

Section IV
Biological & Cultural Control

**TESTING AN ALTERNATIVE METHOD FOR CONTROLLING HOP APHIDS:
 SPRAYING THE APHID'S WINTER HOSTS, PLUM TREES**

L.C. Wright and W.W. Cone

Irrigated Agriculture Research & Extension Center

Washington State University

Prosser, WA 99350-9687

(509) 786-2226

FAX (509) 786-4635

Ornamental and fruit plum trees are the only known over-wintering hosts for the hop aphid. Hop is the sole summer host and only wingless females are produced on hop during the summer. In surveys done in 1990 and 1991 in the lower Yakima Valley, we found large numbers of hop aphids infesting red-leafed ornamental varieties of plum trees, while fruit varieties had much fewer aphids. We concluded that the majority of the hop aphids infesting hops came from the ornamental plums that are used in landscaping. In 1993 and 1994, we did an experiment to test the hypothesis that reducing the number of hop aphids on ornamental plums would reduce the number of aphids infesting hops.

1993 The area selected for the study is the part of the Yakima Valley around Harrah, which is south of the city of Yakima. The valley was divided into a northern part of about 60 square miles and a southern part of about 77 square miles. One hundred forty six plum trees were located in the northern part and 144 trees were sprayed with diazinon and oil on 31 March and 2 April. The southern area was not sprayed and was used as the control. Forty five of the trees were still infested on 7, 11 and 12 May and 43 of them were sprayed with bifenthrin on 2 June. Hop aphids were sampled on plums to determine if the number of aphids in the two areas differed. Ten shoots were examined per tree in the unsprayed area on 15, 16 and 19 July and on 21 and 23 July in the sprayed area. The trees in the sprayed area averaged 4.1 aphids per shoot with 10 of 63 trees infested. The trees in the unsprayed area averaged 6.1 aphids per shoot and 25 of 85 trees were infested.

Hop aphids were sampled in hop yards in the two areas to determine if spraying the plums had an effect on the number of aphids on hops. Sampling was done weekly from 9 June to 30 July for a total of eight weekly samples. Nine to 12 yards were sampled each week in each area and the aphids were counted on 50 leaves in each yard. Over the whole sampling season, the hops sampled in the sprayed area averaged 2.19 aphids per leaf, while the hops in the unsprayed area averaged 2.14

per leaf. The difference was not statistically significant ($t = 0.2587$, $P = 0.796$, 9348 df). The two most likely explanations for the failure of the plum sprays to reduce the number of aphids on hops were: 1. The application of oil and diazinon was not very effective. 2. The sprayed area was too small; hop aphids probably invaded the sprayed zone from the surrounding unsprayed areas.

1994 This year we expanded the sprayed area to about 130 square miles in the valley around Harrah, and used the hop growing area around Moxee, which is east of Yakima, as the unsprayed control. A total of 235 plum trees were located in the Harrah area and 224 trees were sprayed from April 13 to 22 with one application of Talstar (bifenthrin) using 3.2 oz per 10 gallons of water. To see how well the spray worked, hop aphids on 36 trees on a transect of the Moxee area were counted on May 18 and 20, and 49 trees randomly selected in the Harrah area were sampled on May 20 and 23. Ten shoots were examined per tree. The trees in the Moxee area averaged 21.3 aphids per shoot, while the Harrah plums averaged 0.78 aphids per shoot. In a second sampling, 31 plum trees were examined on July 7 in the Moxee area and 36 trees were sampled on July 7 and 8 in the Harrah area. We found an average of 0.17 aphids per shoot in the Moxee area and no aphids were found on the Harrah trees. One application of Talstar controlled the hop aphids very well.

Weekly hop yard sampling started June 13 and continued for eight weeks, concluding the week of August 1. Fifty leaves were sampled per hop yard and 10 yards were sampled in each area per week. The number of aphids on hops in the sprayed area was not significantly different from the number in the unsprayed area over the whole sampling season. The Harrah hops had an average of 2.80 aphids per leaf and the Moxee area had 2.56 per leaf ($t = 1.335$, $P = 0.182$, 7,998 df). Taken one week at a time, the Harrah area had significantly more aphids than the Moxee area in three weeks, the Moxee area had significantly more aphids in two weeks, and there was no difference in three weeks.

Despite good control of the aphids on the plums and the large size of the sprayed area, the aphids were still able to infest hops in relatively high numbers, probably by flying into the area from the surrounding unsprayed areas such as the cities of Yakima, Wapato, Toppenish and White Swan. Based on our knowledge of the hop aphid, the aphid depends on plums to complete its life cycle. Therefore, reducing the number of over-wintering aphids by spraying or removing plum trees should reduce the number of aphids infesting hops. However, to be successful, the control measures would have to be done over a very large area, probably the whole Yakima Valley.