# PLANT NUTRIENT SUMMARY


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### The Elements

Of the 16 plant food elements known to be necessary for the healthy growth and development of plants, 3 usually come from air and water, and 13 usually come from the soil.

Carbon, hydrogen, and oxygen are normally obtained by plants from water and air, and are seldom a limiting factor in plant growth if water is available.

The remaining 13 are divided into three groups according to the quantities plants use in their normal growth processes.

Nitrogen, phosphorous, and potassium are needed in the greatest amount, are most often limiting, and are therefore called major nutrient elements. These three major elements, carried in various types of materials, form the basis of fertilizer formulations in general.

Calcium, magnesium, and sulfur, as a group, are needed by plants in quantities somewhat less than the major elements and are called secondary nutrients. Until relatively recently, the concern for these element generally was not very great because they were not often limiting to plant growth. These elements were often in the materials that carried the major nutrient elements as impurities and were supplied in adequate quantities when applications of the major elements were made. As the technology of fertilizer manufacture has progressed and the drive for higher quality, higher analysis, more refined materials, has succeeded, the amounts of secondary elements supplied as impurities in major element carriers has become less. This fact, combined with the higher quality of turf demanded which intensifies management, makes it necessary to consider the secondary plant food elements separately from the major elements.

A developing deficiency of the secondary elements is more often less dramatic than the major elements and therefore can be responsible for an insidious case of **hidden hunger.**

### Micro-Nutrients

Needed in even less quantities than the major or secondary plant food nutrient elements are the micronutrient elements. In the past, these elements have been called "minor elements" but their importance and limitations to the healthy growth of plants is becoming so well established that calling them "minor" because they are used in small amounts is misleading. A complete lack of one of the micronutrients will eventually be just as detrimental to plant growth as the lack of any other element.

Seldom is there a complete lack of any plant nutrient element in the soil but seldom also are the elements in the exact quantity and balance with each other to produce the best possible quality of plant growth.

### Boron

Boron deficiencies are mostly found in the humid regions as the element, when soluble, is easily leached out of the soil. Most of the boron in soils is tied up in an unavailable form in the organic matter. As the organic matter is broken down by soil micro-organisms, the boron is released in an available form to plants.

Soils likely to be dificient in available boron are

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light-colored sands, sandy loams, and silt loam soils, alkaline soils, and drowthy soils.

### Copper

Grasses are among the plants that have a relatively high requirement for copper. Soils most likely to be dificient are peat and muck soils and light-colored, highly acid, leached soils. Copper is important in controlling water balance in the plant and in leaf and shoot growth. Plants that are suffering from copper deficiency lose their firmness and develop a bleached look. Deficiencies have been reported in 13 states and the number seems to be growing.

### Iron

Most soils contain a lot of iron but the maior portion if it is tied up in unavailable forms often resulting in not enough being available for the plants growing in the soil. Iron is directly essential for the formation of chlorophyll and dramatic results can often be obtained from the addition of iron to the soil.

Iron need is indicated by pale-yellowish color foliage, in the presence of adequate amounts of nitrogen and in soils that are high in lime. A deficiency of iron will often cause a plant to develop short and much branched roots. Iron deficiency is relatively easy to correct and there is little danger of over-applying it because it is not toxic in excessive amounts.

### Manganese

Manganese is somewhat like iron in that it is more available in acid soils with a declining availability as the pH goes up toward alkalinity. Manganese is important in the utilization of calcium, magneisum, and phosphorous within the plant. Sandy soils are often short of this important plant food element as are peat and muck soils in some cases.

### Molybdenum

It has only recently been discovered that molybdenum is essential for plant growth. It is very much like phosphorous in many of its soil reactions. In acid soils, the soluble iron and aluminum tie up molybdenum so plants can't use it. Deficiencies in plants causes them to be stunted and light yellow-green in color. It is associated with nitrogen utilization. Molybdenum is needed in smaller amounts than any other plant food element.

### Zinc

Zinc is linked with iron and manganese in the formation of chlorophyll. The amount available in soils for plant growth is usually very small, ranging from 0.1 to 5 parts per million. Light textured and highly alkaline soils are most likely to be deficient.

### Chlorine

Chorine is the latest element established as an essential micro-nutrient. In plant life it is believed to stimulate the activity of some enzymes and to influence carbohydrate metabolism, the production of chlorophyll, and the water holding capacity of plant tissue. Generally there is no deficiency of chlorine in soils. Chlorine is supplied in many fertilizers, particularly those containing muriate of potash.

### Hidden Hunger

Plants, like humans and animals, not only need enough food, but also a balanced diet if they are to make healthy growth and be of top quality. When any one of the plant food elements is not available to the plant in sufficient quantity, growth is affected whether or not the deficiency is acute.

Acute deficiencies usually will reveal themselves in abnormalities, which can be detected by careful observation and study.

**Hidden hunger** is a much bigger robber of plant growth and quality than is acute deficiency, because it is widespread and goes unseen. While limiting growth and quality, it seldom reveals itself in any recognizable abnormality of plant growth. Moreover, most managers whose turf is suffering from hidden hunger are completely unaware of the fact. It occurs in the zone between acute deficiencies and optimum growth and quality and is relative rather than specific.

### Conclusion

While plant food elements are not the only factor a turf manager has to deal with in his efforts to reach his goal ot quality turf production, they are a very important tool. Like the use of any other tool, skill is required to use it efficiently.

Advanced programing of the fertilizer applications based on the past experience and soil tests is the mark of a good manager. To program, a manager must establish a goal which is an image of the result he wants to achieve. As in any area of life, the man who clearly identifies his goal and develops a program to reach it, will be successful more often than the man who shoots in the dark.