Walnut aphid becoming a costly midsummer pest

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Controls for codling moth suppress aphid parasite, allowing undisturbed population growth.

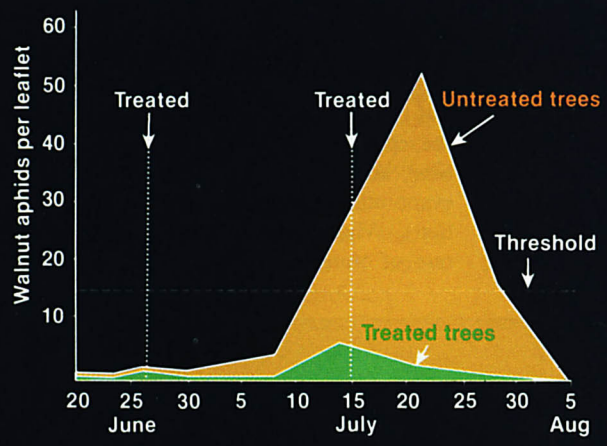
Up to now, the walnut aphid has been considered primarily a cool-season pest. Populations have normally developed on leaves in early May, then have declined with the onset of warm weather in June.

Although chemical treatment is occasionally required to prevent economically important infestations of walnut aphid, *Chromaphis juglandicola*, in spring, the parasitic wasp *Trioxys pallidus*, introduced in 1969, generally provides natural control of this pest. Thus, spring infestations of walnut aphid have been rare. With increasing frequency, however, heavy, short-lived walnut aphid populations have been developing in midsummer, despite normal warm temperatures.

A substantial amount of research has been conducted to determine the effect of a spring infestation of the aphid on production and quality of walnuts. That research showed that, when a threshold level of 15 aphids per leaflet is exceeded for four to six weeks during the spring, walnut production and quality are significantly affected. The research reported here was developed to determine effects on walnut quality of walnut aphid populations occurring in summer.

Methods

To determine the effects on kernel quality, we chose 16 pairs of Ashley walnut trees for the experiment. These were uniform 14-year-old trees, previously uninfested by spring populations of walnut aphid. The second



Summer aphid population, Ashley walnut, Visalia, 1980.

Effect of summer walnut aphid infestation on walnut quality Ashley walnut, Visalia, 1980

Characteristic	Treatment* Aphids	No aphids	Difference†
Light kernels	26.3%	34.9%	8.6%
Total edible kernels	32.6%	41.6%	9.0%
Offgrade kernels	12.8%	7.7%	5.5%
Moldy kernels	14.5%	8.8%	5.7%
Shriveled kernels	7.4%	3.5%	4.9%
Value/inshell lb.	26.6¢	34.0¢	7.4¢

*Average values from 16 replicates (trees) per treatment.
†Analyzed as paired "T" test. All differences significant at 999:1 or greater, except mold and shrivel — 99:1.

Sunburn of walnut husk, following sooty mold development on aphid honeydew, leads to significant quality loss from kernel shrivel and mold.

generation of codling moth was controlled in this orchard with Guthion (azinphosmethyl) applied on June 17, 1980.

Walnut aphid populations began to develop on June 24. On June 27, one tree of each pair was treated with Zolone (phosalone) to exclude walnut aphids. A second Zolone treatment was applied to these trees on July 15 to further suppress aphids.

We monitored walnut aphid populations throughout the infestation period. Numbers of aphids on each test tree were averaged using 10 leaflets per tree.

The economic threshold of 15 walnut aphids per leaflet was exceeded on untreated trees for 19 days from July 11 to July 30. A maximum average of 52 aphids per leaflet occurred on July 21. After July 30, populations declined to near zero for the remainder of the season (see graph). Trees treated to exclude aphids did not sustain populations of more than five aphids per leaflet at any time.

At harvest, samples of 100 nuts were collected from each tree, dried, and submitted to Diamond Walnut Growers, Inc., for quality analysis. Walnut quality from each treated and untreated tree of a pair was compared using a paired "T" test.

Results and discussion

Untreated trees showed a loss of 7.4¢ per inshell pound in this test (see table). This meant a loss of approximately 0.4¢ per inshell pound for each day the economic threshold of 15 aphids was exceeded.

Walnut aphids caused highly significant decreases in the percentage of both light-colored and total edible kernels. A significantly increased percentage of moldy and shriveled kernels also occurred.

These results clearly show that midsummer walnut aphids in excess of 15 per leaflet contribute significantly to reduced quality and subsequent value loss of English walnut.

Economic populations of walnut aphid can develop rapidly in midsummer when temperatures are over 95 °F. Guthion applied for second-brood codling moth control suppresses the walnut aphid parasite, allowing an undisturbed aphid population to develop.

In addition to stress from direct feeding of the aphids, honeydew accumulation on nuts and subsequent sooty mold development results in sunburn injury to the husk, causing kernel shrivel. Preharvest husk injury, such as that caused by sunburn, significantly promotes moldy kernels, as was detected in this test.

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Radioactive measurement of brown mite injury on avocados

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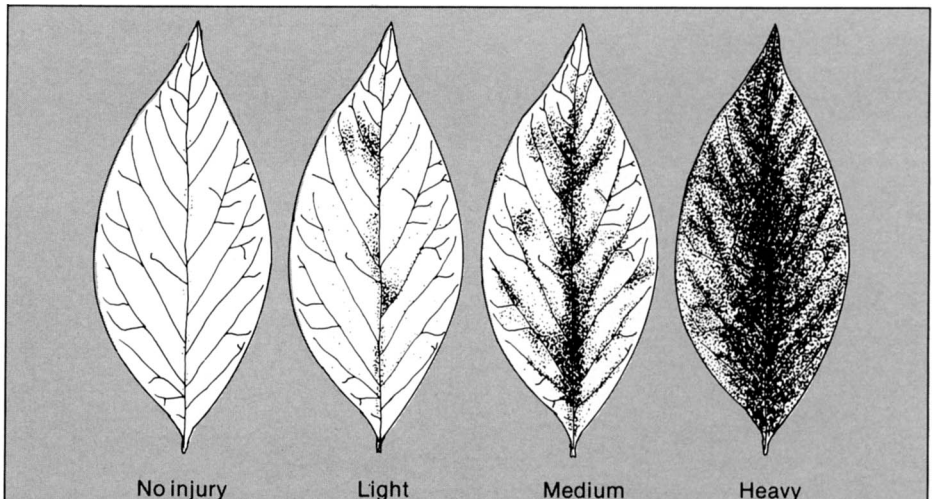
Avocado brown mite can reach high population densities in southern California avocado-growing areas with a coastal or intermediate climate. Its feeding on avocado leaves is initially confined to the area surrounding the midrib on the upper leaf surface. Later, feeding extends along the smaller veins and may eventually cover the entire leaf if mite densities become high. The upper surfaces of recently expanded avocado leaves are the most favorable for adult survival, population increase, egg-laying, and development of immatures as compared with new leaves and the lower surfaces of mature leaves. Many workers have also observed that the accumulation of webbing and mite cast skins on the leaves can limit brown mite population growth.

Feeding by avocado brown mite, *Oligonychus punicae* (Hirst), causes a brownish discoloration of the leaves commonly referred to as bronzing. Heavy infestations may cause complete bronzing of the upper leaf surface with only small portions of the lower leaf surface showing visible injury. Large populations for extended periods lead to partial defoliation of the tree. This leaf drop can occur when population densities average 70 adult females per leaf during short periods or 50 females per leaf for several weeks. However, it has not been determined if partial defoliation affects growth or fruit yields during the season in which the injury occurs.

Plant productivity

Reductions in photosynthesis rates have been detected in apple, citrus, strawberry, and cotton heavily infested with spider mites. Photosynthesis, the process by which sugars (photosynthates) are produced by the binding of carbon and water molecules into carbon-based chains, occurs within the chloroplasts of leaf cells and is powered by solar energy absorbed by the pigment chlorophyll. The required water is brought up from the roots by translocation. Carbon dioxide enters leaf tissue through small closable apertures in the epidermis (stomata), but at the same time, large quantities of water are lost by evaporation to the atmosphere (transpiration). When transpiration rates exceed the rate of water uptake by the roots, plants



Schematic representation of levels of avocado brown mite feeding injury.