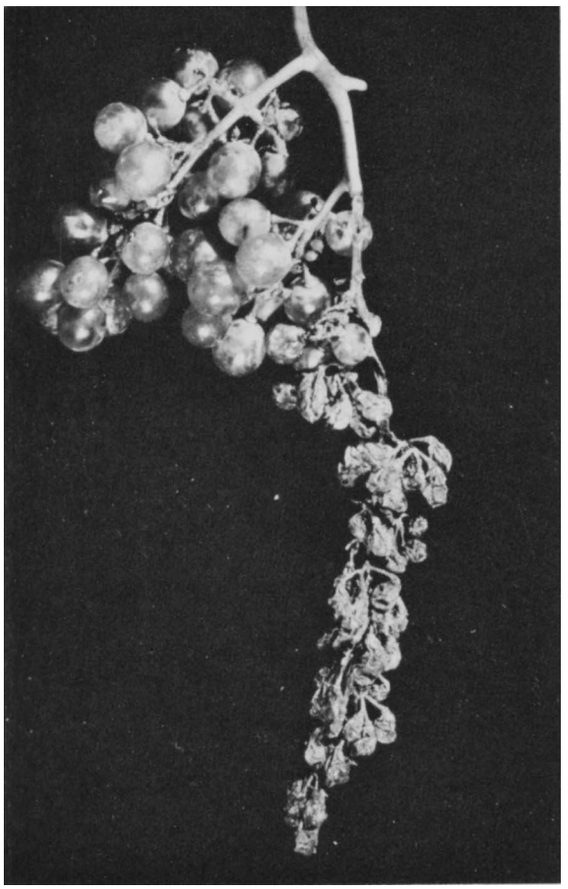

Orange tortrix damage to a grape bunch.

# ORANGE TORTRIX

## *on grapes in Salinas Valley*

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THE ORANGE TORTRIX, *Argyrotaenia citrana* (Fernald), caused considerable damage to grapes in vineyards near Soledad in the Salinas Valley during 1968 and 1969. This insect is morphologically identical to the "apple skinworm" which is a pest of several deciduous fruit trees and other plants in several northern California coastal counties. So far, it has not been found on grapes in Napa, Sonoma, or Mendocino Counties.

In addition to contaminating the grape bunches, the principal damage is caused by the larvae feeding on the berries and stems within the berry clusters. Stem feeding in the cluster causes berry drop and, in some cases, when the stem is cut or girdled, portions of the cluster below the injury are killed. Larval feeding on berry clusters may also provide an avenue for infection by spoilage microorganisms.

The orange tortrix moth can be recognized by its brownish or buff color and its "chevron" or "saddle" of a darker shade across the folded wings. When the moth is at rest, the folded wings flare out a little at the tips like the outline of a bell. The females are somewhat larger (approximately 3/8-inch long) and more robust than the males. The eggs are flat, oval, and cream colored, and they are deposited in masses where they overlap like shingles. On grapevines, the eggs are laid on smooth surfaces such as the upper leaf surfaces, on stems, canes, or berries.

When first hatched, the larvae are about 1/16-inch long. When full grown, they are usually about 1/2-inch long. The larvae are generally straw-colored, but may be greenish or dark gray.

In the Salinas Valley the orange tortrix can be found in vineyards in various stages of development at any time of the year. The larvae may be found on any part of the vine, but they tend to congregate in certain areas of the vine during the season. In early spring the larvae are found on or within the swollen buds. In early spring, the larvae feed on portions of the shoot and on the leaves, which they web together. Later, many larvae are found in the berry clusters which they web to form nests. In the summer months, grape bunches are infested by the larvae. During the dormant season, the larvae are found in the grape clusters and mummies left on the canes and on the ground after harvest. Larvae are also found in cover crops of rye and barley and in weeds, including cheeseweed, *Malva parviflora*, L., buckthorn, *Amsinckia Douglasiana* DC, curly dock, *Rumex crispus* L., filaree, *Erodium* sp., and lambs' quarters, *Chenopodium album* L.

The period of development from egg to adult stage varies with temperature, the lower the temperature, the longer the development takes. At temperatures of 58 to 78°F, other investigators have found that the average duration of the various stages are: egg, 9 days; larva, 40 days; pupa, 10 days—a total of 59 days.

The orange tortrix pupates in the last larval nest or location. The pupa often works itself to the outside of the nest before the adult moth emerges.

### Natural enemies

The orange tortrix in the vineyards around Soledad were found to be parasitized by an ichneumonid wasp, *Exochus nigripalpus subobscurus* Tow., a braconid wasp, *Apanteles aristoteliae* Vier., and a tachinid fly. Green lacewing

TABLE 1. EFFECT OF INSECTICIDES ON LARVAE AND PUPAE OF ORANGE TORTRIX ON GRAPES EXAMINED EIGHT DAYS AFTER APPLICATION, PAUL MASSON, SOLEDAD FRENCH COLOMBARD VARIETY*

| Insecticide material/ 100 gal | AI/A (lb) | Berry clusters examined | Larvae alive | Larvae dead | Pupae total | Pupae emerged† |
|---|---|---|---|---|---|---|
| | | Applied May 13‡ and examined May 21 | | | | |
| | | no. | no. | | no. | |
| St. lead arsenate, 4 lbs | 7.4 | 32 | 4 | 0 | 3 | 1 |
| Cryolite 96%, 3 lbs | 5.3 | 33 | 1 | 2 | 3 | 1 1P |
| Sevin 80W, 1.25 lbs | 1.8 | 36 | 0 | 0 | 2 | 1P |
| Methyl parathion 5E, 9.6 ozs | 0.7 | 36 | 0 | 2 | 1 | 0 |
| Parathion 4E, 1 pt | 0.9 | 37 | 0 | 1 | 4 | 0 |
| Untreated | – | 56 | 13 | 0 | 2 | 2 |
| | | Applied May 20§ and examined May 28 | | | | |
| Dibrom 8, 1/2 pt | 1.1 | 31 | 2 | 2 | 1 | 0 |
| Zolone 3E, 5 1/3 pts | 4.4 | 42 | 0 | 0 | 4 | 0 |
| Guthion 25W, 3 lbs‖ | 0.8 | 43 | 1 | 0 | 5 | 0 |
| Dylox 80W, 0.6 lb | 1.0 | 37 | 0 | 3 | 3 | 0 |
| Gardona 75W, 1.0 lb | 1.6 | 37 | 0 | 2 | 1 | 0 |
| Phosdrin 4E, 1/2 pt | 0.5 | 40 | 0 | 1 | 2 | 0 |
| Untreated | – | 34 | 2 | 0 | 2 | 2 |

* Treatments applied by hand with power sprayer on May 13 and May 20, 1970. Examination consisted of collecting infested grape clusters and counting the number of larvae and pupae present in each cluster.

† Pupae were collected and allowed to emerge. P = ichneumonid parasite emergence.

‡ Applied at the rate of 184 gpa.

§ Applied at the rate of 220 gpa.

‖ Applied at the rate of 110 gpa.

larvae have been observed feeding on the eggs and larvae. The effects of these parasites and predators on the orange tortrix population in the vineyards are not known at the present time.

### Varietal differences

Observations in 1969 and 1970 at Paul Masson and Mirassou vineyards near Soledad showed that the Pinot blanc, Pinot noir, and Pinot chardonnay varieties of grape were more heavily infested than others. The Cabernet sauvignon varietal at the Paul Masson vineyard was severely infested in 1969 but was relatively free of infestation in 1970.

It was hoped that ultraviolet insect light traps could be used to measure the orange tortrix population in the vineyard but these traps were not highly attractive to the moths. Except for the week of September 27, 1970, relatively few moths were caught in the traps. However, the traps confirmed the presence of overlapping generations of the insect. With the exception of the period following insecticide treatments of the whole vineyard, moths (though few in number) were caught continuously from the inception of the use of the traps in the vineyard.

Preliminary trials indicated that more male moths were caught in sex pheromone traps than in light traps. Male moths were caught every month since the beginning of the use of the pheromone traps in August 1970.

### Insecticide tests

Light traps were not effective for determining the timing of insecticide applications, so treatments were generally made when the larvae appeared in numbers on the vines. Because of the severity of the vineyard infestation in fall of 1969 the initial task was to find an insecticide registered for use on grapes that would control the insect.

In October 1969, infested bunches were dipped into known concentrations of insecticides in the laboratory. Of the registered materials tested, Phosdrin (mevinphos), parathion, methyl parathion, and diazinon gave good kill of larvae within the clusters. Of the unregistered materials, Dylox (trichlorfon), Furadan (carbofuran), and Lannate (methomyl) gave good kill.

Results of a small field trial (two vines per treatment) applied in the same month showed that Phosdrin (mevinphos), parathion, methyl parathion, Dibrom (naled) and Dylox (trichorfon) gave excellent kill of the larvae.

Dormant season sprays with parathion and oil, methyl parathion and oil, Furadan (carbofuran), Lannate (methomyl), and Dylox (trichlorfon) also gave good control. Sevin (carbaryl) used at the rate of 3 lbs active ingredient per acre on the treated cover crop (rye) also gave good control of larvae.

Two sprays applied to French Colombard grapes, one in May and a respray in August, resulted in low levels of infestation shown in observations made eight days after the initial application (table 1). Examinations in September, after the second application, showed that Sevin and parathion gave the best control (table 2). Results obtained from Phosdrin (mevinphos) at one-half the manufacturer's recommended dosage were not comparable with the best materials.

Further investigations are necessary to find the most effective means of controlling the orange tortrix. The presence of parasites and predators of this pest in vineyards is an encouraging sign and the effects of these insects should also be evaluated.

Differences in the severity of the infestations at various vineyards located near Soledad have been observed. The infestation at the Paul Masson vineyard was greater than that at the Mission vineyard of Mirassou, while little or no trouble with orange tortrix occurred in the Wente vineyard at Greenfield. An understanding and manipulation of some of the biological and environmental factors causing these differences may lead to the reduction of the pest population so that use of insecticides would be minimal.

TABLE 2. EFFECT OF INSECTICIDES ON LARVAE AND PUPAE OF ORANGE TORTRIX ON GRAPES EXAMINED 3 WEEKS, AND 4 MONTHS, AFTER APPLICATION PAUL MASSON, SOLEDAD, FRENCH COLOMBARD VARIETY

| Insecticide material/ 100 gal | Applied Date | Al/A (lb) | Grape bunches infested: clean | old infestation‡ | with live larva or pupa§ |
|---|---|---|---|---|---|
| | | | no. | no. | no. |
| St. lead arsenate, 4 lbs | May 13* | 7.4 | | | |
| Methyl parathion 5E, 9.6 ozs | Aug. 11† | 0.6 | 143 | 7 | 0 |
| Cryolite 96%, 3 lbs | May 13* | 5.3 | | | |
| Methyl parathion 5E, 9.6 ozs | Aug. 11† | 0.6 | 145 | 5 | 0 |
| Sevin 80W, 1.25 lbs | May 13* | 1.8 | | | |
| Sevin 80W, 1.25 lbs | Aug. 11† | 1.6 | 149 | 1 | 0 |
| Methyl parathion 5E, 9.6 ozs | May 13* | 0.7 | | | |
| Methyl parathion 5E, 9.6 ozs | Aug. 11† | 0.6 | 146 | 4 | 0 |
| Parathion 4E, 1 pt | May 13* | 0.9 | | | |
| Parathion 4E, 1 pt | Aug. 11† | 0.8 | 149 | 1 | 0 |
| Dibrom 8, ½ pt | May 20* | 1.1 | | | |
| Dibrom 8, ½ pt | Aug. 11† | 0.8 | 133 | 15 | 2 |
| Zolone 3E, 5⅓ pts | May 20* | 4.4 | | | |
| Zolone 3E, 5⅓ pts | Aug. 11† | 3.0 | 137 | 13 | 0 |
| Guthion 25W, 3 lbs | May 20* | 0.8 | | | |
| Guthion 2E, 1.5 pts | Aug. 11† | 0.6 | 140 | 9 | 1 |
| Dylox 80W, 0.6 lb | May 20* | 1.0 | | | |
| Dylox 80W, 0.6 lb | Aug. 11† | 0.7 | 136 | 13 | 1 |
| Gardona 75W, 1.0 lb | May 20* | 1.6 | | | |
| Gardona 75W, 1.0 lb | Aug. 11† | 1.1 | 126 | 18 | 6 |
| Phosdrin 4E, ½ pt | May 20* | 0.5 | | | |
| Phosdrin 4E, ½ pt | Aug. 11† | 0.4 | 124 | 14 | 2 |
| Methyl parathion 5E, 12.8 ozs | Aug. 11† | 0.8 | 125 | 25 | 0 |
| Untreated | – | – | 128 | 18 | 4 |

* Treatments applied by hand with power sprayer on May 13 and May 20, 1970.

† Treatments applied with Monterey County over-the-vine boom sprayer on August 11 at 150 gpa. Examination on September 21 and 22 consisted of selecting at random 5 bunches per vine on 30 vines per plot—a total of 150 bunches examined for each plot.

‡ Old infestation = bunches without live larva or pupa but with larval webbing or injury present.

§ With live larva or pupa = number of bunches with live larva or pupa regardless of the number of larvae or pupae present in the bunch.

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Orange tortrix moth, larva, and pupa on a badly damaged grape bunch.