Olive Irrigation Experiments

indicate trees respond to readily available moisture with larger and heavier fruit

A. H. Hendrickson and F. J. Veihmeyer

Olive trees should be irrigated earlier in the spring and—in addition to the summer irrigations—later in the fall than is necessary with deciduous fruits.

Irrigation experiments with olives have been carried on in southern Tulare County during the past three years.

The trees are of the Manzanillo variety, planted in 30 foot squares and are about 25 years old. Two plots of 18 trees each were selected for the experiment. The trees were vigorous, fairly uniform and had been producing large crops for a number of years. The cultural practice followed was to disk or cultivate in the spring, to irrigate as often as necessary during the summer, and to smooth the soil surface just prior to harvesting the crop.

The soil was classed as a Hanford sandy loam, and was fairly uniform to a depth of six feet.

The Hanford Sandy Loam Used in the Experiments with Olives.

Depth	Moisture *equivalent	Permanent wilting *percentage	Apparent specific †gravity
0 to 1 ft.	12.0	4.5	1.65
1 to 2 ft.	10.7	4.0	1.50
2 to 3 ft.	9.1	3.4	1.55
3 to 4 ft.	7.4	3.1	1.57
4 to 5 ft.	6.5	3.3	1.55
5 to 6 ft.	7.2	3.6	1.58

* The moisture equivalents and the permanent wilting percentages show the upper and the lower limits of the readily available moisture.

† The apparent specific gravities are used in the calculations dealing with the amount of water that may be held in a soil.

The general plan of the experiments during the three years was to treat both plots alike until after the fruit had set, then to stop irrigating one of them and allow it to reduce the soil moisture to the permanent wilting percentage and to remain dry for a considerable period. Soil samples were taken at bi-weekly intervals. As soon as the fruit was large enough to measure, 100 fruits—25 on each of four trees—were measured and tagged. These fruits were measured when the soil samples were taken. At the end of the experiment, samples of fruit were taken for weighing.

Inasmuch as the results obtained were similar in each of the three years, only those of 1948 are given in detail. Both plots were irrigated on March 10th and June 2d. The irrigated or West plot was watered on July 22d, August 16th, and September 15th. All of the late summer irrigations on the wet plot were light and did not materially increase the moisture supply below the third foot.

The dry or East plot was not irrigated after June 2d, and the trees were subjected to a prolonged period without readily available moisture in the top six feet of soil.

The slow, steady withdrawal of soil moisture during the early part of the season was indicated in both plots between March 16th and May 26th.

The readily available moisture was exhausted in the top foot of soil about the last of May. Part of this loss was due to transpiration by the trees, and the rest to direct evaporation from the surface of the soil. There was still available moisture below the first foot when both plots were irrigated on June 2d. Soil samples taken a week later, on June 9th, showed that water had penetrated at least six feet.

Following June 9th, a fairly rapid extraction of water in the upper layers, with a somewhat slower extraction from the lower depths, was recorded. The readily available moisture was exhausted for the second time from the first foot late in June.

The permanent wilting percentage was reached in the East plot late in July, in the second foot, and about August 4th in the third foot. The readily available soil moisture was exhausted in both plots in the four-, five-, and six-foot depths about the middle of August.

The unirrigated plot was without readily available moisture in the various depths from the dates given above until after the crop was picked on October 13th. In other words, the roots of the trees in the unirrigated plot were in the dry top foot of soil about 16 weeks, in the second foot about 11 weeks, in the third foot about 10 weeks, and in the four-, five-, and six-foot depths about eight weeks.

The soil-moisture conditions were considerably different in the irrigated plot, in spite of the fact that two irrigations did not increase the moisture supply very much in the lower depths.

The readily available soil moisture was exhausted rapidly during the period following August 18th. The permanent wilting percentage in the two- and three-foot depths was reached again early in September. The final irrigation on September 15th replenished the supply in the top two feet and added water in some places in the plot to a depth of six feet, but the average amount added to the lower depths was rather small.

Fruit Size

One hundred fruits from each plot were measured. The average size, on June 23d—when the first measurements were made—of those in the irrigated plot was 0.93 centimeters, of those in the unirrigated plot, 0.91 centimeters. The fruit in both plots grew at about the same rate until July 21st. By August 4th, when the readily available moisture was exhausted in the top three feet in the dry plot, the fruit in the irrigated plot was significantly larger than that in the dry one, and remained so until harvest.

When picked on October 13th, the average size of the fruit in the irrigated plot was 1.87 centimeters in diameter, while that in the dry plot was 1.77. This seemingly small difference in size was sufficient to put the fruits from the irrigated plot into a larger grade size than those from the unirrigated one.

A representative sample of fruit from each plot picked at random showed the average weight of olives from the irrigated trees was 4.4 grams, those from the dry, 3.4 grams.

In spite of the long period when the trees in the dry plot were without readily available moisture, no evidence of shriveling was noticed on the Manzanillo olives in the experiment.

The soil moisture record indicates that the unirrigated plot was without readily available moisture for periods ranging from eight to 16 weeks and varying according to depth. The irrigated plot had readily available moisture, at least in the second and third foot depths, except for the comparatively brief periods mentioned. The record for the irrigated plot probably illustrates the kind of soil moisture conditions that prevail in many orchards during the growing season. It also shows how difficult it is, even with a pervious soil, to wet the soil uniformly

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to the full depth in which most of the roots are located.

The soil in which these experiments were conducted holds about five or six inches of water in the top six feet of soil. Conversely, when dry, it requires five to six acre inches of water to bring the supply back to the average field capacity. Consequently, in some of the irrigations, an average of only about three acre inches was applied.

In the period following the irrigation on June 2d, there was readily available moisture in the top foot for about three weeks, and in the second and third foot for about five weeks, with a longer period in the lower depths. The amount of water used by olive trees during the growing season is between 24 and 30 acre inches. In addition, some water will be necessary during the fall or winter, depending on the climatic conditions.

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DEER

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ported in all groups of animals. Some of these impressions were undoubtedly due to the fact that the flavor of antelope is entirely different from that of other meats and was reported in this way because of its unfamiliarity.

In most of the animals the meat was very tender. Over the period studied, it was found to be more tender than venison.

The thiamin content of the muscle meats equaled that of the livers. It was highest in May and lowest during the rut.

The riboflavin content of all antelope tissues studied was found to vary with the general condition of the animals and, as in the California mule deer, that in the muscles tended to parallel that found in the livers.

Vitamin Contents

The antelope hams and loins had more thiamin than the same cuts of either species of deer, and deer in turn had slightly more than similar cuts of beef, veal, or lamb as determined by methods similar to the ones used in these experiments. Pork liver ranks with venison liver in thiamin; lamb and antelope come next; and beef and veal livers have the least of this vitamin.

Antelope hams and loins are the highest of all of these meats in riboflavin; veal, pork, and lamb come next, and beef last. Antelope and venison livers excel in this vitamin, having approximately one and one-half times as much as the livers of any of the other animals. The muscular activity of the deer and antelope may be accepted as greatly in excess of that of domestic meat animals. This may account for the higher concentration of riboflavin found in the tissues of the game species.

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PORK PRODUCTION IN CALIFORNIA, by E. H. Hughes and Hubert Heitman, Jr., Ext. Cir. 15, revised August, 1949.

This handbook on raising hogs for meat is intended for both small- and large-scale producers. It lists needed equipment, tells how to care for the breeding herd and young pigs, gives growing and fattening rations, and describes symptoms of important diseases.

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