

Leaf analysis as a guide to nitrogen

Fertilization of the Avocado

Recent reports indicate that applications of too little or too much nitrogen to avocado trees result in reduced yields.

In the course of eight years' research on nitrogen fertilization of the avocado it was observed that heavy planted or volunteer cover crops in orchards competed strongly with the trees for nitrogen. Therefore, a grower must supply not only enough nitrogen to take care of the tree but an additional amount to meet the needs of the cover crop.

A change from cultivation to noncultivation also resulted in a marked change in the nitrogen nutrition in the tree, even though the nitrogen program was not changed.

The MacArthur variety seems to require a higher rate of nitrogen to maintain an adequate nitrogen level in the tree than do the Fuerte or Hass varieties.

Undoubtedly, soil types, rootstock, climate, soil salinity, variations in irrigation water and other less obvious factors influence the efficiency of a given rate of nitrogen as related to the nitrogen nutrition in the tree.

Leaf analysis shows promise of being a reliable guide for nitrogen fertilization practices.

An eight-year study in northern San Diego County was started with 95 11-year-old Fuerte trees. Statistical analyses of the data collected show that the curvature in the graph was highly significant at the 1% level. Nitrogen values were from leaf samples obtained in the August-October period. The leaves were the youngest fully expanded and mature leaves from shoots, from all sides of the trees, that were not fruiting nor flushing. Care was taken to obtain, as nearly as possible, leaves that were free of tipburn, sunburn, or other visible symptoms or blemishes.

The trees with nitrogen leaf values below the most-productive-range were deficient in nitrogen and were weakly vegetative. The foliage was sparse and light green to yellow. Leaves were small and new shoot growth was less than on trees with nitrogen leaf values in the most-productive-range. The trees with nitrogen leaf values that were higher than the most-productive-range were highly vegetative with a dense, deep green foliage. Those trees had large leaves and an abundance of long new shoot growth.

Trees with nitrogen leaf values in the most-productive-range were intermediate in vegetativeness, foliage density, leaf size, leaf color, and amount of new shoot growth.

The curve in the graph also shows clearly that too little or too much nitrogen resulted in a reduction in yield of Fuerte avocado in this particular experiment. Results from other experiments with the Fuerte variety in other areas indicate that the curve applies generally to that variety. Although experiments on other varieties have not been under way long enough to draw conclusions, indications are that the illustrated curve also applies to the MacArthur variety. Results with the Hass variety suggest that the most-productive-range of leaf nitrogen values is somewhat higher than for the Fuerte.

If leaf analyses are used as a guide for nitrogen fertilizer practice, results from samples taken in the August-September period could be used to estimate the amount of nitrogen to apply the following spring. If the leaf nitrogen level is found to be above the most-productive-range, less nitrogen is required than was applied the previous year. If the level in the leaves is below the most-productive-range, more nitrogen is needed than was applied the previous year. Levels of ni-

trogen within the most-productive-range would suggest little or no change in the nitrogen program.

The most-productive-range for nitrogen is wide and includes values from 1.6% to 2.0% of dry weight of leaves. As additional experimental results become available, the range may be defined more clearly, and possibly narrowed, for the major varieties. It is to be expected that there will be specific examples not in close agreement with the curve. However, there is no infallible method for determining the best nitrogen program because of the influence of seasonal factors which can not be predicted. Use of leaf analyses appears to be the best method available.

Indications from studies are that from 100 to 150 pounds of actual nitrogen per acre annually will generally be adequate unless a volunteer or planted cover crop exists in an orchard. The MacArthur avocado seems to need a higher nitrogen rate than other varieties to maintain leaf nitrogen for maximum production.

T. W. Embleton is Associate Horticulturist, University of California, Riverside.

W. W. Jones is Horticulturist, University of California, Riverside.

M. J. Garber is Assistant Biometrician, University of California, Riverside.

The above progress report is based on Research Project No. 1630.

Fuerte avocado yield as related to the percentage of nitrogen in the youngest, fully expanded and mature leaves sampled in the August-October period.

