Long-term study on

Tokay Vineyard

irrigation in Lodi area

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Vineyard decline—an increasing problem in Tokay vineyards in the Lodi district—results in low yields, large losses due to sunburn damage, small berry size and other low quality factors.

Extensive efforts have been made, in past years, to reduce losses from nematode infestations, dead-arm disease, and poor fertilization practices. However, no work has been attempted to improve irrigation practices. Irrigation methods have not been altered over the years to compensate for weakened root systems caused by root pests and a lowering water table.

The most common irrigation method used in Tokay vineyards is a single furrow placed in every other middle between the rows. The efficiency of the single furrow method is questionable and the application of excessive water causes root damage and weakened vines.

In April, 1960, an intensive, long-term irrigation experiment was established in a Tokay vineyard near Lodi. The objective of the study is to determine the method of irrigation that will give better distribution of water in the soil and—combined with good cultural practices—improve vine vigor, increase yield, and produce good quality shipping Tokay grapes.

The experimental block of vines selected consisted of 10 rows of 68 vines each, with the rows 10′ apart and the vines 10′ apart in the rows. The vines are 50 years old. The vines in the southern part of the plot are in a weakened condition, but the northernmost vines have good vigor. The plot was divided into two sections to include the weak vines in one study and the strong vines in the other.

The soil of the plots is deep, relatively well drained Hanford sandy loam. The soil texture is fairly uniform to a depth of 7′, where there is a layer of fine clay. Hanford sandy loam is the soil type in which the majority of shipping Tokay grapes are grown.

The irrigation method used by the grower is the common single furrow in every other row. The same furrow locations have been used for the past 20 years.

The study is designed to compare three methods of irrigation:

1. A single furrow every other vine row.

2. A single furrow every vine row.

3. Flooding the entire area on both sides of the vines.

Evaluations are made to determine if and when differences occur in vine vigor and fruit quality from variations in the irrigation methods. It may be several years before extreme differences occur.

Tensiometers are used to determine the pattern of soil moisture extracted by the vines and the movement of water in the soil following an irrigation.

The locations of the tensiometers and the methods of irrigation are shown in the adjacent diagram. The tensiometers located at Stations I and IV were installed to study irrigation treatment *1;* Stations II and V, treatment *2;* and Stations III and VI for treatment *3.*

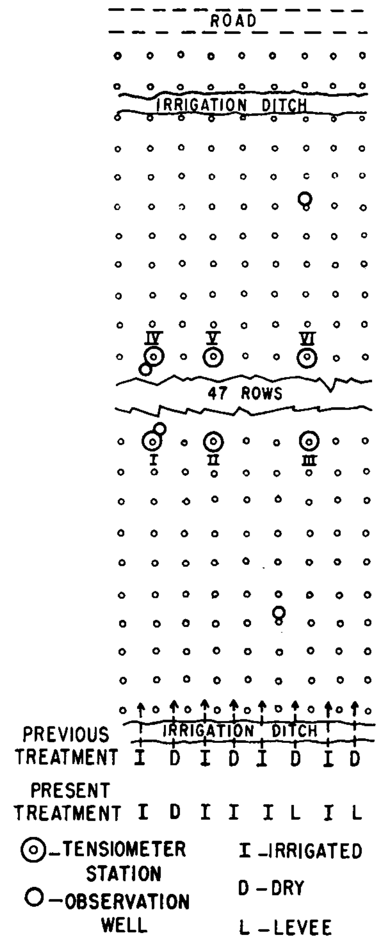
At each station tensiometers were placed at 2′, 4′ and 6′ depths at A, in the west center between vine rows; B, next to the vine; and C, the east center between vine rows.

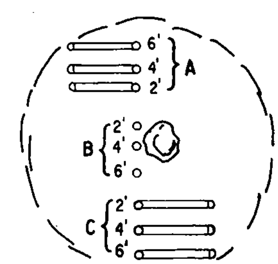
Rising tensiometer readings indicate decreasing available soil moisture. In the 1960 trials readings were taken twice weekly, during the growing season, and ranged from zero to 80. When the average 4′ tensiometer reading was between 60 and 70 the plots were irrigated.

Stations I and IV received five irrigations and the other stations four each. An attempt was made at each irrigation to apply sufficient water to establish a condition of field capacity in the first 6′ of soil. The amount of water and time required to apply it were measured. For the season an average of about three acre-feet of water was applied.

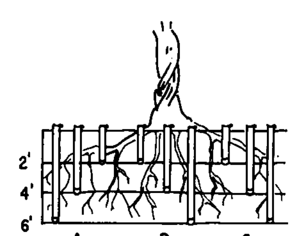
Observation wells were measured weekly to determine if a water table existed. After each irrigation, the observation wells near tensiometer stations II and III had standing water.

LODI TOKAY IRRIGATION PLOTS

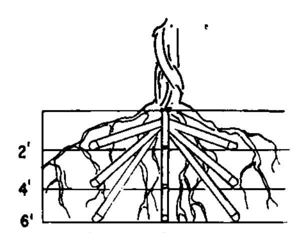




TENSIOMETER DISTRIBUTION PLAN



LEFT ELEVATION



FRONT ELEVATION

The weak vines in the southern portion of the plot showed no moisture extraction and no root activity at the 6′ depth. Following irrigations the water table rose to 7′–8′ below the soil surface and stayed there for several days. In the past when excessive water was applied the lower roots may have been drowned.

The unirrigated centers had very low soil moisture content after mid-June and the roots remained in dry soil during the rest of the growing season. The unirrigated centers never received moisture by lateral subbing. Lateral movement of water from the furrows toward the vines was found to be fair when furrows were placed on both sides of the vine row. There was little or no lateral movement to the vine row when a single furrow was used in every other middle.

The strong vines in the northern portion of the plot began the growing season with low soil moisture content at the 6′ level because of insufficient winter rainfall. An early spring irrigation would supplement light rainfall in dry years.

Although there has been but one year of work on a long-term project, the results indicate that irrigation of a vineyard by a single furrow in every other vine row does not provide adequate soil moisture throughout the entire root zone.

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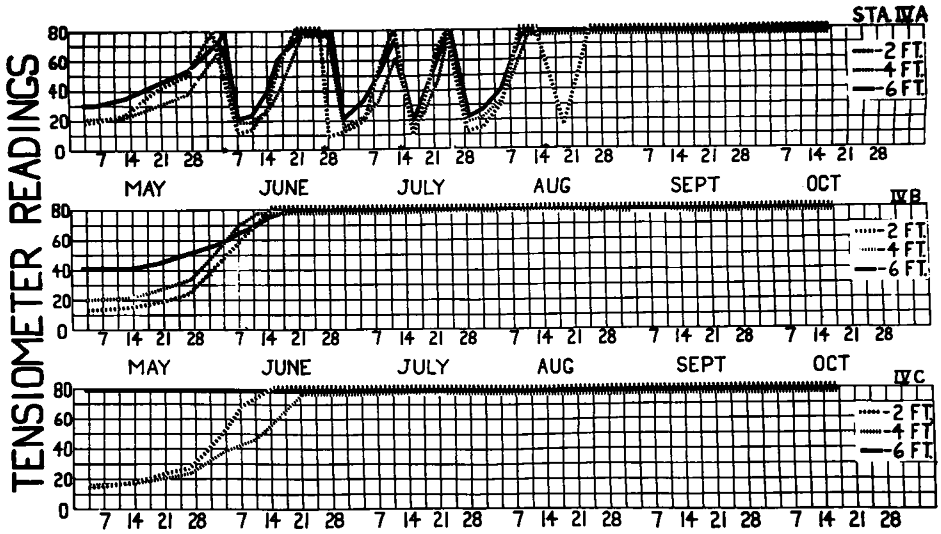
The above reported studies were established at the request of the Tokay Marketing Agreement industry committee.

Tokay grape grower James Sanguinetti, of Lodi, also participated in the investigations.



Tensiometer readings, showing the inadequate irrigation of grapes by use of a single furrow every other vine row.

Plots irrigated June 5, June 27, July 13, July 25, and August 15.

Measuring movements of Soil Amendments made possible by new technique

D. R. NIELSEN and J. W. BIGGAR

The success or failure of fertilizers, herbicides, and pesticides applied as soil amendments depends on distribution and concentration of the material in the soil.

Fertilizers—the most common amendment—usually are applied by side-dressing or broadcasting, or are dissolved in irrigation water. Surface application of herbicides is a common practice but the depth of penetration or lateral movement in the soil must be minimized to protect the crop. On the other hand, the success of soil fumigants depends upon depth of penetration and uniform distribution.

Whether applied to the soil as a liquid or as a dry material soluble in the soil solution, an amendment spreads through the soil as a result of several processes taking place simultaneously.

The process most commonly considered to cause the spreading of a material through the soil—and the least understood—is the movement of water. The volume of soil through which water moves is a complicated network of large and small pores resulting in tortuous interconnecting paths that depend upon the average water content of the soil. The movement of water through small pores is much slower than through the larger pores. A considerable volume of soil may have pores so small that the soil moisture filling the pores is not

Schematic diagram illustrating the manner in which soil additives spread through small and large pores.

displaced by applied water. Because the larger, moisture filled pores conduct the material faster, a substance injected at one point in a soil can be measured very early in the spreading outflow. Eventually, as the smaller and more tortuous pores are flushed with the material, the concentration measured down-

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