CLING PEACH IRRIGATION

Irrigation recommendations for peaches have been based mainly on experimental work carried out 30 to 40 years ago. Today's yield potentials make these early recommendations questionable. A higher level of soil moisture has been found to result in larger fruit size and increased vegetative growth.

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THE PRACTICAL RECOMMENDATIONS on timing cling peach irrigations for optimum production, as discussed in this article, were developed by using tensiometers and gypsum blocks. The experiments, analyzing behavior of cling peach trees under different soil moisture conditions, were conducted in the Yuba City-Marysville area of the Sacramento Valley in 1961 and 1962. Experiments were conducted in 1961 at two Rio Oso-Wheatland district orchards on well-drained soils of unlimited depth. One orchard of Cortez variety peaches was eight years old; the other of the Halford variety was nine years old. The experiment was repeated in 1962 at the Halford orchard. The same experiment was also conducted in another 10-year-old Halford orchard north of Marysville on soil underlain by hardpan at a depth of 3½ to 4½ ft.

Treatments

Three irrigation treatments were rigidly followed in both 1961 and 1962. The "wet" treatment was irrigated whenever the soil moisture suction (at the 2½-ft depth in the deep soils and at the 2-ft depth in the hardpan soil) reached 0.4 bar, or 40 on the tensiometer. The "medium" treatment was irrigated whenever soil moisture suction reached 0.8 bar, or 80 on the tensiometer, and the "dry" whenever soil moisture suction reached 5 bars, as determined by gypsum blocks. The permanent wilting point is considered to occur at a suction of 15 bars.

The number of irrigations up to harvest in the Cortez variety was 5, 3, and 2 for the "wet," "medium," and "dry" treatments, respectively, and in the two Halford orchards, 7, 5, and 3 irrigations, and 8, 5, and 4, respectively. Typical soil moisture curves are shown in graph 1, for the "wet," "medium" and "dry" treatments at the Halford orchard in Rio Oso.

Frequent measurements of fruit growth, shoot growth, fruit soluble solids, and fruit moisture content were taken throughout the growing season to evaluate plant responses. Final fruit size and yield data were obtained at harvest.

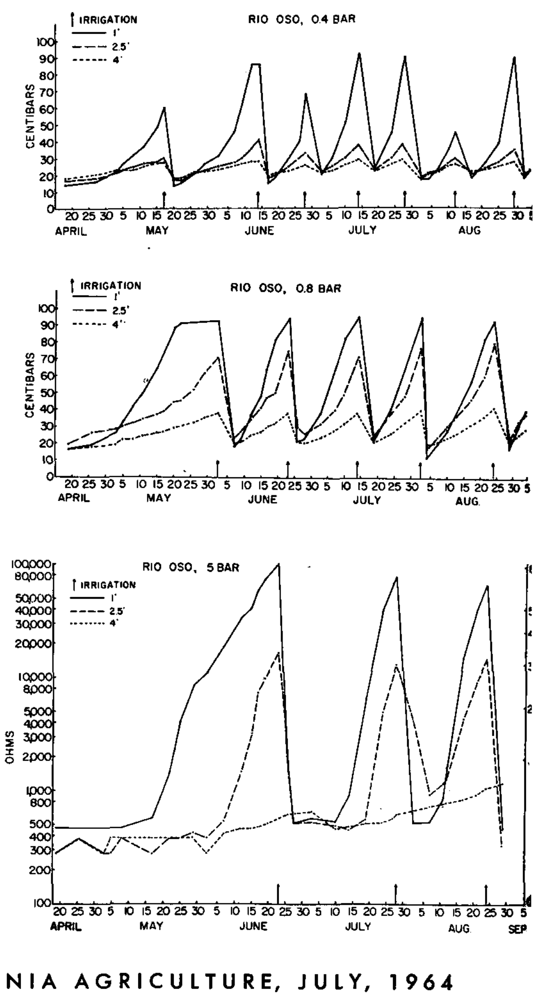
Results

The drop in percentage of fruit moisture (see graph 2) up to mid-June was due to the accumulation of dry matter during pit hardening. The increase in fruit moisture from late June coincides with the "final swell" in fruit size when the fleshy part of the fruit grows rapidly. During this latter period, changes in moisture percentage and in soluble solids were detected in the fruit after each irrigation. The moisture percentage increased and soluble solids decreased upon irrigation in most cases. These changes were more evident in the "dry" and the "medium" treatments than in the "wet." They indicate an increased hydration of the tissues following each irrigation. At harvest time, the highest percentage of soluble solids was found in the drier treatments.

The growth curve for fruits from the "wet" plot was smooth, as shown in graph 3. In the "dry" plot, however, the rate of fruit growth declined before irrigation and increased abruptly after it. Mature fruit on the "dry" plot did not reach the size of the "wet" plot fruit because the size losses prior to the July and August irrigations were never regained.

Fruit size data at harvest (calculated as volume from diameter measurements) indicated fruit from the "wet" plots was the largest; that from the "dry" plots was the smallest; and differences among

GRAPH 1, SOIL MOISTURE SUCTION CURVES for the "wet" (0.4 bar), "medium" (0.8 bar), and "dry" (5 bar) treatments. The "wet" and "medium" curves are based on tensiometer readings, and the "dry," on gypsum block readings.



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all treatments were statistically significant:

FRUIT SIZE AT HARVEST
(Expressed as fruit volume)

	"Wet"	"Med."	"Dry"
Mean fruit volume (cu. cm.)	140	134	129
% of "dry"	109	104	100

Typical shoot growth curves, shown in graph 4, indicate most rapid growth in the "wet," intermediate in the "medium," and the least in the "dry" plot. Shoot growth is apparently affected by soil moisture early in the season. Growth "lost" early in the season in the "medium" and "dry" plots was never recovered by any later irrigation.

The greatest "water sprout" growth per tree occurred in the "wet" plot; the least in the "dry"; and differences between "wet" and "dry" and between "wet" and "medium" were significant:

TOTAL "WATER SPROUT" LENGTH PER TREE

	"Wet"	"Med."	"Dry"
Length (meters)	112	92	83
% of "dry"	136	111	100

The percentage increase of yield in the "wet" and "medium" treatments over the "dry" is of the same order of magnitude as for the increase in fruit volume.

TOTAL YIELD PER TREE

	"Wet"	"Med."	"Dry"
Pounds	572	542	531
% of "dry"	108	102	100

With hand-thinned peaches the variability from tree to tree in fruit size is less than the variability in yield. With the limited number of trees in a test plot, average fruit size (volume), therefore, is a more accurate indicator of treatment response than is the actual yield per tree. Fruit size was used, therefore, as a basis for adjusting yield data in making cost comparisons.

The following cost estimates were projected by Doyle Reed, Extension Economist at Davis, using the mean yields per treatment, adjusted in relation to differences in fruit size:

	"Wet" (7 irrig.)	"Med." (5 irrig.)	"Dry" (3 irrig.)
Additional per acre cost (over dry treatment)	$21.60	$ 9.60	0
Additional yield per acre* (tons)	1.20	0.60	0
Additional value per acre ($55 per ton)	$66.00	$33.00	0
Net benefit from additional irrigation (per acre)	$44.40	$23.40	0

* Based on 15 tons/acre for "dry" treatment.

From these figures it becomes clear that the benefit derived from the additional irrigations exceeds the increased cost considerably.

Practical recommendations

Both gypsum blocks and tensiometers can be used for scheduling peach irrigations. Tensiometers are instruments that measure units of soil moisture stress directly and do not require calibrating. All makes register the same. Gypsum blocks, on the other hand, must be calibrated and readings require use of a resistance meter. Different makes of blocks have different calibrations and thus cannot be compared directly with one another. Tensiometers need servicing but the gypsum blocks do not. The blocks cover the whole range of available soil moisture but tensiometers register only in the 0–1.0 bar range. Tensiometers are more accurate than most gypsum blocks in the upper range of available soil moisture. Since this is the range that was found to be critical for peach production, recommendations are based on tensiometer readings.

Two to three stations consisting of two tensiometers per station for each uniform block of trees are necessary. On deeper soils, a station should consist of one tensiometer at 2½ ft, another at 5 ft; on the shallower soils, one at 2 ft and another on top of the hardpan. Irrigations should be started whenever the 2- or 2½-ft instrument reaches a reading of about 40. For the Sutter peach bowl area, this will mean an irrigation every 14 to 18 days during the hot part of the year—provided the soil has been recharged to the depth of the lower instruments at each irrigation. If the lower depths are not recharged, the top soil will dry out more quickly and irrigation will be necessary sooner. The tensiometers will be especially helpful to schedule the first irrigation in spring, since late rains, cool weather, or early hot weather, will affect the timing of the first irrigation considerably.

Irrigations immediately before harvest are not necessary and will, unfortunately, condition the soil for compaction by heavy harvest equipment. If moisture replenishment of the subsoil is correctly achieved at each irrigation during the season, there should be no need to irrigate later than 7 to 10 days before harvest.

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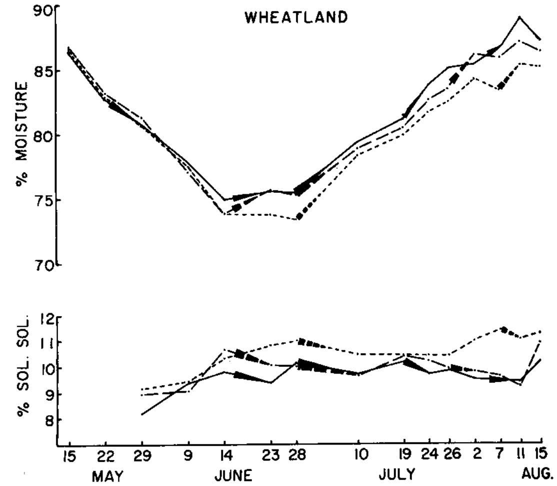
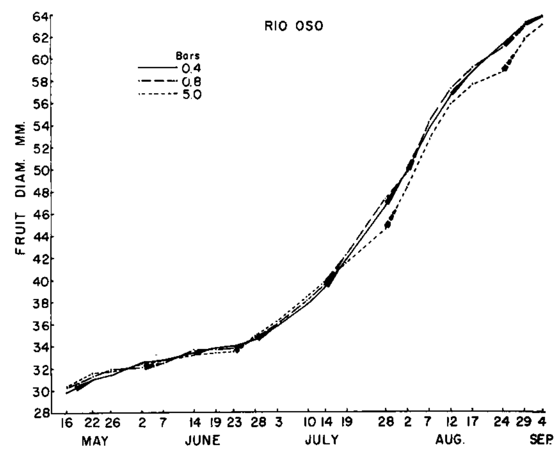
GRAPH 2, PER CENT MOISTURE AND PER CENT SOLUBLE SOLIDS IN THE FRUIT. Solid line stands for "wet," broken line for "medium," and dotted line for "dry" treatment. Wide bands indicate dates of irrigation.



GRAPH 3, FRUIT DIAMETER



GRAPH 4, SHOOT GROWTH