

## BIOLOGICAL CONTROL RESEARCH ON THE AVOCADO BROWN MITE

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The avocado tree seems to be able to tolerate fairly high populations of avocado brown mite. Some degree of "bronzing" to the upper surfaces of the leaves probably does not adversely affect growth or yield. However, in some situations, the mite infestation becomes extremely heavy, and severe bronzing and even some leaf drop may occur. It would be desirable to prevent such heavy infestations and spraying for brown mite is sometimes considered. However, there are several disadvantages to spraying avocados that must be kept in mind: (1) Difficulty of getting efficient spray coverage due to the dense growth and uneven terrain characteristic of most orchards; (2) Lack of miticides which are registered for use on avocados; (3) Ability of spider mites to rapidly develop resistance to pesticides; and (4) Danger of upsetting the generally favorable balance between the many potential pests and their natural enemies.

A more satisfactory alternative, if feasible, is to try to reduce the heavy infestations of avocado brown mite through biological control, either by devising some means of increasing populations of the native natural enemies or by introducing new ones which might do a better job. Previous research indicated that the predaceous beetle, *Stethorus picipes* Casey, is a major factor affecting the abundance of avocado brown mite. Severe infestations were always correlated with low numbers of *Stethorus* during the period when the mites were reaching moderate numbers. If there were already substantial numbers of *Stethorus* present during this critical period, satisfactory control occurred. Therefore, it seemed possible that if additional *Stethorus* were released in the orchards early in the season when the mite populations were just starting to increase, the predators might build up fast enough to prevent heavy infestations of the brown mite. A research program is being conducted in San Diego County to determine the feasibility of releasing *Stethorus* beetles to improve the degree of control of the mite.

An initial trial was conducted in 1966. *Stethorus* beetles produced in our insectary were released on 5-6 trees in each of 4 orchards, at a rate of at least 400 adult beetles per tree. Although the experimental plots were small and there was much between-tree variation in the mite population, the data indicated that the brown mite populations were held to lower levels on the release trees.

In 1967, releases of *Stethorus* adults were made on blocks of 16 trees at the rate of 400-500 per tree in each of 3 orchards. In all three orchards, the release plots had a faster buildup of *Stethorus*, lower peak populations of mites and a lower percentage of

damaged leaves compared to check plots where no releases were made.

In 1968, the sizes of the blocks were increased, and the numbers of beetles released per tree was reduced. Adult *Stethorus* were released in 64-tree blocks at a rate of 200 per tree, in each of two orchards. In one orchard, the releases were about as effective as the previous year, when a higher number of beetles was released per tree. However, in the other orchard, the effect was not as great. This may have been the result of poor timing of the releases, which were not started until the avocado brown mite population had increased to an average of about 20 per leaf.

Thus, in three seasons of research on *Stethorus* releases, progress has been made toward the development of a program to prevent severe infestations by the avocado brown mite. The experiments have shown that although *Stethorus* releases will not hold the mites to such a low level as to prevent browning of some leaves, they can, if properly timed, prevent heavy damage and leaf drop.

There are still some major obstacles to putting such a program to practical use. Timing of the releases is critical, so that precise coordination would be required to achieve benefit from releases. It is still difficult and expensive to produce large numbers of *Stethorus*; consequently it is important to determine the minimum numbers required to achieve satisfactory results. It is planned to conduct an experiment this summer to determine the effect releasing only 50-100 beetles per tree. Work is continuing to improve the efficiency of mass-producing the beetles. Research will also be conducted on storing *Stethorus* at low temperatures. It would be relatively easy to collect large numbers of beetles in the fall, when the mite populations are declining, after which the beetles migrate or die anyway. If they could be stored until early the following year and then released, this would avoid an expensive mass-production program.

Another aspect of biological control being investigated is to obtain new species of mites which prey on avocado brown mite. Since the common native predaceous mite, *Amblyseius hibisci* (Chant), usually does not prevent the avocado brown mite from reaching high numbers, there may be possibilities of finding more effective species and establishing them in California. Searches have been made in Mexico and Central America and several new species of predaceous mites have been introduced and are presently being reared in our insectary. Small numbers were liberated in 1968, and it is planned to release several thousands of each species this season, in an attempt to obtain establishment.

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