Orange Tortrix on Avocados

pest becoming of increasing economic importance on certain varieties of avocado in some orchards in the coastal areas

Walter Ebeling and Roy J. Pence

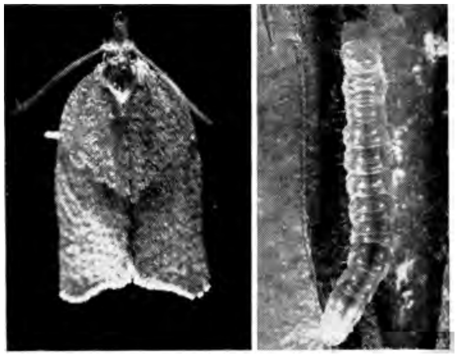
The orange tortrix—*Argyrotaenia citrana* (Fernald)—was discovered to be doing a limited amount of damage to avocados in 1949, although it was known to be in California—primarily on citrus—as early as 1885.

Since 1949, the orange tortrix has gradually increased its depredations on avocado until it may now cause important damage to the crop of some varieties in the coastal areas.

The most important type of orange tortrix injury to avocado is caused by the larvae feeding on the fruit, which results in cullage or reduced grade. The feeding may scar a limited area at the stem end of a fruit—usually accompanied by deep circular holes—or there may be the more frequently occurring extensive scarring of the side of a fruit, with only an occasional deep hole. However, the larvae cause damage to the trees also, by feeding on the bark of green twigs, sometimes girdling them; on terminal buds and foliage, after webbing the leaves together; at the bases of the terminal clusters of twigs, causing a typical rat-tailing; and under the tape of newly budded trees, destroying the inserted buds. The smallest larvae may feed inside the flowers or farther down on the stems.

The orange tortrix is one of a family of moths known primarily as leaf rollers because of their habit of rolling leaves and webbing them together, and then feeding inside of the protective roll. However, they will feed in other sheltered areas, such as under nests of debris built by the larvae, or where two fruits or a fruit and a leaf come together. Other

The rat-tailing of terminal twiglets caused by orange tortrix larvae feeding at their bases.



The orange tortrix. Left—adult moth; right—larva revealed by removing the tape from a bud graft.

examples of leaf rollers are the amorbia—another pest of avocado—the fruit tree leaf roller, the cherry tree tortrix, and the apple skinworm.

Injury to the sides of the avocado fruit may appear similar to that caused by the omnivorous looper and the amorbia but—because the orange tortrix larvae are smaller than those of the other worms—the channels of damaged tissue are usually narrower and more serpentine. However, like the amorbia, the orange tortrix larvae must confine their feeding to the area covered by an adjoining leaf or fruit. Where there is a leaf next to the fruit, there is a particularly large protected area over which the larvae can feed. If larvae are present in a sufficient number, the typical serpentine channels of injured tissue merge into a continuous damaged area. Then either because they have run out of peel or because they have become larger, the larvae bore directly downward and form the round, deep holes that are characteristic of orangeworm injury. The probable reason the holes are more prevalent at the stem end of the fruit is that the available area for feeding is more restricted because the nests offer less protected area than the leaves covering the side of the fruit.

The adult moths of the orange tortrix are about 0.4″ long, brownish, and usually with a chevron of a darker shade across the folded wings. When the moth is at rest the folded wings flare out a little at the tip like a bell. The moths lay their masses of pale-green or cream-colored eggs on the leaves or smooth green bark of the avocado. The egg masses may be distinguished from those of other leaf rollers by the way the eggs overlap one another—like shingles or fish scales—with a characteristic regularity.

The orange tortrix has 5–7 larval instars. When full-grown, the larvae are about one half inch long and may be straw-colored, light tan, greenish, or rather smoky-colored. Like the larvae of the amorbia and other leaf rollers, they are very active when uncovered, and will wriggle about violently and attempt to drop to the ground. There are probably about three overlapping generations a year on trees in the coastal areas.

The most serious orange tortrix infestations of avocado have been observed where the trees are large and interlacing. In such orchards, the continuously shaded environment and particularly the increased opportunity for the accumulation of debris for the construction of nests seem to be factors that accentuate the populations of orange tortrix. The same conditions are equally favorable to the destructive omnivorous looper. The damage from orange tortrix or omnivorous looper—or both—will vary as much as from 50% in large, interlacing trees to 5% or 10% in smaller or more isolated trees in the same orchard.

The Fuerte variety is particularly susceptible to attack by both the orange tortrix and the omnivorous looper but severe infestations are uncommon and, so far, have been confined to the coastal areas.

In one Fuerte orchard in Encinitas the orange tortrix was not suspected as the principal avocado worm attacking the fruit until it was found that DDT, applied for the omnivorous looper and amorbia, had little effect in decreasing the percentage of fruits injured by worms. DDT is known to be ineffective against orange tortrix. Then combined insecticide and fungicide sprays were applied on August 22, 1956. On February 13, 1957, over 2,000 fruits were examined to determine the percentage scarred by orange tortrix.

An examination of the fruits picked from seven trees in a plot not treated with insecticide showed that an average of 37.8% were infested with orange tortrix. Infested fruit ranged from 16.7% to 58.1% per tree.

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AVOCADOS

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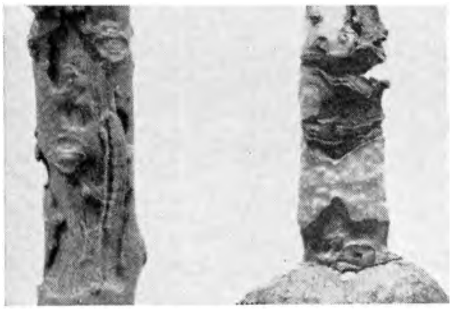
In one row of trees—approximately of the same size—six trees were sprayed for control of avocado brown mites with 50% TDE—also known as DDD—wettable powder and 15% Aramite wettable powder each at two pounds per 100 gallons. The resulting average infestation of orange tortrix was 10.6% of the fruits, with a range of 2.0% to 21.7%.



Orange tortrix injury. *Left*—girdled twig, showing larva; *right*—girdled stem of a fruit.

Cuprocide—applied for control of dothiorella rot—appeared to have no effect on the orange tortrix population. Among 80 fruits picked from the untreated part of the orchard, 41.8% had orange tortrix injuries. The degree of infestation in the treated and in the untreated plots was closely correlated with the size and density of the tree and the interlacing with adjoining trees. Untreated trees that did not interlace with others—and therefore had sunlight on all sides throughout the day, and a minimum of accumulated debris—had a smaller percentage of injured fruit than treated trees with conditions favorable to the orange tortrix. Trees next to a road, and with considerable dust on the foliage, had much heavier infestations than the trees farther from the road. Apparently the dust was favorable to the orangeworm.

In an isolated row of Fuertes—where a row of trees had been removed on either side, causing the remaining trees to be less susceptible to infestation by the orange tortrix—six trees were sprayed with 50% TDE wettable powder and 15% Aramite wettable powder, each at two pounds to 100 gallons. The percentages of tortrix-injured fruit ranged from 2.7% to 7.3%, with an average of 4.4%. On six trees in the same row sprayed with 1½ pounds of 25% parathion wettable powder and two pounds of 15% Aramite wettable powder to 100 gallons, the percentages of injured fruit ranged from 3.8% to 15.1%, with an average of 8.5%.

In these tests, parathion—Aramite suspension—and particularly TDE, were effective in substantially decreasing the percentage of fruit injured by the larvae of the orange tortrix. No avocado brown mite problem developed in the treated plots, presumably because of the addition of an effective miticide to the sprays.

In view of the usual difficulties encountered by upsetting the balance of pests and their natural enemies, all practicable means of utilizing cultural measures to combat avocado worms should be considered. Damage from these pests can be decreased to a tolerable level by removing alternate trees growing under excessively crowded conditions and keeping the remaining trees open to sunlight by a certain amount of pruning, and—particularly—by removal of dead twigs and branches. Experience has shown that in orchards in which this has been done the production per acre can be expected to return to its original level in about three years. Over a prolonged period the average production has often exceeded that of the years preceding the correction of the crowded condition. Another treatment would be to cut every other tree back to the trunk and graft it to the variety that appears to be the most desirable for local conditions.

The Fuerte is not considered to be a particularly desirable variety in coastal areas because of its unpredictable bearing habits and varieties less susceptible to avocadoworms might be considered for grafting.

In an experiment extending over a five-year period—in an avocado orchard near Santa Paula—the average populations of omnivorous loopers were found to be 49% as great on the Hass variety as on the Fuerte variety and 28% as great on the McArthur variety. Observations indicate that there is a similar difference in these varieties with respect to their susceptibility to infestation by the orange tortrix.

Cultural practices such as thinning an orchard to reduce or remove conditions favorable to pests should follow technical procedures established by professional experience.

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Orange tortrix injury to avocado fruits. *Left*—injury to stem end of fruit showing typical deep holes (arrows); *right*—injury to sides of fruit, where they had been covered by foliage, with only occasionally a deep hole.

CANNING FRUIT

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In addition to tree structure and the catching frame itself, other factors must be considered. An effective method for shaking the fruit is needed. Fruit maturity is still a problem which must be resolved although little fruit was harvested that was overripe or immature. The problem of fruit size must be evaluated. The cost of mechanical harvesting is yet to be determined since a satisfactory method has not been worked out. In addition, the cannery operations may be complicated by the necessity of sorting a higher percentage of damaged fruit.

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The above progress report is based on Research Project No. 1551.