this situation by planting blackberries to provide overwintering refuges for the parasite have not been entirely successful. Further studies are needed to improve the parasite output of these cultivated refuges.

Except for taking advantage of the differences in grapevine susceptibility to leafhoppers as discussed, few changes in control practices are foreseen in those table grape areas where natural parasite refuges do not occur. Until cultivated refuges are made more effective, leafhopper control programs must be based on the efficient use of chemicals.

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INTEGRATED CONTROL

Effects of ROAD DUST ON SPIDER MITES

C. FUKUSHIMA · E. M. STAFFORD

Many field observations have caused speculation by both growers and researchers regarding the coincidence of higher spider mite populations on plants with foliage covered with fine road dust. This association occurs more commonly near roads or avenues which are heavily traveled. These investigations indicated that road dust alone did not stimulate or affect the mites in a manner which might result in higher populations.

THESE STUDIES were limited to the Pacific spider mite and to the initial, or immediate, effects of road dust found on a plant leaf surface. A possible variable in studies conducted over longer periods of time is the effect of the dust on the condition of the plants which the mites are inhabiting.

Before the actual experiments, the size and density of the dust particles found on typical roadside plants had to be determined. Normal dust levels were established from leaf samples from the University vineyards. Leaves were collected in July from vines near roads which were heavily traveled, and from vines in the middle of a row, to obtain a level resulting from normal cultivation. The samples of 20 leaves each were then brought into the laboratory, and the dust from the leaves was washed off in a quart of water. The leaves were weighed before and after the washing in order to determine the approximate amount of dust washed off. The dust, then in suspension, was collected by filtration. The filter paper was also weighed before filtration and again after the dust had been scraped off and collected. The dust was then screened through various mesh-sized screens, then categorized, and weighed. These procedures established the basic dust levels to be used for the tests.

Three experiments

The investigation was conducted in three separate experiments with control groups. The first experiment was to determine if the size of the dust particles had any effect on the spider mites. From the leaf samples, it was known that the 200- to 325-mesh-sized dust and the 325- and smaller mesh-sized dust were the most abundant sizes found on the leaves. The leaves and their petioles were removed from a lima bean plant. The petiole was then placed into a glass vial of distilled water. The leaf portion was cut down to an area of 2 square inches. Separate leaf sections were then dusted with the appropriate amount of the dust of each mesh size. A vacuum chamber was employed to ensure that the amount of dust which settled on each leaf was as close as possible, by weight, to the actual amount of dust of this size found on a leaf in the field. The control samples were leaf sections free of any dust.

Adult female and male mites were then placed onto the surfaces and their progress was observed during the next few days. The results were interpreted in terms of the egg laying rates of the mites placed in the various situations. No significant differences could be found between the mites placed onto surfaces with the 200 to 325 mesh dust, those with the 325 and smaller mesh dust, and the control.

The second experiment was conducted in the same manner except that equal amounts of dust of the various mesh sizes were used. Each leaf section was dusted with a certain amount of particles of only one mesh size. The control was again free of dust. Again no significant differences were noted.

Dust types

The same procedures were used in the third experiment. However, dust collected from different areas of the San Joaquin Valley was used to determine any possible influence of the type of dust in a particular location, or dust exposed to the influence of different cultural and control methods. One of the dust samples collected for this phase of the experiment was from an area with a history of spider mite problems. Another sample was taken from an area with relatively few mite problems. Equal amounts of the various types of dust were applied to the testing surfaces with each surface receiving only one type of dust. The results again showed that there were no significant differences.

From these results, it seems that the road dust alone does not cause a direct stimulus to which we might attribute the greater populations of spider mites. In field conditions, the dust on a leaf surface may act as a deterrent to the predators and parasites of the spider mite. Other conditions such as humidity which is important in the environment of the mite, could be a major factor. It was not possible under laboratory conditions to reproduce the actual conditions found in the field. Therefore, only the dust factor was simulated in the environmental testing. The effects of this type of dust on the physiology of the plants which the mites were inhabiting poses a complex problem yet to be investigated, One or a combination of many factors may be contributing reasons for the occurrence of these greater mite populations.

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