

## Thresholds, Monitoring and Sampling

### Action Threshold for Control of Green Apple Aphids and Spirea Aphids

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There are a few methods for sampling aphids, such as estimating the maximum number on a leaf within a colony and the number of infested leaves on a shoot. I have been estimating the size of the colonies from the tip of the shoots down. This research report describes the creation and evaluation of an action threshold based on this sampling method.

I estimate aphid populations by two numbers: the percentage of shoots infested and the average size of the colonies. When scouting, I concentrate on infestation patches within the orchards and examine shoots directly above fruit. Sampling data from a number of orchards were used to create a model of aphid damage. The weekly measurements were first transformed into population indices. The percentage of shoots infested was multiplied by the size of the colonies. Next, the indices were added every week from the beginning of July until the second week of September. This single number, an index of population pressure over time, was correlated with the percentage of fruit damaged at harvest. The index has two assumptions: the absolute number of aphids in a tree, not the distribution, determines damage to the fruit, and honeydew does not deteriorate with time.

There was a rough correlation between the sample index and the percentage of fruit damaged at harvest (Fig. 1). Fruit damage greater than 2% was considered by the grower to be too high. An index of 1500 or greater was most often associated with damage greater than 2%. Assuming no change in population, the number of weeks it would take each aphid density to reach an index of 1500 or greater is presented in Table 1. Densities that would take more time than the season will allow are called Very Low. Those that could reach 1500 within a growing season are called Low, and those that reach it in about three months are called Moderate. Those that could reach 1500 in less than three months are called High, while those that could reach it in a few weeks are called Very High. According to the model, densities called Moderate or greater need to be controlled.

The model was tested with data from other orchards in 1995. Of the 72 blocks monitored, the model predicted correctly that seven would have more than 2% fruit damage and 60 would not. The model was incorrect on five blocks (7% of total). These blocks, including some with large Golden Delicious trees, were predicted to have less than 2% damage but, in fact, they had more. In 1996 the model was tested on the same orchards plus 94 others. Out of 166, the model correctly predicted 2 orchards would have significant damage and 160 would not. However, the model predicted 2 orchards would have significant damage when, in fact, they did not. Two other orchards were predicted to have no damage, but did have significant fruit damage.

My sampling results were compared to those of USDA employees during the summer of

1995. USDA randomly selected 20 trees in nine blocks and examined five shoots in each tree. Their method took more than 20 minutes per block, whereas my estimates took less than 10 minutes. Using Table 1, the results were assigned a severity rating and compared to the visual estimates. Most of the aphid populations were rated much higher by my visual estimate than by a random sample. Six out of fourteen times, the visual estimate called for insecticide treatment when the random sample did not. Probably, my employees and I estimate the population to be higher because I hunt for hot spots and shoots above fruit and report only these observations. My method may serve as a guide for consultants and fieldmen trying to make maximum use of their time in the field.

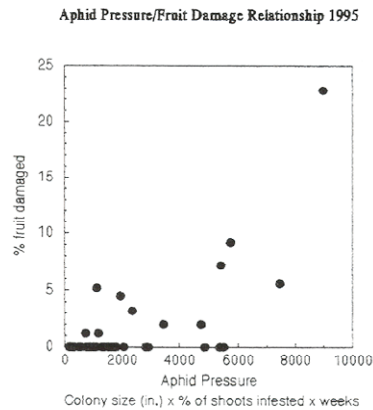


Fig. 1. Aphid population indices and percentage of fruit damaged by aphids on 50 blocks.

Table 1. Number of weeks in summer until aphid colonies damage >2% of fruit

	Average Colony Size (in.)				
	1	3	6	12	18
Percentage of Shoots Infested					
2					← Very Low-Almost no chance of damage.
5	>6 mo.			25	17 ← Low-Damage unlikely.
10			25	13	8 ← Moderate-Damage can occur.
25		20	10	5	3 ← High-Damage is certain.
50		10	5	3	2
75	20	7	3	2	1 ← Very High-Damage has occurred.
90	17	6	3	1	1