Chemical Control/New Products

EFFECT OF VARIOUS INSECTICIDES ON FIRST AND SECOND GENERATION WHITE APPLE LEAFHOPPER NYMPHS

Elizabeth H. Beers and Peter D. Himmel
Washington State University Tree Fruit Research and Extension Center, Wenatchee, WA

Keywords: Actara, thiamethoxam, Calypso, thiacloprid, Assail, acetamiprid, Avaunt, indoxacarb, BAJ-2740, spirodiclofen, Sevin, carbaryl, Provado, imidacloprid, Aza-Direct, azadirachtin, *Typhlocyba pomaria,* apple, chemical control, insecticide

Abstract: This test was part of a series to establish the spectrum of activity of the nicotinoid insecticides against the white apple leafhopper. Secondarily, the miticide spirodiclofen was tested against the first generation and a neem product (Aza-Direct) against the second. First generation treatments were applied 7 d after petal fall (17 May) using a multiple tank airblast sprayer calibrated to deliver 200 gpa. The second-generation test was conducted in the same block, with treatments applied on 9 Aug 2001 (primarily instars 1-3 of the second generation) using the same spray equipment. In the first generation, Actara, Calypso, Assail and Sevin controlled leafhopper nymphs throughout the nymphal period. Avaunt also reduced nymph populations to a low level, although the effect was delayed by about a week compared to the other materials. Spirodiclofen did not cause significant nymph mortality. In the second generation, all treatments reduced nymph populations in relation to the check, however the Aza-Direct population was low initially and essentially caused no change in the population, making the probable effect difficult to interpret.

Materials and Methods

This experiment was conducted in a 'Delicious' apple orchard with 'Golden Delicious' pollenizers south of Orondo on the Columbia River. The experimental design was a randomized complete block with 7 treatments in the first generation and 8 treatments in the second. Both tests had 4 replicates and each replicate consisted of three trees in a single row. Treatments were randomized on the basis of pre-treatment counts. Sampling was done on the middle tree of each three-tree replicate (cv. Delicious) on a weekly basis until adult stages started to appear. Twenty leaves per replicate were examined *in situ* for leafhopper nymphs. The materials were applied 7 d after petal fall (17 May) in the first generation and on 9 Aug 2001 (primarily instars 1-3) in the second generation, using a multiple tank airblast sprayer (Rears Pak-Blast, Rears Sprayers, Eugene, OR) calibrated to deliver 200 gpa.

Data were analyzed using the Statistical Analysis System (SAS 1988). Data were tested prior to analysis for homogeneity of variance using Levene's (1960) test. Variances found to be non-homogeneous were transformed [ln(y+0.5)] before analysis. PROC GLM was used to conduct an analysis of variance, and treatment means were separated using the Waller-Duncan *k*-ratio *t*-test.

Results and Discussion

First generation nymph populations were low (0.60 nymphs/leaf) prior to the application of the materials used in this study. Actara, Calypso, Assail and Sevin, when applied at the PF+7 timing, all caused an immediate and significant reduction in leafhopper nymph populations (less than 0.36 nymphs/leaf). The counts then continued to decrease (less than 0.10 nymphs/leaf) and stayed down throughout the remainder of the first generation (Table 1, Fig. 1). Avaunt had a similar effect, though the onset was delayed and population reduction was not demonstrated until the second sample after application. Once the nymph population in the Avaunt treated trees had declined, the reduction was similar to that of the first group in both degree and duration. BAJ 2740 did not change the leafhopper population dynamics significantly when applied at this timing as compared to the check.

Second generation nymph populations were moderate (0.94 nymphs/leaf) prior to the application of the materials, but rose in the checks during August due to egg hatch. The application of Calypso, Assail, Avaunt, Provado, and Sevin, when applied at the specified rates and early in the second generation, all caused an immediate and significant reduction in leafhopper nymph populations (less than 0.24 nymphs/leaf). The counts then continued to decrease (less than 0.05 nymphs/leaf) and stayed down throughout the remainder of the second generation (Table 2, Fig. 2). Actara had a similar effect, though the initial reduction of the population was somewhat less than the other treatments. Once the nymph population in the Actara treated trees had declined, the reduction was similar to that of the first group in both degree and duration. Application of Aza-Direct did not reduce the leafhopper population but at the same time did not allow the increase noted in the check trees as the second generation progressed.

These studies indicate that there is the potential for use of softer materials to treat leafhopper infestations in both first and second generations.

References

Levene, H. 1960. Robust tests for equality of variances. Chap. 25. *In* Olkin, I., S. G. Ghurye, W. Hoeffding, W. G. Madow and H. B. Mann (Eds.), Contributions to probability and statistics. Stanford University Press, Stanford, CA.

Statistical Analysis Institute. 1988. SAS/Stat User's Guide, Release 6.03 Edition. SAS Institute, Inc., Cary, NC.

Table 1. First generation leafhopper nymph populations, Columbia View 11, 2001

Treatment/ formulation	Rate fm/acre	Nymphs/leaf 15-May	18-May	25-May	1-Jun	8-Jun
Actara 25WG	4 oz	0.77 a	0.04 b	0.00 b	0.01 b	0.00 b
Calypso 480SC	4 fl oz	0.59 a	0.21 b	0.00 b	0.03 b	0.00 b
Assail 70W	3.45 oz	0.58 a	0.10 b	0.00 b	0.00 b	0.03 b
Avaunt 30WG	6 oz	0.45 a	0.60 ab	0.00 b	0.03 b	0.00 b
BAJ 2740 240SC	18 fl oz	0.51 a	1.10 a	0.58 a	0.16 ab	0.10 a
Sevin 4F	16 fl oz	0.84 a	0.36 b	0.05 b	0.00 b	0.03 b
Check	.	0.51 a	0.63 ab	0.58 a	0.29 a	0.15 a

Means within columns not followed by the same letter are significantly different (Waller-Duncan *k*-ratio *t*-test, *k*-ratio=100).
Treatments were applied 7 d after petal fall, 17 May 2001.

Table 2. Second generation leafhopper nymph populations, Columbia View 11, 2001

Treatment/ formulation	Rate fm/acre	Nymphs/leaf 8-Aug	15-Aug	20-Aug	27-Aug
Actara 25WG	2 oz	1.31 a	0.24 bc	0.01 b	0.04 b
Calypso 480SC	4 fl oz	0.94 a	0.05 c	0.01 b	0.06 b
Assail 70W	1.7 oz	0.78 a	0.03 c	0.00 b	0.03 b
Avaunt 30WG	6 oz	1.15 a	0.05 c	0.00 b	0.08 b
Provado 1.6F	4 fl oz	0.80 a	0.09 bc	0.04 b	0.06 b
Sevin 4F	32 fl oz	1.26 a	0.04 c	0.03 b	0.11 b
Aza-Direct 0.0987L	32 fl oz	0.36 a	0.46 b	0.35 b	0.30 b
Check	. .	0.94 a	2.01 a	1.65 a	2.31 a

Means within columns not followed by the same letter are significantly different (Waller-Duncan *k*-ratio *t*-test, *k*-ratio=100).
Treatments applied 9 Aug 2001.

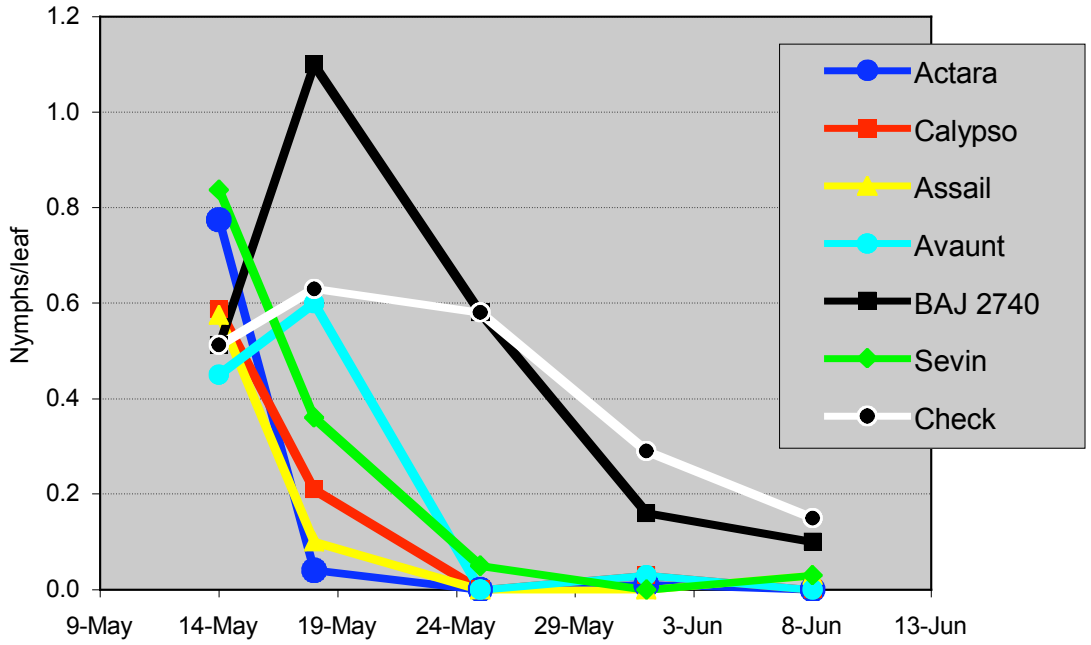

Figure 1. First generation white apple leafhopper nymph populations before and after treatment, CV-11, 2001.

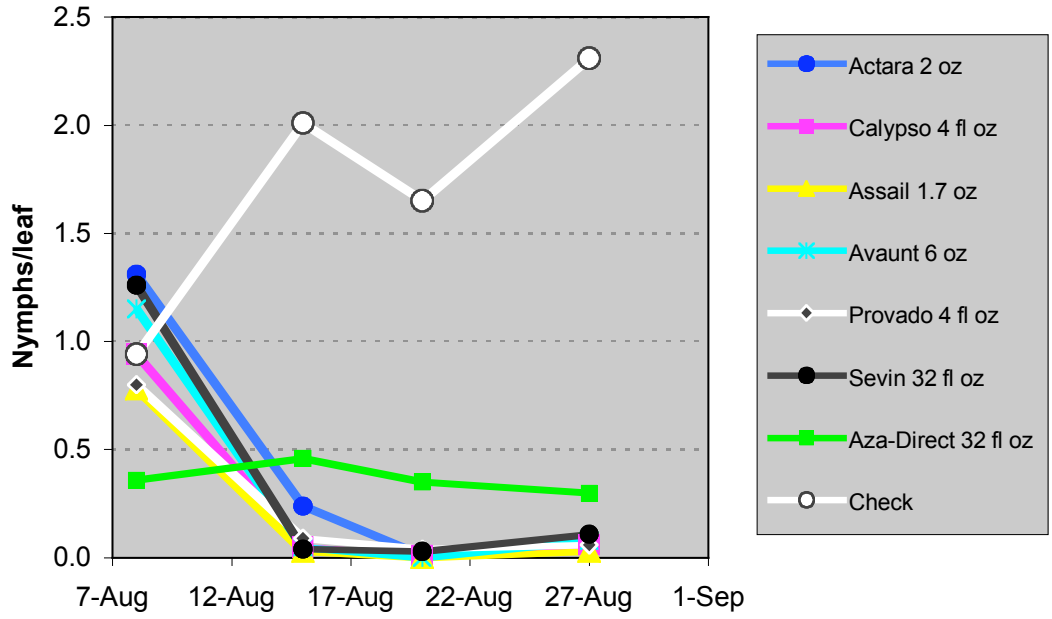

Figure 2. Second generation white apple leafhopper nymph populations before and after treatment, CV-11, 2001.