

## CURRENT RESEARCH ON BIOLOGICAL CONTROL OF AVOCADO INSECT AND MITE PESTS\*

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Fortunately, most of the injurious insects and mites on avocados are kept at low levels by parasites or predators. There are a few pests, however, that are not always effectively controlled by natural enemies, so that damage to the tree or fruit may result, and the use of insecticides is contemplated. Inasmuch as insecticidal treatment can upset the natural balance between various pest species and their natural enemies, it is highly desirable to bring about more effective biological control of the few pest species which may cause economic damage to avocados. Present research is being directed toward the biological control of mites and greenhouse thrips, two of the major avocado pests. The introduction of new natural enemies and the more effective utilization of the native natural enemies of these pests are the two major approaches to the problem.

### INTRODUCTION OF NEW MITE PREDATORS

Three new species of predatory mites belonging to the genus *Typhlodromus* have been imported from India and are being cultured in the Department of Biological Control Insectary. These predators were collected from citrus trees in different climatic areas, one species from Shillong in northern India, another from Bangalore in the south central part of the country, and the third from Bhubaneswar, a coastal area. They will be released in large numbers in avocado and citrus groves in southern California, with the hope that they will become established and play an important role in controlling plant-feeding mites. Various species of *Typhlodromus* mites have been observed to be effective mite predators, so it is felt that much potential exists in finding new species in other areas and attempting to establish them in California. Native *Typhlodromus* mites are found on avocados and often may be important in reducing pest mite populations, especially in the case of the six-spotted mite (2). However, a new species, with slightly different characteristics, may be more effective than the native species in certain microenvironments. This should increase the overall efficiency of the predator complex, and result in control of the pest mites under a wider range of conditions.

In order to produce large numbers of the imported *Typhlodromus* mites for field releases, special techniques must be developed for rearing them in the insectary. The

different species may vary considerably in their habits or requirements, so that a different rearing technique may be needed for each species. One of the imported predators is being reared on trays of oranges infested with plant-feeding mites, similar to the technique developed For *Stethorus* beetles by Fleschner and Scriven (3). Another of the Indian species, though feeding voraciously on mites, apparently requires some additional substance in its diet. It was found that its survival and reproductive rate improved considerably if offered an artificial diet containing honey and yeast hydrolysate, in addition to plant-feeding mites. Consequently, it becomes necessary to learn something of the nutritional requirements of these predators in order to successfully rear them in large numbers.



Fig. 1. *Frankliniopsis vespiformis* (Crawford) nymphs feeding on greenhouse thrips.

## NATURAL ENEMIES OF THE GREENHOUSE THRIPS

Arrangements are in progress to introduce new parasites of *Heliethrips haemorrhoidalis*, the greenhouse thrips. Representatives of the Commonwealth Institute of Biological Control are cooperating in searching for natural enemies of this pest in various foreign countries. The first step in the program, however, has been to conduct a survey of the natural enemies already present here, and to carry out preliminary studies on their effectiveness.

A predatory thrips, *Frankliniopsis vespiformis* (Crawford) has been collected from most greenhouse thrips-infested avocado groves. The adults are black, wasp-like in general appearance, and considerably larger than the greenhouse thrips adults. The immature stages (fig. 1) are easily identified by the bright red coloration on the abdomen. Both the

adults and nymphs feed on greenhouse thrips. They are extremely active and appear to be quite efficient in searching for their prey. Though this predator consumes large number of greenhouse thrips and may sometimes be important in reducing the population, it has not been observed in numbers large enough to control a heavy infestation. Preliminary laboratory studies indicate that *F. vespiformis* has a low reproductive capacity, which may be one explanation why it does not become more numerous in the presence of heavy infestations of greenhouse thrips.

A tiny wasp, *Megaphragma mymaripenne* Timberlake, parasitizes the eggs of the greenhouse thrips. Ebeling (1) indicated that this appears to be the most important natural enemy of the greenhouse thrips. The parasite develops within the thrips egg, which is embedded in the tissue of the leaf or fruit. The presence of a thrips egg is revealed by a minute raised area or "egg blister" on the surface. "Egg blisters" with round exit holes in the top (fig. 2) represent eggs that have been parasitized, with the adult *Megaphragma* already having emerged.

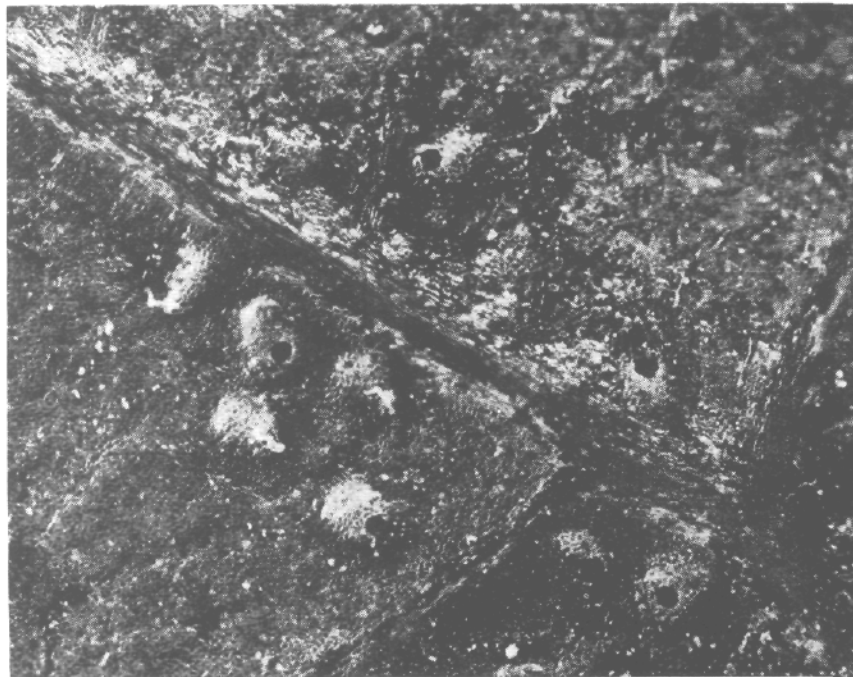


Fig. 2. "Egg blisters" of greenhouse thrips, some with exit holes through which the parasite *Megaphragma mymaripenne* Timberlake has emerged.

In recent surveys of avocado groves, *Megaphragma* has been found in Santa Barbara and San Diego counties, indicating that it is probably distributed throughout most of the coastal avocado-growing area of southern California. It appears to be quite abundant in some thrips-infested groves, but scarce or absent in others. Preliminary sampling in the Mallard grove at Vista during the fall of 1960 indicated that 22-27% of the thrips "egg blisters" contained exit holes of this parasite. On some individual leaves, as high as 75% of the eggs had been parasitized. The parasite appeared to be a significant factor in the reduction of the greenhouse thrips population in this grove.

Further study will be necessary to properly evaluate the effectiveness of *Megaphragma* in controlling the greenhouse thrips. The possibility of more effectively utilizing this parasite will also be explored.

Several general predators found in avocado orchards probably feed on greenhouse thrips under some circumstances. These include larvae of the green lacewing and brown lacewing, and several other species of predatory thrips.

#### **REFERENCES CITED**

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