

Irrigation of Citrus Trees

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Grower Must Know Extent of Root System And Water-Holding Capacity of the Soil

To irrigate a citrus grove properly the grower must know the type and extent of the root system and the capacity of the soil to hold water.

In Arizona, most mature orange and grapefruit trees are growing on the sour orange root which penetrates to a depth of eight feet or more and spreads throughout the upper two feet of soil. Because of this extensive, deep root system the soils in citrus groves may become very dry before wilting of the leaves occurs.

Measurements of the growth of fruit and the extraction of soil moisture have shown that when the entire mass of soil occupied by the roots is wet fruit growth is rapid. As the soil dries after an irrigation, the rate of fruit growth is gradually reduced and also the rate of loss of water from the soil. After the available soil moisture has been removed from the root zone, fruit growth ceases and the wilting

of leaves begins. Thus, fruit growth is affected at a considerable interval before the leaves begin to wilt.

A marked reduction of fruit growth is associated with the depletion of the soil moisture in the upper foot of soil to the wilting range. To obtain maximum fruit growth, it is necessary to irrigate before any portion of the soil dries to the wilting percentage.

When trees are irrigated so that rather uniform fruit growth takes place, the usage of water by the trees during the year is correlated with the evaporation of water from a free surface. Near Phoenix, evaporation averages about 2 inches in January and about 11 inches in July. A mature Valencia orange grove uses about 1-acre inch of water in January and a little over 6-acre inches in July. Figure 1 illustrates this monthly usage of water.

The irrigation guidance schedule at

Figure 1. Average monthly usage of water by Valencia orange trees growing in the Salt River Valley. The irrigation guidance schedule shown at the bottom requires an average 4½-acre inch irrigation on the dates indicated to replenish the soil moisture used by the tree and lost by evaporation.

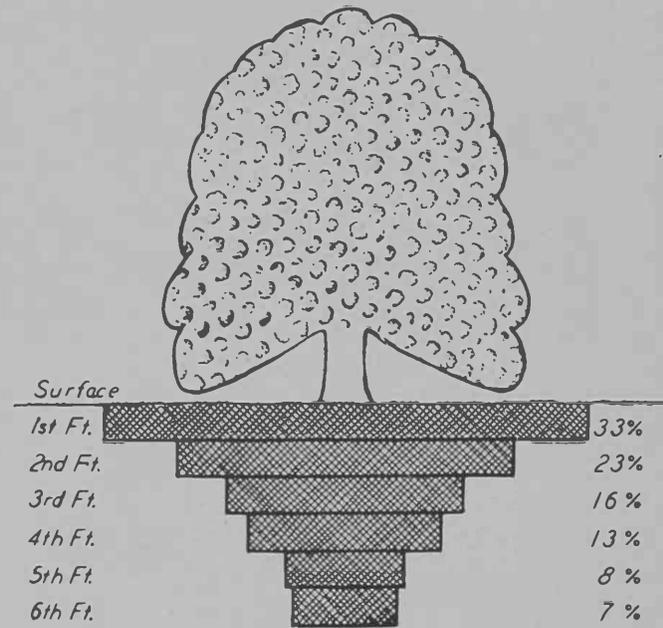
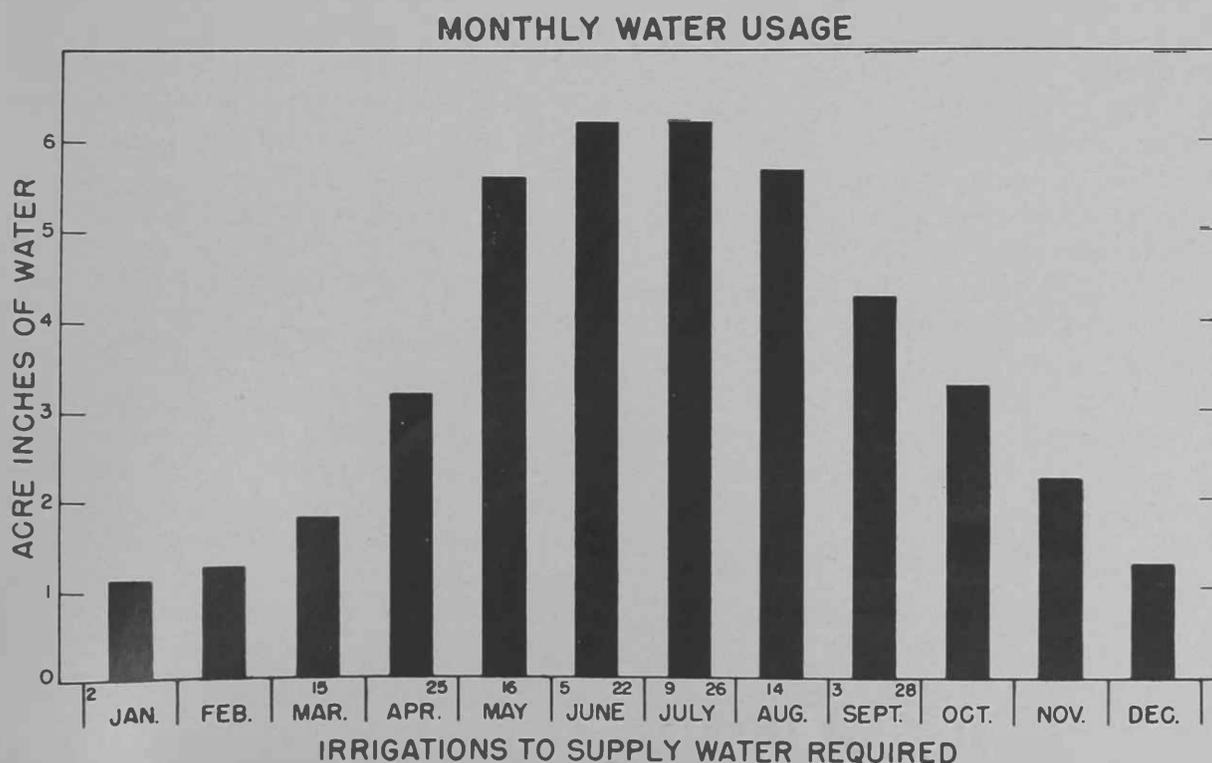


Figure 2. Percentage of total water extracted from each foot of soil beneath Valencia orange trees at the University of Arizona Citrus Experiment Station near Tempe.

the bottom of the figure shows the dates that irrigations of 4½-acre inches of water should be applied to supply the water required. These times of application are designed for medium, sandy loam soils.

The guidance schedule, also, is based upon average weather conditions ignoring benefits from rainfall. During abnormally warm periods the intervals must be shortened, and during abnormally cool periods lengthened. Rainfall will also lengthen the interval.

Different citrus varieties have varying water requirements. Grapefruit and lemons use more water than oranges, so lesser intervals between irrigations are needed.

Irrigations Vary

About 33 percent of the water used by the tree is removed from the surface foot of soil, whereas only 7 percent is obtained from the sixth foot (Figure 2). Therefore, it is not necessary to apply the same amount of water at each irrigation. About 4 irrigations are required per year to maintain ample moisture in the sixth foot of soil. A program of 2 light irrigations followed by one heavier one can be used.

Many groves, particularly those growing in heavy clay type soils containing much caliche, tend to develop iron chlorosis (yellow leaves with green veins) when the soil moisture is maintained at the constantly high level. It has been possible to prevent this condition by allowing the soil to become dry between irrigations once or twice during the late summer or fall. This restricts total tree growth and slightly reduces the ultimate size of the fruit. At present this appears to be the most practical method of preventing and curing this condition.