Effects of Irrigation On Valencia Oranges

University Citrus Farm Experiment Tests Different Water Applications

By R. H. Hilgeman

The amount of water and the frequency of irrigation required to maintain uniform fruit growth of Valencia oranges has not been known. The effects of soil moisture deficiencies upon tree growth, yields, fruit size, and fruit quality are important in understanding the principles involved in citrus irrigation.

An experimental irrigation project on seventeen-year-old Valencia orange trees is now in progress on the University of Arizona Citrus Experiment Farm in the Salt River Valley.

Test Six Irrigations

The effects of six different irrigation treatments are being determined under non-cultivation tillage with oil sprays used for weed control.

The irrigation differentials were begun in March 1949. The water applied to these trees contained from 1100 to 1300 ppm total salt. The soil is classified as a Jocake gravelly loam which contains from 2 percent calcium carbonate in the surface soil to 20 percent at a depth of 3 to 6 feet.

Treatment A. High Moisture.

Trees received 65 acre-inches of water annually in 15 irrigations. Each irrigation was made before the top foot of soil reached the wilting point. In other words, no appreciable amount of soil was allowed to become dry.

Treatment B. Moderate Moisture.

Trees received 50 acre-inches of water annually distributed over 10 irrigations. This approximates the general irrigation practice followed by Valencia orange growers in the Salt River Valley.

Treatment C. Low Moisture.

Trees received 32 acre-inches of water annually distributed over 5 irrigations. This represents the low water supply some orchards receive under water-shortage conditions in the Salt River Valley.

Treatment D. Alternate irrigations to either side of the trees at **low rate** of water supply; namely 33 inches of water applied in 5 alternate irrigations to either side of the trees actually making a total of 10 irrigations with 33 inches of water.

Treatment E. High Moisture in spring and low moisture in the fall.

Trees received 45 acre-inches of water annually distributed over 9 irrigations.

Treatment F. Low moisture in spring and high moisture in the fall.

Trees received 51 acre-inches of water annually distributed over 11 irrigations.

In the experimental plots receiving the respective treatments, soil moisture was determined by oven dry samples and moisture instruments. The net consumptive use of water between April 1 and October 31 as calculated from changes in percentage of moisture in oven dry soil samples was: Treatment A, 39 acre-inches; Treatment B, 29 acre-inches; Treatment C, 21 acre-inches. These represent water usage efficiencies from 74 to 82 percent.

Fruit Growth and Yield

The irrigations applied to the wet A and semi-moist B plots provided a heavy yield and maintained continuous fruit growth. The infrequent irrigation of the dry C plot significantly reduced the yield of fruit and retarded fruit growth for periods of 23, 13 and 39 days prior to irrigations on July 6, August 23 and November 2 respectively.

Rapid fruit enlargement occurred after each irrigation. This accelerated growth combined with the reduced set produced fruit which was comparable in size to that of the A and B plots. The irrigations applied at moderate intervals to alternate sides of the trees in plot D maintained a heavy yield of fruit but caused short intervals of retarded fruit growth which significantly reduced the size

The use of a soil tube is practical in estimating soil moisture in a citrus orchard. It aids in determining when to irrigate, and depth of water penetration which should show to six feet.

On the Cover is shown a part of the University of Arizona Citrus Experiment Farm located in the Salt River Valley.

of fruit. Similarly, by irrigating frequently between March 10 and July 6 and only on August 23 and November 2 thereafter, the heavy yield of fruit in plot E was significantly reduced in size. This fruit failed to grow as rapidly after irrigating as that in the C plot.

Where infrequent spring irrigation was followed by frequent fall irrigation in plot F, the fruit yield was reduced and growth retarded during the dry periods. During the frequent irrigation period the smaller number of fruit grew more rapidly and attained a significantly larger size than those in any plot.

Fruit Quality

As less water was applied, the solids in the juice increased. However, equally high solids were present in the E plot fruit where growth was restricted in August and October.

Frequent irrigation and moderate irrigation between July 6 and November 2 induced a high juice content fruit in Plots A, B, and F; whereas in-

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New Bulletins

New bulletins and circulars issued since the last issue of Progressive Agriculture in Arizona are listed below. Ask your County Agricultural Agent for a copy.

Experiment Station

Gen. Bul. 232—Arizona Agriculture 1951.

Gen. Bul. 233—Cotton Planting

Tech. Bul. 121—Behavior of Nitrogenous Fertilizers in Alkaline Calcareous Soils: II. Field Experiments with Organic and Inorganic Nitrogenous Compounds.

Agricultural Extension Service

Cotton Insect Control (1951), Circular 179.

Stay Stitching Makes Sewing Easier, Circular 180

Bacterial Heart-Rot of Celery, Circular 181

Cotton Seeds Can Carry Verticilium-Wilt Fungus, Circular 182

Fruit Insect Control Hints (1951), Circular 148, Revised

Rural Leaders' Guide for Square and Group Dances, Circular 183

Foods for 2nd Year 4-H, Circular 184

Livestock Pests (External Parasites), Circular 185

Internal Boll-Rot of Cotton, Circular 186

AVAILABILITY
Of Added Phosphates

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treated soil extracts at the right supported abundant microbial growth. The density of growth was taken as an indication of microbial activity. Over a period of six months the phosphate content was nil in the two right soil solutions though the two left solutions contained phosphorus in an available form.

May Cause Slow Growth

Retardation of growth in crops planted immediately after plowing under large amounts of plant material may be caused by microbial fixation of phosphorus as well as nitrogen. Immobilization of available phosphorus by this means would be expected to be most serious in soils that are intensively farmed and in soils after plowing under plant residues low in phosphorus such as straw and sorghum stalks.

In soils where decomposition is slow because of limiting moisture supply or where crops follow each other in rapid succession, additions of phosphate fertilizers to plant residue before plowing may prevent phosphate hunger during the early growth of the succeeding crop. In this respect phosphorus "tie-up" is very similar to that of nitrogen. Phosphorus may be tied-up in unavailable biological tissues for many weeks before it is liberated for use by plants.

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June In

Daily (Except Sunday)

KRUX, Glendale, 6:55 a.m.—Farm Front—Maricopa County Extension Agent.

Sundays

KOY, Phoenix, 9:05 a.m.—Demonstration Garden (County Agent) Program

Wednesdays

KYUM, Yuma, 6:45 a.m. — Yuma County Agricultural Extension Service Radio Program.

Fridays

KCKY, Casa Grande, 4:30 p.m.—Pinal County Farm and Home Program.

Saturdays

KGLU, Safford, 11:30 a.m.—Stepping Along With the Agricultural Extension Service.

KOY, Phoenix
KYMA, Yuma
KTUC, Tucson
KSUN, Bisbee
} 12:00 to 12:30 p.m.

Arizona Farm and Ranch Hour, presented by the Radio Bureau, University of Arizona, and the College of Agriculture.

Second Monday of Each Month

KCLF, Clifton, 10:15 a.m. — The Homemakers' Program.

Your University

Your University of Arizona local representative is the Agricultural Agent or Home Demonstration Agent in your county. The Agricultural Extension Service, the Agricultural Experiment Station, and Resident Instruction are the three divisions of the College of Agriculture at the University—practical farm information, useful research, and modern teaching.

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frequent irrigation reduced the juiciness of the fruit in Plots C and E.

The peel of fruit from the C and E plots was significantly thicker than that from the A and B plots. From this it may be concluded that serious moisture stresses in either August or October tended to increase peel thickness. F plot fruit also has a thick peel. This suggests that either poor yield or a moisture stress in June or both are the factors involved. The heavy yield coupled with frequent slight moisture stresses in plot D appeared to develop a fruit with a thin peel.

The increases in cross sectional area of the trunk were significantly increased with each additional amount of water applied.

Nutritional Response

All trees received 2 lbs. of nitrogen from two applications of ammonium nitrate. The analyses of leaves for nitrogen and phosphorus in December revealed that the irrigation treatments did not produce any significant differences in the amounts of these elements present.

Saturated extracts of each foot of soil to a depth of 6 feet showed that the accumulation of salt in the upper 2 feet of soil was similar in all plots. However, below this level significantly larger amounts were present in the B plot than in the A plot, and in the C plot than in the B plot.

This experiment is in progress at present and further reports on significant developments will be made.

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