

# Navel Orangeworm on Walnuts

infestations in northern California orchards dependent on population overwintering in past crop's waste left in field

A. E. Michelbacher

**The navel orangeworm** infestation in the 1955 walnut crop in northern California was less than it was in 1954, but whether the downward trend will continue in 1956 is unknown.

The pest was found in only one of the experimental orchards where the 1955 insect investigations were conducted. That orchard was at Modesto where the pest caused some damage in 1954. One half of the orchard received no winter cultivation, and it was in this portion where a large population of the navel orangeworm survived the winter. The many nuts on the ground and a few left in the trees furnished excellent breeding places for the pest. These sources allowed the pest to carry over until nuts of the current season were rendered in a suitable condition to be infested.

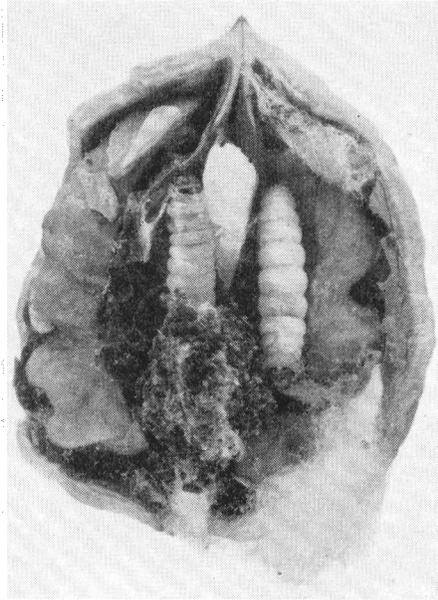
## Infestation Count

On May 5, 1955, some 300 of the walnuts were gathered. An examination of the nuts showed that 40% were or had been infested by larvae of the navel orangeworm. There was an average of 18 larvae and 23 pupae per 100 nuts. As many as four larvae or seven pupae were taken from a single nut. By June 3, the entire orchard had been cultivated, and it was found that 30% of the nuts remaining on the ground had been infested. Many of them contained empty pupal cases.

A survey conducted on June 29 showed that 34% of the nuts on the ground had been infested with the navel orangeworm. There were 24 larvae per 100 nuts. Many of the larvae were small, and as many as six caterpillars were taken from a single nut. Walnuts of the previous year's crop that were suitable as breeding sites for the navel orangeworm were becoming difficult to find. About one half of the 57 nuts gathered on July 11 were found to be infested.

## Codling Moth and Blight

A considerable number of walnuts in the orchard were infected with walnut blight and some were infested by the codling moth. A sample of walnuts infected with walnut blight and another group that was infested with the codling moth—both blighted and not blighted—were



A walnut broken open showing larvae and the nature of injury done by the navel orangeworm. Note the copious amount of webbing.

taken into the laboratory on August 1 for examination.

Navel orangeworm adults were reared from the group of codling moth infested nuts, but no adults were obtained from the blighted nuts. This established the fact that the pest can carry over in the nuts of the previous year's crop to a time when the nuts of the current season are in a condition suitable to be infested. Further, it appears that blighted nuts are not infested to any great degree, but those that have been attacked by the codling moth are subject to infestation. It also illustrates the importance of controlling the codling moth as a means of reducing the seriousness of the navel orangeworm infestation. The pests can increase in numbers on the codling moth infested nuts and their progeny can attack sound nuts when the husks begin to crack as maturity is reached. Caterpillars of the navel orangeworm cannot penetrate unblemished husks, but once the husks crack, the nuts are subject to infestation. The caterpillars crawl through the breaks and enter the nuts at the stem end.

At harvest, 0.66% of the nuts in experimental plot that received no codling moth treatment were infested with the

navel orangeworm, as compared to 0.16% in the plots where DDT was applied to control the codling moth. The navel orangeworm infestation in the entire orchard was much below that encountered in 1954. This might be explained—in part—by the fact that the codling moth infestation in 1955 was considerably less than that in the preceding year.

## No Spray Program

There is no known spray program that will directly control the navel orangeworm. Control of the pest in the field is largely dependent upon preventive measures: 1. Effective control of the codling moth where it is a pest. 2. Early harvest. 3. Good general orchard sanitation practices.

Because the navel orangeworm is a scavenger, uncontrolled infestations of the codling moth encourage attack by the pest. Nuts infested by the codling moth furnish a source of food upon which the navel orangeworm can increase. As a result, a large population of navel orangeworm moths may be present to attack the crop as it reaches maturity and the husks begin to crack.

Early harvest is important because the navel orangeworm cannot enter sound nuts until the husks begin to crack. The longer the nuts are left on the trees or on the ground, the greater the hazard of infestation because the navel orangeworm population expands as the season advances.

Sanitary practices that will tend to break the food chain that carries the navel orangeworm from one crop to another should be followed. The nuts and stick-tights on the trees and the crop residue on the ground should be collected and destroyed—either by cultivation or burning—before midspring. Culls and other waste that accumulate about hullers, dehydrators, barns, and other buildings should be destroyed well in advance of the growing season.

Whenever the harvested crop is suspected of being infested with the navel orangeworm, it should be fumigated as soon as possible.

A. E. Michelbacher is Associate Professor of Entomology, University of California, Berkeley.