Codling Moth at Linden in 1953

successful control sprays applied in experimental orchard in season of serious infestation at Linden

A. E. Michelbacher and Earl Oatman

An outbreak of the codling moth on walnuts in 1953—the most destructive infestation since 1948—was successfully controlled with a single treatment in the experimental orchard at Linden, whether the sprays were applied with a conventional or with an air carrier sprayer.

In extensive codling moth control experiments at Linden, sprays were applied to Payne walnuts that numbered 18 trees to the acre. All treatments were replicated from two to 10 times.

The sprays were applied from May 6 through May 11. The average cross sectional diameter of the nuts ranged from 3/8" to 1/2", and the treatments were applied just prior to the time that the first-brood caterpillars began entering the nuts.

Conventional Sprayer

Using the conventional sprayer, two treatments were compared. The sprayer had a 25' tower and was equipped for automatic spraying. The trees were circled and approximately 1,000 gallons of spray were applied per acre. The treatments were:

1. Standard lead arsenate... 6 pounds
   Safener .....1.5 pounds
   DDT 50% wettable powder .....1.5 pounds
   Parathion 25% wettable powder .....0.5 pound
   Light summer oil emulsion ..... 1 gallon
   Water .....300 gallons
2. DDT 50% wettable powder .....2.25 pounds
   Parathion 25% wettable powder .....0.5 pound
   Light summer oil ..... 1 gallon
   Water .....300 gallons

Better control was obtained with the straight DDT spray than with the DDT-standard lead arsenate mixture. The results clearly indicated that an increase of 2½ pounds of DDT, 50% wettable powder, per acre more than made up for 20 pounds of standard lead arsenate. These results substantiate experimental trends of previous years.

The 7½ pounds dosage of DDT, 50% wettable powder, in no way increased the frosted scale, walnut aphid or spider mite population more than when the standard lead arsenate-DDT mixture was used. In both treatments, the walnut aphid was checked by adding parathion to the sprays, and in neither case did a frosted scale or spider mite problem develop.

Air Carrier Sprayer

The air carrier sprayer used was equipped with a volute and had an air capacity of at least 43,000 cubic feet per minute. All applications were made at the rate of approximately 200 gallons per acre, and two dosages of DDT were compared. In one series, approximately eight pounds of DDT, 50% wettable powder, were applied per acre in combination with different aphicides. In the second series, DDT, 25% wettable powder, combined with 3% parathion, was used at the approximate rate of 12 pounds per acre. In the first case, about four pounds of actual DDT were applied, while in the latter, roughly three pounds were used.

The compositions of the two spray mixtures per 500 gallons of water were:

1. DDT, 50% wettable powder ..... 20 pounds
   DDT Depositor ..... 2 pounds
   Parathion, 25% wettable powder .....2.5 pounds
   or
   Liquid Parathion (4 pounds per gallon) .... 20 ounces
   or
   EPN 300, 25% wettable powder .....7.5 pounds
   or
   Malathion, 25% wettable powder .....7.5 pounds
   or
   Nicotine, 14% dry concentrate ..... 18 pounds
   or
   Demeton—several dosages
   or
   OMPA .....7.5 pounds
   Light summer oil emulsion ..... 3 gallons
2. DDT, 25% wettable powder, combined with 3% parathion .....30 pounds
   DDT, Depositor ..... 2 pounds
   Light summer oil emulsion ..... 3 gallons

Per Cent of Infested Walnuts in the Harvested Crop in Experimental Plots at Linden, California.

Treatment Amount of insecticide applied per acre	% infested nuts
Check	
No codling moth treatment.....	2.20
Conventional Sprayer	
Standard lead arsenate, 20 lbs. + 50% DDT, wettable powder 5 lbs. in 1,000 gallons of water....	0.26
50% DDT, wettable powder, 7½ lbs. in 1,000 gallons of water.	0.06
Air Carrier Sprayer	
50% DDT, wettable powder, 8 lbs. in 200 gallons of water.....	0.28
25% DDT, wettable powder, 12 lbs. in 200 gallons of water..	0.25

The infestation in each case was only about one fourth of 1%, and the three-pound dosage of actual DDT resulted in as good control as did the four-pound dosage. This is in substantiation of some previous investigations where three pounds equaled a four-pound dosage. However, the control fell off rapidly as the amount of DDT was reduced below three pounds.

Community Action

Codling moth control could be simplified if all growers in an area applied effective sprays. This was well illustrated at Linden where approximately 150 acres were under experimentation. Effective treatments were applied to all but 40 trees, which were left unsprayed except for an aphid treatment to serve as check trees. The check trees were well protected from surrounding orchards by sprayed plots. Yet in spite of a general raise in the codling moth population throughout the area, the infestation in the harvested crop in the check trees was only 2.2%.

There was some migration of the codling moth into the experimental orchards but this was largely confined to the edge. For example, the average per cent of infested nuts in the harvested crop in the marginal plots was 0.69% as compared with 0.28%, the average figure for the inner plots.

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Biological Control of Fig Scale

from 67% to 100% of scale on twigs sampled in 1954 at colonization sites was found to be parasitized

Richard L. Doutt

Two small colonies of *Aphytis* "C," a wasp parasite of the fig scale—*Lepidosaphes ficus* (Signoret)—released in the San Joaquin Valley, one at Merced and the other near Fresno, demonstrated what is almost an axiom in biological control work: if a parasite is destined to succeed, it will take hold immediately after an adequate release on susceptible hosts.

Aphytis "C" was first colonized on March 10, 1949, and eight days later—March 18—after an unfavorable period of wind and heavy rains, the wasps were observed to be active on scale-infested fig trees. Dissections of hosts at that time showed that the fig scale had been attacked and that *Aphytis* "C" had deposited eggs.

One month after colonization, the adult progeny of the introduced stock was abundant at the release sites and could be easily observed as they searched the trees for suitable hosts.

During the summer months, the leaf and fruit forms of the fig scale did not appear to be attacked by *Aphytis* "C." However, the parasites did manage to survive in small numbers until late fall and then began to increase slowly on the overwintering population of fig scales.

Although the greatest activity of the *Aphytis* "C" seems to be restricted to the scales on the twigs, the parasite through a steady process of attrition has been able to reduce the fig scale populations. For example, in a colony of parasites released at a new site in December 1950, samples taken during the spring of 1951 consisted of 296 scales, of which 21.2% were attacked by *Aphytis* "C." A similar twig sample from the same site in 1954 contained a total of only 25 fig scales, of which 96% were parasitized.

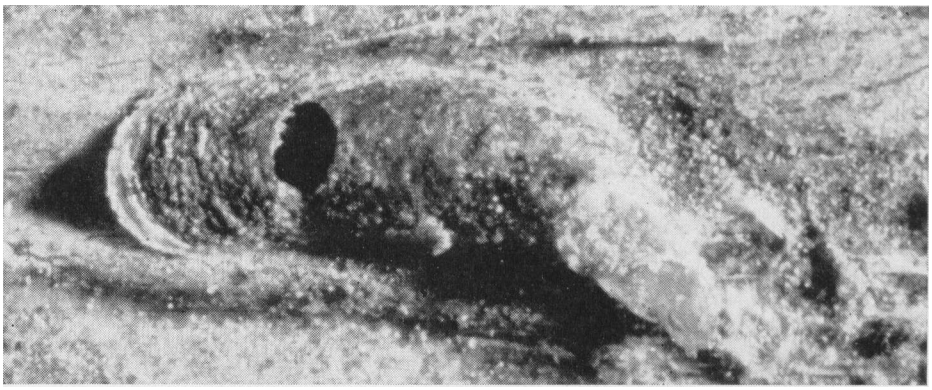

Fig scale which has been attacked and killed by *Aphytis* "C." The hole is cut by the wasp when emerging from the scale. Greatly magnified.

The first attempts in California to establish imported natural enemies of the fig scale were made in 1940 when small lots of an internal parasite—*Physcus testaceous* Masi—from Italy were liberated at Clovis. No recoveries of this parasite were made, and subsequent efforts to establish it were unsuccessfully repeated from 1948 to 1953. Several additional species of imported beneficial insects—including two species from China, *Aspidiotiphagus* sp. and *Telsimia* sp., and two African coccinellids, *Chilocorus wahlbergi* Mulsant, and *Lotis nigerrima* Casey—were colonized on fig scale during 1948 and 1949. As in the case of the *Physcus*, none of these species have been recovered.

In 1949, a species of *Aphytis* was bred from *Lepidosaphes conchiformis* (Gmel.) infesting a shipment of elm twigs from France. This *Aphytis* resembles the cosmopolitan species *mytilaspidis* (LeBaron), but as differences were suspected, it was designated as *Aphytis* "C."

The establishment of *Aphytis* "C" on the fig scale in California is viewed as an important and valuable adjunct to the fig industry's efforts in suppressing this pest, because samples collected in 1954—at other colonization sites—yielded parasitism records ranging from 67% to 100%.

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The attempts to establish the parasite Physcus testaceous *Masi in California in 1940 were conducted by S. E. Flanders, Professor of Biological Control, University of California, Riverside.*

CODLING MOTH

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For most efficient control, treatments should be thoroughly applied—under favorable weather conditions—just before the first brood of caterpillars begins to enter the developing nuts.

Although the spray date varies from year to year and from area to area, the treatment will be properly timed if it is applied when the average cross sectional diameter of developing Payne walnuts measures from 3/8" to 1/2". This timing does not hold for Franquetts. Information in regard to Franquetts is not complete, but where destructive infestations have occurred, it is believed that best control will result when a single spray is applied between June 15 and 20.

When effective equipment is available and treatments are thoroughly applied and correctly timed, a single spray should give adequate control of the codling moth for the season. When these conditions can not be met or when an orchard has suffered serious infestation during the previous season, a second application might be desirable. The second treatment should be applied between the 15 and 25 of June, which is prior to the time that the second-brood caterpillars make their appearance.

The important factor in codling moth control—as far as the dosage of DDT is concerned—is the application of approximately eight pounds of DDT, 50% wettable powder, per acre.

Insecticides used in the control of walnut insects are poisonous and care must be exercised in handling and applying them. Particular caution should be exercised with parathion, and directions given on the containers should be followed exactly.

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