

# Oriental Fruitfly Parasites

## biological control of damaging pest established in Hawaii diminishes threat to mainland's fruit production

Robert van den Bosch

The oriental fruitfly threat to California's fruit industry has been reduced by the successful establishment in Hawaii of natural enemies of the pest.

The accidental introduction of the oriental fruitfly—*Dacus dorsalis* Hendel—into Hawaii, and its alarming increase in abundance was a threat to the mainland—especially California—fruit production.

Biological control was one of the first measures employed by entomologists in their attack upon the fruitfly in a large-scale, co-operative program to attempt its control in Hawaii. Co-operating agencies were the Territorial Board of Agriculture and Forestry, United States Department of Agriculture Oriental Fruit Fly Investigations, Hawaiian Sugar Planters Association, Pineapple Research Institute, University of Hawaii, and the University of California.

Foreign exploration to search for natural enemies was initiated within a year after the discovery of the fly in Hawaii. The extensive search soon resulted in the release in the Hawaiian Islands of more than a dozen species of natural enemies of the fruitfly.

Today, four parasites are well established in the Islands and three of them appear to have played important roles in the biological control of the fly. There is evidence that several additional species of parasites have become established.

The four well-established oriental fruitfly parasites in Hawaii are: *Opius longi-*

*caudatus* (Ashm.), *Opius vandenboschi* Full.—formerly called *O. persulcatus* (Silv.), *Opius oophilus* Full., and *Opius incisi* Silv. Only the first three species have played important roles in the biological control of *Dacus dorsalis*; *O. incisi*, though well established, has never occurred in large numbers.

*Opius longicaudatus* and *O. vandenboschi* are parasites which oviposit in the fruitfly larvae. They were first recovered in Hawaii in the fall of 1948 with the former becoming very abundant during the next year. However, in the fall of 1949, *O. vandenboschi* suddenly increased tremendously in abundance and replaced *O. longicaudatus* as the predominant species.

### Predominant Parasite

*O. oophilus* was first recovered at a single locality on the island of Oahu in December of 1949. It proved to be a very efficient parasite and quickly spread over the island. By the summer of 1950 it exceeded the combined abundance of *O. vandenboschi* and *O. longicaudatus* on Oahu and has now become the predominant parasite throughout the Territory.

*O. oophilus* has the unique habit of ovipositing in the fruitfly egg. The parasite egg hatches at about the same time as the host egg. The larva feeds within the growing host larva and eventually kills the host when it is about to mature. The egg-loving *O. oophilus* has been respon-

sible for the destruction of enormous numbers of fly larvae during the past two years and at the present time is maintaining a very high degree of parasitization in larvae infesting a wide variety of fruits.

*O. oophilus* apparently derives its great effectiveness from its habit of stinging the highly vulnerable fruitfly eggs which are concentrated in cavities in the fruit rind. In searching for its host, the female parasite has merely to find the fruitfly egg puncture in the surface of the fruit and to thrust its ovipositor—sting—through this puncture into the cavity below. It then systematically deposits its own eggs in the fruitfly eggs. This habit enables *O. oophilus* to parasitize up to 100% of the fly larvae in individual fruits and undoubtedly has been the major factor which has enabled it to sustain a high degree of parasitization, ranging from 70% to 90% in larvae in wild guava over a period of a year and a half on Oahu.

The introduced parasites—particularly *Opius oophilus*—have played an important role in reducing the population level of the oriental fruitfly and its ravages in local fruits in Hawaii and have diminished the threat to mainland fruit production. It is anticipated that the fruitfly population density in the Islands will be maintained at a relatively low level by its natural enemies.

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### AVOCADO

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fruit has averaged 10 ounces and the seed two ounces plus. The oil content averaged 14.5% for the season. The quality is good. The season is December 15 to February. It is the most consistent producer of good crops of all the varieties under test.

The Zutano can be recommended for the home garden and may have some commercial possibilities in the inland districts.

Before commercial plantings are made, the grower should investigate market outlets.

### Haas Variety

The Haas comes from Orange County and is one of the newer varieties. The tree is large, moderately spreading, and—at Riverside—moderately frost resistant. During the winter of 1948-49 the tree suffered only slight leaf and twig damage. However, the fruit was severely damaged and about 90% of it dropped. The fruit is medium size, the skin pebbled and leathery, green colored early in season becoming black when ready to eat. The Haas avocado fruit has averaged seven ounces and the seed one ounce in weight. The oil content averaged 17% as early as April. The quality is good. The season

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The Emerald avocado.

