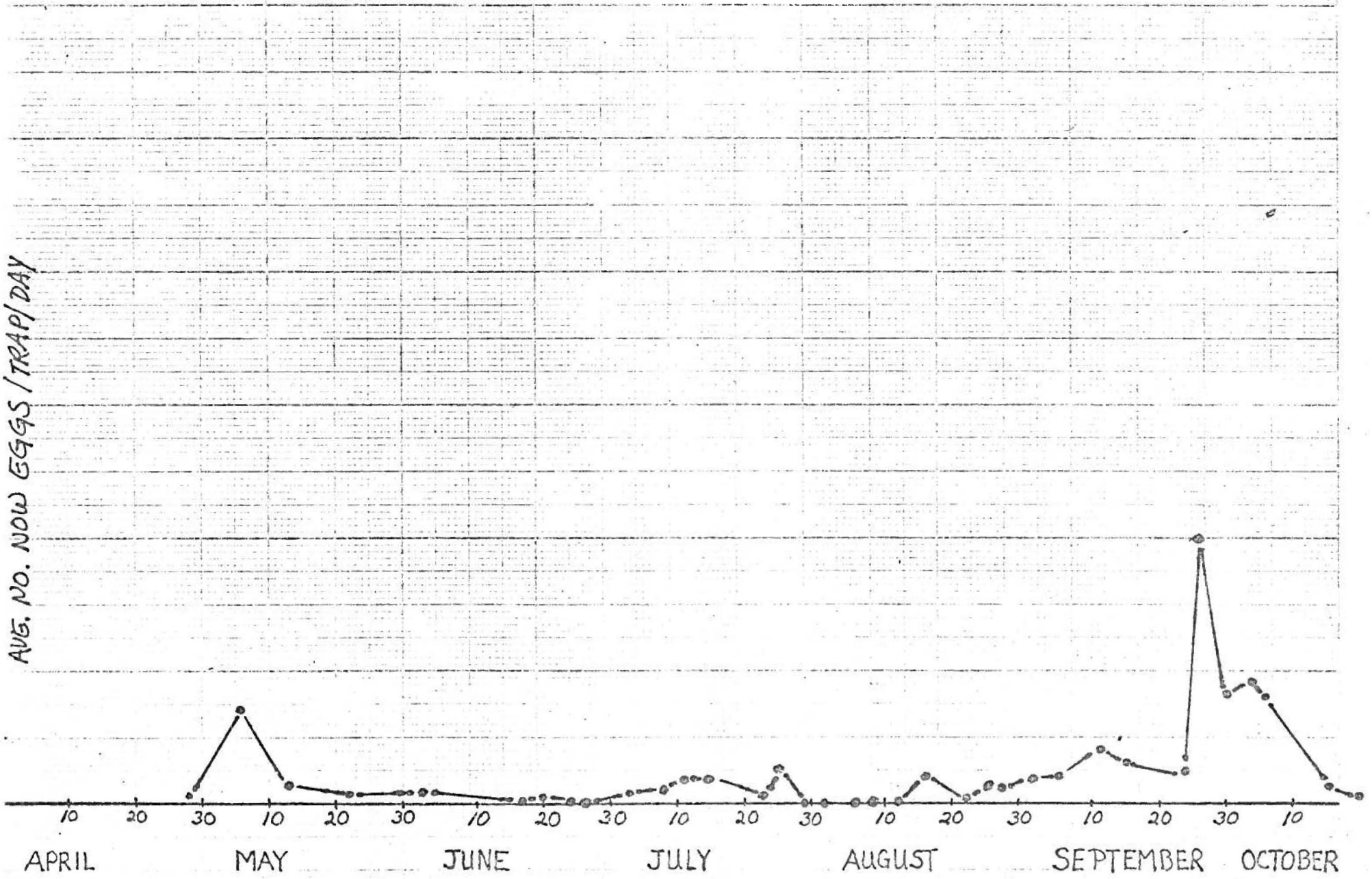
Merced Variety - Almonds 1980
Helicopter Applied @ 40 gal./Ac.

Chemical	A.I./Ac.	% Damage NOW	% Damage Ant
Ambush	0.2 lb.	15.65	0.45
Diazinon	3.0 lb.	16.55	0.95
Check	-------	17.60	0.65

Chemicals Applied September 4, 1980
Sampled September 12, 1980

GRAPH 1

BIDART
1980
NAVEL ORANGEWORM



GRAPH 2

BIDART
1980
PEACH TWIG BORER