A new approach to thinning olives

George C. Martin

Shimon Lavee

G. Steven Sibbett

Chic Nishijima

Stephen P. Carlson

Olive varieties in California bear fruit in cycles of heavy yields followed by light yields. We can anticipate a record-breaking crop in 1980 following the light crop of 1979. The basic problem is the physiology of the olive. The tree produces more flowers and sets more fruit than can be sustained by the available raw materials. This condition of heavy crop results in limb breakage; small fruit of less value, late maturity and poor quality; reduced vegetative growth; and ultimately depressed prices. The year following excessive production the return crop may be so depressed that harvest would not be economical.

A solution to this problem has existed for many years. Use of naphthalene acetic acid (NAA) at 150 parts per million (ppm) as a foliar spray effectively reduces crop size and helps to ensure larger individual fruit size the current year and return cropping the next year. California growers have been reluctant to thin with NAA, probably because of difficulties in determining fruit size for timing the treatment and the possibility of high temperature following treatment. On occasion, temperatures in the range of 95° to 105° F can occur in late May and early June, which induce fruit abscission. Thus, the combined thinning effect of NAA and the possibility of 95° to 105° F temperature cause grower concern and procrastination. Our intent in the present work was to provide an alternative approach with greater flexibility — specifically, an easier method for timing of treatment and a system for adjusting NAA concentration.

The purpose of this work was three-fold: (1) to reemphasize the need for crop load reduction on individual trees, (2) to test a

TABLE 1. Effect of NAA as a Fruit Thinner on Olive Weight, Size, and Value at Harvest, Kettleman City, Lindcove and Orland, California, 1979

Treatment	Timing and fruit size: Date	Days after full bloom	Fruit width	Harvest: Weight of 100 fruit*	Size*: Std. and smaller	Med. and Lg.	Ex. Lg. and Mammoth	Value/ ton
			mm	*g*	%	%	%	$
Kettleman City								
Control	—	—	—	292 a	88 a	12 a	—	316.00
NAA 100 ppm	May 25	12	3.35	416 b	44 b	56 b	—	401.50
NAA 150 ppm	May 25	12	3.35	401 b	57 b	42 b	—	396.70
NAA 150 ppm	May 29	16	4.74	385 b	64 b	36 ab	—	400.40
NAA 180 ppm	May 29	16	4.74	412 b	14 c	86 c	—	404.30
Lindcove								
Control	—	—	—	421 a	11 bc	82 c	7 a	405.44
NAA 130 ppm	May 29	14	4.53	496 c	0 a	51 a	49 c	416.45
NAA 150 ppm	May 29	14	4.53	467 c	2 ab	64 ab	34 bc	413.12
NAA 160 ppm	June 1	16	5.59	465 bc	4 abc	75 bc	21 ab	409.55
NAA 190 ppm	June 1	16	5.59	455 abc	2 ab	77 bc	22 ab	410.30
Orland								
Control	—	—	—	402 ab	39 bcd	39 a	22 a	389.20
NAA 150 ppm	June 5	15	4.53	461 c	17 a	34 a	51 d	411.15
NAA 180 ppm	June 5	15	4.53	430 abc	25 ab	41 a	34 abcd	402.55
NAA 170 ppm	June 8	18	6.10	430 abc	28 abc	33 a	40 bcd	402.20
NAA 200 ppm	June 8	18	6.10	446 bc	20 a	36 a	44 cd	404.20

*Means in each column followed by same letter are not significantly different. Duncan's multiple range test, 5 percent.

TABLE 2. Method of Establishing NAA Concentration to Use

Examples	Full bloom	Spray day	Days after full bloom	NAA concentration
1	May 27	June 10	14 x 10 ppm =	140 ppm
2	May 29	June 15	17 x 10 ppm =	170 ppm
3	May 25	June 7	13 x 10 ppm =	130 ppm

Olive thinning agent is applied about two weeks after full bloom. Single olive flower at full bloom has bright yellow anther (pollen-bearing organ) in center. Olive twig with many flowers at full bloom sheds yellow pollen on the hand.

different approach for determining treatment time, and (3) to evaluate post-"June-drop" chemicals.

In 1979 field experiments were conducted on 'Manzanillo' olive at three California locations comparing NAA, (2-chloroethyl) phosphonic acid (ethephon), and GAF 7767141 (GAF) as thinning chemicals. Both ethephon and GAF are ethylene-releasing chemicals, which we hoped would thin in mid-June after fruit set.

In the past, olive growers have applied NAA when fruit were about 4 millimeters (mm) in diameter. Although this technique is reliable, the range of fruit size on the tree makes size determination inexact. An alternative approach was compared with size — using days after full bloom. One determines full bloom, notes the calendar date, and then sprays about two weeks later (a time when the fruit are coincidentally about 4 mm in size). The following is a guide to use in determining olive full bloom in California during May.

The flowers develop over a period of time. After the inflorescence has fully elongated and while the flowers are still closed, both leaves and flowers are green. Later as the flowers begin to open one will notice a contrast in color between leaves and flowers when approaching the orchard from a distance. At *full bloom* a white color should be evident, with a marked color contrast between the green leaves and white flowers. At that time shoots should contain approximately 80 percent open, fresh flowers with the bright yellow anthers exposed. The remaining flowers will include those which are not open and those whose petals have dropped. At this stage of development one should be able to collect pollen by sliding the hand down a shoot. The beginning of petal fall should be evident as judged by petals seen on the ground around the tree, particularly on the south side. Additionally, tapping a limb should result in a puff of yellow pollen and falling petals. These reference points indicate the date for designation of full bloom. Three days after full bloom the orchard should reflect a bronze cast from the aging flowers contrasting with the green leaves.

At Kettleman City, NAA applied 12 or 16 days after full bloom resulted in heavier, larger fruit when compared with unsprayed controls. The comparison in value per ton leaves little doubt as to the benefit of these treatments.

The interesting situation at Lindcove was the low fruit set on controls. Normally, we would not have thinned an orchard with minimal numbers of fruit, but the excessive 1978 crop made it difficult to find test orchards in 1979 with heavy crops. We compromised and chose an orchard with a modest crop so that we could conduct an experiment. Even so, NAA did not cause excessive thinning, and fruit size, weight, and value were larger than in the controls.

The orchard at Orland was adequately thinned by NAA with resultant increase in fruit size, weight, and value. In this plot we were able to obtain yields for each tree and found no significant difference among treatments. Thus, it is important to note that NAA induced fruit size increase without reducing yield.

Clearly, NAA will thin olive fruit when applied 12 to 18 days after full bloom. In these experiments, the best timing appeared to occur 12 to 15 days after full bloom, when fruit width was 2.5 to 5 mm. Neither ethephon nor GAF applied 30 days after full bloom showed any promise as a chemical thinning agent for olive in any of the plots tested.

Timing for application can be determined by either fruit size (3 to 6 mm) or days after full bloom. A base concentration of 150 ppm NAA is reliable if fruit size is used for timing. However, with the assistance of a farm advisor, the grower may find the days after full bloom method to be the most useful technique. Once full bloom has been determined, a convenient spray date can be chosen between 12 and 18 days later. Concentration of NAA to use can be established by multiplying 10 ppm NAA times the number of days after full bloom.

Presently NAA (Olive Stop and Liquid Olive Control) is registered for use in thinning olives.

George C. Martin is Pomologist, Department of Pomology, University of California, Davis; Shimon Lavee is Professor of Horticulture, Department of Olive and Viticulture, Volcani Center, Bet Dagan, Israel; G. Steven Sibbett is Farm Advisor, Tulare County; Chic Nishijima is Staff Research Associate, Department of Pomology, University of California, Davis; and Stephen P. Carlson is Coordinator, 208 Planning, Department of Land, Air, and Water Resources, University of California, Davis.