Leaf Analysis of Citrus

tests in eight counties indicate the potassium and phosphorus status of California citrus orchards

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Orange size, yield and quality can be improved in California citrus orchards by adjusting potassium and phosphorus content of the tree.

A leaf analysis showed that 93% of the orchards tested had a potassium level low enough to warrant the belief that fruit size may be somewhat increased if enough potash can be gotten into the tree. There was less probability of measurably increasing yields through potash fertilization.

Some 10% of the orange orchards—and a higher percentage of lemon orchards—were low enough in phosphorus to respond favorably in yield and quality to additions of phosphate fertilizer. At least another 10% of the orchards contained too much phosphate which tends to decrease fruit size, lower nitrogen efficiency, aggravate zinc and iron deficiency, and possibly increase susceptibility to insect attacks.

The potassium and phosphorus status of the trees was determined in these experiments by newly developed techniques of leaf analysis and procedures for sampling leaves.

Potassium

Potash deficiency reduces fruit size; excess causes large, extremely coarse, low-grade fruit. Intermediate potash levels produce good-sized fruit of commercial quality.

To develop leaf analysis standards for potassium, three to seven months old spring cycle leaves borne on fruit-bearing twigs were chosen. A total of 661 orchards—mostly orange—were sampled in San Diego, Orange, Riverside, San Bernardino, Los Angeles, Ventura, Santa Barbara, and Tulare counties.

If orange leaves of the type specified contain less than .25% total potassium in the dry matter the tree is likely to be deficient in this element; the prospects of a yield increase by raising the potassium content of the tree are good, and of a fruit size increase, excellent. In the less than .25% potassium range, only one orchard was found, located in San Diego County.

Leaf values ranging from .25% to .4% potassium indicate slight potassium deficiency. The chances of a yield response are only fair, but if the potassium content of the tree can be substantially increased there is a good chance that fruit sizes may be enlarged. Of the 661 orchards sampled, 7.4% fell in this group. Two-fifths of these samples were from San Diego County, and none from Tulare County.

Leaf values ranging from .4% to .6% potassium represent a doubtful zone so far as probable yield response to potash is concerned, but the possibilities for increasing fruit sizes are reasonably good. A substantial percentage—20.3%—of all the groves sampled fell in this range.

Leaves showing from .6% to 1.3% potassium indicate that the supply is ample for yield, but some size increase might occur if the potassium of the leaf can be substantially increased. Sixty-five per cent of all the orchards fell in this group.

Values between 1.3% and 2.5% indicate ample potassium with no likelihood of either yield or size response from the use of potash. Only 6.6% of the orchards were in this group.

Values in excess of 2.5% indicate excess potash. None of the orchards in this survey showed potash values above this amount.

A substantially larger percentage of the samples from San Diego County showed lower potash than the samples from any of the other counties. The average potassium content of all samples from San Diego County was .51%, that of Tulare County samples was 1.02%. This may be one of the reasons why the small size problem is less acute in Tulare County, though a number of other factors are also involved. The reason for the high potassium status of the Tulare County samples is not clear, and is being investigated.

Phosphate

Low phosphate tends to increase fruit size but results in sponginess, thick rinds, and low juice content. High phosphate tends to decrease fruit size and juice acidity.

Analyses for phosphorus were made in 519 of the 661 orchards sampled for the potash survey. They were located in San Diego, Orange, Riverside, San Bernardino, Ventura, Tulare, and Los Angeles counties.

If total phosphorus in three to seven months old spring cycle leaves from fruit-bearing twigs shows less than .07% phosphorus in the dry matter, the probabilities of a yield response to phosphate are good and fruit quality will be improved. Sizes are not likely to be much affected. No orange orchards were found in which leaf values were less than .07% phosphorus.

Values in the .07% to .1% range indicate slight phosphorus deficiency; yield responses and fruit quality improvement are likely, but no effect on size is probable. About 11% of the orchards sampled fell in this range.

The optimum range lies between .1% and .14% phosphorus; neither size, quality, nor yield responses are probable in this range. Seventy-eight per cent of all the orchards sampled were in this group.

Where phosphorus is higher than .14%, soil levels may be excessive, and both yield and size may be reduced due to direct effects on soil availability of nutrients. Over 10% of the orchards sampled fell in this group.

Diagnostic Methods

A larger percentage of lemon than orange orchards may be deficient in phosphate. In addition to leaf analyses, conspicuous brown splotching of old lemon leaves is an excellent diagnostic aid in detecting phosphate deficiency.

Work is progressing to improve present diagnostic methods for determining phosphorus status in view of the fact that in some orchards phosphorus is deficient while in others it is in excess. Growers should not indiscriminately use either phosphate or potash but should have the advantage of some previous guiding information. The best guide available for oranges at present is leaf analysis, and for lemons, the leaf spotting plus leaf analysis.

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