EVALUATION OF DRIP IRRIGATION IN PRUNE PRODUCTION

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ABSTRACT

The 3 years' (1980, 1981, 1982) results did not show any definite trend to favor one method of irrigation over the other as to production. It appears that as long as sufficient water is supplied to satisfy the needs of the tree it does not matter whether the irrigation is done by the flood or drip method. However, in 2 of the 3 years more end cracks occurred in the flood than in the drip irrigated treatment in the Gridley experiment which is located on shallow soil in which water stress could easily occur between irrigations. In the deep fertile soil of the Vina experiment end cracks were at a minimum and there was no difference between the two methods. One aspect that was different was in the efficiency of water use, i.e., the amount of water used by the tree for the amount of water applied. This ratio was much better in the drip than in the flood.

OBJECTIVE

The objective of this project is to evaluate drip irrigation for use in prune production. Does this form of irrigation offer advantages over other forms of irrigation by, perhaps, increasing yield, fruit quality, efficiency of water use, etc?

PROCEDURE

A drip irrigation system was installed in the Monastery orchard in Vina in 1979 and one in the Gilstrap orchard in Live Oak in early 1980. In both orchards, the drip method was compared to the flood method. The Vina orchard is on very deep and fertile soil while the Live Oak orchard is on a typical prune orchard soil for that area - shallow and 2 to 3 feet to a siltstone layer. The project is to run 4 growing seasons.

The amount of water to be applied in the drip system was based on estimated evapotranspiration as determined by U. S. Weather Bureau Class A evaporation pan data obtained by the Department of Water Resources at a station in Gerber, near Red Bluff. Water was applied to supply 100% and 70% of the water needs (evapotranspiration) by both flood and drip irrigations. Irrigation by the flood method was at periodic intervals while in the drip method water was applied daily, the length of each application depending on the weather and the time of the year. The experimental trees were individually harvested, a sample from each tree taken, dried in a commercial dehydrator, the dried fruit passed through screens to separate into 4 sizes, and the fruit evaluated for quality.

Fruit growth measurements were made during the growing season at weekly intervals. Several trunk measurements were taken to evaluate tree growth. Leaf samples were taken before harvest to evaluate

the effect of the form of irrigation on the mineral composition of the leaves.

RESULTS AND CONCLUSIONS

Crop load (number of fruits per cm^2 of trunk cross-sectional area), yield in dry pounds per tree, dried fruit size in grams per fruit, and the percentage of end cracks according to DFA (Dried Fruit Association) standards were obtained in 1980, 1981 and 1982 are given in Table 1.

There does not seem to be any definite trend favoring one form of irrigation over another in terms of the yields obtained. The variability in the data was more from the alternate bearing behavior of prunes than by effects from the form of irrigation. Also, the prune set in 1982 was very low everywhere and again that was not affected by the type of irrigation.

The method of irrigation, however, did affect the amount of end cracks that developed in the Live Oak orchard. In 1980 and 1982, the flood treatments had more end cracks than the drip. In 1981, the amount of end cracks was low and the same in both treatments. The development of end cracks is a sign that the trees were temporarily under water stress sometime during the growing season. The soil in this orchard is very shallow and the trees can easily come into water stress as the soil dries out between irrigation cycles, especially in the flood 70% ET treatment. The drip method would not result in drying out of the soil since water is applied daily.

The Vina orchard showed no difference in end cracks between the flood and drip treatments. This soil is very deep and the water reservoir capacity so large that drying out of the soil between the flood irrigations does not occur and thus end cracking is held to a minimum.

It appears that as long as sufficient water is applied to prune trees it does not matter if it is done by the flood or drip method. It also seems that supplying 70% of the evapotranspirational needs may not be significantly detrimental. If less water is applied, perhaps detrimental effects can develop.

One definite advantage of drip irrigation, however, is in the efficiency of the system in terms of the amount of water used by the tree to the amount of water applied. Much more water must be applied in flood irrigation than in drip because of the runoff and large soil evaporation losses in the flood compared to the drip method.

Table 1

Treatment	Fruit density; number frt/cm² trunk X-sect. area 1980	1981	1982	Yield-dry Pounds/tree 1980	1981	1982	Dried frt size Grams/frt 1980	1981	1982	% end cracks DFA standards 1980	1981	1982
MONASTERY ORCHARD - Vina												
Flood 100% ET	28.5	34.0	17.5	75.6	92.0	65.5	6.4	6.0	8.4	5.9	2.5	11.4
Flood 70% ET	28.1	39.6	17.8	78.4	99.8	67.8	6.5	5.4	8.5	7.8	2.5	12.9
Drip 100% ET	29.6	33.2	15.0	80.4	93.2	61.8	6.2	6.2	9.4	7.7	2.3	12.7
Drip 70% ET	24.2	39.3	11.7	74.6	97.4	50.8	7.5	5.6	10.1	7.8	2.2	12.9
GILSTRAP ORCHARD - Live Oak												
Flood 100% ET	23.3	27.4	8.0	83.6	102.8	52.7	5.6	5.6	10.0	20.2	3.7	15.3
Flood 70% ET	26.6	21.4	9.4	84.9	91.0	57.5	5.0	6.1	9.2	20.6	3.1	24.4
Drip 100% ET	24.5	17.9	12.9	91.7	90.7	67.0	5.9	7.4	7.8	8.5	3.0	12.4
Drip 70% ET	24.1	18.5	10.6	85.8	83.9	52.4	5.9	6.6	7.6	7.4	2.9	10.4