Section 4. Chemical control/new products

FURTHER INVESTIGATIONS IN THE MANAGEMENT OF SAN JOSE SCALE WITH NARROW RANGE HORTICULTURAL OIL

Walt Bentley, Lee Martin, Dick Rice, Brian Ribeiro, and Kevin Day
University of California Kearney Agricultural Center and Tulare County Cooperative Extension
9240 S. Riverbend Ave., Parlier, CA 93648

This study was initiated in 1999 to evaluate the efficacy of narrow range horticultural oils applied during the delayed dormant period to plums for control of San Jose scale (SJS) (*Quadraspidiotus perniciosus*). In 1999, either Volck Supreme or Orchex 692 oil applied at the green tip stage of growth (8 gallons of oil in 400 gallons of water per acre) gave significantly better ($P<0.05$, Fisher's Protected LSD) control of SJS than no treatment (Bentley et al, 1999). Infestation of Black Amber cultivar did not exceed 1.50% with either oil (untreated check 10.75%). Infestation of the Queen Rosa cultivar was less than 5% (untreated check 14%). Additionally, in August harvested Royal Diamond and Rosemary cultivars, there was a significant ($P<0.05$, Fisher's Protected LSD) interaction between the efficacy of oil spray, as measured by harvest infestation, and the abundance of SJS measured by the previous years infestation.

In 2000 we further studied the efficacy of a delayed dormant oil application (8 gallons of Exxon 100 Dormant Spray Oil) on SJS fruit infestation of these same cultivars, as influenced by the volume of water/oil mixture applied.

Methods and Materials

The 2000 study was done in a 3.5-acre block of mid-June-harvested plums (Black Amber and Queen Rosa cultivars) and late-July harvested plums (Royal Diamond and Rosemary cultivars). On February 11, individual plots of trees were sprayed with 8 gallons of Exxon 100 Dormant Spray Oil in either 100 gallons or 400 gallons of spray mixture or left untreated. Treatments were made with an FMC air carrier sprayer driven at 2 mph. The desired volume per acre was achieved by changing nozzle size. The individual plots of the mixed Black Amber and Queen Rosa plums consisted of 64 trees and treatments were replicated four times in a randomized complete block design. Harvest (200 fruit from central trees from each plot) occurred on 6/16/2000 (Black Amber) and 6/21/2000 (Queen Rosa). An analysis of variance was performed on the number of SJS infested fruit.

Two experiments were performed in the late July harvested plums. Individual plots were smaller than that used in the earlier harvested fruit and consisted of 30 trees. Using four replicates, one trial was designed to compare the 100-gallon per acre rate, the 400-gallon per acre rate, and an untreated check. A randomized complete block design was used. A paired experimental design was also evaluated where 10 replicated treatments were used to compare the efficacy of 100 and 400 GPA in reducing SJS infestation. The additional replicates allowed for a more powerful test of the efficacy of the two treatments. The late harvested plums were Royal Diamond (harvested 7/26) and Rosemary (harvested 7/28) cultivars. The determination of infestation for each variety

was made by sampling 200 fruit from the central two rows of trees in each plot. An analysis of variance measuring the number of scale infested fruit was performed in both experiments. In all evaluations a single scale on a fruit would classify it as being infested.

Results

Both the 100 GPA and 400 GPA treatments gave significantly ($P<0.05$, Fisher's Protected LSD) better control SJS than the untreated check. There was no difference between the 100 and 400 GPA treatments. Infestation in the Black Amber cultivar was 0.88, 1.38, and 14.38% for the 400 GPA treatment, the 100 GPA treatment and the untreated check respectively. Infestation in the Queen Rosa cultivar was 1.50, 2.50, and 15.13% for the 400 GPA, 100 GPA, and untreated check respectively. The Royal Diamond harvest infestation was 5.5, 13.63, and 19.88% for the 400 GPA, 100 GPA, and the untreated check respectively. The 400 GPA treatment resulted in significantly ($P<0.05$) fewer scale infested fruit than the untreated check. The 100 GPA treatment was not significantly different ($P<0.05$) from the 400 GPA treatment or the untreated check. Infestation on Rosemary at harvest was 5.00, 7.75, and 18.75% for the 400 GPA, 100 GPA, and untreated check treatments respectively. Both the 400 GPA and 100 GPA treatments resulted in significantly ($P<0.05$) fewer infested fruit than the untreated check. There was no difference between 400 GPA and 100 GPA treatments.

The 10 replicate paired comparison between the 400 GPA and 100 GPA treatments resulted in a highly significant ($P<0.01$) difference in scale infested fruit for both the Royal Diamond and Rosemary cultivars. For Rosemary plums, the 400 GPA treatment resulted in 4.55% infested fruit and the 100 GPA treatment resulted 11.2% infested fruit. The Royal Diamond plums had 8.85 and 13.4% infested fruit in the 400 and 100 GPA treatments respectively.

Discussion

The 2000 study established the benefits of a narrow range superior horticultural mineral oil (Exxon 100 Horticultural Spray Oil) in reducing San Jose scale infestation in four cultivars of plum. This confirmed work done in 1999 showing similar efficacy. There was no clear difference in infestation based on the volume of spray mixture applied to plums when four replicates were used to evaluate treatment effects.

Where additional replicates were evaluated, in a paired comparison, in each of two late July harvested cultivars, clear differences were seen between 100 and 400 GPA in reducing SJS infestation. Ten replications result in a more sensitive statistical test. Because of non-uniform infestation by SJS throughout the test orchard, additional replications are needed to establish significant differences.

Horticultural mineral oils can be used to manage SJS in plums with acceptable efficacy against SJS. There are a number of benefits to using such a program. First, the use of oil alone reduces the cost of the pesticide to the grower. Unless SJS populations are extreme, an 8-gallon rate of oil can be applied with minimal infestation at harvest, eliminating the need for an organophosphate or insect growth regulator. Secondly, horticultural mineral oils can be used to combat insecticide resistance. Oils physically smother the insect; efficacy is not dependent upon

the detoxification ability of the target pest. Thirdly, oils can be used safely with minimal hazard to those applying the spray. Also, horticultural mineral oils are allowable for organic farmers. Based on the results obtained with paired comparison of 100 & 400 GPA, using 10 replications, fruit harvested after the end of June should be sprayed with the higher volume of spray mixture. This may not be needed for fruit harvested in June. Later harvested fruit is exposed to at least one and possibly two additional generations of SJS. The greater volume of spray mixture appears to give better coverage of wintering scale, in the parameters of this study. The greater time needed to apply a 400 GPA mixture is a disadvantage. If a farmer contracts with a private applicator the additional application time will cost more.