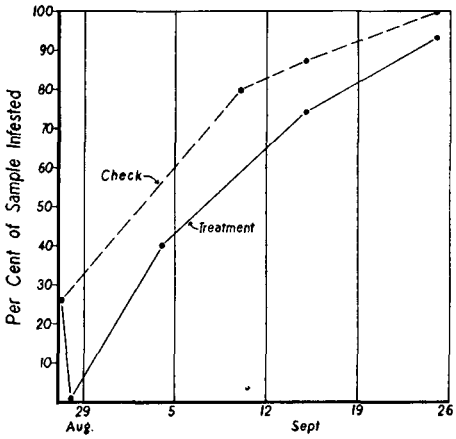

Trend of the mite population following spraying with parathion.

Walnut Aphid

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control of mites, leafhoppers, *Diabrotica*, and aphids was good on those plants that were hit.

An application of three pounds of a 15% parathion in 100 gallons of water per acre on a three-acre plot of honeydew melons was made at Woodland. The melon aphid was successfully controlled for 14 days, the leafhopper, *Empoasca* sp. for seven days, and the adults and the nymphal forms of the two-spotted and Pacific mites were apparently killed. It was felt that the homemade spray rig which developed only 60 pounds pressure per square inch was not sufficient to give adequate coverage on the undersides of the leaves. However, the reduction in population of natural enemies may well have been responsible for the rapid increase in the aphid and mite populations. The first stages of mites and leafhoppers to appear were immature. No plant injury was noted.

To study the control of the walnut aphid, the following aphicides were added to the codling moth sprays applied to nine blocks of 40 trees each. The insecticides used for this purpose were a 14% dry nicotine concentrate, benzene hexachloride(gamma isomer content 6%) and 50% hexaethyl tetraphosphate. These were used in conjunction with DDT, standard lead arsenate, and basic lead arsenate. The spray programs are given in table 1.

In mixing the sprays the dry materials were always slurried. Frequently the dry nicotine concentrate was slurried separately and added to the tank either just before or immediately after the oil emulsion. In general the order of mixing was as follows: The dry materials were slurried and added to the spray tank when one third to one half full, followed by the oil emulsion. In experiments where HETP was used, this material was added just as the tank was full, and the spray immediately applied.

The trees were large and approximately 55 gallons of spray were applied per tree. The spray was applied at a pressure of 600 pounds with sprayers having 25-foot towers equipped for automatic spraying.

Numerous surveys were made in order to compare treatments and to follow the seasonal population trends of the aphid. The relative aphid population was determined by counting the number of individuals on the next to the terminal leaflet. Six leaflets were collected at random from the skirt of each of five trees, in each of the treatments. As in previous years, a wide variation in the number of aphids found on the leaflets of the same tree was noted.

Where nicotine dusts are used to control aphids, it is very difficult to avoid dusting contiguous experimental plots. This has made it difficult to accurately evaluate the addition of aphicides to the early codling moth spray. The orchard would usually require treatment for the control of aphids prior to that of the experimental area. This condition was eliminated in the Linden experiments this past year. Here an aphicide was added to the early codling moth spray applied to the grower-treated portion of the orchard. As a result, the need for aphid control in the entire orchard paralleled rather closely the need for treatment in the plot area. The results obtained are given in table 1. An examination of the table shows that the addition of an aphicide to the early codling moth spray resulted in excellent aphid control.

All treatments were so effective in reducing the aphid population that a week after treatment it was extremely difficult to find any aphids in any of the treatments. The control of aphids held up remarkably well, and in all the treatments the population remained at a rather low

TABLE 1

Control of the Walnut Aphid in the Commercial Sprayed Codling Moth Plots at Linden
(Entire Experimental Area Dusted with a Nicotine Dust, June 12)

Treatment and date applied*	Average number of aphids per leaflet on the survey date given												
	Apr. 23	May 1	May 8	May 22	June 2	June 9	June 17	June 27	July 14	July 31	Aug. 19	Sept. 12	Oct. 21
DDT, depositor, HETP oil, May 2	0.9	4.9	0.0	0.1	1.3	2.1	1.3	12.7	38.7	2.6	6.6	7.7	0.8
DDT, depositor, nicotine, oil, May 2	1.8	9.0	0.0	0.8	7.5	9.0	3.4	18.0	40.0	1.1	5.0	14.5	0.5
DDT, depositor, benzene hexachloride, May 2	2.3	6.4	0.0	0.1	8.5	6.3	7.3	33.8	40.4	1.7	5.5	6.5	0.2
Standard lead arsenate, safener, HETP, oil, May 2	1.5	8.1	0.0	1.1	5.5	17.7	8.1	50.0	8.6	1.1	4.8	17.4	0.3
Standard lead arsenate, safener, benzene hexachloride, May 2	1.4	6.3	0.0	0.2	3.5	16.3	5.2	33.2	5.7	1.1	4.2	32.5	0.2
Standard lead arsenate, safener, nicotine, oil, May 2	1.5	4.5	0.0	0.6	6.0	8.1	6.3	24.0	4.5	0.8	3.2	32.0	1.4
Two sprays basic lead arsenate, benzene hexachloride, May 2 and June 2	0.9	3.9	0.0	0.1	2.2	3.6	1.2	23.0	6.0	0.5	3.2	30.6	1.2
Two sprays basic lead arsenate, nicotine, oil, May 2 and June 2†	1.2	3.4	0.0	0.7	1.6	3.5	2.0	9.0	2.2	0.9	5.2	21.9	1.1
Two sprays basic lead arsenate, HETP, oil, May 2 and June 2	0.8	2.1	0.1	1.5	6.3	8.7	1.7	7.9	3.1	1.7	11.2	23.0	1.5

* Composition of sprays per 100 gallons of water as follows: DDT, 1 pound 50 per cent wettable powder; depositor ½ pound; HETP, 1 pint of a 50 per cent concentrate where used with DDT and ½ pint where used with lead arsenate; oil, ½ gallon medium summer oil emulsion containing 83 per cent oil; nicotine, 1 pound of a 14 per cent dry nicotine concentrate; benzene hexachloride, 1 pound of a material containing 6 per cent gamma isomer; standard lead arsenate, 3 pounds; safener, 1 pound of a commercial basic zinc sulfate product containing 50 per cent zinc expressed as metallic; basic lead arsenate, 4 pounds.
† No nicotine dry concentrate used in June 2 application.

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