# Codling Moth on Apricots

## field investigations of problem started in 1948 are to be continued during current season

Arthur D. Borden and Harold F. Madsen

**Many apricot orchards** in the Santa Clara Valley have been severely attacked by the codling moth for a number of years. The losses in wormy fruit at harvest have frequently been as high as 30% to 50% of the crop. The attempts of some growers at control were usually unsatisfactory and at their request the Division of Entomology and Parasitology at Berkeley started a field investigation of the problem in the spring of 1948.

Though the codling moth has generally shown a preference to apples and pears it occasionally does attack peaches, apricots, plums, nectarines, and cherries.

Such infestations generally require a control program different from that on apple and pear due to the early ripening of the fruit and the possibility of having a spray residue problem on fruit that is not washed thoroughly enough to remove spray residue before packing or processing.

Though stone fruits are regularly sprayed in the jacket period with arsenicals or DDT for the control of peach twig borer, no subsequent sprays of these materials are usually applied. Such applications, if applied late, are apt to cause a spray residue problem.

The 1948 experimental plot was located in an orchard of large apricot trees, the fruit of which had shown close to 50% wormy fruit the previous season. Each treatment was applied to 10 trees randomized within the experimental plot. Both applications were made with the conventional type of ground equipment using 400 pounds pressure at the pump and short orchard guns. The average gallonage applied per tree was 9.5 gallons.

| Materials tested | Dosage per 100 gallons | Number of applications | Wormy fruit |
|---|---|---|---|
| 50% wettable DDT | 1½ lbs. | 2 | 2.6% |
| 50% wettable DDT | 1½ lbs. | 1(*) | 2.8% |
| 50% wettable DDD | 2 lbs. | 2 | 2.0% |
| 15% wettable Parathion | 3 lbs. | 2 | 4.0% |
| Basic lead arsenate | 4 lbs. | 2 | 8.0% |
| Unsprayed orchard adjoining | ..... | ..... | 34.0% |

(*) Sprayed May 6th. All other applications were made on April 1 and May 6.

### Applications

The first application was made April 1st when the young fruit was in the jacket period and the second application was made May 6th when most of the fruit was out of the jackets and showed considerable growth. There was no apparent spray injury to the fruit or foliage excepting minor injury to the young tender foliage following the first application of parathion. This injury to the foliage did not occur in the second parathion application.

The materials tested, the dosages employed and the percentage of wormy fruit at harvest from each of the treatments are shown in the table in the first column.

The remainder of the orchard was sprayed by a commercial sprayer using the conventional ground spray equipment, with 1½ pounds 50% wettable DDT per 100 gallons of spray with the applications being made April 17th and May 10th. Fruit counts at harvest—July 26th—in this sprayed area showed only 1.6% wormy fruit.

Ripened fruit was collected from all trees in each spray plot and chemical analyses were run for spray residues. The table in the column to the right gives the results of these analyses.

The spray residues of the first application show a marked reduction as the results of the heavy rains—3.83 inches rainfall—between the first and second applications. The deposits after the second application were largely reduced by weathering and growth.

The grower's first application, applied April 17th—which was less affected by the rain—probably was more effective in the early season and showed slightly better control at harvest.

### Results

The past season's fruit development was late and the spring months cool with more rain than usual. This may have affected to some extent the behavior of the codling moth in the early season, as there was very little moth activity until late in April. In another year with more codling moth activity in the early season the jacket period application might assume more importance. This early spray also controls the larvae of fruit tree leaf roller, tussock moth, and pistol case bearer.

**Spray residue deposits in parts per million**

| Materials | After 1st spray | Before 2nd spray | After 2nd spray | At harvest |
|---|---|---|---|---|
| DDT 2 app. | 84 | 2.0 | 30.5 | trace |
| 1 app. | ... | .. | 21.0 | trace |
| DDD | 113 | 2.5 | 38.5 | 3.7 |
| Parathion | 24 | 0.0 | 5.0 | 0.02 |
| Basic lead arsenate | 130 | 4.4 | 38.0 | 5.4 |

It appears that satisfactory control can be obtained either with 50% wettable DDT, 50% wettable DDD, or 15% wettable parathion in two applications when applied early in the season. It is apparent that when two wet sprays of DDT, DDD, or basic lead arsenate are applied per season, and the last application is 2½ months prior to harvest there may be a spray residue problem.

The United States Food and Drug Administration and the canning industry on March 29, 1949 made the following recommendation:

DDT may be applied in the jacket period or not later than April 15th at the rate of 1½ pounds of 50% wettable powder per 100 gallons of water; or a dosage of two pounds of 50% wettable DDD powder per 100 gallons of water may be used.

The second application to be made within 30 days of the first application may be either 50% wettable DDD at two pounds per 100 gallons of water; or 50% wettable methoxychlor at three pounds per 100 gallons of water; or 15% parathion at three pounds per 100 gallons of water. No spray application should be made within 30 days before harvest.

The Federal authorities have announced that a parathion spray applied 30 days or more before harvest should not constitute a health hazard to the consumer. This limitation on the use of parathion before harvest should be followed explicitly.

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## PLANT BREEDING

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Because most of the first backcross plants were highly sterile it was again necessary to backcross the stem rust resistant plants to common wheat to obtain progeny. Some of the second backcross plants so obtained were resistant to stem rust and most of them were partly fertile, setting a few seeds. During three additional backcrosses of stem rust resistant plants to common wheat, complete fertility was restored and plants which resembled bread wheat very closely were finally obtained.

After the last backcross to bread wheat the constitution of the resistant plants was as follows: The chromosome number of 42, or 21 pairs of chromosomes, typical of bread wheats had been restored. Of these 21 pairs, 20 pairs were essentially identical to the bread wheat parent used for the recurrent parent. The two members of the other pair of chromosomes differed in that one member of the pair, contributed at the backcross by the bread wheat parent, carried the gene for susceptibility to stem rust, and the other member included the segment of a Timopheevi chromosome which carried the genes for stem rust resistance.

Such a plant, after self pollination produced approximately three stem rust resistant plants to one susceptible plant. When progeny of the resistant plants were grown it was found that approximately one-third bred true for resistance and two-thirds retained the ratio of approximately three resistant plants to one susceptible.

The true breeding resistant rows constituted a new strain of common wheat. This new strain is completely fertile with common wheat varieties and is a source of resistance to stem rust for the practical plant breeder.

A careful genetic analysis of the new resistant selection was made. It is revealed that not one, but two genes—located very closely together upon the same chromosome—govern the stem rust resistance. In the process of crossing-over, the breaks in the chromosomes—which allow the exchange of segments to occur at random throughout the length of the chromosome—are not as likely to occur between two genes close together as between two genes farther apart. Consequently, these two genes tended to be inherited together.

Similarly, a gene which governs resistance to mildew disease was also located upon the same chromosome. Although the mildew disease did not occur during the breeding program, this gene was maintained just because it was located very close to the stem rust genes. When selection was practiced to retain stem rust resistance, the mildew gene was automatically transmitted—pulled along much as one Siamese twin must go where the other goes.

The gene or genes controlling resistance to leaf rust disease and also resistance to loose smut disease probably are located upon the same chromosome. As a result many more plants resistant to all four diseases were obtained than would have been the case had the genes concerned been located on entirely different chromosomes.

Disease resistance genes are now available to plant breeders separated from unfavorable Timopheevi genes. These disease resistance genes will be called upon to protect the wheat crop whenever need arises.

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## APRICOTS

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The possibility of applying DDT—one pound of 50% wettable powder per 100 gallons—or DDD—two pounds of a 50% wettable powder per 100 gallons—in the jacket period and followed by an application of parathion in the second application has not been tested as yet though it will be tested the coming season. It should not cause a residue problem at harvest due to the weathering, chemical decomposition and loss of spray residue deposit through growth of the fruit. Further field investigations will be carried on during the coming season to determine the timing factors under another season's conditions and to obtain additional data on the spray residue problem.

Parathion is a toxic material and must be handled accordingly. All of the precautions given on the labels for the handling of this material and for the protection of the spray operators should be carefully followed.

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## NEW PUBLICATIONS

*A copy of the publications listed here may be obtained without charge from the local office of the Farm Advisor or by addressing a request to Publications Office, College of Agriculture, University of California, Berkeley 4, California.*

*LAND DRAINAGE, 1949, by Walter W. Weir, Cir. 391, April 1949.*

*Land needs draining if drainage results either in better crops or in making arable swamps, ponds, and alkali areas.*

*ELIMINATING TILLAGE IN CITRUS SOIL MANAGEMENT, by J. C. Johnston and Wallace Sullivan, Cir. 150.*

*This circular describes the method of complete nontillage of citrus groves and gives the results in groves where tried.*

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