level until June 9. At this time, in some of the treatments, the population was moderately high, and it was decided to treat the entire orchard including all of the experimental plots with a nicotine dust. The treatment was applied June 12 and 13. The weather conditions were not ideal and the control obtained was not highly satisfactory. However, no further control measures were applied during the rest of the season. During the latter part of June and early July the aphid population increased to a rather high level, but was reduced to non-destructive numbers by a large predator population which gained the upper hand.

The host predator population relationship that exists in the case of the walnut aphid is a very interesting one, and has a very important bearing on the timing of control measures. This fact has long been recognized and a complete understanding of the fluctuations that occur in the aphid population must take into account the action of parasites and predators.

The addition of aphicides to the early codling moth spray resulted in excellent control of the walnut aphid. With the aphid menace removed, orchards can receive an early irrigation without the fear of a destructive aphid population developing while it is under water. Further, it appears as if the control occurs at a period that is very likely to improve the host predator relationship in that the aphid population is reduced at a time when the number of predators may be at a rather low level. Also, need for further control is delayed until warmer weather sets in, which is very desirable if an aphicide such as nicotine dust is used in the control program.

One pound of a 14% dry nicotine concentrate, or one half pint of 50% HETP, or one pound of benzene hexachloride (gamma isomer 6%) per 100 gallons of spray all resulted in excellent control of aphids. Pending further investigation the 14% dry nicotine concentrate is probably the safest material to recommend, since it is likely to have the least adverse affect upon the host predator balance.

The timing of aphid control measures is a very important consideration. They should be applied before there is a rapid increase in the predator population, and it becomes obvious that the predators will soon reduce the aphid population to an innocuous level. Poorly timed applications may adversely affect the host predator balance and actually do more harm than good.

In general, if an aphicide is to be applied, the treatment should occur before or at about the time that an average of 10 aphids are found per leaflet. However, the treatment should not be made until after it has been determined that the predator population is inadequate to take care of the situation.

Olive Scale

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GREAT NUMBERS OF THE OLIVE SCALE, *Parlatoria oleae* (Colvée), are found on all the aboveground parts of the olive tree; often the scales overlap. Where found on the twigs, the scales frequently cause a purple discoloration and slight deformity of the wood. Infested olives do not make good pickles. Dark purple spots appear on the immature fruit and become more pronounced as the olives mature and turn straw colored. Heavy infestations may reduce the oil content as much as 20%.

There are two broods each year. Adult females overwinter and lay eggs in late March. The eggs hatch in early May, and a second brood starts hatching in late July.

A series of small test plots for control of adult female scales using HETP alone and in combination with other insecticides was begun in November, 1946. The plots were located in a Manzanillo orchard in Madera County and the sprays were applied with an orchard sprayer at 500 pounds pressure. A month or longer after application of the sprays an examination was made to determine the per cent of dead scale. The results of the tests are summarized in table 1. No count of scales was made on treatments applied April 25. Effectiveness of these sprays was measured by determining the per cent of scale-infested fruit on June 12. The results were unsatisfactory.

On March 31, 1947, parathion treat-

TABLE 1

Results of Sprays Containing HETP for Control of Olive Scale

Treatment per 100 gallons	Date applied	Date counted	Per cent dead scale	Per cent infested fruit
HETP 50%, inert 50%, ½ gal.	11/26/46	1/30/47	20.8	..
HETP 50%, inert 50%, 1 qt.; di 2 ethyl hexyl phthalate, ½ gal.	11/26/46	1/30/47	23.8	..
HETP 50%, inert 50%, ½ gal.; kerosene, 3 gals.	11/26/46	1/30/47	47.0	..
HETP, 1 pt.; Chlordan, ¾ lb.; blood albumen spreader, 2 oz.	1/10/47	2/21/47	15.4	..
HETP, 1 pt.; Chlordan, 2 lbs.; blood albumen spreader, 2 oz.	1/10/47	2/21/47	7.6	..
HETP, 1 qt.; di 2 ethyl hexyl phthalate, 3 qt.; blood albumen spreader, 4 oz.	1/29/47	3/21/47	13.6	..
HETP, 1 pt.; methyl naphthalenes, ½ gal.; blood albumen spreader, 4 oz.	4/25/47	6/12/47	....	32
HETP, 1 pt.; benzene, ½ gal.; blood albumen spreader, 2 oz.	4/25/47	6/12/47	....	27
Untreated	.....	6/12/47	....	43

TABLE 2

Results of Hand-Sprayer Trials of Parathion for Control of Olive Scale

Treatment	Per cent dead	Per cent live females laying eggs
Parathion 15% wettable:		
1 lb. per 100 gallons	19.7	37.7
2 lbs. per 100 gallons	52.4	16.7
4 lbs. per 100 gallons	77.2	11.8
Parathion 20% in di 2 ethyl hexyl phthalate, emulsible:		
1 to 2666	11.1	45.0
1 to 1600	27.0	67.4
1 to 400	60.9	25.0
1 to 200	93.8	10.0
1 to 100	100.0	....
Untreated	6.2	83.6

ments were applied to small olive branches at Fresno using a hand sprayer. At the time the sprays were applied the scale had started oviposition but only a few eggs were laid. An examination was made on April 23. On this date some of the treated adult female scale were alive and able to move but had a strange appearance. The body contents had contracted to the center leaving a thin, light colored margin around the scale. These scale were counted as "dead." It appeared that the treatments had delayed oviposition. The results of the examination appear in table 2.

On April 24, 1947, sprays were applied to two-tree plots using a Hardie sprayer at 500 pounds pressure. At this time the blossoms had not yet opened on the olive trees. By June 12 the young fruit were about one fourth inch in diameter and where ever olive scale had settled the olives showed a dark purple spot. On this date a sample of 100 olives from each plot was examined. A like sample was examined again on September 24. The results of these examinations are summarized in table 3.

On June 28, 1947, scale were examined from three of the plots. Where two pounds of the 15% parathion per 100 gallons of water had been used, most of the eggs appeared to have been killed. Where the adult female had not been killed, however, a few normal appearing eggs were seen among the dead ones. Some eggs were hatching. Many old scales had live young beneath them and some live young were seen on leaves. Many crawlers had died during hatching.

Where four pounds of 15% parathion had been used the appearance of the eggs was much as where two pounds was used. No live young were seen where four pounds was used but some of the eggs from the few surviving adult females appeared normal. Where two pounds of 15% parathion and one quart of Velsicol

TABLE 3

Results of Parathion Sprays Applied April 24, for Control of Olive Scale

Treatment per 100 Gallons	Per cent scale infested olives	
	June 12	September 24
Parathion 15%, ½ lb.	29	100
Parathion 15%, 1 lb.	4	97
Parathion 15%, 2 lbs.	1	47
Parathion 15%, 4 lbs.	0	18
Parathion 15%, 2 lbs.; methyl naphthalenes, 1 qt.	0	42
Untreated	43	100

TABLE 4

Results of a Parathion Spray to Control Olive Scale at Fresno

Treatment per 100 gallons August 8, 1947	Per cent dead scale Sept. 4, 1947		Number live scale per foot of twig January 7, 1948
	Immature scale	Adult females	
Parathion 15%, 4 lbs.	97.3	40.4	0.05
Untreated	5.7	15.6	19.45

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Fig Scale

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FIG SCALES SPEND THE WINTER as adult females on the wood of the fig tree. Eggs are laid from February to June.

Hatching starts early in April and continues well into June. While most of the young settle on the leaves, some settle on the fruit and a few settle on the wood. Additional broods of the scale develop during the summer and fall. The young females settle principally on the leaves during the summer and on the twigs in the fall. The scales on the twigs form the overwintering brood. The scales that settle on the fruit cause the greatest losses. On canning figs the part beneath and surrounding the scale remains dark green and will not "cook out" in processing. Such figs must go into jam stock with consequent reduction in returns. Heavily infested drying figs are less acceptable to packers, being lighter in weight and having a warty appearance.

A parathion spray was applied to an Adriatic fig tree near Fresno on March 31, 1947. At that time eggs were present

TABLE 1

Results of a Parathion Spray to Control Fig Scale (1 Pint of 20 Per Cent Parathion in Emulsible Di 2 Ethyl Hexyl Phthalate per 100 Gallons of Water. Applied March 31, 1947)

Average number scale per lead on third basal leaves, July 2, 1947	
Sprayed	Unsprayed
10.4	397.6
Average number scale per fig on oldest 2 figs, July 2, 1947	
Sprayed	Unsprayed
0.8	21.6

TABLE 2

Results of a Parathion Spray in Reducing Scale Infestation on Figs

Number of scale on figs	Number of figs in each group	
	Unsprayed	Sprayed
0	0	22
1–5	0	50
6–10	4	18
11–15	5	7
16–20	8	3
21–25	11	0
26–50	35	0
51–100	28	0
Over 100	9	0
	100	100

and hatching was about to start. On July 2, the number of scales on the third leaf of two twigs from five locations on the sprayed tree (top center, bottom center, north, south, east, and west sides) and a nearby unsprayed tree were counted. At the same time, the number of scales on the first and second figs on these same twigs were counted. The results are summarized in table 1.

Both counts indicated a material reduction in infestation following the use of parathion. Only the early stages of the scale were found on the leaves and figs from the sprayed tree while all stages, including ovipositing females and empty scales of emerged males, were present on the unsprayed tree. The application of

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