Walnut Pest Studies, 1950

conventional and air carrier sprayers compared in codling moth and aphid control for northern California

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Efficiency of the codling moth and aphid control program depends to some extent on the type of sprayer used.

Applied with conventional spray rigs the codling moth spray can be made more effective by the addition of one half pound of 50% wettable DDT powder to the regular three pounds of standard lead arsenate per 100 gallons of water.

Applied with an air carrier type sprayer satisfactory control of the codling moth resulted only when DDT was used.

The addition of aphicides to the early codling moth spray will insure adequate aphid control up to a period of two months, but after that further control measures may be necessary.

Conventional Sprayers

The conventional sprayers used in the studies had 25-foot towers and were equipped for automatic spraying. The spray was applied at a pressure of 600 pounds, and each tree was circled. The trees were large, and approximately 55 to 60 gallons of spray were applied per tree.

Excellent control of the codling moth was obtained with a single application containing one half pound of 50% DDT wettable powder, and three pounds of standard lead arsenate per 100 gallons of spray.

Reduction of the standard lead arsenate from three to two or 1½ pounds did not greatly reduce the degree of control.

The DDT-standard lead arsenate treatments proved to be more effective than one in which one pound of 50% DDT wettable powder was used without the lead arsenate.

The poorest control resulted with a regular standard lead arsenate spray alone.

The grower can choose one of several aphicides which can be incorporated in the codling moth spray. The ones showing considerable promise have been 14% nicotine dry concentrate; 25% wettable parathion; benzene hexachloride containing 6% gamma isomer; 25% wettable lindane; and tetraethyl pyrophosphate.

Applied with conventional sprayers, all the aphicides resulted in good initial kill, but varied widely in the length of time for which they held the aphids in check.

All aphicides controlled the pest for at least one month. The aphid population re-established itself most rapidly where 14% nicotine dry concentrate was used. The increase in the aphid population was next most rapid where tetraethyl pyrophosphate was used. Excellent control resulted from parathion, benzene hexachloride, and lindane.

After nearly two months of excellent control where benzene hexachloride was used with standard lead arsenate alone, the aphid population increased at a rather rapid rate. This confirmed previous findings that aphicides apparently are more effective when used in combination with DDT than with standard lead arsenate alone.

Air Carrier Sprayers

The machine used in the investigation was equipped with a volute and had an air capacity of 43,000 cubic feet per minute.

Codling moth control studies at Linden compared the effectiveness of DDT programs with DDT-standard lead arsenate combinations.

Where air carrier sprayers were used best control was obtained with the DDT sprays, particularly those using 10 pounds of 50% wettable powder per 500 gallons of water at approximately 20 gallons per tree. Where the amount of DDT was reduced from 10 to five pounds, and combined with 30 pounds of standard lead arsenate in 500 gallons of spray, control was relatively poor. Where DDT 50% wettable powder was used at the rate of 20 pounds to 500 gallons of spray and applied at approximately 11 gallons per tree, the control was similar to that obtained with a 10-pound dosage applied at about 20 gallons per tree.

Commercial applications with an air carrier sprayer at San Jose brought relatively the same results as the experiments at Linden. Best codling moth control was achieved in applications in which DDT was used without lead arsenate at 7½ to eight pounds of 50% wettable powder per acre.

An aphicide was included in the air carrier spray application of the codling moth spray in seven blocks of 40 trees each. To six of these treatments 14% nicotine dry concentrate was added, one block received benzene hexachloride.

All treatments resulted in excellent control. After a period of nearly two months the aphid population in some of the treatments averaged only 0.5 aphid per leaflet, and in the poorest the average was five.

From the standpoint of control alone there was little to choose between the nicotine and the benzene hexachloride. On a cost of material basis the benzene hexachloride is the cheapest, but it must be used with discretion as there is a danger of its imparting an off-flavor to the harvested walnuts.

Late Season Aphid Control

Experiments were made on late season aphid control since the addition of an aphicide to the early codling moth spray does not provide lasting control. Eight weeks of control is about the best to be expected.

An air carrier type sprayer was used for these later treatments, having an air capacity of 30,000 cubic feet per minute. It was used on June 14 to apply parathion, tetraethyl pyrophosphate and nicotine dry concentrate.

The parathion treatment resulted in excellent control and even as late as August 21 the number of aphids per leaflet averaged slightly less than one. Parathion also offered more latitude in application than nicotine concentrate and tetraethyl pyrophosphate. For example, satisfactory control with the 30,000 cubic foot air carrier was insured with parathion where only 50 gallons of water were used per acre; with the other materials 88 gallons of water were needed.

Recommendations

Where the conventional rig is used for codling moth and aphid control in areas of considerable codling moth infestation, the best mixture probably is:

Standard lead arsenate	3 pounds
DDT, 50% wettable powder	½ pound
Safener—a commercial basic zinc sulfate product containing 50% zinc expressed as metallic	½ pound
25% wettable parathion powder	2⅔ ounces
or	
Benzene hexachloride (6% gamma isomer)	1 pound
Light summer oil emulsion containing 80% oil	⅓ gallon
Water	100 gallons

Continued on page 14

WALNUT

Continued from page 4

The dry ingredients should be slurried, and added to the spray tank—with agitator going—when the tank is one third to one half filled with water. The oil should be added when the tank is three fourths or more full. This treatment does not appear to cause an increase in orchard mites over that which occurs where no DDT is used.

In areas where the codling moth has not presented a serious problem, the DDT wettable powder can be omitted from the spray. A single, thorough application of the spray mixture should result in adequate control of the codling moth, if applied before the first brood of larvae begins to enter the developing walnuts. This is just before, or about the time, the average diameter of the nuts reaches one half inch, and in the Linden area this is usually about the first week in May.

The aphicide to use in combination with the codling moth spray applied by a conventional sprayer would be one of the following: 2⅔ ounces of 25% parathion; one half pound of 25% lindane; one pound of benzene hexachloride containing 6% gamma isomer; one pound of 14% nicotine dry concentrate; or ⅛ pint of 40% tetraethyl pyrophosphate in 100 gallons of water.

Under no conditions should benzene hexachloride be applied later than in the early codling moth spray and then never at higher rates than the above amount. There is some danger of off-flavor to the nuts.

When application is made by air carrier sprayer satisfactory results in codling moth control may be obtained with 50% DDT wettable powder at the rate of two pounds per 100 gallons of spray.

Regardless of the number of trees per acre, the dosage—in terms of the amount of 50% wettable DDT powder—should be 7½–8 pounds per acre.

Although 1950 investigations showed that a liquid depositor could be substituted for the oil and dry DDT depositor, the later is recommended pending further studies with the liquid depositor. It appears that the following mixture is the best to use for codling moth and aphid based upon investigations to the present time:

50% DDT wettable powder	**10 pounds**
DDT depositor	**3 pounds**
14% nicotine dry concentrate	**9 pounds**
or	
25% wettable parathion	**1¼ pounds**
or	
Benzene hexachloride (6% gamma isomer)	**9 pounds**
Light medium summer oil emulsion	**3 gallons**
Water	**500 gallons**

To insure the proper rate of application, the optimum number and kind of nozzles and the rate of speed to travel for the spray rig in use, should be known.

Where these concentrations are used approximately 400 gallons of dilute spray should be applied per acre.

To gain satisfactory aphid control with such insecticides as parathion and tetraethyl pyrophosphate, it is necessary to obtain exceptionally good kills. This means that the aphid population should be reduced to such a low level that it is nearly impossible to find any live individuals following treatment. Insecticides also destroy the natural enemies of the aphids, and if many aphids escape treatment they will soon increase to a destructive level.

To avoid any possibility of aiding in the selection of a resistant strain of aphid it will probably be a desirable practice to alternate two different insecticides in the aphid control program. For example, parathion might be used in one treatment and nicotine dry concentrate in the next.

Insecticides used for the control of walnut insects are poisonous, and care should be taken in handling and applying them. Particular caution should be used with parathion, and tetraethyl pyrophosphate. Precautions as given by the manufacturer should be observed.

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ECONOMICS

Continued from page 6

of orange and lemon demand, of almonds, of canned cling peaches, canned asparagus, canned apricots, and canned pears are being used in this way.

Various statistical data are compiled which are necessary to chart trends in production, shipments, uses, and prices of many commercial crops produced in California.

A comprehensive set of index numbers on major aspects of the state's agriculture is being kept up to date. These index numbers measure—for the state as a whole—changes in production, shipment, and prices of major commodity groups.

Another example of the compilations necessary, are the statistics on temperatures and related factors being compiled in connection with a study on the development of frost insurance for crops such as citrus.

The current situation and outlook for many agricultural commodities are evaluated. Examples include commodity studies on apples, asparagus, avocados, dried beans, eggs, grapes, lettuce, milk and milk products, olives, peaches, pears, plums, tomatoes, walnuts, sheep and wool.

Situation and outlook bulletins on lemons and oranges are in preparation. Also a detailed economic analysis is being made of the complicated interrelations existing among the grape industries including wine, raisins, and fresh shipping grapes.

To evaluate the situation and outlook for a crop, it is necessary to have an adequate picture of the national situation, and even the international situation for some crops. Trends in items such as national income, industrial production, employment, and the general price level must be recognized.

National agricultural policy on production, price supports, and marketing agreements affects California agriculture. The state also has its own legislation on marketing agreements and orders. These types of governmental influences are major aspects of some of the agricultural industries in this state.

Adequate emphasis on these—and other—factors is a necessary part of the research by the Division of Agricultural Economics to provide useful information for the state's agricultural industries.

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PREDICTION

Continued from page 3

Six weeks after full bloom the heat units for that period are calculated, placed in the formula, and the prediction made.

Two mathematical formulae are used. The first determines how close the relationship of heat accumulated for the first six weeks after full bloom is to the period between full bloom and harvest time. If a high correlation exists, it may be assumed that the prediction of harvest time halfway through the season may be good to excellent.

The second formula predicts the number of days between full bloom and harvest time. In calculating the harvest time of Blenheim apricots at Brentwood in 1950 the computation gave a figure of 103 for the predicted number of days between full bloom and harvest. Since full bloom occurred February 27, harvest was predicted for June 9. Actual harvest began June 8.

The method has been applied to similar data for Bartlett pears and French prunes with good results.

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