

WALNUT



Experimental walnut orchard, Campbell ranch, Visalia.

The two articles included here are from separate experiments. The first concerns the influence of walnut aphids on production and quality of Payne walnuts, on trees whitewashed in the normal practice for prevention of sunburn. This trial showed a marked loss of both production and quality resulting from aphid infestations. In the second trial, the walnuts were not whitewashed and were subjected to varying degrees of aphid infestation. The resulting evidence showed that most of the sunburn problem was aphid-related. If aphids were controlled, sunburn was reduced to a non-economic level. In orchards where codling moth was not a problem, a recently introduced parasite provided adequate aphid control.

... aphid effects on walnut production and quality

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DATA WERE COLLECTED FROM A two-year experiment conducted in Tulare County in 1969-1970 to determine the influence of aphids on yield and quality of walnuts. The experiment showed an advantage of \$425 per acre during the two-year period through maintaining a low aphid population (less than 5 to 10 per leaf). During the first year (1969) aphid control resulted in an increase in return of \$191 per acre and during the second year, \$234 per acre.

The trees in the control plot were maintained without benefit of either biological or chemical aphid control. Codling moth was controlled, however, and all trees were whitewashed. Under these circumstances aphid populations exceeded 10 per leaf for 5 to 6 weeks, reaching 50 to 90 per leaflet on untreated trees before the hot weather in June. Two insecticide treatments were required each year to control walnut aphids on the protected trees.

The trees with aphid infestation for about six weeks in the spring of 1969 and 1970 bore fewer catkins in 1970 and 1971. Counts made the first week in April showed 39 percent fewer catkins in 1970 and 64 percent fewer in 1971 on these trees, as compared with trees on

which aphids were controlled. These reductions were significant considering the odds at 99 to 1.

This experiment was conducted on the Campbell Ranch, near Visalia, with 11-year-old Payne trees planted 35 trees per acre (see photo). Twenty-four pairs of trees were involved, with one of each pair permitted to develop an aphid population and on the other, aphids were controlled by chemical treatment. Each tree was harvested separately in two picks, and yield weights were taken and corrected for drying. Samples from each pick of the 48 trees were taken and combined in a final sample for each tree, in proportion to the size of the pick. These samples were submitted for quality analyses to Diamond Walnut Growers, Inc., Stockton. Differences reported (tables 1 and 2) are averages of data from the 24 pairs of trees and were statistically analyzed.

The reduction in yield resulting from the first year of aphid infestation was 10 percent, as compared with 26 percent the second year. Quality reduction related to aphid infestation was expressed in reduced nut size, with a 25 percent reduction in the large, sound category. Aphid infestation also caused a 10 percent

increase in off-grade nuts and an average of 11.5 percent decrease in Diamond kernels. Combining quality with quantity losses in this orchard, loss revenues totaled \$425 per acre for the two year period. The most important factor in prevention of sunburn on the Payne variety has proved to be control of walnut aphids (as discussed in the accompanying article).

During the period 1968-70, a wasp, *Trioxys pallidus*, which is parasitic on walnut aphid was introduced to Central Valley walnut orchards by Robert van den Bosch, Entomologist on the Berkeley campus. This tiny parasite has spread rapidly throughout most of the Central Valley. In many orchards it was demonstrated that it can maintain control of walnut aphid. Growers should familiarize

TABLE 1. EFFECTS OF SPRING INFESTATION OF WALNUT APHID ON YIELD OF PAYNE WALNUTS, VISALIA, 1969-1970*

	Walnuts/Tree		Walnut/Acre	
	1969	1970	1969	1970
	Lbs.		Lbs.	
Aphids controlled	93.7	81.8	3281	2863
Aphids not controlled	84.4	60.7	2955	2125
Difference	9.3	21.1	326	738

* Differences significant: Odds greater than 40:1 for 1969 and 999:1 for 1970.

APHID MANAGEMENT

themselves with evidences of activity of this parasite (appearance of parasitized aphids or so-called aphid mummies). If evidence of activity of this parasite is frequently encountered in the orchard at the time control applications are being considered, treatment should be withheld unless aphid populations exceed 10 to 15 per leaflet. This level of walnut aphid infestation is presently considered the threshold for damage. From the experience of the past season, orchards in which this aphid parasite has been well established have not required aphid control treatments.

In a special category for consideration, are orchards in which codling moth is a problem, since present materials available for codling moth control kill the parasitic wasps. Experiments are underway which are designed to develop practices which will prevent interference of codling moth treatments with activities

of the parasite. These involve treatment against the second brood of codling moth, instead of the first, and the search for selective materials.

Timing of the codling moth treatment against second brood should reduce or eliminate interference with the parasite in orchards where aphid populations are a problem only in spring. Where aphids are present in significant populations more or less continuously during the summer, a selective material will be required.

Results of this two-year experiment demonstrate that proper management of walnut aphid infestations is one of the most important factors in successful walnut production.

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TABLE 2. EFFECT OF SPRING INFESTATION OF WALNUT APHID ON QUALITY OF PAYNE WALNUTS, VISALIA, 1969-1970*
Walnut quality criteria

	% Lg. Sound		% Diamond		% Non-Blowable Damage		% Off-Grade	
	1969	1970	1969	1970	1969	1970	1969	1970
Aphids controlled	73	51	53	56	18%	17	8	11
Aphids, not controlled	47	26	37	49	33%	29	18	21
Difference	26%	25%	16%	7%	15%	12%	10%	10%

*All differences significant at odds of 99:1 except percent Diamond in 1970 which was 19:1.

... walnut aphid and the sunburn problem

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TRIALS CONDUCTED in Tulare County (reported in accompanying article) have demonstrated that the walnut aphid has a profound influence on walnut production and quality. Observations on infested trees during 1969 showed that honeydew accumulations on developing nuts had a phytotoxic effect on husk tissue which resulted in killing surface cells (photo 1). These turn black and together

with subsequent sooty mold aggravate sunburn, since dark surfaces have the capacity to absorb more heat. It was also noted that sooty mold developed through the whitewash deposits. This situation of dark husk surfaces due to honeydew (photo 2) compounded by sooty mold accumulation (photo 3), was studied in relation to the sunburn problem of walnuts grown in interior valleys.

To determine the role of walnut aphid in the sunburn problem an experiment was conducted in 1970 on 11-year-old Payne walnuts planted 35 trees per acre. The trial consisted of 12 pairs of trees, one tree of each pair treated to exclude walnut aphid. All trees received normal cultural practices, including a codling moth treatment, and were not whitewashed for normal sunburn protection—allowing a clear determination of the effect of walnut aphid infestation on the sunburn problem.

During 1970, walnut aphid infestation on untreated trees began April 21 and reached a peak of 54 aphids per leaflet on May 19. Following high temperatures the first week of June, the population declined, becoming sub-economic by June 30—typical of a walnut aphid population in a warm district (table 1). Damaging populations of walnut aphid existed during the period of most rapid increase in nut size. Honeydew accumulated on nut surfaces with resultant discoloration; then nuts became exposed to sunlight as full size was attained and populations

Photo 1. Degrees of necrotic spotting of upper husk tissue from honeydew accumulation and a collapsed husk from sunburn.

