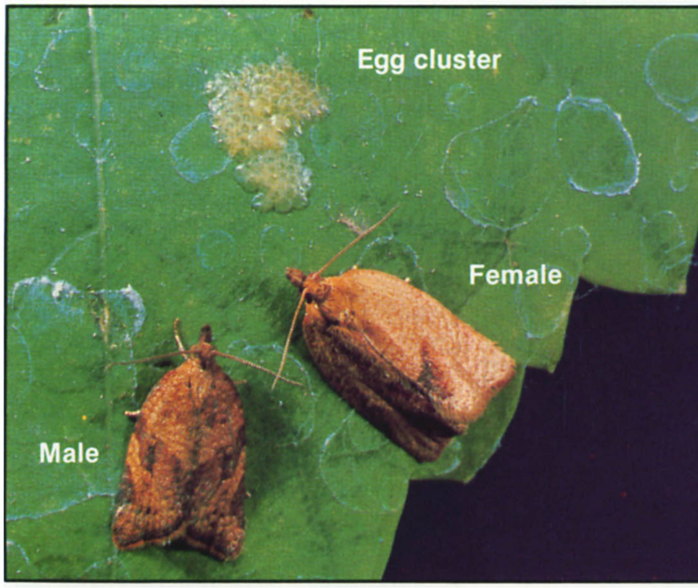

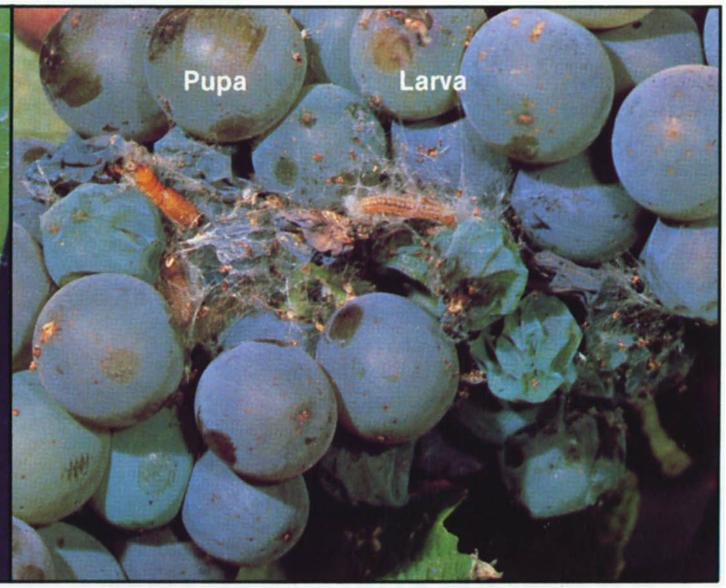

Jack Kelly Clark

Seeking the reasons for differences in orange tortrix infestations

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The orange tortrix moth, *Argyrotaenia citrana* (Fernald), has become a major pest of grapes in California's Salinas Valley during recent years. Larvae cause the primary damage by feeding in grape clusters and allowing rot-causing organisms to invade.

In 1980 we sampled orange tortrix populations on Gamay Beaujolais grapevines in two vineyards. One, near Soledad, had a history of injurious infestations and periodically had required insecticide treatments. The other, near Greenfield, had had very light infestations and no treatments, although neighboring vineyards had suffered periodic orange tortrix damage requiring treatment.

Biweekly examinations of 54 vines were conducted at both vineyards. Larval population and the location of the infestations on the vines were noted. One goal of our study was to find out why the infestations apparently differed in the two vineyards.

Seasonal development

Orange tortrix is generally found in California's coastal regions and is adapted to the cooler areas. In the laboratory, the insect needed a temperature of at least 6° C (43° F) to develop; optimal temperature was 25.6° C (78° F). Most larvae failed to develop at temperatures above 32.2° C (90° F). In contrast, the omnivorous leafroller, *Platynota stultana* Walshingham, a similarly damaging tortricid moth in the warmer Sacramento and San Joaquin valleys needs at least 8.9° C (48° F) to develop; the optimum is 30° C (86° F); and the insect develops at temperatures above 32.2° C (90° F).

Daily flight activity of the male moths monitored in the field with pheromone lures in insect traps also showed the insect's adaptation to a cooler climate. Most moths were caught during the early morning from 12:00 to 3:00 a.m., when daily temperatures were lowest (fig. 1).

Orange tortrix does not hibernate (diapause) but usually spends the winter in various larval stages in old grape clusters (mummies) on the vine or ground. Larvae are also found in vineyard weeds, such as mallow, curly dock, filaree, lupine, mustard, pigweed, and California poppy. Populations gradually

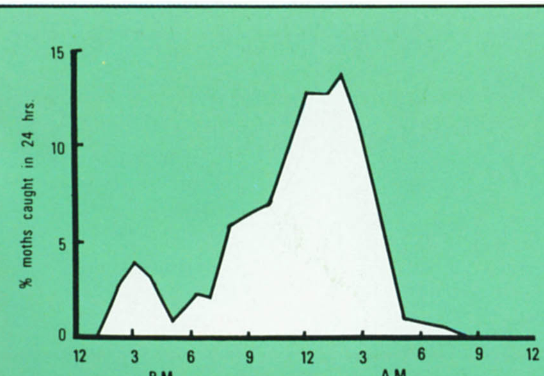


Fig. 1. Daily flight activity of male orange tortrix moths.

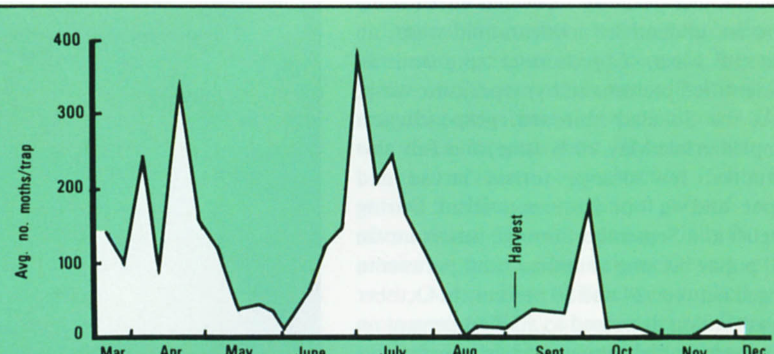


Fig. 2. Orange tortrix male moths caught in Soledad insect traps.

decline during winter, presumably because of adverse weather, insect predators and parasites, and birds feeding on clusters. In spring, larvae infest developing shoots but later are found in flower and fruit clusters.

All developmental stages are present during the year, hindering attempts to count the number of generations. However, the three peaks in flight activity of male moths indicate that there are three generations a year (fig. 2).

At Soledad in April and May, larvae were on the shoots, but as the season progressed, most were in the clusters (fig. 3). At Greenfield, infestations were considerably lower, but the same trend occurred early in the season (fig. 4). Later, however, the Greenfield infestation and larval population declined and remained very low, while infestation in Soledad increased again to high levels. Natural control was apparently more effective in the Greenfield vineyard.

Natural control

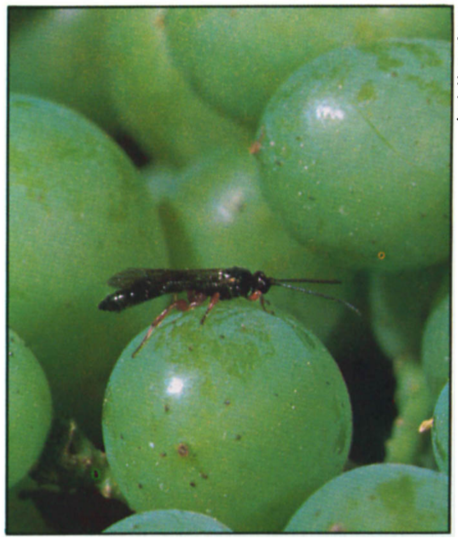
We began a survey at the Greenfield and Soledad vineyards during late spring 1980 to learn what natural enemies were attacking orange tortrix and to assess the potential for biological control.

At Greenfield, grape clusters contained few orange tortrix larvae and pupae during late May and early June. However parasitization of this low population was relatively high—73 percent. Orange tortrix levels were again low in July (fig. 4), and larval parasitization was about 65 percent. During August, September, and October we recovered almost no orange tortrix or parasites. Total parasitization for the entire sampling period from late May to October was 53.5 percent (23 of 43 orange tortrix larvae and pupae parasitized).

An ichneumonid wasp, *Exochus nigripalpus subobscurus* Walker, predominated in all Greenfield vineyard samples. A braconid wasp, *Apanteles aristoteliae* Walker, was also recovered but much less frequently than *Exochus.* Other parasites recovered infrequently were an unidentified ichneumonid wasp, an encyrtid wasp, *Copidosoma* sp., and an unidentified pteromalid hyperparasitic wasp.

At the Soledad vineyard, grape clusters sampled in late May, early June, and July also contained few orange tortrix larvae and pupae, and we found little parasitism. During August and September, orange tortrix larvae and pupae became abundant, and parasitism ranged between 24 and 30 percent. In October parasitization decreased to about 3 percent on an extremely high orange tortrix population.

The *Exochus* wasp was also the predominant parasite at Soledad, and several *Apanteles* wasps were recovered. Other parasites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Exochus wasp, parasite of orange tortrix.

were absent. Total parasitization for the entire sampling period was about 16 percent (44 of 279 orange tortrix larvae and pupae parasitized).

The relatively high parasitization levels in the Greenfield vineyard suggest that natural enemies may have been responsible for the consistently small orange tortrix infestations occurring from late May to October. Parasitization in the Soledad vineyard remained much lower, indicating that natural enemies had less impact on the orange tortrix population.

Orange tortrix infestations also occurred on coyote brush, *Baccharis pilularis* DC, a native shrub commonly found in the Salinas Valley, and growing in large numbers near the Greenfield vineyard. Larvae and pupae were easy to find on these plants during May to July. Parasites emerging from this source were *Exochus, Apanteles,* and an unidentified gregarious braconid wasp. In August, no orange tortrix larvae or pupae were found on the coyote brush.

Large numbers of another tortricid moth, *Aristoteliae argentifera* Bsk., also infested coyote brush near the Greenfield vineyard. From larvae and pupae of this moth collected during June to August, several parasitic species emerged, including wasps and flies. Two of the parasites were *Exochus* and *Apanteles.* No infestations of this tortricid moth were found on coyote brush growing near the Soledad vineyard.

Coyote brush was much less abundant near the Soledad vineyard and consisted mostly of young plants. Nine orange tortrix larvae taken in June resulted in six *Exochus* wasps, but in later examinations, no orange tortrix was found on the coyote brush.

We are expanding our investigations to determine if the coyote brush ecosystem influences natural enemy activity in adjacent vineyards.

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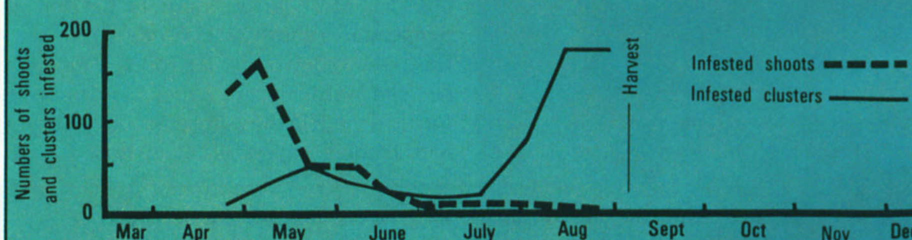

Fig. 3. Orange tortrix infestation of grape shoots and clusters on 54 vines in Soledad.

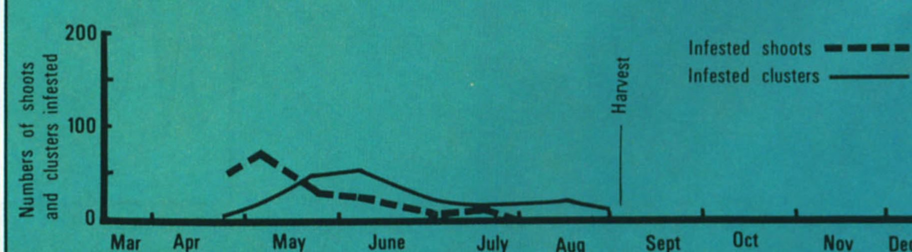

Fig. 4. Orange tortrix infestation of grape shoots and clusters on 54 vines, Greenfield.