Tree Nutrient Sprays

results of foliar sprays to supplement deficiencies affected by fruit variety

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Deficiencies of many of the minor nutrient elements in most species of fruit trees can be corrected by sprays.

Spraying with manganese sulfate at a rate of five pounds per 100 gallons has corrected manganese deficiency and bordeaux mixture has been generally successful in supplying copper. Zinc oxide or a mixture of zinc sulfate and lime—five pounds of each per 100 gallons—as a foliage spray or zinc sulfate at 10 to 25 pounds per 100 gallons in the dormant season have eliminated deficiency symptoms except on sweet cherry and walnut.

Boron is more commonly applied to the soil than to the tree as a spray because it is not fixed by the soil. However, sprays have been used and are usually confined to the first year of treatment to speed up response.

Molybdenum deficiency has not yet been found in fruit trees.

Iron is by far the most troublesome of the minor element deficiencies. It was the first to be recognized and the problem has been worked on for more than forty years, without satisfactory control. At present, new chelated iron compounds are being tried with some promise but it seems too early for commercial use of these materials.

The first experiments with nitrogen in a nutrient spray program were with dormant applications of sodium nitrate in about 1910. Results were inconclusive and were not followed up for some time.

Interest was revived by work in New York, some 30 years later, that showed responses of apples to sprays of urea. Other nitrogen compounds used did not prove satisfactory.

Most of the available information deals with apples and indicates that the majority of the varieties absorb urea readily when applied at the rate of five pounds per 100 gallons. It is compatible with most other spray materials and is generally put on when a pesticide is applied, thereby avoiding an extra cost of application.

Some apple varieties do not absorb urea as readily as others. For example, in adjacent rows of Gravenstein and Golden Delicious in Sonoma County, the Gravensteins absorbed nitrogen readily while the Golden Delicious did not, judged both by leaf color and chemical analysis.

There is widespread use of urea as a supplement to ground applications on apples in the northeastern states and considerable adoption in other districts. Few growers use the spray method for the entire nitrogen supply, although it is quite possible to do so. The rapidity of absorption and limited duration of response to a spray makes it very suitable for adjustments of the nitrogen status.

Pears have been less responsive than apples. Although a number of growers have reported satisfaction with the method, negative results have been obtained in a number of experiments in different states. In trials at Davis, measurable amounts were absorbed at both five and 10 pound rates of application, but no visible response was obtained from trees either in a low or moderate nitrogen status. It has not been determined whether this lack of response is due to enzyme constitution of the leaf or to other factors.

The stone fruits have generally proved to be poor absorbers of urea. Trials at Davis with peaches, Japanese plums, and apricots were unsuccessful. In another orchard of peaches with very nitrogen-deficient trees, six sprays failed to give response, although the trees gave normal improvement from soil applications. Later trials with peaches using 10 pounds per 100 gallons—rather than the standard five pounds—gave increased absorption but some leaf burning. There was little response.

Stone fruits sprayed with urea at 10 pounds per 100 gallons in June, 1955, gave average values in per cent nitrogen on a dry weight basis as follows: peach, 3.56; apricot, 3.22; almond, 2.70; Japanese plum, 3.25; European plum, 2.99; and sweet cherry, 2.62. Check trees were: peach, 2.99; apricot, 2.71; almond, 2.35; Japanese plum, 3.06; European plum, 2.50; and sweet cherry, 2.57.

All of the species—except sweet cherry—absorbed some nitrogen at the 10 pounds strength. There was some injury but no benefit. A similar trial in early May, when nitrogen levels are higher in the leaves, gave smaller differences between sprayed and unsprayed trees.

Prunes seem to absorb urea more readily than the other stone fruits at the five pound rate. Trials at Davis and in two orchards in Sutter County showed much better absorption, as measured by leaf analyses, but little response in leaf color, growth, yield, or in the time of maturity.

Extensive trials with the fig have shown ready absorption of urea, but the current spray program does not lend itself to use of the material.

The absorption of urea is aided by the addition of a detergent as a wetting agent. This was shown in detailed experiments at Cornell, where it was also shown that absorption was much greater through the lower than through the upper surface of apple leaves. When urea was applied to the under surface, 42% was absorbed within two hours, while it took two days for the upper surface to absorb the same proportion.

Phosphorus, like nitrogen, may be absorbed by some plants when applied in proper form. Unlike urea, phosphate compounds react with many pesticides to form insoluble or otherwise unsuitable materials. The resulting compounds may not be absorbed or they may prove to be toxic.

Although several species—notably the fig—will absorb phosphate, response has not been observed. Few deciduous fruit trees are low enough in phosphorus to give response from phosphate. However, it is possible that some cases of failure may have been due to the rapid fixation of phosphate by the soil with a consequent inability of the tree to get it.

Leaf analyses have shown that in some soils, addition of up to 50 pounds of treble superphosphate per tree has not increased the level in the leaf. In such a situation, the use of foliar sprays to bypass the problem is at least a promising approach from the experimental standpoint but no such response has been demonstrated.

About one-tenth as much phosphorus as nitrogen is present in normal leaves so—in case of a known deficiency—only a small amount would be needed.

The use of potassium as a nutrient spray has not been successful. The high solubility of potassium compounds has made it easily absorbed in most cases, but with severe leaf burn. It is required by trees in rather large amounts, which has made it impractical to supply the necessary quantities in the dilute spray solutions that can be used.

Urea, the only satisfactory nitrogen-supplying material so far developed, has established itself as a useful foliar applied supplement to ground applications with many apple varieties but not with the stone fruits. Further advances in understanding the mechanism of absorption may improve this situation.

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