

# Nitrogen and Orange Production

results of preliminary experiments indicate some groves need less nitrogen to maintain production

W. W. Jones and T. W. Embleton

**Annual applications** of two to three pounds of actual nitrogen per tree are commonly made in California orange orchards.

Production cannot be long maintained without the use of nitrogen fertilizers, but developing evidence indicates overusage may be commonplace.

Preliminary results obtained from field experiments in several localities—on the use of nitrogen in orange production—indicate that leaf analysis is somewhat limited for the determination of nitrogen usage; that the period of flowering and fruit setting is the critical time for nitrogen to be high in the tree; that after the period of flowering and fruit setting, the nitrogen level in the leaves appears to have little influence on yields; and that annual applications of two to three pounds of nitrogen may not be necessary to maintain yields.

The percentage of nitrogen in orange leaves varies widely from one season to another, as shown by the graph on this page which depicts the leaf nitrogen content from three different treatments in the long-term Navel orange fertilizer experiment at Riverside. Trees in one treatment receive no nitrogen, while those in the second receive three pounds of nitrogen, and the trees in the third treatment receive five pounds of nitrogen annually. Yields are equal for the second and third treatments, but the treatment receiving no nitrogen produces almost

no fruit. Yet for most of the year the leaf nitrogen for trees not receiving nitrogen treatment is above the so-called critical level of 2%. Only in the spring does the level fall below 2% in this treatment. The leaves of trees in the treatments receiving nitrogen do not drop below the 2% level until they are approximately a year old. The fact that leaves in the treatment without added nitrogen are above 2.6% in September does not increase yields. From the records, these trees produce practically no fruit, yet a leaf sample taken during July, August, or September would not indicate a nitrogen deficiency. Thus, if the nitrogen in the tree is low at the period of flowering and fruit setting, yields probably will be low regardless of what the nitrogen level in the tree may be during the remainder of the fruiting cycle.

Annual application of nitrogen fertilizers is a common practice and in some cases several applications are made annually. This practice assumes that there is not an adequate carry-over of nitrogen fertilizers from one year to the next. Some experiments now in progress do not support this practice. Certain plots in one experiment on a Tujunga stony-sandy loam soil have received no nitrogen fertilizer for five years; yet in 1953, trees in these no-nitrogen plots produced an average of 8.0 field boxes per tree as compared to 7.8 field boxes from trees in other plots receiving approximately

five pounds of nitrogen per tree annually. In no year of the five years of the experiment have the no-nitrogen plots produced less fruit than the plots receiving nitrogen.

In another experiment on Yolo loam soil, certain plots have received no nitrogen for four years. In 1951, 1952, and 1953, these plots produced 8.9, 6.3, and 8.8 packed box equivalents as compared to 8.9, 6.7, and 8.8 for other plots in the same orchard receiving two pounds of nitrogen per tree annually. The irrigation water used in these experiments carries no appreciable amount of nitrogen. Thus, after five years in one experiment and after four years in another, the omission of nitrogen fertilizers has not reduced yields. It is expected, however, that after a few more years without nitrogen, yields will be reduced.

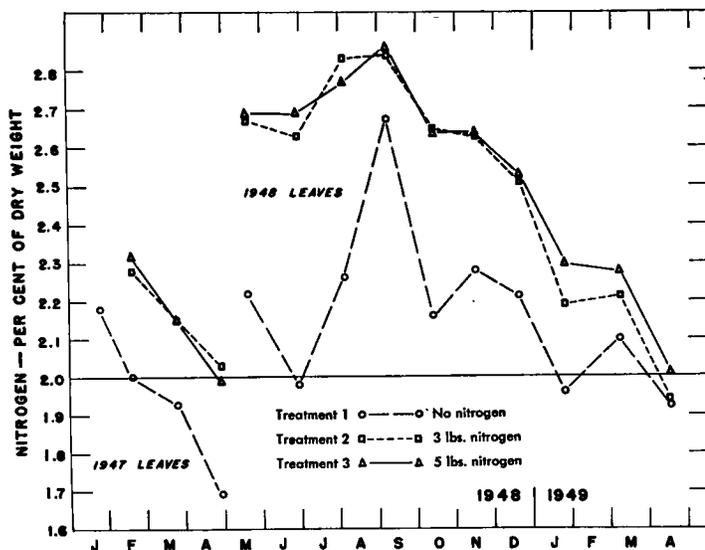
The results of these experiments show that in some groves production may be maintained with lesser amounts of nitrogen than are presently being applied by growers.

These studies are being expanded to evaluate the above findings in other locations.

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Nitrogen content of Washington Navel orange leaves. Note the line drawn at the 2% level. The nitrogen was applied as calcium nitrate.

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