Woolly and Green Apple Aphids

field trials with new materials in orchard near Watsonville indicate same timing of spray treatment controls both pests

Harold F. Madsen and J. Blair Bailey

Woolly apple aphid and green apple aphid are two of the more important pests of apple, especially in the coastal districts of northern California. Both are difficult to control because they are able to reinfest trees after spray applications.

The woolly apple aphid causes damage by feeding upon the twigs and limbs, reducing the vigor of the tree, and causing bumps and swellings on the twigs. They also produce honeydew which drips to the fruit and foliage. On the Yellow Newtown Pippin variety, the aphids enter the core, where their presence creates a problem for the canning industry. The difficulty in controlling this aphid is due to the presence of root forms which move up to the twigs and limbs throughout most of the season. The peak of upward movement is during the summer months, and even though complete control of the aerial forms is obtained, new colonies may form in less than 30 days.

The green apple aphid is injurious in two principal ways. The aphids attack the growing shoots and cause them to be stunted. On young trees, green apple aphid attacks can be so severe that seasonal growth is almost completely checked. The aphids also produce copious quantities of honeydew, which drips to the foliage and fruit. The presence of the honeydew and the black fungus which grows in it causes the fruit and leaves to be black and sticky.

The aphids first become noticeable in late June or early July on the shoot growth, and populations build up rapidly during July and August. Winged forms are constantly developing, and they migrate to other trees. Even though spray applications are effective in destroying the aphids, reinfestation takes place very rapidly from adjoining orchards or other hosts. With materials such as parathion and malathion, reinfestation can take place within two weeks after spray treatment.

During the 1957 season, plots were established in a Yellow Newtown Pippin apple orchard near Watsonville to evaluate new materials for woolly apple aphid control and to study the proper timing of treatments. Although the plots were established for woolly aphid control, it was possible to check the effects of the materials on the green apple aphid as well.

Because Thimet was an outstanding material for woolly aphid control in 1955 and 1956, it was selected for use in the 1957 timing trials. Separate plots were established, and Thimet was applied in a two-spray program in May and July, and in single seasonal treatments in July, August, and September. In these test plots, the dosage was one quart of 48% Thimet emulsion per 100 gallons. In order to check the effectiveness of a lower dosage of Thimet, a plot was established using the material at one pint per 100 gallons, in a two-spray program for the season. Similarly, Diazinon was tried at one pound 25% wettable per 100 gallons, using the same timing program. All previous work with Diazinon had been at two pounds per 100 gallons, and at this dosage, the material has given excellent aphid control.

New compounds—Thiodan, Nialate, and Guthion—were applied at monthly intervals, starting in May and continuing through September.

Each plot consisted of single trees, with eight replications, and materials were applied with conventional ground equipment and orchard spray guns. Since the trees were small and widely spaced, the gallonage per acre averaged only 350.

The woolly aphid treatments were evaluated in two ways, one by means of sticky trunk bands, and the other by taking harvest counts of aphid colonies on the limbs and by checking apples for infested cores.

The banding technique consisted of using 2″ wide bands of aluminum foil which were wrapped tightly around the trunk of the tree. The bands were coated with a narrow line of Deadline, an extremely sticky polyethylene compound. Two bands were used for each treatment, and they were changed at weekly intervals. The downward movement of aphids, reflected by the aphids trapped on the upper edge of the sticky band, gives a good indication of the aphid population in the aerial portion of the tree. A low aphid catch would indicate good control with the reverse true for a heavy aphid movement.

At harvest, counts of aphid colonies were made by examining four limbs on each tree, and recording the number of active colonies. In addition, 100 apples were selected at random from each plot, cut in half, and examined for infested cores.

Both Thimet and Diazinon, in a two-spray program, were very effective in controlling woolly apple aphid. Thimet at the pint dosage did not provide the degree of control obtained with the quart dosage. The timing experiments indicate that a single treatment in July did not control aphids for a long enough period to prevent buildup by harvest. Both the August and September treatments pro-

Woolly Apple Aphid Plots
Watsonville, 1957

Material	Dosage 100 gals.	Application dates	Total monthly downward aphid movement trapped on sticky bands					Av. no. aphid colonies per limb— Sept. 26	Infested apple cores Sept. 26 %
			May	June	July	Aug.	Sept.		
Thimet	1 quart 48% em.	May 6, July 11	2	19	20	8	4	0.0	0
Thimet	1 quart 48% em.	July 11	21	615	0	35	131	1.0	4
Thimet	1 quart 48% em.	August 8	4	153	306	11	2	0.6	2
Thimet	1 quart 48% em.	Sept. 3	1	14	31	162	2	0.1	1
Thimet	1 pint 48% em.	May 6	12	143	144	487	77	0.8	4
Diazinon	1 pound 25% wet.	May 6	57	71	62	60	75	0.0	0
Guthion	1½ pints 18% em.	May 6, June 10, July 11, Aug. 8, Sept. 3	40	163	151	468	268	0.5	4
Nialate	1 pound 25% wet.	May 6, June 10, July 11, Aug. 8, Sept. 3	473	779	1085	2314	1025	2.3	7
Thiodan	2 lbs. 25% wet.	May 6, June 10, July 11, Aug. 8, Sept. 3	570	139	7	1	7	0.1	0
Check	no spray	———	14	482	1192	4865	2079	6.0	13

Green Apple Aphid Plots
Watsonville
Materials applied on July 11, 1957

Material	Dosage 100 gals.	Live aphids per leaf		Honeydew rating of apples—Sept. 26			
		July 25	August 1	1 (0–5%)	2 (5–10%)	3 (10–50%)	4 (50–100%)
Thimet	1 quart 48% em.	0.8	1.4	100	0	0	0
Thimet	1 pint 48% em.	2.3	2.2	88	6	6	0
Diazinon	1 pound 25% wet.	6.0	5.0	68	13	13	6
Guthion	1½ pints 18% em.	3.5	1.3	100	0	0	0
Nialate	1 pound 25% wet.	12.8	9.7	48	25	15	12
Thiodan	2 pounds 25% wet.	4.7	1.2	100	0	0	0
Check	No spray	28.6	12.8	24	18	38	20
Thimet	1 quart* 48% em.	0.7	1.5	98	2	0	0
Thimet	1 quart** 48% em.	—	—	53	20	22	5
Thimet	1 quart*** 48% em.	—	—	24	21	40	15

* Applied July 11. ** Applied August 8.
*** Applied Sept. 3.

vided good control, but the trees used for the September application had so low an aphid population in the early season that it is difficult to draw conclusions. The trees used in this particular plot had received Thimet the previous season, which may indicate that the effects of the material can carry over for two seasons.

Of the new materials, Thiodan gave the best control. Guthion was fair, but Nialate did not provide what could be considered commercial control.

Green apple aphids became numerous during July, and the July 11 treatment for woolly apple aphid was directed against the two pests.

Evaluation of green apple aphid control was made by taking leaf counts in July and by fruit counts at harvest. The aphids on the leaves were checked by

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CREDIT

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Alameda and in 17% of these stores in Los Angeles.

The proportions of rural stores in Butte, Fresno, and San Diego providing credit alone—39%–64%—were higher than the proportions of these stores providing three services—10%–22%. The proportion of urban stores offering three services was almost twice the proportion offering credit only in Alameda, one third higher in Fresno and San Diego, and slightly higher in Los Angeles. In Butte the proportion of urban stores offering credit alone was one third higher than the proportion offering three services.

When location was considered, credit alone was least frequently available in stores in downtown shopping areas in each of the counties. In Butte and Fresno it was available in only 6%–10% of these stores, while it was offered in 35%–40% of the stores in neighborhood-secondary shopping areas, and in 56%–58% of the isolated stores. In San Diego the proportions of stores offering credit alone were quite similar in the different locations, that is, it was offered in 21% of the downtown stores, in 23% of the stores in neighborhood-secondary shopping areas, and in 24% of the isolated stores. In Alameda and Los Angeles, where there were few isolated stores, 15% and 11% of the stores in downtown areas in the respective counties and 20% and 18% of those in neighborhood-secondary areas offered credit only.

Credit alone was granted predominantly by independents rather than by chains. The proportions of independent stores offering credit alone ranged from 21% in Los Angeles to 43% in Butte. The proportions of chains which limited their services to credit ranged from none in Fresno to 20% in Butte.

Credit alone was offered more frequently in the nonaffiliated than in the affiliated independent stores in each county. From 25% of the nonaffiliated stores in Los Angeles to 52% in Butte provided credit only whereas the proportions of affiliated stores in which this service alone was provided ranged from 13% in Alameda to 30% in Butte.

In each county the proportion of stores with one or two employees offering credit alone was much higher than the proportions of stores employing more persons. From 26%–52% of the stores with one or two employees as compared with 3%–32% of those with 3–6 employees made credit only available to their customers.

Of the stores employing 7–14 persons, none in Alameda and San Diego, 3% in Los Angeles, 11% in Fresno, and 18% in Butte granted credit only. In four counties, none of the stores with 15 or more employees and in the fifth—Los Angeles—only 1% of these stores offered credit alone.

No Services

None of the three services—credit, telephone, or delivery—was available to customers in from one sixth to about one half of the retail grocery stores in each county. Los Angeles had the highest proportion of stores offering none of the services and Fresno the lowest.

Urban stores provided none of the services relatively more frequently than rural stores in Butte, Fresno, and San Diego counties. From 18%–36% of the urban stores in these counties as compared with 13%–23% of the rural stores offered no services. In Los Angeles 47% of the urban stores and in Alameda 28% of these stores granted none of the services. Proportions of the stores in downtown shopping areas offering no services ranged from 20% in Fresno to 50% in Los Angeles. Those in neighborhood-secondary areas ranged from 15% to 48% in these two counties. From 19% of the isolated stores in Fresno to 59% of those in San Diego provided no services.

Chain stores were predominantly no-service stores. Almost three fourths or more of the chains in each county offered none of the three services. The proportions ranged from 73% of the stores in Butte to 93% in Alameda.

By contrast, only 12%–37% of the independent stores were no-service stores. Fresno had the lowest proportion of these stores and Los Angeles had the highest. The proportions of affiliated and nonaffiliated independent stores with no services were quite similar in each county. Proportions were lowest—15% affiliated and 11% nonaffiliated—in Fresno and highest in Los Angeles—36% and 38%.

Stores employing the largest number of persons—15 or more—were predominantly no-service stores. From 80% of these stores in Fresno to 100% in San Diego granted none of the services. The proportions of no-service stores were much smaller for stores with fewer employees. From 13%–38% of the stores with one or two employees and 15%–32% of those with 3–6 employees offered none of the services. For both of the above groups of stores, Fresno and Alameda had the lowest proportions—13%–17%—and Los Angeles the highest—32% and 38%.

Marilyn Dunsing is Assistant Professor of Home Economics, University of California, Davis.

Jessie V. Coles is Professor of Family Economics, University of California, Berkeley.

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APHIDS

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selecting the third leaf from the terminal on an infested shoot, and 25 leaves per plot were collected. The leaves were run through an aphid shaker and the live aphids were recorded.

At harvest, 100 apples were selected at random from each treatment, and rated on the amount of honeydew present on the fruit. Those apples with more than 10% of the surface covered with honeydew would be downgraded in the fresh fruit market.

Thimet at both the quart and pint dosages, Guthion, and Thiodan gave good control, and the fruit was free of honeydew at harvest. Diazinon did not provide as good control as had been obtained in past seasons with a higher dosage. Nialate provided only partial control, and the fruit was almost as badly covered with honeydew as those of the nontreated check plot.

The single treatments of Thimet—which were timed for woolly apple aphid—pointed out the correct timing for green apple aphid. The July treatment resulted in clean fruit, but the August and September treatments were too late to prevent damage.

Because Thimet is a systemic—and provides a long residual effect—it probably would be necessary to treat at more frequent intervals with a nonsystemic material.

The results of the 1957 trials emphasize that it would be possible to control both woolly apple and green apple aphid with the same timing of treatments. However, a systemic compound—or a material with a long residual effect—would be necessary in order to avoid several repeated applications.

Harold F. Madsen is Assistant Entomologist, University of California, Berkeley.

J. Blair Bailey is Research Assistant in Entomology, University of California, Berkeley.

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