IRRIGATING ORANGES

At Three Moisture Levels

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When large mature Valencia orange trees at the University of Arizona Citrus Experiment Station near Phoenix were frequently irrigated so that available moisture was always present in the soil, the trees grew rapidly and large fruit was produced. However, when this schedule was continued for several years, the roots failed to take up sufficient iron from the soil and the leaves developed iron chlorosis.

Thus this program cannot be recommended for most Arizona soils. On the other hand, when irrigations were delayed until the leaves were almost ready to wilt, the trees grew decidedly slower and ultimately produced smaller yields.

A happy medium was indicated where irrigations were applied when the moisture in the upper foot of soil reached the wilting point and fruit growth was slightly retarded before each irrigation. These trees maintained normal fruit production and health, but tree growth was reduced.

Seven Years of Experiments

These conclusions are evident at the end of the seventh year from three treatments in a larger irrigation experiment with mature Valencia orange trees which is in progress at present at the U of A Citrus Experiment Station in the Salt River Valley.

The Plot "A" trees in the high soil moisture treatments were irrigated 15 times per year with an average of 4.3 acre inches of water. Almost uniform fruit growth was maintained by irrigating at 14 to 17 day intervals in summer and 5 to 7 week intervals during the winter. Soil moisture tensions at the 30 inch depth ranged from 270 to 320 centimeters of water and available water was always present below four inches.

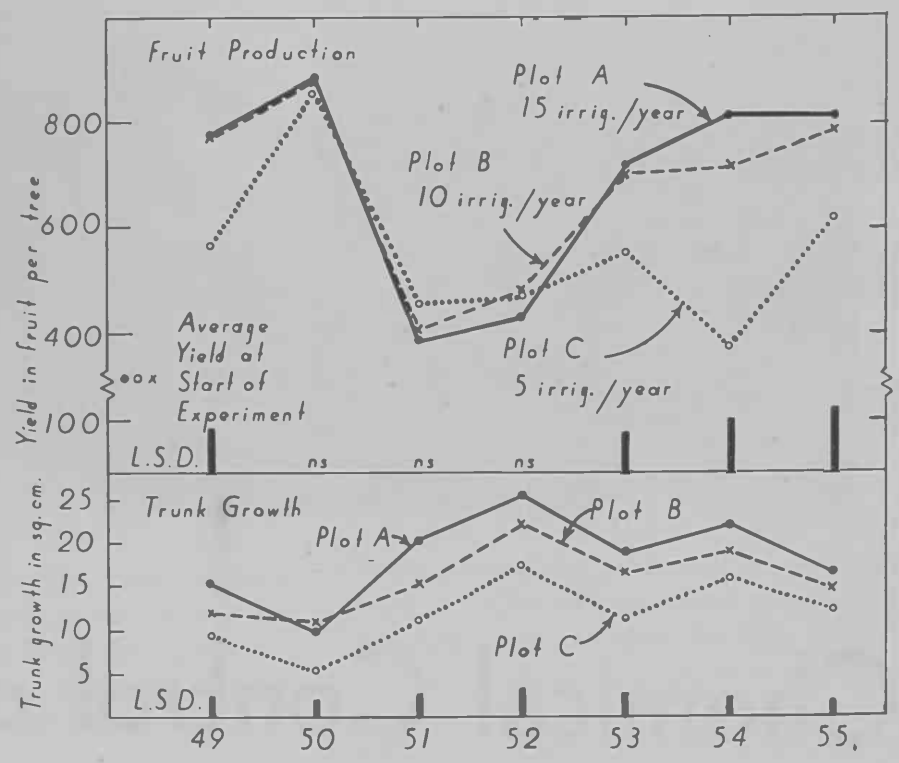
The plot "B" medium moisture treatment trees received 10 irrigations per year that averaged five acre inches. Fruit growth was slightly retarded before each irrigation. In the summer, 22 to 25 day intervals occurred between irrigations and 9 to 11 week intervals in the winter. Soil moisture was reduced to the wilting point in the first foot of soil but was ample at lower depths. The moisture tension at the 30 inch depth ranged from 350 to 525 centimeters of water when irrigations were applied.

Wilting Was Slight

In the plot "C" low moisture treatment, the trees received five irrigations each year that averaged 7.3 acre inches. Fruit growth was retarded for three to four weeks prior to each irrigation, but only slight or no wilting of leaves occurred. The average irrigation dates were March 14, May 30, July 16, Sept. 2 and Nov. 1. Soil moisture was reduced to the wilting point in the upper two feet of soil and largely depleted from the third and fourth feet. Moisture tensions at the 30 inch depth reached 700 centimeters of water from 3 to 14 days before irrigations were applied.

High Soil Moisture Boosts Tree Growth

In five of the seven years the A plot trees made significantly more trunk growth than the B plot trees. In all years the trees under the low moisture C plot schedule produced significantly less growth than the B plot trees.



Trunk growth was influenced by fruit production. The least trunk growth was in 1949 and 1950 when extremely heavy fruiting took place following serious freezes which partially defoliated the trees. Maximum trunk growth followed in 1951 and 1952 when light crops of fruit were set and no damage from freezing occurred. The reduced trunk growth in 1955, apparently is associated with the moderate freeze in December, 1954, combined with a moderately heavy fruit set.

Effects on Fruit Production Delayed

In 1949, the first year of the experiment, drying the soil during the spring increased the "June drop" of fruit and reduced yields of the C plot trees. They then seemed to adjust to this lower moisture level and yields were not affected for three years. In the last three years, however, the yields dropped sharply.

Throughout the experiment there has been no significant difference in yields between the A plot and B plot trees. In 1951 iron chlorosis began to develop in the frequently irrigated A plot trees and became gradually worse until about 35 per cent of the leaves were affected in 1955. Despite this condition, normal yields and high rates of trunk growth were maintained.

Effect on Fruit Size

The average sizes of the fruit during the seven year period show that the size of the fruit tends to be reduced as less water is applied. However, the sizes of the fruit from the A and the B plots has never been significantly different in any year. Fruit production has modified the effects of irrigation on fruit size in the low moisture C plots. In 1951, when the yields of all plots were similar, the fruit sizes were reduced, whereas in 1954 when yields from the C plot trees were greatly reduced, the sizes were increased.

In every year the total soluble solids, the percentage of acid and the amount of vitamin C in the juice was increased as the amount of water applied was decreased. Consistent significant differences in the juice content of the fruit and in the thickness of the peel have not occurred.

Effect of Irrigation on Fruit Characteristics

		A	B	C	LSD (b)
Size 110 & larger (a) 7 yr. ave.	%	62	60	55	
Size 110 & larger (a) 1951	%	63	59	40	15
Size 110 & larger (a) 1954	%	61	71	80	15
Soluble solids in May, 4 yr. ave.	%	11.8	12.2	12.8	.6
Total acid in May, 4 yr. ave.	%	1.01	1.05	1.20	.07
Vitamin C in May, mg. per 100 ml		47	48	52	2.1

(a) Commercial size per carton.
(b) Difference between any two values which is required to be significant.