TECH CENTER

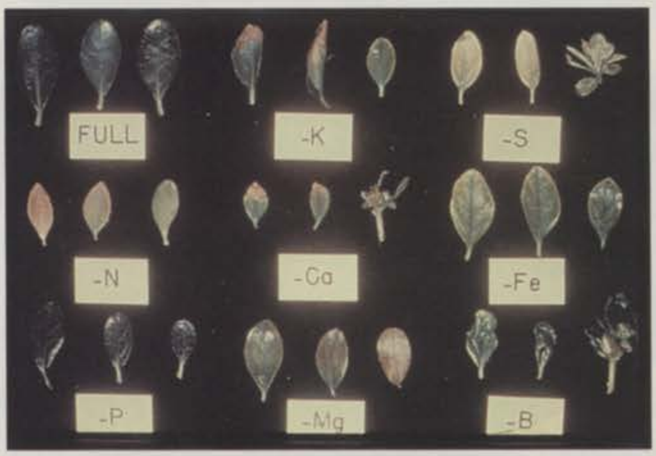
Micronutrients take their place in feeding programs

■ Proper feeding of turf and ornamentals is like forging strong links of a chain. To grow and remain healthy, plants need air, water and nutrients.

According to the "Western Fertilizer Handbook," researchers identify 16 elements required for plant growth and reproduction:

- **Carbon, hydrogen, oxygen** and **chlorine** are provided free by air and water.
- **Nitrogen, phosphorus** and **potash** are provided by traditional NPK fertilizer.
- **Calcium** can be provided by liming.
- **Sulfur** and **magnesium** (secondary nutrients); **iron, manganese, zinc, boron, molybdenum** and **copper** (micronutrients) are too often neglected by turf managers. Special micronutrient fertilizer applications are often necessary to provide these elements.

"Even though micronutrients are used by plants in very small amounts, they are just as essential for plant growth as the larger amounts of primary and secondary nutrients," says the Handbook.



The 'nutrition chain' (top) shows the interdependents of elements. Shown below are various deficiency symptoms.

Courtesy United Horticultural Supply

Like a chain, the strength is only as good as its weakest link. If a heavy application of nitrogen or phosphorus is made, it may disturb the balance or, at best, may give the fertility chain one strong link while leaving the other links wire-thin.

While major and secondary nutrients provide basic building blocks for cell reproduction, water transportation and root development, micronutrients allow the synthesis of chlorophyll and activation of enzymes in the growth process. They are essential for the plant to use nitrogen and synthesize proteins.

Iron—The most common micronutrient deficiency is a lack of iron, which often results in the decreased ability of turf to produce the chlorophyll that gives plants their green color. Iron can also enhance a plant's ability to tolerate drought, resist disease and develop a stronger root system.

Even though iron is found in substantial amounts in soils all across the U.S., it is often in a chemical form that makes it unavailable to the plant. Therefore, soil tests alone are inadequate to determine plant deficiency. An assay process which determines the iron in the plant itself is a better (but much more expensive and still not reliable) way to determine iron deficiency. Even this tissue analysis only measures the amount—not type—of iron in the plant.

Iron may be naturally unavailable to plants or the deficiency may be induced by high soil pH or presence of calcium carbonate (around new concrete, for example). Removing the top layer of soil in development can also remove the available iron from the plants' rootzone. Excessive amounts of other nutrients, including

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phosphorus, zinc, manganese and copper, can also limit the plants' ability to take up and use the iron.

Manganese—Likewise, the amount of manganese available to plants is not reflected in the amount of manganese available in the soil. Soil pH, cation exchange capacity, organic matter content, drainage, temperature, soil compaction and microbial activity all limit availability of manganese. Even fertilizer packages of iron with sulfur and nitrogen were found to induce manganese deficiency. They caused growth without necessary additional manganese to fuel such processes as hydrolysis, metabolism of organic acids and oxidation reduction that produced spindly, yellow plants.

Occasionally, too much manganese can be as bad as too little. In acid or poorly-drained soils, manganese becomes extremely available and blocks out the uptake of other vital nutrients.

Zinc—Zinc deficiency can be determined through soil and tissue tests. Muck soils and some western, Florida and Michigan soils are naturally deficient in zinc. High soil pH and removing topsoil can also cause zinc deficiency. Unbalanced applications of phosphorus can intensify zinc deficiencies. Uptake of zinc can be more limited when soils are cold and wet during the early part of the growing season.

Others—Other micronutrient deficiencies are less spectacular in their symptoms and are not as often corrected.

Symptoms of boron deficiency can be confused with other deficiencies and can be more difficult to correct. Researchers have documented boron scarcity in most of the East and Midwest and in some parts of the Northwest. This lack often shows up as reduced plant quality rather than lack of growth.

Organic and very sandy soils are most likely to have copper deficiencies. Problems are fairly localized and can often be diagnosed by soil tests.

Only a small amount of molybdenum is needed for nitrogen fixation and nitrate reduction in plants. Availability may be limited primarily in acid soils; therefore, pH can be a good indicator of a potential problem. Tissue analysis can also diagnose a scarcity. Although turfgrass scientists recognize the element's importance, little else is known about its effects.

Recent research indicates very few cases where overapplication of micronutrients can pose a problem. Balance is most important. Look for a micronutrient package that contains not only iron and manganese, but also magnesium and—depending on soil tests—zinc, copper, boron and molybdenum.

SYMPTOMS OF SOME NUTRIENT DEFICIENCIES

Nutrient	Symptom
IRON	Yellowing of the interveinal area of young leaves. On turf, the chlorosis is not uniform, but often appears in irregular patches.
MANGANESE	First signalled by interveinal chlorosis. As deficiency becomes more severe, leaves get brown spots and developing leaves often drop off.
ZINC	Interveinal chlorotic striping, a thin purple margin around leaf edge. For ornamentals, narrowed or reduced leaf size and internodal spacing, giving the plant a "witch's broom" appearance.
COPPER	Can cause newer leaves to die before unrolling. Older leaves may appear limp or turn gray.

Treating soils for dangerous contamination

Pesticide spills, battery acid, oil and gasoline leaks can be cleaned up with specially-treated rocks.

by James E. Guyette
Contributing Editor

■ A new technology may allow landscape managers, golf course superintendents and institutional groundskeepers to treat lead-contaminated soils more cost-effectively.

The discovery involves covering the affected soil with finely ground phosphate rocks. Research indicates that the phosphate rocks reduce the amount of water-soluble lead in contaminated soil by 57 percent to 100 percent.

For the landscape industry, this could drastically reduce the costs faced by business managers being forced to purify soils tainted by pesticide spills or previous power equipment maintenance activities that resulted in petroleum products soaking into the ground or leaking gasoline storage tanks. The process also will work on battery acid leaks.

In addition to cleaning their own company headquarters' yards, landscape managers may also find economic opportunities in helping other business owners clean polluted grounds.

"A combination of leaded paint and gasoline has caused soils in some urban areas to be very high in lead," explains Dr. Terry Logan, professor of natural resources and director of the Environmental Science Graduate Program at Ohio State University. The U.S. Environmental Protection Agency and the University of Florida are also participating in the project.

"We envision using our treatment and then covering the surface with a couple inches of clean soil and then planting vegetation," Logan predicts.

Combats heavy metals—The technology, which has been patented by OSU

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