Plants Need Minor Elements

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PLANTS NEED nourishment in the forms of nitrogen, phosphate, and potassium, the three major food requirements, in order to grow healthy and vigorous. However, plants which have been adequately fertilized can still appear sickly. Plants as well as man and animals need, in addition to the major elements, very minute quantities of certain metals to act as agents to regulate many intricate mechanisms which constitute a living organism. Because these elements are needed in such small amounts, they are called minor elements, trace elements, or sometimes micronutrients.

Yellow Leaves Need Iron

Iron deficiency has long been recognized by the typical symptom of yellow leaves with only the veins remaining green. Iron sulfate has been used as the remedy for this sick condition of plants. There are a number of drawbacks to the use of this form of iron. If used in too strong concentrations, it can burn the foliage. If placed in the soil, much of it becomes tied up with other chemicals and is available to the plants. Iron citrate, a form of chelated iron, gives some temporary correction as a foliage spray, but is of such weak construction that it is rapidly broken down in the soil.

In the early 1950's, ethylenediamine tetraacetate (EDTA) proved effective and stable for the chelation of iron, zinc, manganese, copper, magnesium, and other metals. The EDTA-iron combination is very effective and is still a major remedy for iron chlorosis of citrus in Florida. This form of iron chelate does not correct iron chlorosis of plants growing in the alkaline soils of western states. Most of the iron deficiency cases in the West can be remedied by using sodium ferric diethylenetriamine pentaacetate, developed by Geigy as Sequestrene 330 Fe. Continuing research, however, has produced a much stronger chelating agent, sodium ferris ethylenediamine di-(o-hydroxyphenylacetate). It has proven safe and effective for treating iron deficient plants in any kind of soil, particularly in alkaline soils.

Chelated minor elements are excellent tools for diagnosing the ills of plants. If a chlorotic plant fails to respond to iron chelate, then we can be quite sure the plant is not deficient in iron, or that there is another minor element so deficient that normal plant processes cannot be maintained.

Iron Chlorosis Uncertain

Soil and climatic conditions which result in iron chlorosis of plants may also cause zinc and manganese deficiencies. The three deficiencies apparently go hand in hand. Many times, what appears to be typical iron deficiency conditions treated with iron chelate shows up the following year, not as iron deficency again but as a severe case of zinc deficiency. Treated with zinc chelate, the tree returns to normal. The following year, however, the tree may show symptoms of manganese deficiency. Combinations of all three chelated trace elements, applied either as a soil or foliage application, will prevent the progression of deficiencies and obtain a better and nicer looking, healthy plant.

Three years ago, a combination of iron, zinc, and manganese chelates was applied as a soil treatment to selected and paired ornamental trees in Ala Moana Park, Hawaii. One application of 2/3 to 1 lb. of each chelate per tree helped them produce leaves and twigs larger and more luxuriant than on check trees. Differences between treated trees and checks are still evident three years after the one application.

Mild Symptoms Not Seen

During our travels we find plants, shrubs, and trees of all kinds showing signs of disease. At times, symptoms are so mild that growers are unaware their plant production may be unusually low. Only when deficiencies become so acute that the plant becomes severely chlorotic and

crop production has fallen, do growers call in a plant disease diagnostician. Applications of chelated minor elements are the quickest and easiest way to determine just what ails the plant if symptoms indicate a nutrient shortage.

In states west of the Rocky Mountains, iron deficiency is severe or pronounced. Slight to moderate and sometimes severe deficiencies of zinc are found in Hawaii. There are only a few areas where plants show signs of manganese deficiency; pahala blight of sugar cane on the island of Hawaii is an example. Conversely, it is said that most areas have too much manganese and a toxic manganese condition exists. Here again, chelates may correct the situation. Because of a copper deficiency in Florida, growers continue to spray citrus trees with copper until they create a toxic condition with symptoms similar to iron deficiency. Iron chelate applications correct this condition by offsetting the excess copper rather than fulfilling an iron shortage. In the Pacific Northwest, after years of spraying with lead arsenate for codling moth control, soils became so saturated with arsenic that young peach trees failed to grow. Dr. Nels Benson, Wenatchee Experiment Station, found that a soil application of zinc chelate would offset this toxic condition and allow the young peach trees to grow normally.

Manganese chelate, as a foliage spray on manganese deficient Yellow Newton apple trees in the Watsonville area of California, gives only partial correction. Zinc chelate has very little effect when applied alone on these trees, but the combination of both manganese and zinc chelates does an excellent job. Dr. K. Uriu, University of California, Davis, found that the soil conditions causing these deficiencies have not been changed; growers must apply manganese and zinc chelate sprays every year if trees of good color and production are to be maintained.

Severely sick almond and apple trees grow in Zee Canyon near San Luis Obispo, Calif. Tests with the various chelates revealed that a severe copper deficiency was the cause. Copper deficient plants may start new growth in the spring but soon run out of steam; the terminals die, and leaf tips and edges progressively burn and die back.

These same symptoms were noted on lychee and macadamia nut trees growing in the Knudsen Gap area of Kauai, Hawaii. Various chelates were tested on these sick trees. These tests have shown that copper chelate, applied as a foliage spray at ½ lb. per 100 gals. of water with a good wetting agent was sufficient to help these trees return toward normality and to set a nut crop. The check trees are still sick.

Tree Drip Area Sprayed

In December, iron, zinc, manganese, magnesium, and copper chelates were applied separately to young macadamia nut trees on the Honomalino Ranch, south of Kona, Hawaii. These chelates were applied to the soil at 1, 2, and 4 ounces per tree and distributed over the drip area (under the canopy) of each tree. Preliminary data show that trees treated with the copper chelate are ahead of all others in appearance, color, and leaf size.

A severe twisting and deforming condition of new branches is fast becoming a serious problem of the young macadamia nut trees growing in this area. Indications are that copper chelate prevents this condition. Further tests are needed to verify these findings.

Three years ago, sick, young slash pine seedlings, at the Kamuela Tree Nursery on the big island, Hawaii, were saved with a foliage spray of copper chelate at ¼-teaspoon per gallon of water.

Homeowners are usually unaware of sick plants in their yards. If they do notice diseased plants, their application of a general fertilizer may not give the green garden envisioned as normal for their part of the country. With this in mind, and using a balanced combination of chelates, concentrate solutions of trace elements have been developed; one is Geigy's "Greenzit." Tests are now underway to verify the early results of tests with this material. Such concentrates can be applied through a hose sprayer for convenience or by a regular spray machine. They have been applied to a wide variety of ornamental plants, shrubs, trees, and lawns. Tests were established in the latter part of July on golf greens at the Navy Marine Golf Course. So far, only one plant, the poinsettia, is found sensitive to the spray solution. However, new growth more than makes up for slight "burning" of the terminal leaves.

Response to a foliage spray has been very rapid. New leaves and blossoms appear within a week after application. Dormant buds are activated and make plants bushier. Color of old, chlorotic leaves is not changed to any large extent, but new leaves emerge larger and stronger with a liquid luster. Combination chelate sprays intensify any natural color variation of the plant; the reds become redder, the yellows more yellow, and the green a more luxuriant green. With the help of these chelated minor or trace elements, we are now able to make plants greener and more beautiful than ever before.

New Ornamental Developed

An extremely hardy, evergreen, ornamental vine, adapted to shady and partially shady areas, has been developed by the United States Department of Agriculture, at the University of Maryland agricultural experiment station.

Particularly suited for use as a ground cover and as a cover for low masonry walls, the new vine has been named Longwood. A type of euonymus, the vine is a vigorous grower with dark leaves and light-colored veins. Leaf dimension is one-half by three-quarter inches, and is readily propagated from cuttings.

The new ornamental has withstood temperatures from minus 25°F. to 106°F. Grown in full sun, at high temperatures it may scald. Longwood has been distributed for commercial reproduction and will be available on the retail market in 1967.