COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

SOIL and WATER

Summer 1983–No. 55

Rates of Nitrogen at Two Drip Irrigation Levels on Almonds

-Roland Meyer-

During the past several years, growers and agricultural advisors have been interested in what effect drip irrigation has on the nitrogen requirements of new almond plantings. The first few years of tree growth with less than complete canopy cover result in less water use with drip irrigation because of reduced evaporation from the bare soil surface. Past research with other crops has shown that fertilizer materials applied by drip are distributed differently in the soil than when broadcast on the surface.

Multiple applications throughout the growing season are possible with drip systems which should result in greater efficiency of nitrogen use. The high concentrations of some fertilizers, such as the ammonium form of nitrogen, may result in an undesirable plant root environment. The low pH may bring into solution sufficient levels of manganese and aluminum to reach toxic proportions.

The objectives of this experiment are to evaluate the effect rates of nitrogen at two water application levels have on growth, nutrient concentrations of several plant parts, fertility, and nut yield of almonds.

The experiment was established with ten treatments, five rates of nitrogen at each of two water rates. During the irrigation season, the water rates were 1.0 and 0.6 of evapotranspiration, and nitrogen rates were 0, 1, 2, 3, and 4 ounces per tree. The nitrogen source used was urea with the one and two ounce treatments divided equally among April, June, and August applications. The three and four ounce treatments were divided among April, May, June, and August applications. Each treatment was applied to two replications of the three almond varieties--Butte, Carmel, and Nonpareil. During the 1982 season, leaf samples were taken monthly beginning in April and ending in November.

Photo Credit: Dr. Roland Meyer
LAWR/Hoagland Hall
UC Davis

(continued)

Figure 1 shows the decline in total nitrogen throughout the growing season. Unassimilated nitrogen fractions, nitrate, and ammonium show the same trend. Little if any difference between water levels or nitrogen rates appeared until the August 4 leaf sampling date.

Figure 2 indicates that the total nitrogen in the leaves on August 4 increased with increasing water and nitrogen application rates. It is somewhat difficult to explain why these relationships were not observed in the months that followed the August sample date.

During the dormant period, January 1982 and January 1983, tree trunk diameters have been recorded and cross-sectional areas for the five trees per plot calculated. A trend, increasing trunk size with increasing water and nitrogen application rates, appears to exist (Fig. 3).

Plans for the 1983 season include taking twig, leaf, trunk diameter, and perhaps other measurements. Because of the rapid growth and size of the trees, the nitrogen rates were changed to 0, 1, 2, 4, and 8 ounces per tree for the season.

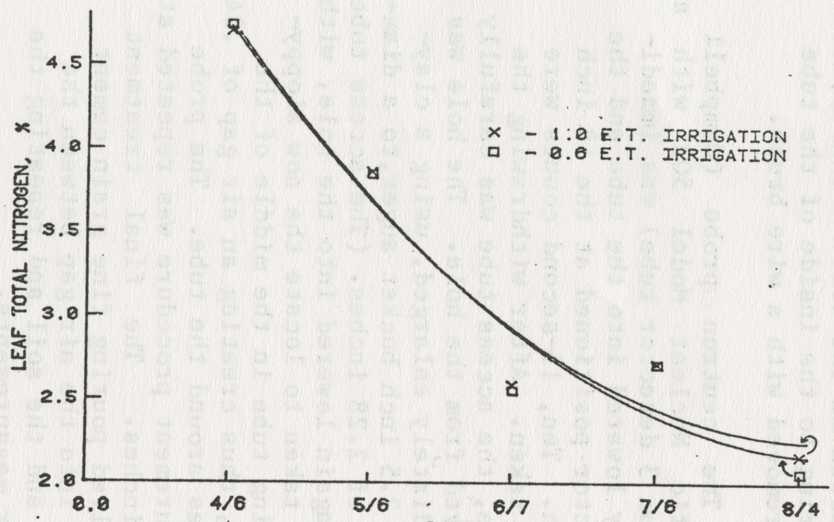

FIGURE 1

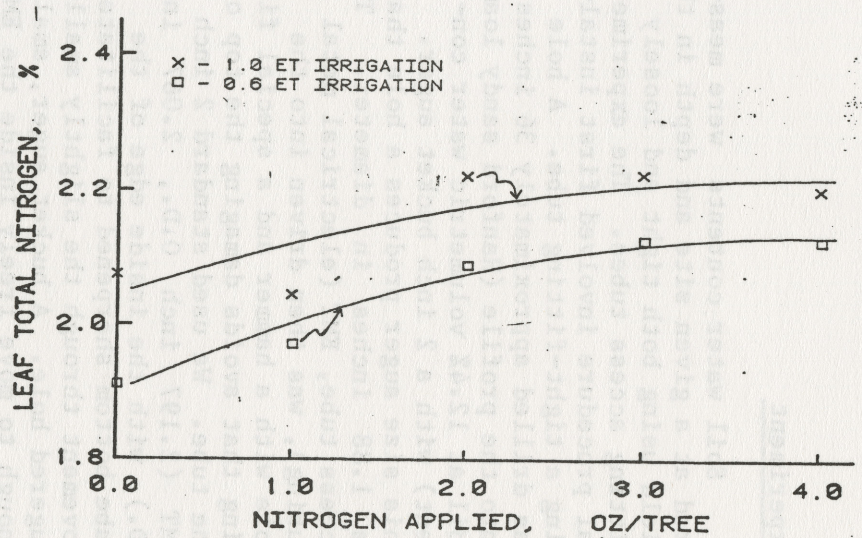

FIGURE 2

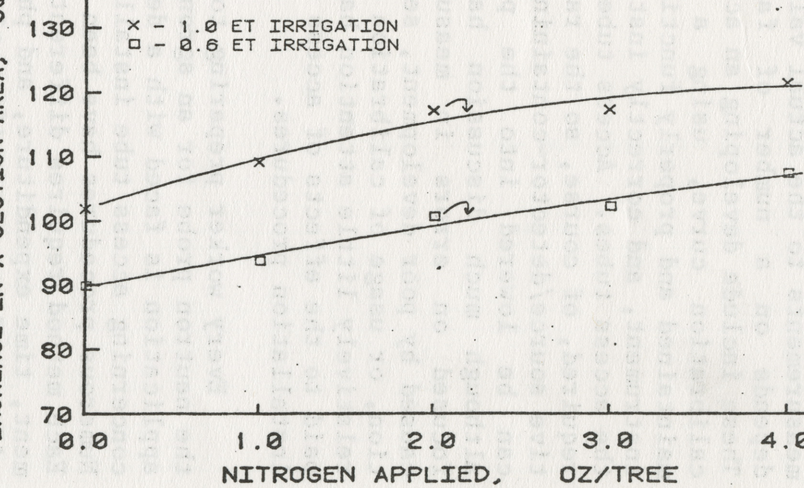

FIGURE 3

Estimating Soil Water Contents with the Neutron Probe--How Important is a Tight-Fitting Access Tube?

Dave Goldhamer and Roger Kjelgren

Introduction

Accuracy, i.e. the closeness of neutron probe soil water content measurements to the actual values, depends on a number of factors. These include developing an accurate calibration curve, using a well-maintained and properly functioning instrument, and correctly installing the access tubes. Access tubes are required, of course, so the radioactive source/detector-containing probe can be lowered into the profile. Although much discussion has been focused on errors in measurement caused by poor development, selection, or usage of calibration curves, relatively little attention has been paid to the effects of access tube installation procedures.

Every worker preparing to use the neutron probe for an agronomic application is faced with a decision concerning access tube installation. Numerous procedures have been used. Each method requires different equipment, time expenditure, and physical effort. Just as significantly, each method can result in different closeness of fits between the access tube and the soil. Most would agree that the easier the method, with respect to physical effort and time required, the poorer the access tube fit. In order to prevent erroneous field measurements, is it necessary to spend the time and energy normally required to obtain a tight fit? Specifically, how does the presence of an air gap between the wall of the access tube and the surrounding soil influence the accuracy of the measurement?

Experiment

Soil water contents were measured at a given site and depth in the field using both tight and loosely fitting access tubes. The experimental procedure involved first installing a tight-fitting tube. A hole was drilled approximately 36 inches into the profile (Hanford sandy loam soil at 12.4% volumetric water content) with a 2 inch bucket auger. This size auger produces a hole that is 1.88 inches in diameter. The access tube, EMT (electrical metal tubing), was then driven into the hole with a hammer and a special fitting that avoids damaging the top of the tube. We used standard 2 inch EMT (2.197 inch O.D., 2.067 inch ID.), with the inside edge of the tube bottom sharpened to facilitate movement through the slightly smaller augered hole. A bucket auger, small enough to move freely inside the EMT, was used to withdraw the soil that collected in the tube. Finally, soil adhering to the inside of the tube was removed with a wire brush.

The neutron probe (Campbell Pacific Nuclear Model 503 with a helium 3 detector tube) was immediately lowered into the tube and the detector positioned at the 18 inch depth. Ten, 15-second counts were then taken. After withdrawing the probe, the access tube was carefully removed from the hole. The hole was immediately enlarged, using a clay-type 2.5 inch bucket auger,to a diameter of 2.28 inches. (The access tube was again lowered into the hole, with care taken to locate the now sloppy-fitting tube in the middle of the hole, thus creating an air gap of .04 inches around the tube. The probe measurement procedure was repeated at 18 inches. The final treatment involved pouring fine grain cement sand into the air gap between the tube and the soil and repeating the water measurements.