Walnut Aphid Investigations

1951 tests on Payne walnuts help develop economical control program under northern California conditions

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Satisfactory and economical control of the walnut aphid throughout the season is possible.

To obtain control, effective aphicides and suitable equipment must be used, coverage must be thorough, and—with some aphicides—consideration must be given to the weather conditions at time of application.

Addition of an aphicide to the codling moth spray during late April or May is recommended, particularly in any codling moth spray program where DDT is used.

In the 1951 experimental studies 25% wettable parathion, benzene hexachloride containing 6% gamma isomer, and 14% nicotine dry concentrate were combined with codling moth sprays for aphid control. Where sprays were applied with conventional sprayers, only 25% parathion and benzene hexachloride were used while all three materials were tested in experiments utilizing air carrier type sprayers. Most of the aphid investigations were conducted at Linden.

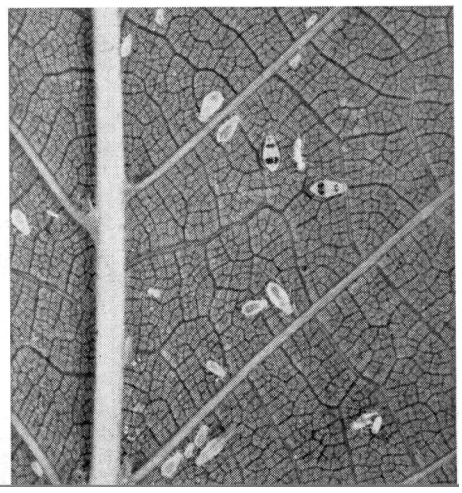
The conventional sprayers had 25-foot towers and were equipped for automatic spraying. There were 18 large trees to the acre and each tree was circled in applying the spray. Information concerning treatments, dosage, rate of application and the degree of control obtained are summarized in the table on this page. The 25% wettable parathion at the rate of ½ pound to 300 gallons of spray resulted in longer protection against the aphid than did benzene hexachloride containing 6% gamma isomer at three pounds to 300 gallons of spray.

Comparative Control of Walnut Aphid with Parathion and Benzene Hexachloride, where these Insecticides were Combined with Codling Moth Sprays Applied May 11 to 14 with Conventional Spray Rigs

Treatment Composition per 300 gallons*	Approx. number of gallons applied per acre	Average number of aphids per leaflet					
		May 11	May 18	May 28	June 7	June 22	June 30
25% wettable parathion, ½ pound; Linden mix, 12 pounds; light summer oil emulsion, 1 gallon	1,000	11.10	0.00	0.01	0.08	3.63	19.75
Benzene hexachloride, 6% gamma isomer, 3 pounds; Linden mix, 12 pounds; light summer oil emulsion, 1 gallon	1,000	15.22	0.00	0.32	1.28	21.92	68.04

* Composition of Linden mix; Standard lead arsenate, 9 pounds; Safener, 1½ pounds; 50 per cent DDT wettable powder, 1½ pounds.

Left: **Overwintering walnut aphid eggs in cracks of a leaf scar. Eggs are also to be found about growth scars and similar locations. They hatch in the spring when the leaf buds start to push.** ***Right:*** **Aphids on underside of leaf.**



The sprays were applied under rather unfavorable weather conditions. A strong wind—while not greatly lessening the effectiveness of parathion—had a marked adverse effect on benzene hexachloride. Control with either material can not be considered satisfactory unless the aphid population is almost eliminated. This did not happen with benzene hexachloride; although no aphids are shown for the survey made May 18, additional search beyond the normal survey revealed that some aphids escaped treatment. This failure to obtain a highly satisfactory kill was associated with unfavorable weather conditions, for in another block in the same orchard, treated in the same manner, but under favorable weather conditions the control was excellent. In this block no aphids were found as late as June 7, and on June 30 there were only 3.34 aphids per leaflet as compared to 68.04 in the experimental series that was treated under windy conditions.

The air carrier sprayer used in the experiments was equipped with a volute and had an air capacity of at least 40,000 cubic feet per minute. The results summarized in the table on page 12 show that parathion gave best control, followed by benzene hexachloride, and 14% nicotine dry concentrate. As long as the amount of aphicide remained constant there was little difference in the control at application rates of either 200 or 400 gallons per acre. No clear trend in relation to control was established where a liquid depositor was used in place of the DDT depositor and oil in the spray program. The latter may be slightly better, but should be used in any case because it results in best control of the codling moth.

Late Season Aphid Control

Usually more than a single treatment is necessary to control the aphid for the entire season. In many cases two applications will give satisfactory control.

With proper equipment the following dosages of insecticides per acre should result in satisfactory control:

25% wettable parathion.....one pound
TEPP, 40% .....¾ to one pint
14% nicotine dry
concentrate .... seven to nine pounds

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Best control has been obtained with parathion. This insecticide at comparative dosages has shown the most latitude both in regards to equipment and weather conditions. However, it should not be applied later than three weeks before harvest.

Tetraethyl pyrophosphate can be effectively used but its limitations are greater than those of parathion.

In experimental work EPN 300 gave better control than parathion but the comparison is not fair because it was used at a dosage four times greater.

Benzene hexachloride has resulted in excellent aphid control, but its use is limited to applications in the codling moth spray. If more than one application is made during a year, or it is used later in the season, there is danger of its imparting an off flavor to the harvested nuts. Also, the investigations during 1951 revealed that unsatisfactory control is likely to result if it is applied under windy conditions.

Nicotine—once the most important aphicide in the walnut aphid control program—is satisfactory only where applied under ideal conditions and with suitable equipment.

Complete Kill Desirable

Equipment—conventional sprayer, air carrier type sprayer, airplane, ground duster or smoke machine—should be in good repair and have sufficient capacity to insure thorough coverage. When used at the proper dosage the newer insecticides—such as parathion, TEPP, and benzene hexachloride—should result in a kill of aphids so complete that following treatments no live aphids can be found. These insecticides are very destructive to natural enemies, and in the absence of them the aphid population doubles about every three days. At this rate of increase a population averaging only one aphid per leaflet will increase to 32 in 15 days. Where control approaches eradication a long period of protection can be expected, and when the aphid does start to increase their natural enemies have had sufficient time to re-establish themselves in the orchard. Even under these conditions, the aphid population—if no further treatment is applied—might rise to a destructive level but it is almost certain to be checked by natural enemies before the trees drip with honeydew. Any damage which might occur would be much less than where the initial aphid control was unsatisfactory.

Frequent treatments for aphid control are undesirable because they are expensive and have an adverse action upon the natural balance, affecting aphids and other pests such as mites and scales.

Control of Walnut Aphid Where Aphicides Were Combined with Various Experimental Codling Moth Sprays, Applied May 11 to 14, with an Air Carrier Type Sprayer

Treatment composition per 500 gallons of water*	Approx. number of gallons applied per acre	Average number of aphids per leaflet					
		May 11†	May 18	May 28	June 7	June 22	June 30
Nicotine, 18 pounds; DDT, 20 pounds; DDT depositor, 3 pounds; Oil, 3 gallons	200	7.22	0.08	0.02	0.32	14.06	40.02
Nicotine, 18 pounds; DDT, 20 pounds; Liquid depositor, 1 pint	200	8.00	0.06	0.12	0.78	11.28	31.14
Nicotine, 9 pounds; DDT, 10 pounds; DDT depositor, 3 pounds; Oil, 3 gallons	400	9.58	0.00	0.04	0.42	9.50	16.96
Nicotine, 9 pounds; DDT, 10 pounds; Liquid depositor, 1 pint	400	7.84	0.26	0.32	1.84	21.18	48.00
BHC, 9 pounds; Standard lead arsenate, 30 pounds; Safener, 5 pounds; DDT, 5 pounds; DDT depositor, 3 pounds; Oil, 3 gallons	400	7.66	0.00	0.00	0.10	7.00	25.10
Parathion, 2½ pounds; DDT, 20 pounds; DDT depositor, 3 pounds; Oil, 3 gallons	200	6.84	0.00	0.00	0.00	0.14	2.72
Parathion, 2½ pounds; DDT, 20 pounds; Liquid depositor, 1 pint	200	3.22	0.00	0.00	0.00	0.42	6.32
Parathion, 1¼ pounds; DDT, 10 pounds; DDT depositor, 3 pounds; Oil, 3 gallons	400	4.72	0.00	0.00	0.00	0.14	3.80

* Ingredients expressed as: DDT, 50 per cent wettable powder; nicotine, 14 per cent dry nicotine concentrate; Parathion, 25 per cent wettable powder; BHC, benzene hexachloride 6 per cent gamma isomer; Oil, light summer oil emulsion containing 80 per cent oil.

† Pretreatment counts.

Migrating Aphids

Migration of winged aphids from heavily infested orchards can be of considerable portions. In experimental plots at Linden the aphid population increased much more rapidly in the outside five rows, which were located across the road from a heavily infested orchard, than it did in the 10th to 15th rows from the orchard. The influx of migrating aphids greatly reduced the effective period of control.

It is questionable whether an increase in the aphid population in late summer is likely to result in much damage. During the past year large populations were encountered about the middle of September and later. These did not appear to be causing much damage or to be producing quantities of honeydew. If these observations are substantiated by further studies it might be desirable not to treat for aphids in late season. If treatment is avoided the aphid may go into winter in better balance with its natural enemies. However, even if treatment is necessary, the aphid population should be kept in check until well into September.

All insecticides in the walnut aphid control program should be used with great caution. Particularly with parathion and TEPP the safety precautions given on the labels should be followed rigidly. Before making applications with parathion a grower should obtain a permit from his county agricultural commissioner.

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