Chemical "pruning" of walnut trees

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Although proper use of pruning shears remains the best procedure for training young walnut trees, other methods also may prove to be useful. Walnut trees are structurally trained during the first five years of growth in the orchard, during which time terminal extension growth is vigorous. Lateral branching is less rapid than in most other deciduous fruit trees, and it often occurs at undesirable locations for tree training. A greater number of lateral branches may allow better early branch selection for tree training.

Walnut fruit grow at the ends of shoots from terminal buds and, in highly fruitful cultivars, from lateral buds as well. Age at which a tree bears an economically significant crop depends on the number of shoots developing and bearing nuts in the early years. Increased lateral branching might promote a larger crop.

In some walnut cultivars (for example, Hartley, Franquette) few lateral buds develop, and they may be excessively vigorous. This growth habit results in delayed fruiting and a modest fruit production per unit area of land in the early life of the orchard. Treatments to direct more energy into fruit production are required. Although training and pruning of walnut trees are advocated and extensively practiced, they do not correct problems of limited lateral bud growth and delayed yields.

Dikegulac [sodium salt of 2,4:4,6-di-O-(1-methylethylidene)-X-L-Xylo-Z-hexulofuranosonic acid] is the most promising of a number of chemical pinching agents tested recently on nut trees. Positive results in other studies with pecan were of particular interest because of similarities with walnut in growth habit and delayed bearing.

In preliminary tests, dikegulac was applied as a foliar spray to 'Ashley' walnut at harvest, and treatments were evaluated for possible hull splitting. Increased splitting did not occur, but the number of lateral buds was increased the next spring on treated trees.

In subsequent experiments we evaluated the concentration and timing of dikegulac for inducing lateral bud growth of young walnut trees.

In 1976, several timings (June to October) and concentrations (1,000 to 10,000 ppm) of dikegulac were tested on 'Ashley' to screen major effects. Results were evaluated to establish measurement parameters for studies the next year.

In 1977, trees of six cultivars (Franquette, Hartley, Payne, Ashley, Serr, and Tehama, representing the main cultivars of California's 220,000-acre walnut industry) three to five years old were chosen for treatment in Stanislaus County. Dikegulac was applied as a foliar spray at 500, 1,000, and 2,000 ppm in May, June, and July to six single tree replicates for each date, cultivar, and concentration. Where available, nuts of the current crop were taken at harvest for quality evaluation by Diamond/Sunsweet, Inc.

'Ashley' was selected for treatment in 1978 in Stanislaus and Tulare counties. Dikegulac was applied as a foliar spray at 500 and 1,000 ppm in April and May to six single tree replicates for each date and concentration.

Treatment at 10,000 ppm in October 1976 induced multiple pistillate flowering (up to 50 per terminal) the following spring. Normally, one would expect one or two pistillate flowers on a given terminal.

When applied in July 1977 after most vegetative growth had ceased, 500 to 2,000 ppm dikegulac induced lateral bud growth at the terminal. Growth following the 2,000-ppm treatment was weak and so multibranched that it was useless.

In general, response to dikegulac treatment during May, June, and July 1977 was similar in all cultivars. May treatments of either 500 or 1,000 ppm induced more lateral bud growth than June or July treatments, and subsequent growth of the tree was compact. Whenever applied, the 2,000-ppm treatment induced phytotoxicity.

Development of lateral buds in response to dikegulac was always best on vigorous limbs. Concentrations up to 2,000 ppm were ineffective on nonvigorous limbs of 20-year-old trees. The chemical did not reduce fruit set, even though treatments were applied at bloom. Although the treated trees were young, sufficient nuts were available from some cultivars for quality evaluation at harvest in 1977. No influence on nut quality was noted, even at 2,000 ppm dikegulac.

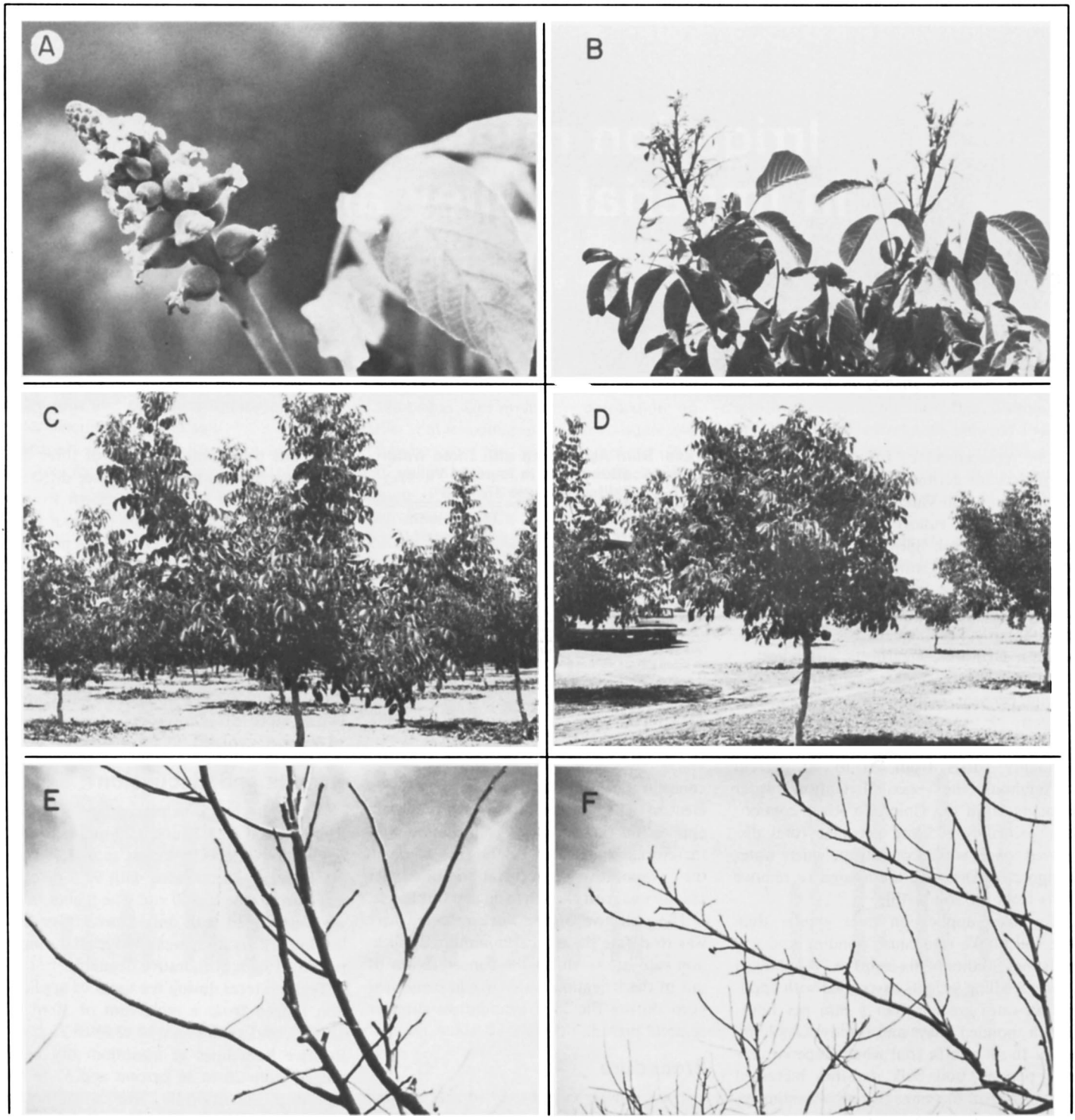
In 1978, the first treatment was applied during pistillate bloom to evaluate earlier application. In Stanislaus and Tulare counties, 13 and 20 cm, respectively, of vegetative growth had occurred at treatment time. All treatments increased the number of growing points in 1978. April or early May treatments resulted in the most desirable location of shoots. Reduced terminal growth and increased development of lateral shoots produced a compact tree in comparison with the normal elongated growth.

TABLE 1. Effect of Concentration and Timing of Dikegulac on Number of Laterals per 100 cm of Shoot in Various Walnut Cultivars, 1977

Dikegulac concentration	Time of treatment	Number of laterals per shoot					
		Franquette	Hartley	Serr	Ashley	Tehama	Payne
ppm							
0	—	0.9	0.7	0.7	0.7	0.6	0.8
500	May	1.4	4.2	0.6	2.5	2.5	2.1
1000	May	1.3	5.9	1.3	4.4	4.2	5.0
2000	May	3.3	7.2	3.3	3.8	3.7	7.7
500	June	6.7	8.4	2.2	4.4	3.7	5.9
1000	June	6.2	5.3	4.2	7.7	8.4	7.7
2000	June	7.2	5.9	6.2	7.2	8.4	7.7
500	July	2.3	0.7	1.5	0.7	2.0	2.8
1000	July	2.2	0.9	4.0	1.6	2.8	3.1
2000	July	3.0	1.8	3.7	2.1	2.6	5.0

TABLE 2. Effects of Concentration and Timing of Dikegulac Sprays on Number of Laterals per 100 cm of Shoot for 'Ashley' Walnut at Two Locations, 1978

Dikegulac concentration	Time of treatment	Vegetative growth at treatment time	Number of growing points per 100 cm shoot 1978
ppm		*cm*	
	STANISLAUS COUNTY		
0	—	13	0.5
500	April 14	13	1.7
1000	April 14	13	3.8
500	May 5	15	3.6
1000	May 5	15	2.7
500	May 17	21	1.3
1000	May 17	21	2.7
	TULARE COUNTY		
500	April 12	20	2.5
1000	April 12	20	2.8
500	April 25	40	3.0
1000	April 25	40	4.3
500	May 25	60	6.3
1000	May 25	60	7.7



Chemical pinching agent, dikegulac, affected walnut flowering and shoot growth: A, pistillate bloom in 1977 after fall 1976 treatment (10,000 ppm); B, numerous laterals at terminals in 1977 after July 1977 spray (2,000 ppm); C, untreated control; D, result of 500-ppm dikegulac treatment in May; E, control; F, tree in dormant season after dikegulac treatment in April at 500 ppm.

Response to dikegulac varied greatly. Some limbs on many treated trees did not respond, but other limbs on the same tree produced many laterals. Although no yield increase was noted, dikegulac treatments induced growth of lateral shoots of young walnuts, and distribution of these shoots was more desirable when the chemical was applied at 500 to 1,000 ppm in the early stages of growth. The treatment resulted in a compact tree without reducing nut set or harvest quality of the nuts. However, longer term studies would be needed to determine the effect of single and repeated applications of dikegulac and subsequent reduction of tree canopy size on yields.

Although dikegulac has not been cleared by the U.S. Environmental Protection Agency for commercial use, the results illustrate the potential for altering tree form with chemical treatment.

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