

# MOISTURE EXTRACTION OF ALMOND TREES

## *in Kern County*

F. K. ALJIBURY · K. W. HENCH

**N**UT CROPS GROW PRIMARILY in the temperate zone and are irrigated to satisfy their moisture requirement. Irrigation of these crops is practiced where annual precipitation is less than 20 inches, or when rain does not fall during the water demand periods of the trees. Since nut trees are deciduous and are without leaves during the winter months, they use little water during that time. Precipitation occurring in the winter is stored in the soil if the profile is deep and uniform. In the Bakersfield area of California where this study took place, precipitation in the winter is limited to about 6 inches per year.

This study took place in a seven-year-old almond orchard planted on deep Hesperia sandy loam soil. The trees were planted in a square pattern 25 × 25 ft on elevated burms and were irrigated by 1200-ft long borders. For pollination, two rows of Mission variety almond trees (on Nemagard peach rootstock) were alternated with one row of Thompson variety (on Lovell peach rootstock). About five to seven preharvest and post-harvest irrigations were applied. The total amount of water applied per irrigation varied from one irrigator to another and from field to field. Early in the season short irrigations were applied, while toward the end of the season the water was allowed to run for 24 hours. The quantity of water entering the soil profile was a fraction of what the irrigators applied. The poor water penetration problem in most soils in the valley is a contributing factor to the inefficiency of the irrigation of tree crops.

The primary objective of this investigation was to study the water extraction pattern of almond orchards in the San Joaquin Valley. Gypsum blocks were installed in nine different sites throughout the orchard. In each site, seven instruments were installed at 1.5-, 2.5-, 4-, 6-, 8-, 10-, and 12-ft depths. The instruments were read twice a week as illustrated in the graph.

Roots were found throughout the 12-ft profile, although most of the roots were concentrated in the upper 3-ft depth. The concentration of feeder roots was less at increasing distances from the trunk both

laterally and vertically. Beyond the 3-ft depth and the spread of the branches, the number of roots per given area diminished progressively.

Water uptake increased significantly with leaf appearance and development in the spring. The initial water uptake in the spring was greater from the surface 18 inches than deeper depths as illustrated by the gypsum block readings in the graph. The warming of the soil profile and the depletion of soil moisture from the surface gradually affected the rate of withdrawal of water from the deep profile down to the 12-foot depth. It appears that the moisture depletion by roots at the lower zones is affected by the moisture content of the soil above at 1- to 3-ft depths. When the moisture at 1- to 3-ft depths was depleted, the roots at 4- to 12-ft depths began extracting the soil moisture progressively. The graph shows that when extreme moisture stress was imposed for the purpose of harvest, the rate of moisture withdrawal increased progressively to the 12-ft depth. The duration of withholding water application before harvest is believed to be too severe and should be shortened. The imposition of a high moisture stress for such a period is believed injurious.

The deep soil moisture is a significant part of the total amount of water used by almond trees. During the summer months, deep water percolation cannot be attained on many fields because of the poor permeability of the local soils. Therefore, an attempt should be made to restore the deep soil moisture during the winter months.

Evidence from many soil water experiments indicates that over-drying the soils between irrigations results in water deficit within the trees and should be avoided. Periodic examination of the soil moisture during the growing season is an essential practice that could prevent stress damage to almond trees. Winter injury of many trees can be caused by desiccation of the shoot tissues, or by winter freezing. If the soil is too dry at the beginning of winter, the trees may be damaged by the cold weather. To prevent this type of winter injury, the depleted deep moisture irrigation should be replenished in late fall.

*F. K. Aljibury is Irrigation and Soils Technologist, San Joaquin Valley Agricultural Research and Extension Center, Parlier. K. W. Hench is Farm Advisor, Kern County.*

