

CITRUS HEDGING AND TOPPING

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Orange yields were maintained and pack-out appeared to be improved over a four-year period following maintenance hedging and topping (done before excessive crowding occurred) in a mature Valencia citrus grove.

TREES IN MANY older citrus orchards have become crowded to the point that their skirt foliage has been killed because of shading. In some cases, where the fruit-producing zone has shifted to the top of the canopy, there may be little actual change in per-acre yield. However, relocation of the fruiting zone to the top of the trees makes harvesting more difficult. Often upper-story fruit is smaller and of lower quality than fruit produced on the skirts of the trees. Other cultural practices, including pest and weed control, are also hampered when trees are crowded. Movement of pesticide spray rigs through the crowded orchard is difficult and spray coverage is less effective. Thus, maintaining smaller, open-spaced trees is probably advantageous. Mechanical hedging and topping have been used as an economical method to open crowded orchards. Usually this type of pruning is delayed until the orchard is already considerably crowded, and the severe pruning needed to open the orchard removes large amounts of wood and foli-

age. Heavy pruning is usually followed by a substantial drop in yield for one or more years, depending upon the condition of the trees and the amount of fruit-producing foliage removed.

To determine the effects of light mechanical hedging and topping before excessive crowding occurs, a test plot of Valencia orange trees was established involving removal of a minimum amount of foliage by hedging, and a moderate amount by topping. The orchard was still open and foliage of adjacent trees was not touching. Hedging removed only the shoots protruding into the alley between rows, and the tips of most shoots removed were less than $\frac{3}{8}$ inch in diameter at the point of cutting. A full wall of foliage remained after the passage of the hedger. Topping was a little more severe, and 4 to 5 ft of top foliage was removed with cuts ranging up to $2\frac{1}{2}$ inches in diameter.

The trees were 30-year-old, Sespe XI Valencias on sweet orange rootstock. The plot was located on the Limoneira Ranch in Ventura County on deep, fertile, Yolo

soil. Trees were spaced 23 ft between rows and 19 ft within the row. Each treatment was replicated five times and treated trees were surrounded by similarly pruned guard trees. Treatments were: (1) non-pruned check, (2) trees hedged on two sides, (3) trees hedged on two sides and topped, (4) trees hedged on four sides, (5) trees hedged on four sides and topped, and (6) trees which were topped only. The amount of yield was noted annually from 1964 through 1967. Average yields for each year, and all four years, were analyzed statistically, using Duncan's Multiple Range Test (see table I).

The 4-year average shows no significant differences in yield. The year following pruning, trees which were topped showed a reduction in yield. This difference disappeared by the second year. Trees which had been topped, as well as hedged and topped, were significantly higher producers in 1967 than control trees or trees which had only been hedged. This yield increase compensated

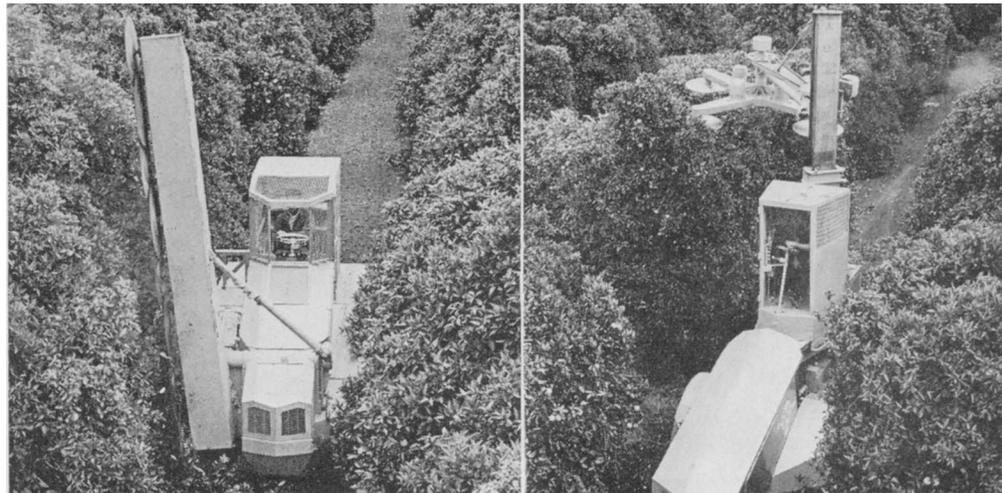


TABLE 1. MEAN ANNUAL YIELD IN FIELD BOXES PER TREE OF HEDGED AND TOPPED TREES

Treatments*	1964**	1965†	1966†	1967**	4-year average
Check	3.26 z	10.72	4.62	6.62 y	6.30
H2	3.30 z	11.66	4.65	6.59 y	6.55
H2T	1.53 y	11.32	4.55	8.02 yz	6.35
H4	3.25 z	11.63	4.92	7.07 yz	6.72
H4T	2.00 yz	11.92	6.00	8.25 z	7.04
Topped	2.06 yz	12.07	4.55	8.69 z	6.85

* H2, hedged two sides; H2T, hedged two sides and topped; H4, hedged four sides; H4T, hedged four sides and topped. ** Means not having letters in common differ at 5% level of significance. † Differences not statistically significant.

TABLE 2. PACK-OUT DATA 1965, 1966 AND 1967 (40 TREES PER TREATMENT)

Treatments*	F. box/treat.	Cartons packed		Sunkist & Choice		% F. box prod.	% F. box waste
		Sunkist	Choice	% 113's & larger	% 138's & smaller		
Check	886	492	102	37	63	36	1.58
H2	918	596	81	33	67	32	1.08
H2T	966	634	116	40	60	31	.93
H4	944	619	106	35	65	27	.95
H4T	1040	648	117	46	54	27	.96
Topped	1016	675	114	39	61	28	.88

TO PREVENT CROWDING IN MATURE TREES

C. D. MCCARTY • R. M. BURNS • L. N. LEWIS

for the 1964 loss right after pruning.

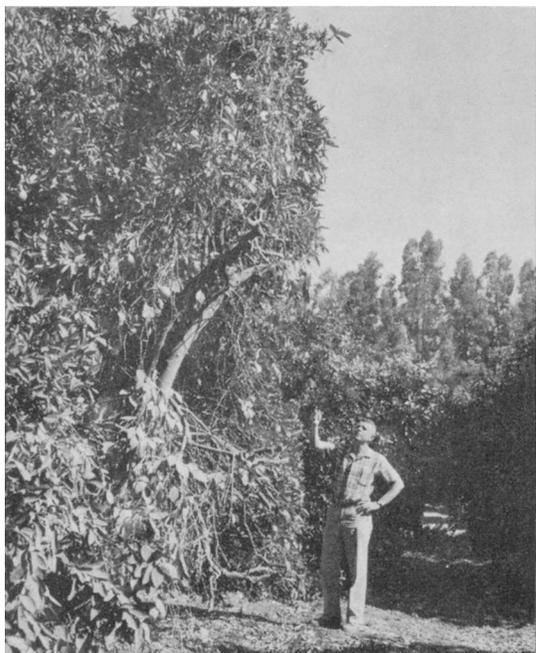
Although the 4-year average shows no significant increase, the trend favored the pruned trees. Tree size was reduced without an overall reduction in yield for the 4-year period.

Pack-out data were obtained for three years—1965, 1966, and 1967. Fruit from each replicate was lumped according to treatment so that enough fruit could be obtained for a packinghouse run. No statistical analysis is available. The lowest percentage of pack-out was obtained from the unpruned check while the most heavily pruned trees produced the largest percentage of fruit size 113 or larger (see table 2).

S. B. Boswell is Associate Specialist, L. N. Lewis is Associate Horticulturist, Department of Horticulture, and C. D. McCarty is Horticulture Technologist, Agricultural Extension Service, University of California, Riverside; B. W. Lee and R. M. Burns are Farm Advisors, Ventura County. Kimball Toppers cooperated by performing the topping and hedging, and the Limoneira Company supplied the orchard test plot site.

Citrus hedger, and topper (left and cover photo) were photographed in action in a mature orange grove.

Severe hedging shown in photo below removed the entire vegetative wall of the tree, and reduced yield until a new wall was formed.



The training of young orange trees in close-spaced hedgerow plantings to allow easier picking, and use of harvesting aids such as movable scaffolds and platforms—or possible machine harvesting—is being considered and tested by many citrus growers. The two reports included here involve many aspects of the topping and hedging operations involved and the effects on trees, fruit quality, and yields. One article discusses results of experiments with both topping and hedging to prevent crowding of mature citrus trees in the Ventura area, and the other discusses yield effects from annual sidewall trimming of trees in an Orange County plot. These are progress reports of continuing research by both Experimental Station and Extension Service researchers toward cost reduction and eventual mechanization in citrus harvesting.

Yield effects of annual **SIDE-WALL TRIMMING** *on young orange trees*

J. E. PEHRSON • C. D. MCCARTY • G. L. SUTHERS • L. N. LEWIS

THIS ORANGE COUNTY pruning experiment was initiated in 1961 to measure effects on citrus yields resulting from annual side-wall trimming of young Valencia trees. The trial was a joint undertaking of the Citrus Research Center, University of California, Riverside, and the Agricultural Extension Service. Plots were located in the Santa Ana Canyon orchards of the Santa Ana Valley Irrigation District in northeastern Orange County.

The orchard was planted in 1957 with Olinda Valencia trees on Troyer citrange rootstock. Tree spacing was 12 ft by 22 ft; irrigation furrows were in a north-south direction. The soil was Hanford sandy loam to loamy sand. Average tree diameter was 6 to 8 ft at the base of the skirts, and tree height was 5 to 7 ft. By 1967 the unpruned checks were 14 to 16 ft across and 12 to 15 ft high.

The trial consisted of four treatments replicated six times; there were seven trees per plot. The treatments were a series of hedged pruning steps increasing in severity. The cutting was done by mechanical hedger to maintain trees at thicknesses of 12, 9, and 6 ft. The amount

of wood removed by these treatments is compared in table 1.

Fruit production resulting from each treatment was measured individually in each plot. Replicates were combined in this report so that each of the treatments represents the yield of 42 trees. Results of the treatments are compared in table 2. Trees trimmed to a 12-ft wide hedge produced the largest number of boxes of fruit (684) over the six-year test, and results were closely comparable to those of the control plot (715 boxes).

The fruit was picked each season and sent to a packinghouse whenever there was sufficient volume to obtain pack-out records. This was done to see if there was any correlation between fruit size and quality resulting from the pruning treatments. The pack-out records indicated that no treatment improved fruit size. The packing grade did not vary greatly between treatments in given crop years. In one year, all treatments failed to produce first-grade fruit. Fruit was subjected to higher than average wind and frost at this orchard location.

A successful hedgerow planting depends on the setting of a heavy crop of