Vinegar Fly in Tomato Fields

series of experimental tests indicates solution of control problem may be in field treatments

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DDT and dieldrin have shown the most promise in experiments to control the vinegar fly—*Drosophila melanogaster* Meig.—on tomatoes. However, field investigations with insecticides have not progressed to a point where treatment recommendations can be made.

Shortly after the middle of September, 1952, troublesome populations of the vinegar fly developed in tomato fields in the Linden area of San Joaquin County. Prior to that time flies were found in abundance in harvested peach orchards where they were breeding in rotting fruit on the ground. The delayed start in tomatoes may have been due to the late maturity of this crop or the dusting program conducted to control caterpillars attacking tomato may have had a suppressing effect upon the vinegar fly population in the fields.

A series of experiments was conducted in the Linden and Tracy areas to determine whether tomatoes in boxes could be protected against the flies.

Because none of the first four experimental treatments showed promise, a fifth test was conducted in which the concentration of the materials used was increased to at least twice the concentration applied in any of the preceding experiments.

All the treatments in the fifth test were replicated twice and were applied by hand to plots of 0.2 acre on November 4, 1952.

The treatments and the approximate amounts of insecticides applied per acre are given below:

1. Check—untreated
2. 10% DDT dust 30 pounds
3. DDT emulsion spray 3 pounds actual DDT
4. DDT emulsion spray 3 pounds actual DDT, plus malathon wettable powder, 1 pound actual
5. Dieldrin, emulsion spray, 1 pound actual
6. Dieldrin emulsion spray, 1 pound actual; malathon wettable powder, 1 pound actual
7. Malathon wettable powder, 1 pound actual

Relative populations were determined by using slit tomatoes and counting the eggs deposited on the fleshy portion of the fruits. Each count was based on 10 tomatoes, five from each replicate.

Of these treatments the 10% DDT dust and the dieldrin spray showed the most promise.

The adult vinegar flies were most active in the morning and in late afternoon. Of the physical factors, temperature and light intensity appeared to be very important. Little activity occurred at temperatures below 55° F, and flies became quiet at temperatures higher than 95° F. Light intensity and temperature were closely interrelated. The flies preferred light of low intensity, and were not active during midday even when temperature conditions were favorable. Optimum temperatures appeared to range between 60° F and 77° F. In general there was more activity and flight in the afternoon than in the morning, probably because in the morning—when light intensity was best for maximum activity—temperatures were too low. In the evening highly satisfactory temperatures almost always coincided with proper light intensities. The flies remained inactive in the dark and strong winds tended to keep them quiet even when other conditions were favorable.

During periods of flight, adult flies entered the boxes by the thousands, and under severe conditions the fruit was almost covered with them.

During the swarming period eggs were laid on any tomatoes that had been recently cracked or crushed. From observations made during the past season it appears that the vinegar fly problem must be stopped in the field although experiments to control the flies in the field with insecticides have not proved very successful.

Fly abundance in tomato fields is associated to a large extent with the amount of crushed and cull fruit to be found. As a result they are most abundant along box rows, or portions of the field where equipment has run over the vines.

Although large populations may be encountered in tomato fields, the largest infestations have been found in melons. It is certain that melon fields and certain fruit orchards are sources of infestation for tomatoes that grow adjacent to them.

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Of those five, two had been colonized with a few parasites in 1949 when heavily ant-infested. A combination of the effects from the 1949–50 freeze and from ants may have eliminated the incipient colonies. The third of the five plots was oil sprayed twice following colonization. The fourth plot was colonized in January and the fifth in March, 1952.

The 25 plots which showed parasite establishment were rated as to progress of the parasite in relation to the length of time the parasites had been out, abundance of the parasites, and mortality to the purple scale. Progress was poor in seven plots, fair in seven, good in five, and very good in six. Ants were associated with poor progress in three and dust in one of the seven poor plots. Ants were associated with two and spray treatment with one of the seven plots showing only fair progress. Of the five plots showing good progress, a few ants were present in one. No ants were present in the six plots showing very good progress. These and other observations indicate that ants have a depressing effect on *Aphytis* "X" population increase. However, in about half of the plots rated as poor some other factors were responsible for unfavorable parasite increases.

The parasite's preference for adult scales on which to lay its eggs reduces its efficiency when the majority of scales present are young but the fact that it lays its eggs—to a certain extent—on male scales helps to bridge this gap.

Aphytis "X" is slow to increase and disperse but demonstrates good efficiency at low scale densities—a prime requisite for a successful parasite.

It appears hopeful from these studies that under favorable environmental conditions, biological control of purple scale ultimately may be achieved as it has been for certain other citrus pests.

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