Progress report, 1969 . . .

Whitewash

WHITEWASH SPRAYS were found beneficial to walnuts in studies conducted during the early 1960's. Sunburn injury to exposed nuts and limbs was reduced with applications of various types of whitewash sprays. Internal temperatures of exposed nuts averaged 2 to 3 degrees lower on whitewashed trees than the unsprayed checks, and there was a greater percentage of large sound nuts on sprayed trees than on unsprayed trees. Only slight differences in kernel color were reported in these early trials. A good whitewash cover on the trees was needed for results.

Grower returns are often reduced as a result of heat injury in walnuts of the interior valley, particularly at the northern and southern ends. Most of the new heavy-bearing varieties are particularly susceptible to injury. Improved nut quality can mean more net return per acre, but treatment costs bring up the question of whether whitewash sprays can be used to substantially improve grower returns. In recent years growers have experienced both good and poor results in using whitewash sprays. Materials, rates, timing and methods of application, water quality, and surfactants have been blamed for the variation in results.

Preliminary tests were conducted on the Ashley and Lompoc varieties in the Chico area during the summer of 1969 to evaluate the effectiveness of whitewash sprays. Three aspects were investigated: (1) spray coverage as affected by surfactants, (2) walnut kernel quality as affected by spray timing, and (3) the feasibility of vertical boom, and aerial applications. The trees were sprayed with a hand gun from a height of 12 to 15 ft above the ground. The southwest half of each tree was covered with the whitewash material Sunguard. Earliest evidence of sunburn injury on hulls occurred during the middle of July after six consecutive days of maximum temperatures at or slightly above 100°F. After this period, the weather remained hot with maximum daily temperatures near 100°F until the first week of September.

TABLE 1. EFFECTS OF SURFACTANTS ON WALNUT WHITEWASH SPRAY COVERAGE (GUNTHER ORCHARD, CHICO, 1969)

Treatment	Material* & amount per 100 gallons of water	Average per cent of area of exposed hull covered with whitewash†	
		Ashley	Lompoc
I	Sunguard and DuPont spreader-sticker at 6 ozs	97.5 a‡	93.3 a
L	Sunguard and DuPont spreader-sticker at 6 ozs plus Sunguard spreader-sticker at 2 lbs	97.3 a	97.3 a
T	Sunguard spreader-sticker at 2 lbs	61.3 b	64.0 b
Q	Sunguard alone	50.5 c	47.8 c

* Sunguard used under each treatment at 135 lbs in 150 gallons of water per acre.

† Each value is an average of 400 nuts sampled from 8 trees.

‡ Values followed by different letters are significantly different at the 1% level as determined by the Duncans Multiple Range Test.

Spray coverage

The degree of spray coverage determines the success or failure of any whitewash operation—the more surface area covered with a white deposit, the greater the protection from sunburn. Early in the summer there is a waxy layer on the surface of the hull which is difficult to cover with a whitewash deposit unless an effective surfactant is used. Not all surfactants will perform well with any active ingredient. In this trial, 12 different surfactants and combinations were evaluated for effectiveness in spreading the whitewash deposit and for the degree of whiteness of the deposit. Only the most significant results are reported here.

Use of a single surfactant in the whitewash spray treatment I was far superior to all other treatments (table 1). Spreading of the whitewash deposit was excellent with almost all of the exposed surfaces of the nuts covered. The spray deposit was not very white, however, because only a thin layer of Sunguard was deposited over the surface.

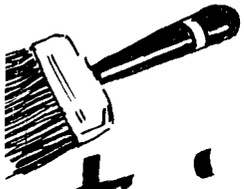
To increase the degree of whiteness of the deposit in treatment I, Sunguard spreader-sticker, which had good deposit-building properties, was added. The results (under treatment L, table 1) show the whitewash deposit was spread over the entire surface in treatment I but was much whiter.

If a single early spray is to be successful, the deposit must stick on the nuts until harvest despite rains, pesticide sprays, and leaf and limb rubbing which may reduce the effectiveness. In this study, weathering ability of the spray deposit appeared to be related to spray coverage. A spray of water at a pressure of 50 psi was directed to the whitewashed nuts at harvest time. An effort was made to remove the whitewash deposit with three successive applications lasting 2, 3, and 5 minutes each. The most whitewash was retained after treatments which gave the best spreading of the deposit. A spray deposit which was evenly spread over all or most of the exposed surface of each nut was the most difficult to remove.

Nut quality

Under the conditions of these tests, whitewashed trees produced kernels valued at 1 to 2 cents per pound higher than the unsprayed trees. As shown in table 2 the percentages of offgrade and diamond kernels are the main factors responsible for the differences in kernel values.

A single application in June before the first signs of sunburn proved to be the most valuable treatment. Although two



trials in walnuts

sprays—one in June, followed by another in August—offered slightly more protection than one early spray, the cost of the additional spray was not justified.

Even the best treatment offered only a slim margin of profit. Better spray coverage would likely have brought greater differences in nut quality between sprayed and unsprayed trees. Nut samples submitted for kernel quality evaluation were collected from trees under treatment T (which did not receive the spray providing the best coverage).

The costly whitewash sprays are too often deposited on the undersides of nuts

TABLE 2. EFFECT OF WHITEWASH SPRAY TIMING ON WALNUT KERNEL QUALITY (GUNTHER ORCHARD. CHICO. 1969)

Treatment*	Spray date	Average per cent of diamond kernels (light colored kernels)	Average per cent of offgrade kernels	Average inshell value‡ cents/pound	Net return per acre§ (above check)
Check (unsprayed)	———	67.8 a†	16.5 a	24.20 a	—
One Spray—early	June 26	73.0 b	12.0 b	25.95 b	$16.50
One Spray—late	August 6	72.9 b	16.3 a	25.26 ab	6.84
Two Sprays—early & late	June 26 & August 6	76.3 b	10.8 b	26.30 b	13.40

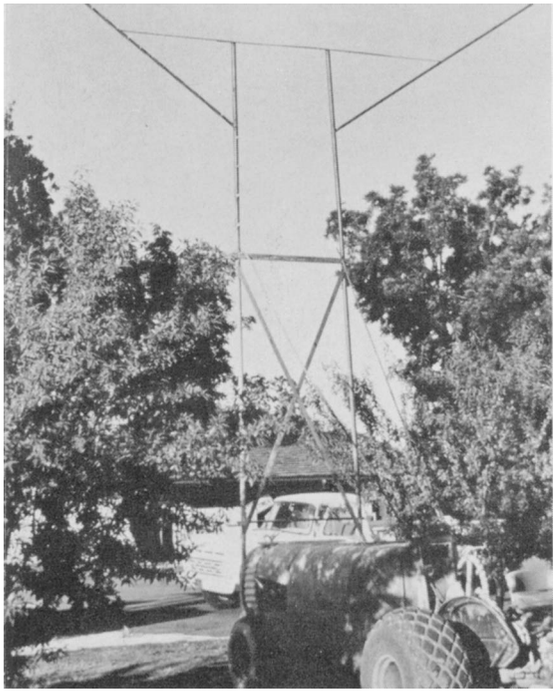
* Trees in each treatment reeceived Sunguard each 135 lbs plus Sunguard Spreader-Sticker each at 2 lbs per 150 gallons of water per acre at each application date.

† Each value is an average of 1,300 nuts sampled from 14 trees. Values followed by different letters are significantly different.

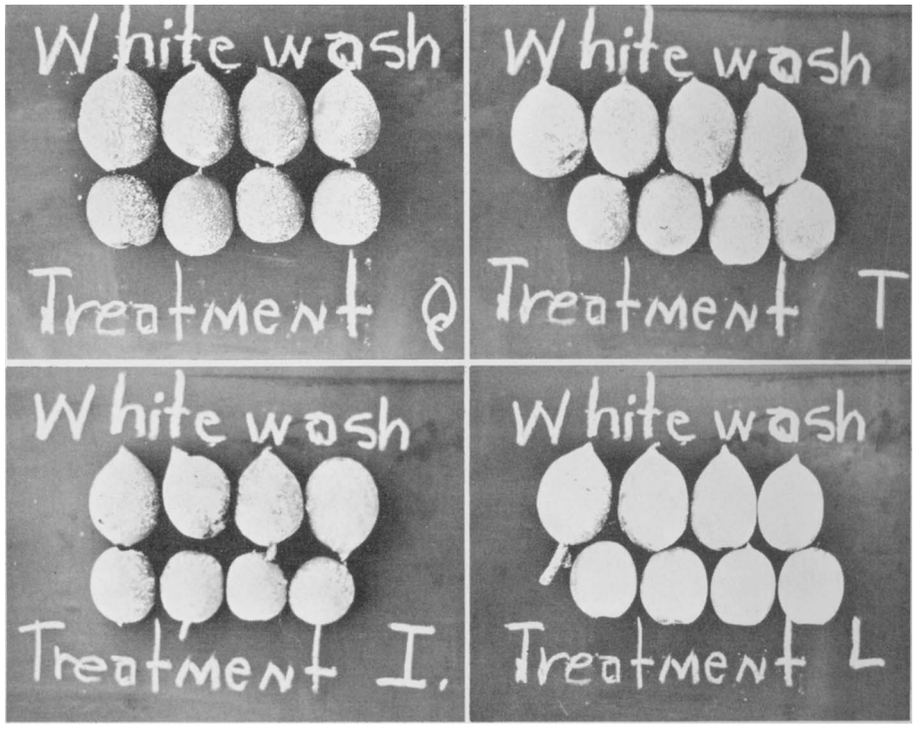
‡ Values based on price per inshell pound using estimated inshell values.

§ Figures based on increased value of crop less cost of spray material.

Vertical boom constructed of 2-inch diameter pipe mounted on conventional air-carrier sprayer for whitewash spray applications on walnuts.



Effects of surfactants on whitewash spray coverage on walnuts when added to Sunguard: Treatment Q, no surfactant; Treatment T, Sunguard spreader-sticker; Treatment I, DuPont spreader-sticker; and Treatment L, DuPont spreader-sticker plus Sunguard spreader-sticker



and leaves, in shaded areas where protection is unimportant, or on the ground surface. While it is impossible to spray only the exposed nuts, with proper equipment there may be ways of applying whitewash sprays with less waste of material.

Vertical boom

Spray applications should be geared to covering mainly the periphery of the tree, since this is the area where the nuts are exposed to the sun. Preliminary tests were conducted using a 28 ft vertical boom mounted on the back of an air-carrier sprayer. The upper one-third of the boom was constructed so that it towered at an angle extending over the centers of the trees during the spraying operation. Spray coverage results were undesirable and were seriously hampered by light winds which caused drifting. Increasing the size of nozzles and reducing operating pressures, thereby increasing droplet size might overcome some of these problems. (D-5 and D-8 hollow-cone nozzles were operated at a pressure of around 150 psi in these tests.) This season more tests will be conducted using different types of nozzles and operating pressures.

Airplane application

In preliminary tests conducted last season with a fixed wing aircraft, spray coverage was undesirable in application of less than 100 gallons of water per acre. The most desirable coverage was obtained with applications of 200 gallons of water per acre (not a very economical rate for the grower). Time of day, type of surfactant, and amount of whitewash in the spray may affect spray coverage. In tests planned this season, attempts will be made to reduce the volume of water needed to give adequate spray coverage by airplane.

Air-carrier sprayers, if properly modified and operated, are capable of good whitewash coverage. Vertical booms and hand guns operated under high pressure are also capable of satisfactorily applying the whitewash spray. However, both of these methods require large amounts of material to do an effective job. The question still remains—is there another method that will give good spray coverage with less material and with the least amount of hand labor. More work is planned for this season in attempts to find other methods.

Floyd Perry is Farm Advisor, Butte County; and A. D. Rizzi is Extension Pomologist, University of California Agricultural Extension Service.

Effects of

on

of irrigated

TABLE 1. MEAN NUMBER OF NODULES PER SOYBEAN PLANT (VARIETY WAYNE) AFTER FERTILIZATION WITH AMMONIUM SULFATE AT DIFFERENT RATES AND TIMES, WEST SIDE FIELD STATION, 1968

Time of application	Nitrogen applied lbs/acre	Straw burned	Straw chopped	Treatment average
		Mean number nodules per plant*		
Preplant	0	17.5	15.4	16.5a
	50	5.2	2.2	3.7 b
	100	1.8	6.8	4.3 b
	150	2.2	4.4	3.3 b
Preplant + flowering	0 + 0 = 0	7.9	23.2	15.6
	0 + 50 = 50	7.9	19.0	13.5
	50 + 50 = 100	5.7	9.4	7.6
	100 + 50 = 150	1.5	8.6	5.1
Flowering	0	12.0	24.6	18.3
	50	17.4	21.2	19.3
	100	13.5	21.8	17.7
	150	4.4	15.2	9.8
Timing, average all rates				
No fertilizer		12.5	21.1	16.8a
Preplant		3.1	4.5	3.8 b
Preplant + flowering		5.0	12.3	8.7ab
Flowering		11.8	19.4	15.6ab
Rates, average all times†				
	0	12.5	21.1	16.8A
	50	10.2	14.1	12.2AB
	100	7.0	12.7	9.9 B
	150	2.7	9.4	6.1 B
Average		8.1	14.3	11.2

* Means with the same letter within any group are not significantly different. Small letters and capital letters indicate 5% and 1% levels of probability, respectively. Means in groups without letters are not significantly different.

† Nodulation and rates were negatively associated in a linear manner.

TABLE 2. MEAN YIELD OF SOYBEANS AFTER FERTILIZATION OF PLOTS WITH AMMONIUM SULFATE AT DIFFERENT RATES AND AT DIFFERENT TIMES

Time of application	Nitrogen applied lbs/acre	Straw burned	Straw chopped	Treatment average
		Yield of beans in lbs per acre*		
Preplant	0	1009	1115	1062
	50	938	1080	1009
	100	1122	1069	1096
	150	950	932	941
Preplant + flowering	0 + 0 = 0	962	1070	1016
	0 + 50 = 50	1177	1105	1141
	50 + 50 = 100	1084	1161	1123
	100 + 50 = 150	997	1145	1071
Flowering	0	1037	1180	1109
	50	962	1240	1101
	100	1064	1260	1162
	150	1030	1238	1134
Timing, average all rates				
No fertilizer		1003	1121	1062
Preplant		1003	1027	1015
Preplant + flowering		1086	1137	1112
Flowering		1019	1246	1132
Rates, average all times				
	0	1003	1121	1062
	50	1026	1142	1084
	100	1090	1163	1127
	150	992	1105	1049
Average		1028	1133	1081

* Differences due to timing, or rates of fertilizer application, and burned or chopped barley straw were not significant.