Cyclamen Mite on Strawberry

successful control by use of natural enemy of pest possible as indicated by results of field investigations

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The predatory mite—*Typhlodromus reticulatus* or *T. cucumeris*—which feeds on the cyclamen mite brought and held the pest under fairly good control in strawberry fields during tests in 1952.

First year strawberry plants are sparse and open to the sun and wind—a condition not favorable to the mite—but 2nd-year plantings seem to have an almost explosive physiological capacity to produce cyclamen mite populations of high densities. In certain seasons some growers have suffered near complete loss of their crops.

Generally, 3rd-year and 4th-year fields experience much less trouble from cyclamen mite than do 2nd-year fields. Part of the differences sometimes observed may be because of the varieties, unusual conditions of temperature, of humidity, cultural practices, or physiological conditions in the plants; but the 1952 experiments showed that 3rd- and 4th-year fields did experience fairly good natural control compared to 2nd-year fields. This strongly indicated that the major factor accounting for the control in the older fields was the predatory mite.

The predatory mite feeds only on cyclamen mite and closely related mites and in no way damages the plant. Its reproductive rate is very high when the population of its host is high, but it has the capacity for survival at very low densities of its host. It has shown also that it is capable of controlling even the most severe infestations.

When the numbers of the cyclamen mite have been greatly reduced, the predator hides in the petiole sheaths at the base of the plant and waits for the surviving mites which must enter that area in moving to new tender leaf shoots—a move forced by the opening of the maturing leaf shoots which exposes the mites to the sun and desiccating air.

The predators do not enter a new field because they must delay their appearance until after the mite has become established. Thus it is during the second year that the mite finds the field highly suitable and its natural enemy largely absent. The predators enter infested 2nd-year fields and increase rapidly toward the end of the season. But they are able to bring the mite under control in a few spots only, apparently because of the great lag in the time of their appearance. However, it seems certain that operators of 3rd- and 4th-year fields receive financial gain from the control of the cyclamen mite by the predators.

No satisfactory means of controlling the cyclamen mite by cultural or chemical means has been developed so a study, aimed at utilization of native predators was started in 1950.

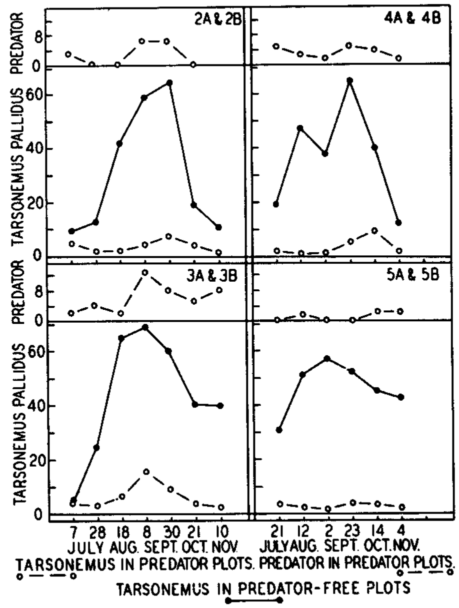
During 1950 and 1951, the study was on the Lassen variety principally with plots in Santa Clara and Santa Cruz Counties.

To evaluate the influence of the predators treated plots—dusted with parathion which killed the predators—were checked against untreated plots.

The results showed that the predator-free plots built up and held moderate to high mite infestations whereas the infestation in the predator-present plots were maintained at much lower levels.

In 1952, plots were established to determine how consistently the predators can effect control—if undisturbed.

From 16 pairs of plots, information was obtained which was suitable for comparison of 2nd-, 3rd- and 4th-year fields



Comparison of number of cyclamen mites in predator-free plot—solid line—and in predator-present plot—broken line—in third-year fields of strawberries.

of Lassen, Shasta, and four experimental varieties; and of plots handled and owned by many different operators.

Plots in 3rd- and 4th-year fields generally showed a very quick and pronounced difference in the mite populations. The predator-free plots developed economic infestations and maintained them through the latter part of the summer. The predator plots, as well as the fields in which they were located, were brought and held under fairly good natural control by the predators.

In 2nd-year fields there was a more delayed arrival at a condition of natural control because, at least in part, of the time-lag in development of a predator population.

The primary complication in improving predator control in strawberry fields is the necessity for effective control of red spider, or two-spotted mite, during the spring. The use of TEPP against these pests during recent years has—undoubtedly—increased the problem of cyclamen mite on strawberries and delayed achievement of an earlier economic balance. Tests revealed that overwintered populations of the predators on the cyclamen mite—but not on red spider—may

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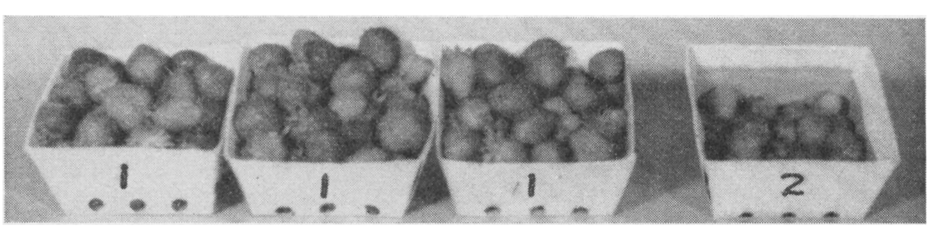

The three cartons on the left—numbered 1—contain strawberries from a group of plants in predator-present plots. The carton on the right—numbered 2—contains yield from the same number of plants from predator-free plots, indicating that the yield was seven times higher in the plots where the enemies of the cyclamen mite were present.

SPRINKLER

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a healthy vigorous condition with the branches of adjoining trees coming together in many cases. The orchard is in a permanent cover crop, principally grass which is mowed several times a year. The sprinklers are supplied from an underground pipe system and are moved in a regular rotation that provides each tree with a watering every 12 days. The sprinklers are run about 12 hours and apply a little over 3″ of water at each setting. The soil holds about 1.25″ of available water per foot of depth.

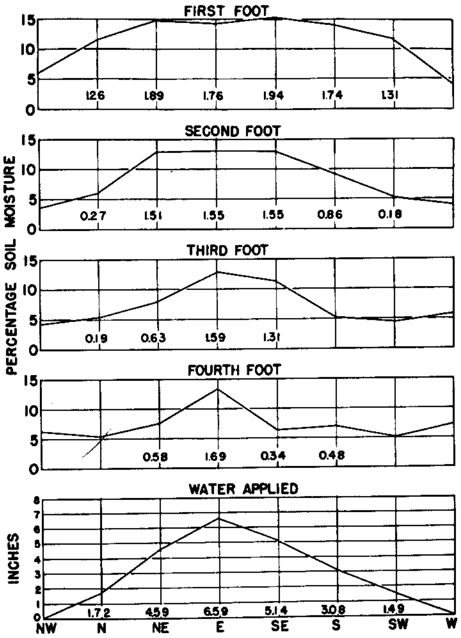
The bar graph shows the percentages of soil moisture around a recently irrigated tree, and one just before the water was applied. The open bar of each pair shows the average soil moisture content a few hours after sprinkling, and the solid bar, the moisture content a few hours before the end of the 12-day interval. The dry tree—solid bar—was brought up to about the same moisture content as the sprinkled one within the next 24 hours.

The length of the solid bar indicates that, in the early part of the season, while there was some moisture left from the winter rains and the previous irrigations, the soil moisture could be maintained above the permanent wilting percentage easily. Later in the season, however, the amounts of water applied were barely adequate to maintain readily available moisture during the 12-day interval. The last irrigation—October 15—wet down only about 2′.

The difference between the amount of moisture found at the end of each 12-day period and the amount applied at the beginning, indicates that the average daily use of a mature plum orchard in permanent cover crop in the foothills of central California is closer to 0.3″ per day than to 0.2″—the amount sometimes used.

A study of the distribution of water by sprinkling was made in a pear orchard where many branches hung down and touched the ground. The orchard was left unirrigated for several weeks until the soil moisture was reduced to the permanent wilting percentage—5%—to a depth of 4′. The orchard was then irrigated.

Soil samples were taken to a depth of 4′ at eight compass points about 8′ from the trunk of a tree with low-hanging branches. The sprinkler position was on the east side of the tree. No water reached the northwest and the west sides of the tree in the top foot of soil. Water penetrated the second foot in four of the sampling places, the third foot in three, and the fourth foot in only one sample. The total amount of water at the eight sampling points is shown in the bottom unit of the diagram on this page.



Distribution of soil moisture from sprinklers in a pear orchard where low branches interfered with uniform delivery.

Observation throughout the orchard showed dry areas behind each tree when the position of the low-hanging branches interfered with the distribution of water. Moving the pipeline to change the relative position of the sprinklers with regard to the trees would change the position of the unsprinkled area, so that the same area would not remain dry all season.

These studies showed that whether irrigation of deciduous orchards is by sprinklers or by surface methods, the growth of the fruit is the same—provided the supply of readily available soil moisture is maintained.

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LEAFHOPPERS

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yards were killed after 43-hour exposure to DDT-treated leaves. On leaves treated with malathon—dipped in a suspension one fifth as concentrated as the DDT-treated leaves—the leafhoppers from both vineyards were all dead in 24 hours. In this test the cages were cloth covered on opposite sides. This lessened the possibility that malathon killed leafhoppers by fumigant action.

Malathon is a new organic phosphate insecticide of much lower toxicity to humans and animals than most of the other organic phosphates. It is less persistent than DDT—especially in warm weather—and part of its effectiveness appears to result from its fumigant action. Probably the fumigant effect is less during the cooler weather of spring, so in the pre-bloom dust applications good coverage is most important.

As compounded during the 1952 season, malathon dusts possessed an unpleasant odor which, however, could not be detected in the vineyard the day after treatment. Taste tests conducted with grapes either sprayed or dusted with normal dosages have shown no off-flavors. As presently licensed for use on grapes, malathon may be applied not later than two weeks before harvest.

Although field tests and grower experience during the 1952 season showed malathon to be outstanding for leafhopper control where DDT resistance is present, some questions as to dosage and timing still await solution. Further tests with malathon are planned for 1953.

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STRAWBERRY

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be high enough to prevent serious infestations of cyclamen mite. In most fields, however, TEPP applications against red spider destroy the predators and early-season or mid-season infestations of cyclamen mite are the natural result. Populations of these predators recover fairly soon from a single early spring treatment but applications of TEPP—where no real red-spider threat exists—are likely to do more harm than good. Three or more repeated applications over an interval of time may so reduce the predator population that it will not reappear in sufficient numbers to regain control of the cyclamen mite until serious loss has resulted.

Pesticide applications to adjoining crops may drift into fields under natural predator control and destroy the predators throughout a wide margin of a field and disrupt an achieved control. This has been observed where dust applications of adjacent crops by airplane were made.

Research is in progress to develop methods of mass-rearing this predator or of harvesting it from clipped strawberry tops, cold-storing them, and distributing them in developing infestations of early-season 2nd-year, or late-season 1st-year fields.

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