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ALTERNATIVE CONTROL METHODS FOR GRAPE LEAFHOPPER: PART 2
— FINAL REPORT —
1/22/01

Important lessons were learned from the first part of this on-farm research in 1999 to control an outbreak of grape leafhoppers in this Finger Lakes vineyard, without resorting to chemical insecticides. The core of last year's effort was a repeated application of the botanicals pyrethrum and rotenone along with an insecticidal soap. The result was encouraging but inadequate; leaf feeding by the insects was still too damaging by the end of the season, reducing grape sugar levels and weakening the vines. It was decided that the sprays were started too late in the season.

Several materials were tried in 2000, including pyrethrum-rotenone-soap.

PYRETHRUM-ROTENONE-SOAP

Starting with the first vineyard spray on 5/17, at approximately 2-inch shoot stage, Bonide liquid rotenone-pyrethrum was applied at the rate of 8 oz/acre in a 1.5% solution of M-pede insecticidal soap. Four more applications were made at 7-11 day intervals ending with the postbloom spray on 6/23. Then one more follow-up application was made in mid-July. A total of 6 sprays compared to 9 similar sprays applied in 1999.

As in '99, leaves were collected on a weekly basis and brought to the laboratory at Cornell University's NY State Agricultural Experiment Station in Geneva for counts of leafhopper nymphs. Two 1-acre blocks of vines were sampled separately, identified on the accompanying chart (Figure 1) as East and West. 60 leaves were taken from each block: 10 leaves per vine (subsample) in 3 locations in 2 rows.

In '99, the season started with a high infestation: first count 25-35 nymphs/leaf. In 2000 the first count showed a much lower initial population of 7-11 nymphs/leaf. The benefit of the previous year's spray program had carried over, as hoped for.

But the initial number of pests in spring 2000 was still disturbingly high, and there was a serious practical concern that this may have resulted, at least in part, from the fact that a row of vines was left unsprayed in 1999 as a control. While providing a benchmark for measuring results, that row may have also provided a breeding ground for reinfestation in the following year. To avoid this in 2000 the entire vineyard was sprayed, with no unsprayed control. Hence there was no benchmark and conclusions can be drawn only in general terms. Figure 1 shows a fluctuating population of leafhopper nymphs that suggests several observations:

1) As in 1999, the spray program did appear to have the general effect of suppressing the leafhopper population, but specific sprays did not have an obvious immediate impact on the number of nymphs counted per leaf. Rather Figure 1 shows a nymph population following the ups and downs of successive generations of leafhoppers.

2) The second generation of leafhoppers, peaking in mid-August, actually reached higher numbers per leaf (4-10) than it did the previous year. This may have related to very different growing conditions in 2000, which was much wetter and caused significantly more vegetative growth than '99. More green leaves meant more available food, presumably boosting the insect population.

3) Final counts in late August were at similar low levels in 2000 as in 1999. Visual signs of foliar feeding damage were evident by the end of the growing season but dramatically less so than in '99. The difference appears to have more to do with more abundant foliage in 2000 than with the spray program, but the resulting higher grape sugar levels and better overall fruit quality were welcome in any case.

ECOZIN (NEEM OIL)

Three applications of Ecozin, a product derived from the neem plant, were made in August at the rate of 8 oz/acre, only to the block of vines identified in Figure 1 as East. The West block received no application. Nymph counts happened to be approximately twice as high in the East (sprayed) block at the time of the first spray. After 3 applications, counts in the sprayed block had dropped slightly below the control, an encouraging result.

Ecozin (azadiractin) acts by interfering with the insect's molting process. For this reason, the effects (nymph mortality) often don't show up for a month or more and two or three applications, according to the manufacturer. If the molting effect were pronounced, we might expect to see different proportions of young (1-3 instar) and older (4-5 instar) nymphs when comparing the treated and untreated samples. However, stage-specific counts (shown in Figure 3) at the end of the season showed little difference between the two samples.

Ecozin is reportedly more effective when applied in combination with oils. Unfortunately most spray oils applied in combination with foliar sulfur sprays tend to result in phytotoxicity. Hence the use of sulfur, common in many vineyards and particularly in organic vineyards, may limit the effectiveness of Ecozin. But it still may have a role to play, and applications started early in the growing season may prove more useful than the mid-season applications made this year (due to delays in receiving the material).

JMS STYLET OIL
VALERO CINNAMON OIL

Each of these two summer oils was appliedonce on 6/26 in single vine treatments replicated three times. JMS Stylet Oil was applied at 2% dilution; Valero (cinnamic aldehyde) at a rate of 2 gallons/acre. Both, but particularly Valero, proved phytotoxic to the vines. (Sulfur was applied to the test vines before and after treatment and stylet oil is known to be phytotoxic in combination with sulfur. The same may be true of Valero.)

No effect on leafhopper populations was observed from either material.

CONCLUSIONS

Combination rotenone-pyrethrum-soap sprays suppress leafhopper populations but require repeated applications and still do not appear to give adequate control in this Finger Lakes vineyard with high insect pressure. Particularly in a dry year, accumulation of grape soluble solids was depressed (as was the grower).

We'll try other materials and stategies next year, notably more experimentation with neem oil (Ecozin), a new spray formulation of garlic (Envirepel), and possibly an early spray of Stylet Oil made before any applications of sulfur. We will also try a phased planting of buckwheat as a source of nectar

to enhance fecundity (egg production) of Anagrus epos, a native wasp that parasitizes leafhopper eggs. Anagrus can reach high populations and parasitize 80-90% of eggs by late in the growing season (Martinson unpublished data).

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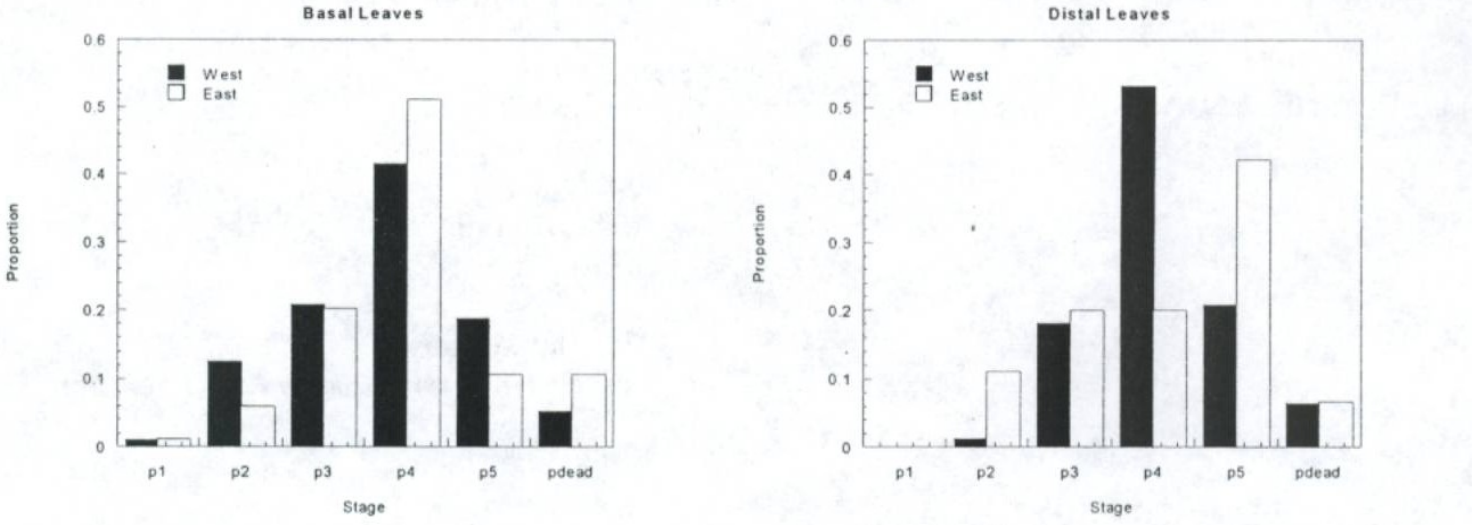

Figure 3. Stage distribution of 1-5 instar and adult grape leafhopper during the final count of the season on basal grape leaves (left) and distal grape leaves (right)

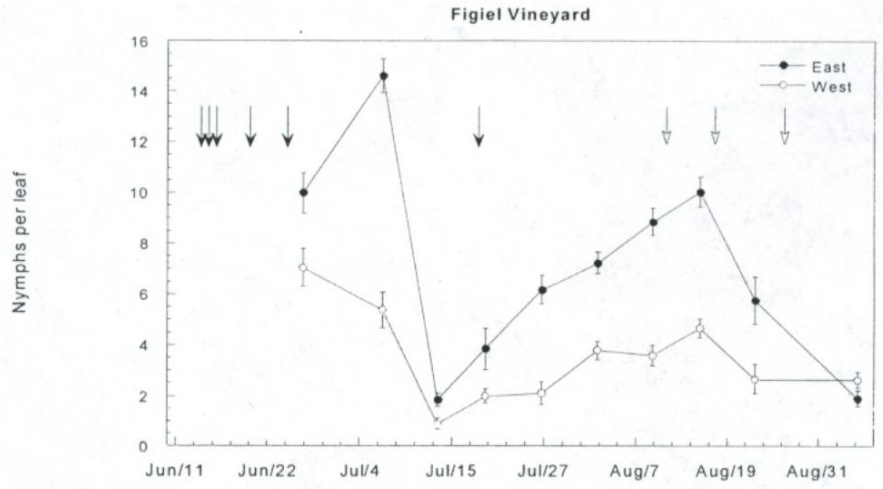

Figure 1. Leafhopper population trends on East and West section of vineyard. Arrows with solid heads indicate dates of pyrethrum/rotenone/soap sprays (5/17, 5/26, 6/5, 6/16, 6/23, and 7/19), applied to entire vineyard. Arrows with open heads indicate dates of Ecozin (neem oil extract) sprays (8/9, 8/18, 8/29), applied to the East end only..

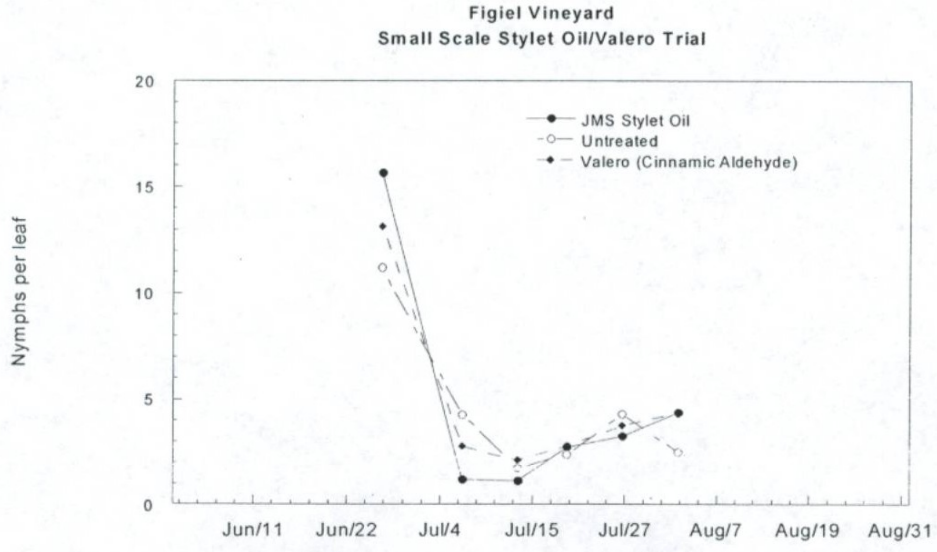

Figure 2. Small scale Valero (Cinnamic aldehyde) and JMS Stylet Oil trial. One application was made to single vine replicates on June 28.