Nitrogen Fertilizer

usually beneficial to soils of California

E. L. Proebsting

THERE ARE 15 elements that are necessary for plant growth.

Of those 15, carbon, hydrogen, and oxygen come from the air and the water. The rest of the necessary elements come from the soil.

The three elements most commonly found to give plant responses, the world over, are nitrogen, phosphorus, and potassium. These three constitute the so-called "complete" fertilizers.

When a mixture such as 10-10-5 is sold, it means 10% nitrogen, 10% phosphorus pentoxide, and 5% potash.

Nitrogen Commonly Beneficial

The one element most commonly giving benefit in California is nitrogen.

A large percentage of peach, almond, and walnut orchards have shown profitable response to this material. Smaller proportions of the other fruits have been improved.

In spite of trials on different fruits in various fruit-producing districts, extending over a period of about 25 years, none of our data has shown phosphorus applications to orchards to pay for themselves.

It is not uncommon for covercrops to show benefit in the same orchard where trees do not.

A few small areas have been low enough in potassium so that certain trees have benefited from additions of this element. This has been particularly true with the prune in which leaf scorch and die-back have been corrected by making up the soil deficiency.

Calcium, Magnesium, and Sulfur

Calcium, magnesium, and sulfur are used in large amounts by the trees. The question of the soil supply of these three is very important from the standpoint of the physical condition of the soil, its ability to take water, and its salt balance. From the strictly nutritional point of view, California growers are more often faced with too much of these materials than too little.

For example, high calcium in the form of marl may interfere with the utilization of iron, and produce a marked yellowing of the leaves. This is the so-called "lime-induced chlorosis" found in a number of places in the state.

Limited areas also have such a high magnesium content that absorption of potassium is interfered with.

Other Elements Needed

Copper deficiency has been found in a few small spots, often where old corrals have been.

Manganese may be low enough to cause yellowing of leaves in some areas, but the trouble is generally not severe enough to make corrective measures necessary.

Zinc deficiency is probably the most widely spread of the minor element troubles. It makes itself evident as "little-leaf," and is not uncommon in most of the major fruit districts.

Boron, like magnesium, is much more likely to be present in too great than too small amounts, although both situations occur. The last on the list, molybdenum, has never been found to be deficient or in excess in California orchards.

Amount of Nitrogen

As a general rule actual nitrogen will give about the same response, pound for pound from different materials, with the qualification that the time and method of use be adjusted to the character of the source.

Many things enter into determining the rate of application. The kind and age of tree, the use to which the fruit is to be put, the kind of pruning, the type of soil management, the soil type, irrigation and local climatic factors all play a part in the response to be expected from a given dose.

Where it is needed, and for most species, 60 to 150 pounds of actual nitrogen per acre would cover the majority of cases.

In terms of a material like ammonium sulfate, this would mean about 300 to 750 pounds per acre.

Many orchards do not need nitrogen, and with those that do it is possible to use too much for best results, as well as too little.

If the trees are making short annual growth with small, light green leaves and they are blooming heavily, but are setting only a few fruits, it is likely that they do need nitrogen.

If growth is excessive, with large, dark green leaves and if the fruit matures late with poor color, it is likely that they have too much.

Timing the Application

The most common practice, and a satisfactory one for nearly all orchards, is to broadcast the fertilizer during the dormant season.

Late fall, before the ground gets too muddy, is a good time, but any time later, until perhaps a month before blossoming is satisfactory for any of the common sources.

The rains should have a chance to carry the fertilizer into the root zone before growth is resumed in the spring. The period of blossoming and setting of fruit and of the first shoot growth in the spring is probably the most important time of the year to have an adequate supply of nitrogen.

Fruit Size

Comparison of growth curves of apricots and peaches with and without late applications of nitrogen have failed to show any differences as affecting fruit sizes.

Final fruit sizes of cherries and prunes have not been increased by late treatment.

In this case, late treatment means when the fruit is still green but has made considerable growth. Most stone fruits go through three stages of growth, an early rapid one, a middle one about the time the pit hardens when growth is very slow, and a third, very rapid one, the period of final swell.

Some growers, worried about their fruit failing to size as they have watched it during the middle period, have tried nitrogen application to snap it out, and have felt the period of final swell was the result of the treatment rather than the normal course of development.

It appears that the amount of leaf surface per fruit is the most important factor in sizing fruit.

Use of Too Much Nitrogen

Late maturity and poor color caused by too much nitrogen are two factors which might be of the utmost importance for early shipping fruit, where a few days' difference in marketing may make the difference between a profit and a loss on the crop.

In extreme cases the fruit may eventually become soft without ever losing its green color or developing satisfactory sugar content or flavor. These culls will be noticed first inside the tree and on the lower branches where the shade makes the condition worse.

E. L. Proebsting is Professor of Pomology, and Pomologist in the Experiment Station, Davis.