

RIGHT photo shows plastic levees used in vineyard leaching tests. COVER photo shows ponding with soil levees in upper half of photo and plastic levees on contour in lower part of test strip through the vineyard. Soil levees proved too difficult to construct and maintain and did not cover soil as completely with water.

Annual leaching with heavy water applications by ponding, with the aid of plastic levees, or use of sprinklers, may be the answer to problems of excess salt accumulation in Coachella Valley vineyards. Trials in a Thompson Seedless vineyard showed marked improvement in vine condition following these special leaching practices. Previous installations of additional tile drains had not corrected this vineyard salinity problem. Salt accumulation in the soil, with resulting vine decline, is the most important current problem facing grape growers in the Coachella Valley.



# *Vineyard Salinity Problems*

**CORRECTED WITH SPECIAL LEACHING IN COACHELLA VALLEY TRIALS**

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**C**OACHELLA VALLEY soils in general are sandy with high infiltration rates. The climate is very hot, with an average rainfall of only three inches. Vineyard irrigation is usually by furrows with short runs. Vine decline due to salinity frequently occurs in the lower third of the irrigation run, excluding the end vines where water ponds during irrigation.

Colorado River water was imported for irrigation in this desert valley in 1949. Since that time, water tables have risen requiring the installation of tile drains in many vineyards. Drain tile spacing in vineyards varies from 60 to as much as 300 feet. Initially, wide spacings are used, but more drain lines are placed if vines begin to show salt damage.

The symptoms noticed in vines declining because of excess soil salinity include decreases in vegetative growth, leaf burn, reductions in yield, fruit size and quality, and in extreme cases, death of the vines.

This trial was conducted to demonstrate the benefits of salt removal by

leaching, and was a joint project with the Agricultural Extension Service and Coachella Valley County Water District. A portion of a vineyard near Thermal which was showing distress from salt accumulations was selected as the test area. The vines were Thompson Seedless on their own roots and were about 24 years of age with an excellent record of production. Tile drains were first installed in the trial area in 1956 at intervals of 287 feet. Intermediate lines added in 1957 cut this interval in half and additional lines added in 1961 brought the interval down to 72 feet. The depth of placement varies from an average of about 7 feet.

## **Soil type**

The Indio soil type in the test plot area is very fine and sandy, without profile development, but with marked textural stratification. Average infiltration rate as measured from recession rates in leaching ponds was 2.1 inches per day. The irrigation slope of the test plot was .8%. Water application by the grower using

furrows has varied from a low of 2.7 acre-feet per acre per year to a high of 8 feet (applied during the 1962 season in an effort to reduce salinity and restore productivity of the vines in the saline areas).

The trial area consisted of seven rows of 37 vines each. The adjacent seven rows were designated as a control plot to be handled by the grower as he did the remainder of the vineyard.

Treatments consisted of the application of 42 acre-inches of water per acre by underhead sprinklers in April of 1961 and of 57 inches applied by ponding with plastic levees in March of 1962. Otherwise, regular irrigation was by standard furrow application methods. Only Colorado River water was used.

## **Tensiometers**

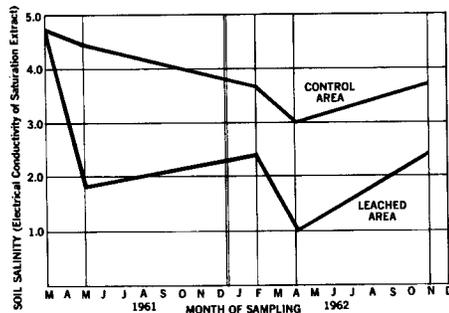
Tensiometers were used to record soil suction levels during the 1961 growing season. They showed that the soil dried out very slowly under these conditions, and that suction values did not exceed 40 centibars even though water was withheld for as long as 55 days during June

and July of 1961. Water was presumed to be supplied from the water table—which stood at about six feet below the surface during this period.

Recorders operated during much of the 1961-62 season indicated that the water table rose to within 1½ feet of the surface during leaching, but generally receded to 5 or 6 feet or lower during normal irrigation. Comparisons of water table recession rates in 1961 (tile interval, 144 feet) and in 1962 (tile interval, 72 feet) showed no justification for the expense of the extra tile.

Twenty-eight soil sampling locations were selected in the leached and control plots. These were located at 1/5, 2/5, 3/5 and 4/5 of the distance down each of the 14 rows to determine salt content variations down the length of the irrigation run. At each sampling, successive one-foot increments were taken to five feet and were analyzed separately to determine salt distribution by depth. Samples were taken in March of 1961 before treatment, after the first leaching in May of 1961, before the second leaching in February of 1962, after the second leaching in April of 1962 and again after a season's normal irrigation in December 1962.

GRAPH 1. SOIL SALINITY (EC<sub>e</sub>) ON FIVE SAMPLING DATES, LEACHED AND CONTROL PLOTS COMPARED.



Leached with 42 acre-inches of water per acre applied by sprinklers in April, 1961 and with 57 inches applied by ponding in March, 1962. Each point represents the mean of 140 samples (28 holes, 5 depths).

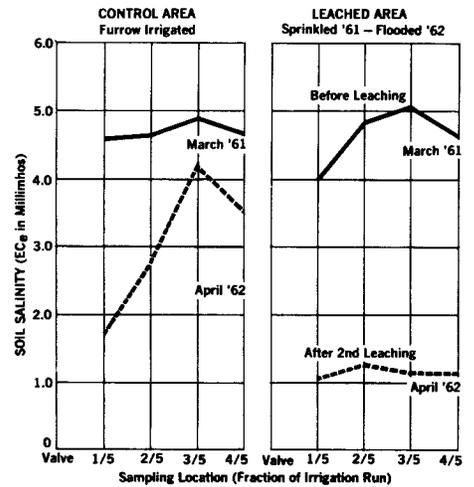
Results of the soil analyses, are shown in graph 1. Salt levels generally were higher before treatment than they have been since. In the control area, the grower had been applying increasing amounts of irrigation water and the data show that some leaching was accomplished. Graph 2 shows, however, that the salt had not been reduced to satisfactory levels in the lower portion of the irrigation run. In the leached area, both leachings were effective in reducing the salt to safe levels, but there was a marked tendency for salinity to increase during the growing season. Leaching improved vine condition as shown in graph 4.

The tests clearly demonstrated that, in this vineyard, the declining vines were in areas of high soil salinity and that the excess salt can be removed by heavy leaching—following which vine condition improves and approaches the original health and vigor. However, with the normal irrigation used in this vineyard during the growing season, salt levels tend to increase again suggesting that a yearly leaching during the fall, winter and/or spring may be required. A method of water application which covers the entire ground surface during leaching is desirable. This is difficult on steep slopes, but it can be accomplished by use of sprinklers or by the construction of leaching ponds.

A new evaluation of soil salinity levels with respect to effects on table grapes in Coachella Valley is also suggested. Soil salinity readings (EC<sub>e</sub>) of .6 to 2 millimhos are in a safe range. Readings of 2 to 3 millimhos in the root zone indicate the need for heavier irrigation and/or better drainage, although very slight adverse effects, if any, can be noted on the vines. Readings of 3 to 6 result in varying degrees of leaf burn, loss of vigor and decline in fruit size, quality and quantity, and indicate that leaching is definitely required. Readings of 6 millimhos up will result in severe effects on vines, probably resulting in death if continued.

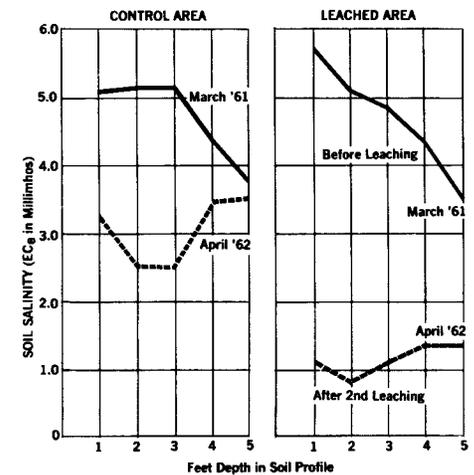
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GRAPH 2. SOIL SALINITY (EC<sub>e</sub>) BY LOCATION DOWN THE IRRIGATION RUN (330 FT.) ON TWO SAMPLING DATES.



Each point represents the mean of 35 samples. (7 holes, 5 depths)

GRAPH 3. SOIL SALINITY (EC<sub>e</sub>) BY DEPTH IN SOIL PROFILE ON TWO SAMPLING DATES.



Each point represents the mean of 28 samples.

GRAPH 4. PERCENTAGE OF VINES SHOWING NO SALINITY DAMAGE (CLASS 1); MODERATE SALINITY DAMAGE (CLASS 2) AND SEVERE SALINITY DAMAGE (CLASS 3) AT THE END OF EACH OF THE GROWING SEASONS FOLLOWING LEACHINGS IN SPRING OF 1961 AND 1962.

