TABLE 1. EFFECT OF ETHREL APPLICATION (JUNE 12) ON ULTIMATE DIAMETER AND WEIGHT PER BASAL FIRST-CROP MISSION FIG FRUIT*

Ethrel concentration	Diameter	Weight			Dry weight
		Fresh	Dry	Water	
ppm	mm		gms		%
		Harvested June 19			
100	46.9a	53.1b	10.4b	42.7	19.6
250	48.8a	57.8a	11.9a	45.9	20.6
500	47.3a	56.4a	11.3a	45.1	20.0
		Harvested July 3			
Control	47.1a	58.9a	11.6a	47.3	19.7

* Means within a column not followed by the same letter are statistically different at the 5% level.

with 500 ppm on May 22 and lateral buds on current-, one-, two-, and three-year-old wood produced a few millimeters of growth. No vegetative responses were noted on the Calimyrna variety.

Time of application

The data presented clearly indicate the importance of timing Ethrel applications. Applied during period 1, when cell division was progressing, it inhibited fruit growth and promoted abscission. Growth during period 2 is primarily by cell enlargement and it was stimulated by Ethrel application. However, quality of Ethrel-treated fruits equal to that of unsprayed fruits was not attained until treatment was made the latter part of period 2. To stimulate early maturation of fruits with quality characteristics equal to those of later maturing control fruits, the approximate time for Ethrel application is a few days after the time all drupelets within the fruits have turned red. This corresponds approximately to a week before the transition from period 2 to 3, and marks the beginning of rapid influx of sugars into the fruits as they grow to maturity.

TABLE 2. EFFECT OF ETHREL APPLICATION (AUGUST 1) ON ULTIMATE DIAMETER AND WEIGHT PER BASAL SECOND-CROP MISSION FIG FRUIT

Ethrel concentration	Diameter	Weight*			Dry Weight %
		Fresh	Dry	Water	
ppm	mm		gms		
		Harvested August 7			
100	42.9	36.8	7.9	28.9	21.5
250	41.6	35.5	7.4	28.1	20.8
500	42.8	36.7	7.7	29.0	21.0
		Harvested August 20			
Control	42.6	36.3	7.4	28.9	20.4

* No statistical differences occurred among the fresh or dry weight means.

It is evident in graph 1 that this stage of first-crop fruit development corresponds to about the middle of period 1 of second-crop fruit growth. Unless the spray is restricted to fruits only, the use of Ethrel on first-crop figs is precluded because it would eliminate the second-crop. Its application to fruits only has been shown to be just as effective as when it is applied to leaves and fruits. However, its use on second-crop fruits, the major and only crop of the Mission and Calimyrna varieties respectively, would seem very promising for increasing the yield of marketable fruits at reduced cost.

Figs produced for drying ripen on the tree and eventually drop to the ground. Since fruit ripening and abscission progress successively from bases to tips of shoots, the harvesting period may extend over a month or more, depending upon weather conditions. The longer the figs remain on the ground the more they are exposed to dust, dirt, and insect infestation. Therefore, the fruits are picked up by hand or machine two, three, or more times during the harvest period. It appears that the use of Ethrel would enable the entire crop to be harvested in one operation. Ethrel is not yet registered for use, and these results should not be considered as recommendations.

Julian C. Crane is Professor and Pomologist in the Experiment Station; Nasr Marei is Research Assistant; and M. M. Nelson is Laboratory Technician, Department of Pomology, University of California, Davis.

TABLE 3. EFFECT OF ETHREL APPLICATION (AUGUST 13) ON ULTIMATE DIAMETER AND WEIGHT PER SECOND-CROP CALIMYRNA FIG FRUIT (HARVESTED DURING THE PERIODS INDICATED IN GRAPH 1)

Ethrel concentration	and fruit position	Diameter	Weight*			Dry Weight
			Fresh	Dry	Water	
	ppm	mm		gms		%
Control	1	52.8	50.2	11.1	39.2	22.1
	3	57.8	60.0	12.1	47.9	20.2
	5	53.9	46.9	9.3	37.6	19.8
	Mean	54.8	52.4	10.8	41.6	20.6
100	1	53.0	50.6	10.9	39.7	21.5
	3	54.4	55.9	11.5	44.4	20.6
	5	50.8	44.1	10.1	34.0	22.9
	Mean	52.7	50.2	10.8	39.4	21.5
250	1	53.1	48.4	9.6	38.8	19.8
	3	54.6	54.3	10.1	44.2	18.6
	5	48.9	44.3	9.3	35.0	21.0
	Mean	52.2	49.0	9.7	39.3	19.8
500	1	53.3	51.5	10.1	41.4	19.6
	3	56.9	60.0	10.6	49.4	17.7
	5	52.2	49.3	9.2	40.1	18.7
	Mean	54.1	53.6	10.0	43.6	18.6

* No statistical differences occurred among the fresh or dry weight means of all fruit positions of a particular treatment.

Foliar zinc

ZINC DEFICIENCY is one of the most serious nutritional problems of walnut production in California, and has been very difficult to correct. The most common treatment in past years has been the use of zinc-coated sheet metal strips driven into the sapwood of the tree. This method has been laborious and expensive and has required periodic treatments (every three to four years) to maintain deficiency-free trees. In some soils, trees have responded well to soil applications of zinc, while in other soils they have responded poorly. Soil applications of zinc at levels sufficient to achieve correction have often been very expensive.

Foliar sprays of zinc materials had been considered ineffective for correcting the deficiency of walnut trees until recently. However, because of the pressing need for easier and cheaper control methods, an intensive effort was made to find effective sprays to correct walnut zinc deficiency. One experiment indicating that zinc deficiency of walnuts can be corrected with spring foliar sprays is described here.

Trees in an eight-year-old Hartley walnut orchard in Sutter County were graded visually on October 7, 1965, for leaf and growth symptoms of zinc deficiency. Thirty-four trees selected for the trial were divided into five groups. Five trees were used in each of four spray treatments and fourteen trees were left as an untreated check. The degree of deficiency of each group was essentially the same.

Applications were made with a 100-gallon hand-gun sprayer, and care was taken to achieve thorough coverage. Four treatments were applied in the spring of 1966. Three of these were resprayed in the spring of 1968. No applications were made in 1967. The treatments were as follows:

Spray Treatment		Application dates	
Material	lbs/100 gals	1966	1968
1. $ZnSO_4$ (36% Zn)	6.6 lb	4/20	
2. $ZnSO_4$ (36% Zn)	6.6 lb	4/20	5/12
+ Hydrated Lime	5 lb		
3. $ZnSO_4$ (36% Zn)	6.6 lb	4/20,	5/12
+ Hydrated Lime	5 lb	5/1	5/28
4. ZnEDTA 14% Zn)	3 lb	4/20, 5/1, 5/13, 6/2	5/7 5/28

sprays for correcting deficiencies in walnuts

K. URIU · DAVID H. CHANEY

To evaluate the response, all trees were re-graded in the summer and fall of 1966, again in the fall of 1967, and in the summer and fall of 1968. Results are summarized in the graph showing amounts of improvement of sprayed trees as compared with the untreated check trees.

All four spray treatments in 1966 showed responses varying according to the material and the number of spray applications. On July 14, trees sprayed only once showed a moderate correction. Those sprayed more than once showed good correction. By October 9 the single-spray treatments had declined in response, the double-spray treatment maintained good correction while the four-spray treatment of ZnEDTA continued to improve.

Evaluations

Evaluations on October 18, 1967, showed that about 50 per cent of the correction obtained from 1966 sprays was lost in each treatment during 1967. After the treatments were repeated in the spring of 1968, the trees again showed a response, except for the treatment which was not resprayed in 1968, and which continued to decline from its first year response.

The condition of the trees on May 31, 1968, in the treatments resprayed, was about the same. By July 15, trees in the two-spray ZnEDTA treatment were superior to the one- and two-spray applications of zinc sulphate plus lime. By October 19, trees in both of the double-spray treatments were definitely superior to those in the single-spray treatment where response declined slightly from midsummer.

The foliar sprays caused varying degrees of injury to the leaves. Zinc sulphate at 6.6 lbs per 100 gallons of water, applied when the new growth was 2 to 4 inches long, gave moderate blackening of leaf margins and shoot tips. However, this injury was rapidly outgrown as tree response to the zinc resulted in vigorous new growth. The same rate of zinc sulphate, applied in another trial later in the season when leaves were more fully expanded, resulted in severe foliage injury which remained evident throughout the growing season.

Leaf injury

Leaves sprayed with ZnEDTA showed a slight yellowing around the margin which disappeared during the summer. The zinc sulphate plus lime treatment rarely produced any leaf injury, however—indicating that the addition of lime allowed use of the zinc sulphate with a higher degree of safety.

The degree of zinc deficiency correction on walnut trees achieved from foliar sprays was good, although complete correction of severely deficient trees did not result after one season of spraying. Repeated spraying for two to three years appeared to be necessary to achieve maximum correction for moderately to severely deficient trees.

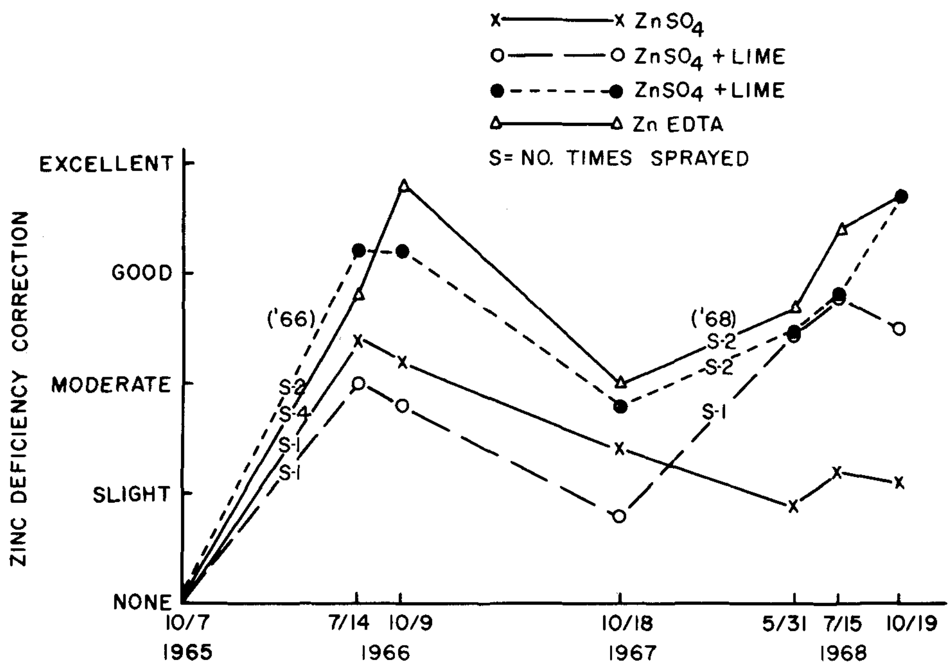
A single spray in the spring gave moderate correction for zinc deficiency but effects did not last throughout the growing season. Two or more sprays in a single season gave greater, longer-lasting correction. Both single and repeated sprays resulted in some residual effect the following year.

Other trials

In other trials, on walnuts, low rates of zinc materials were applied throughout the foliage season with little apparent leaf injury. Further work is being conducted using multiple applications of low, nonphytotoxic rates of both zinc sulphate and ZnEDTA. The effects of different materials, concentrations, timing, and numbers of sprays per season are being studied.

K. Uriu is Associate Pomologist, Department of Pomology, University of California, Davis, and David H. Chaney is Farm Advisor, Sutter County.

RESPONSE OF ZINC DEFICIENT WALNUT TREES TO FOLIAR APPLICATIONS OF ZINC SPRAY MATERIALS



Points represent amounts of improvement over check trees. Sprays were applied in spring, 1966 and 1968. Sprays applied only once per season are indicated by S-1, sprays applied two times, by S-2, and four times, by S-4.