Overwintering grape leafhopper adult resting on a weed leaf.

LEAFHOPPER TREATMENT LEVELS for THOMPSON GRAPES RAISINS

INTEGRATED CONTROL

GRAPE GROWERS in the San Joaquin Valley use more pesticides for controlling grape leafhoppers than for any other insect or mite pest. The lack of available information on economic damage caused by leafhoppers has resulted in a variety of treatments based upon individual judgment rather than accurate indications of harmful population levels. The field trials reported here are the first of a series of experiments designed to measure the influence of leafhoppers on grape production so that economic treatment levels may be established.

Economic treatment level determination for raisin or wine grapes is essential to the concept of an integrated pest control program based on the use of pesticides only when needed. Soluble solids (sugars) are a factor, particularly in raisin quality, but soluble solids also influence yields. Effects on total organic acids would be of concern in wine production. Under present raisin and wine standards, berry size is not important except for its relation to yield.

The initial trial was established in 1963 in a Thompson Seedless raisin vineyard near Biola in Fresno County. The Thompson Seedless variety was chosen for this test because of its dominance in San Joaquin Valley grape culture. Thompsons for either wine or raisins could be used, but obtaining raisin yields presents fewer problems. The Biola vineyard used in the test is normally not treated for leafhoppers—which made it relatively easy to compare treated and untreated plots.

Three treatments

Three treatments, replicated six times, were included in the trial. Each plot consisted of a single vine row of 90 vines (7 × 11 ft spacing). In addition to the untreated checks, plots were treated with (1) Tedion to control spider mites and (2) a Thiodan-Tedion combination to control leafhoppers and spider mites. Spider mites had not been a problem in this vineyard in the past, but the miticide was included as a precaution. The chemical treatments were applied three times during the season (June 6, July 5, and July 23) to keep leafhopper injury to a minimum.

Leafhopper nymph counts were made at approximately 10-day intervals from late May to mid-August. Ten leaves per plot were counted for nymph levels on each sampling date. Basal leaves showing leafhopper feeding symptoms were selected for first-brood counts and mid-cane leaves showing feeding symptoms were selected for the later-season counts. Prior to picking for raisins, berry samples were taken for soluble solids and berry size determinations. Raisin yields were obtained by weighing the trays in each plot.

Leafhopper nymph populations remained low during the first brood—reaching a peak of three nymphs per leaf on June 11 in both the Tedion-treated plots and untreated check plots. The second-brood nymph population in the Tedion-treated and untreated plots reached a peak of eight nymphs per leaf on July 25. Because of heavy egg parasitism by *Anagrus* after mid-July, there was essentially no third brood. Following the first treatment on June 6, leafhopper nymph counts never averaged higher than one nymph per 10 leaves in the Thiodan-Tedion combination treated plots. Yields in the untreated check and Tedion-treated plots were about 5% lower than in the Thiodan-Tedion combination treated plots. There were no significant differences in soluble solids content or berry size among the treatments—which makes it difficult to explain the reduction in yield.

1964 trial

In 1964, a trial was again established in the Biola vineyard used in the 1963 test. The same plots had been used for the 1963 treatments—making it possible to measure 1964 effects plus any carry-over effects of leafhopper injury from the previous season. Enough untreated rows had been left between treated rows in 1963 to allow for a fourth treatment in 1964. An insecticide treatment with Sevin was used to encourage the development of spider mites by killing predators and allowing measurement of the effect of mite injury. A trial similar to

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Preliminary results of field studies on economic treatment levels for control of grape leafhoppers indicate that many growers in the San Joaquin Valley use insecticides unnecessarily because they lack accurate knowledge of insect population levels. Thompson Seedless grapes also appear to be more tolerant of nymph populations than expected. Results also have shown that some insecticides result in a severe build-up of spider mite populations, and further screening is necessary to find materials with least harmful side effects on beneficial parasites and predators.

SEEDLESS USED for or WINE

the Biola experiment was also established in 1964 in a Thompson Seedless raisin vineyard near Dinuba, Tulare County. The essential difference in design between this trial and the Biola trial was the choice of pesticides and number of treatments. In the Dinuba trial, Sevin rather than Thiodan was chosen to control leafhoppers and Kelthane rather than Tedion was used to control mites. In addition to the untreated check plot, the Dinuba trial included: (1) Kelthane to control mites; (2) Sevin to control leafhoppers; (3) Sevin-Kelthane combination to control both leafhoppers and mites. Plots in the Biola trial were treated on May 25, June 26, and July 10. Plots in the Dinuba trial were treated on May 29 and July 9. Nymph counting procedures in both the Dinuba and Biola trials in 1964 were essentially the same as those used in the Biola trial in 1963.

Nymph counts in 1964 in the Biola vineyard showed a peak of nine nymphs per leaf for the first brood and four nymphs per leaf for the second brood in the untreated and Tedion-treated plots. Practically no nymphs were found after the end of July in these plots. Heavy leafhopper egg parasitism after early July probably accounts for the low second brood counts and for the failure of the third brood to develop. Following the first treatment on May 25, the Thiodan and Sevin-treated plots remained below one nymph per leaf all season. There were no significant differences in raisin yields, soluble solids, berry size and total acid content among any of the treatments. The Sevin-treated plots became heavily infested with mites in August, and although the yield averaged about 5% lower in these plots than the other plots, the difference was not significant.

In the Dinuba trial, nymph counts in the untreated plots showed a peak of eight nymphs per leaf for the first brood and 18 nymphs per leaf for the second brood. Third brood nymph populations (late August) averaged less than two nymphs per leaf in both the untreated and Kelthane-treated plots. Many parasitized leafhopper eggs were seen in August—probably accounting for the low leafhopper nymph counts obtained in these plots in late season. Throughout most of the season, nymph counts in the Kelthane-treated plots averaged about half of those counts obtained in the untreated plots—indicating some insecticidal activity of Kelthane. Similar activity had been observed with Kelthane on leafhoppers in previous years.

Late season

After the first treatment on May 29, the Sevin and Sevin-Kelthane treated plots remained below one nymph per leaf until mid-August when the third brood populations suddenly began to increase. By late August, counts averaged 12 and 19 nymphs per leaf, respectively, in these plots. The cause of the late season buildup of leafhoppers in the Sevin and Sevin-Kelthane treated plots is a matter for speculation. Resurgence of nymphal population following a month's reduction after treatment has been noted previously on several occasions following certain insecticide applications including Sevin.

Some rather unexpected raisin yield results were obtained in the Dinuba trial. The Sevin and Sevin-Kelthane combination treated plots were 7% lower in raisin yield than the Kelthane-treated and untreated plots. This reduction in yield was significant at the 5% level. Although not significant, berry size and/or soluble solids were slightly higher in the Sevin and Sevin-Kelthane combination treated plots.

No counts were made in the Dinuba trial but a heavy mite population was noted in the Sevin plots by the end of July. A light mite population was also noted at this time in the untreated checks. No mites were observed in the Kelthane and Sevin-Kelthane combination treated plots. Because of the mite infestation, the entire vineyard was treated with Kelthane dust on July 31.

Since the information collected to date is quite limited, it is impossible to set a definite suggested treatment level for grape leafhoppers at this time. The trials reported above, however, indicate that many grape growers unnecessarily treat for leafhoppers. It appears Thompson Seedless grapes for raisins or wine can tolerate populations of at least ten nymphs per leaf in the first brood and at least five nymphs per leaf for the second brood. The results also demonstrate the effect the insecticide Sevin has on the buildup of spider mites.

It will be necessary to expand the field trial program to include enough Thompson vineyards to make it possible to consider differences in area, vine vigor and crop level. Future work must also include other grape varieties since effects of leafhoppers may differ among varieties. Effective insecticides also have to be screened sufficiently to find those having the least harmful side effects on beneficial parasites and predators.

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