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%

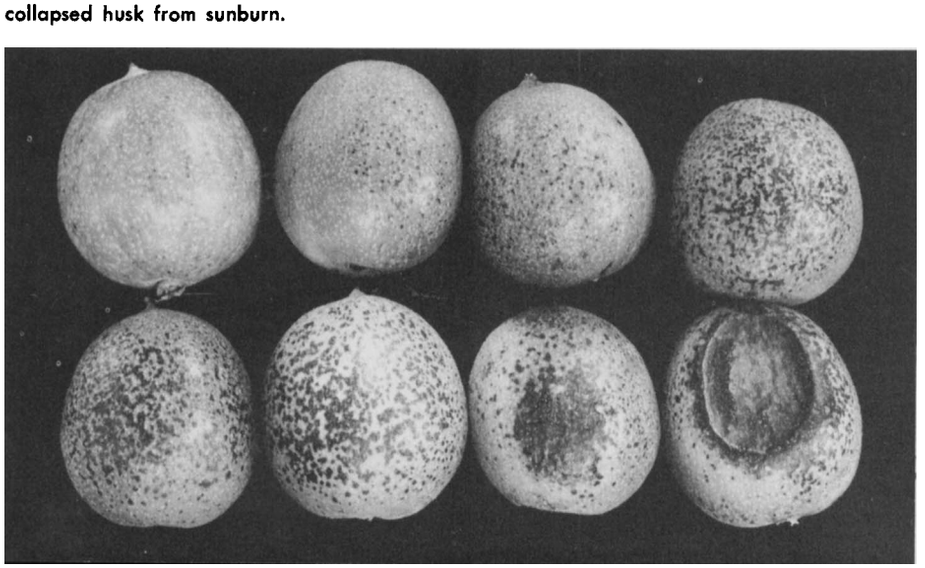
*All differences significant at odds of 99:1 except percent Diamond in 1970 which was 19:1.

. . . walnut aphid and the sunburn problem

G. STEVEN SIBBETT · C. S. DAVIS · M. M. BARNES

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.

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



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

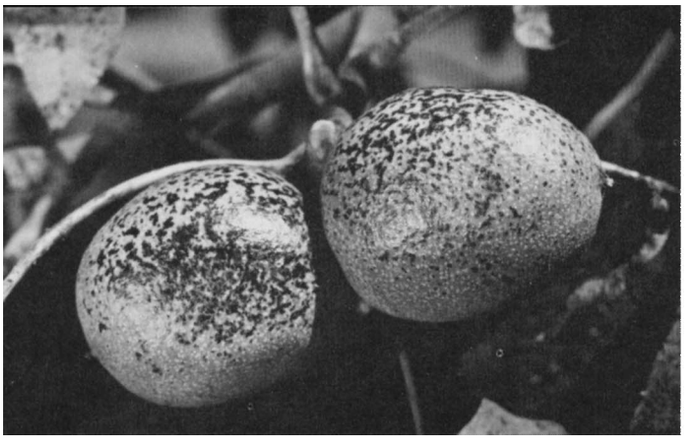


Photo 2. Dark husk surface due to honeydew.

Photo 3. Sooty mold development on nut surface (same nuts as photo 2).

began to decline. Two applications of an insecticide were required to control walnut aphid on trees designated to be treated.

During the 1970 season, typical symptoms of nut sunburn, yellowing and increased darkening of the upper husk surface, began to appear during mid-July. To evaluate and compare this condition between treatments (unwhitewashed trees with aphids and those with no aphids), 25 nuts, exposed in the lower one-third of each tree's southwest quadrant were rated at two-week intervals as to husk condition: *Clean*—no yellowing, no spotting from honeydew accumulation; *Slight*—yellow blush beginning to appear with slight spotting and sooty mold; *Moderate*—prominent yellow blush, obvious necrotic spotting, sooty mold common; *Severe*—severe yellow blush, dark coalescing necrotic areas on husk tissue; *Very Severe*—collapsed husks (photo 4).

Rating of husk condition on each of three dates is presented in table 2. It was important to note changing husk condition as the season progressed. In mid-July, 94 percent of counted nuts rated slight to moderate husk discoloration typical of initial sunburn symptoms where walnut aphid was not controlled. Ten days prior to harvest, husk condition of these nuts had progressed, and 81 percent rated moderate to severe injury and 12 percent had collapsed husks. Eighty-five percent of nuts rated on trees where aphids were controlled remained in the clear/slight category throughout the season, however. These data indicated walnut aphids, in absence of whitewash, have a dramatic influence on typical sunburn of Payne walnuts. Only minor sunburn was considered to have occurred in this test during 1970 if aphids were kept below damaging levels in absence of whitewash.

Walnut quality data were obtained from this trial; yield data were not, as information on walnut aphid influence on production was being developed in a separate experiment and is presented in an accompanying article.

Nut samples for quality determination were obtained from each experimental tree for each of two picks. Each tree was shaken mechanically and (while on the ground), a 12″ swath of nuts from trunk to dripline in each quadrant of the tree (including southwest) was removed and combined to make up the sample. Subsample data from each pick, following Diamond Walnut Growers, Inc. evaluation, were combined in proportion to amount of crop each represented. These were statistically analyzed and are presented in table 3.

Significant increases in nut size (number of walnuts per 500 g.), percent large sound walnuts, and percent diamond kernels occurred when walnut aphids were controlled. A significant increase in offgrade kernels resulted when walnut aphid was not controlled.

Walnuts in each quality category, for each treatment, were evaluated in terms of price. Nuts from trees not whitewashed with no walnut aphids were worth 23.1¢ per pound while nuts from identical trees with walnut aphids were worth 20.1¢ per pound. These differences amounted to $60.00 per ton favoring aphid control in this non-whitewashed test.

Data obtained from this test indicated walnut aphid infestations were intimately related to the sunburn problem associated with Payne walnuts. Honeydew accumulations on nut surfaces directly discolored hull tissue and resulted in sooty mold development, greatly increasing sunburn. Controlling aphids, and thus honeydew and sooty mold, resulted in sound, green husks less apt to burn. Where walnut aphids were not controlled, two applications of whitewash were usually required to prevent burn.

These tests are being continued and expanded to include comparisons of walnut aphid influence on whitewashed and non-whitewashed trees to determine the need for this practice.

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Photo 4. Collapsed husks, sooty mold removed.

TABLE 1. WALNUT APHID POPULATION, PAYNE WALNUTS, UNWHITEWASHED, VISALIA, 1970.

	treated 4/22 and 5/19						
	4/21	4/28	5/5	5/11	5/19	6/4	6/17
Treated	3	1	1	3	5	0	0
Untreated	3	8	21	38	54*	11	16

* Heat wave 6/1 and 6/2

TABLE 2. PERCENT EXPOSED, NON-WHITEWASHED PAYNE WALNUTS AFFECTED BY WALNUT APHID HONEYDEW-INDUCED BLACKENING, AND RESULTING SUNBURN VISALIA, 1970*

	Date	Clean	Slight	Moderate	Severe	Very severe (Collapsed Husks)
No aphids	7/23	68	30	2	0	0
No aphids	8/12	57	37	7	0	0
No aphids	8/26	59	26	7	6	2
Aphids	7/23	0	39	55	6	0
Aphids	8/12	1	21	46	27	8
Aphids	8/26	0	4	43	38	12

* Samples taken from southwest quadrant of tree.

TABLE 3. INFLUENCE OF WALNUT APHID INFESTATION ON PAYNE WALNUT QUALITY, TREES NOT WHITEWASHED, VISALIA, 1970

	Aphids controlled	Aphids not controlled	Significant at odds
Nuts/500 g.	55	65	99/1
% large, sound nuts	49	22	999/1
% non-blowable damage	19	25	19/1
% Diamonds	77	66	99/1
% Offgrade	12	21	99/1