

# Nitrogen Fertilization

of oranges

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A nitrogen fertilization program for oranges can affect fruit production, fruit quality, fruit size, and consequently the pack-out.

Studies during the past 10 years have suggested that a nitrogen control program for oranges should be based on leaf analysis rather than on a fixed number of pounds of nitrogen per tree. An increase in the nitrogen rate above the critical level for top production has very little effect on the number of field boxes a tree produces but such an increase may adversely affect fruit quality and fruit size.

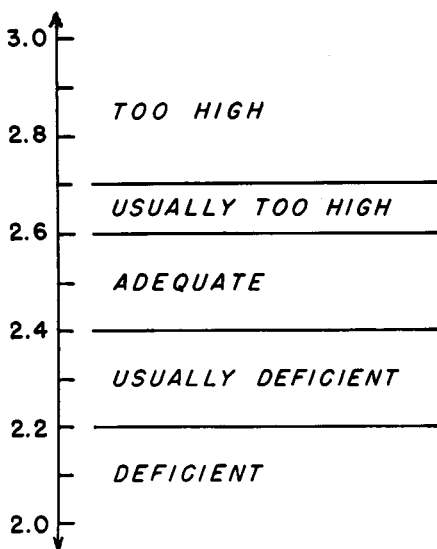
A nitrogen fertilization program for oranges based on leaf analysis must observe certain procedures and restrictions. The results of leaf analysis can be no better than the sample analyzed and some training and practice are required to do acceptable sampling.

Leaf samples should be taken from healthy trees only—not diseased, injured, or obviously off-type—and should be spring-flush leaves from nonfruiting and nonflushing terminals. The sample leaves should be four to six months of age, approximately August 15 to October 15.

The orchard should be judged for uni-

formity, and areas that appear to be different in tree size, tree condition, foliage color, foliage density, fruiting, and so forth should be sampled separately. When the orchard is uniform, 5–10 acres can be sampled as one unit. If, after a couple of years, several sampling units are found to be similar in nitrogen levels, the units can be lumped into one sample

Nitrogen in orange leaves—percent of dry weight. August–October.



for each of the next several years. When starting a leaf analysis program for nitrogen, more samples are needed the first two years than are necessary in subsequent years.

The actual leaf analysis should be done by a qualified laboratory and the results reported as percent nitrogen of the leaf on a dry weight basis. The accompanying chart shows the range of nitrogen usually found in orange leaves and indicates the adequacy of the fertilizer program.

When the percent nitrogen is deficient, applications should be increased, perhaps to the extent of doubling the former rate.

A usually deficient report indicates that only a small increase in the rate of application is in order.

An adequate percent nitrogen report indicates that no change is needed and the rate of application of the previous year should be repeated.

Usually too high reports indicate a slight decrease in rate of application—perhaps by 1/3—should be made.

When the percent nitrogen is reported as too high, the next scheduled nitrogen application should be decreased or even omitted and further applications withheld until the leaf nitrogen values fall to the adequate range.

The nitrogen values for the August–October samples indicate the nitrogen program for the following year. When an application of nitrogen is needed, it should be made in late December, January, or February.

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## Sulfur requirements of

### SUBTERRANEAN CLOVER

Sulfur needs of subterranean clover in Lake, Mendocino and Sonoma counties are being investigated because field and greenhouse studies indicated sulfur deficiencies are widespread. In some cases, the increased growth of clover previously attributed to phosphorus fertilization, actually was a result of the sulfur contained in the fertilizer. Even the small amount of sulfur contained in treble superphosphate has given significant increases in clover production where comparable applications of potassium phosphate, with no sulfur, gave no increase.

One objective of current research is to develop a method of predicting whether clover growing at a given location would respond to sulfur fertilization. Subterranean clover growing on a known sulfur deficient soil is sampled and the sulfate content of the leaves, petioles and stems determined. The critical sulfur level is estimated by comparing the sulfate content of the subterranean clover to the content of clover from plots fertilized with various rates of sulfur. Preliminary results indicate that there was little change in sulfate content of the clover over the stages of maturity from one to five flowers, and there is little difference between the parts of the clover

plant analyzed when sulfate was low. There was a wide range in sulfate content of plants taken from plots fertilized with different amounts of sulfur. Further work is needed to determine with precision the critical sulfate level in the plant.

Another aspect of the study is the comparison of the sulfate content of other range species such as soft chess with the sulfate content of subterranean clover. Preliminary figures indicate that the sulfate content of soft chess and subterranean clover taken from the same plots on the same date are similar but further work is needed to substantiate the correlation.—*Milton B. Jones, Dept. of Agronomy, Hopland Field Station.*