

A Guide to the Use of Fertilizers

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The elements essential to the life of plants may be classified as nutritive or regulatory. Carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus are nutritive. Sulfur and phosphorus may also function as regulatory elements together with potassium, calcium, and others. Of these mineral elements, all may be redistributed within the plant, usually from older tissue to younger tissue, except calcium and iron. Deficiencies of boron, copper, manganese, or zinc in the soil is usually not a question of an absolute deficiency in the total quantity of the element present in the soil, but rather is a physiological deficiency arising from the insufficient availability of the element to the plant — not enough of the element can be absorbed and distributed in the plant for its physiological needs at each successive phase of growth. These four elements are also highly toxic in higher concentrations.

All of the factors that would affect the absorption, accumulation, upward movement, distribution, and utilization of fertilizer salts in the plant must be considered in fertilizer use. Fertilizer use is actually an attempt to assure that the right amount of the right element will be available to the plant when it is needed to permit the plant to grow as we would like to have it grow. The balance, the nutrient level, the fertilizer interactions, and all the other factors are simply attempts to have the plant grow to our specifications.

The simple guide to fertilizer use is the



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ability to answer the questions of What, When, How Much, How to Apply, and finally, but not least, Why? Think of fertilizer use in terms of the three R's — the Right amount of the Right kind at the Right time, in order to grow turfgrass to meet your needs rather than to simply grow turfgrass. For example, an excessively fast rate of growth in turfgrass requires more maintenance, is likely to be more susceptible to diseases and traffic damage.

On the other hand, an extremely slow rate of growth does not recover quickly enough from traffic damage and will probably not have a good appearance. The desired quality of the turf must be of prime consideration in a good fertilizer use program. Generally, it becomes more difficult to maintain the desired color and vigor of turfgrass when such factors as temperature, light, humidity, and wind movement are adverse. In most areas, the winter and summer fertilizer programs are more difficult than in the spring or fall.

Waterflow Prevalent

In certain respects the grass plant can be considered a bundle of pipes extending from the tip of the tiniest root to the top of the leaf. More water moves through this plumbing system than anything else. As a matter of fact, as much as 50,000 times as much water is apt to move through a plant as all of the mineral elements combined. This simply means that the medium in which the plant is growing must be of such a nature that it will be easy for the plant roots to penetrate and proliferate in order to meet the water requirements. If roots cannot grow readily in a soil, it is not likely that sufficient moisture can be absorbed to fulfill the needs of the plant. In many respects the

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mineral nutrition of a plant is simply that of a surface area relationship. Many of the mineral elements are held on the surface area of the soil particles and organic colloids. As the plant roots grow and make contact with these surface areas, the bio-chemical activities render these mineral components more soluble so they can be absorbed.

Soil Constantly Changes

The soil is not static but is constantly changing. A good soil is literally teeming with life processes. Ammonia which is held on the soil particles may be changed to nitrates. Nitrates are highly soluble and will move with the soil moisture. If the soil contains a large amount of nitrate nitrogen, the greater the amount of water absorbed by the plant the greater will be the amount of nitrate nitrogen absorbed by the plant.

On the other hand, if the soil does not contain much nitrate nitrogen but does contain a considerable amount of ammonia nitrogen, increasing the amount of water absorbed by the plant will not necessarily increase the amount of ammonia absorbed. Ammonia is absorbed more in relation to the root activity of the plant. A similar situation holds true for phosphorus, sulfur, calcium, magnesium, potassium, and perhaps a number of the micronutrient elements. This helps to account for the fact that young and rapidly growing plants tend to respond more to ammonia, phosphorus, potassium, calcium, magnesium, and sulfur applications than do slow growing or older plants.

For Growth Stimulation

If one were interested in rapidly stimulating slow growing or older plants, he would obtain faster response from using nitrate nitrogen than ammonia nitrogen or organic nitrogen. However, he would have to also keep in mind that the lasting effects would be in proportion to the rapidity in which the different forms of nitrogen would be absorbed and utilized by the plants. Many research results prove these points but actually they could be postulated simply by a better understanding of the nutrition of the plants and growth characteristics.

The more intensively a turfgrass is maintained and utilized the greater will be the fertilizer use problems. The only reason to use fertilizer on turfgrass is to make it better than it would be had fertilizer not been used. Fertilizers are chem-

ical compounds, either organic, inorganic, or both, that can be utilized by the turfgrass in various ways that improves the growth, color, or quality characteristics. These compounds may be applied to the soil, to the leaves or as a combination of these methods. A continued program of supplying all the fertilizer by foliar application on turfgrass is usually not advisable nor desirable.

Minerals Immobile

There are at least two very good reasons why this statement can be made. First, certain of the mineral elements are very immobile and do not readily move within the plant. Second, and probably more important is the simple fact that many vital compounds are synthesized in the roots, notably the fact that nucleoprotein synthesis in plants is only possible if inorganic phosphorus is assimilated through the roots. This does not mean that foliar fertilizer use in combination with fertilizer use in the soil is not good.

There are numerous instances when foliar use of fertilizer would be highly desirable and beneficial. Correcting iron chlorosis with foliar sprays is only one example. There are many others that could be given. However, turfgrasses normally obtain their required mineral elements and also water through the roots from the soil.

Retards Reproduction

Fertilizers can also be used to influence the normal development processes of plants. For example, high nitrogen rates tend to retard reproductive development whereas low nitrogen rates tend to stimulate flower initiation. As would be expected, in short-day and in short season plants, the amount of nitrogen needed to retard reproductive development tends to be higher than for long-day and long season plants.

High rates of phosphorus also tend to stimulate flower initiation. The practical implication from this should be rather obvious. If, early in the season there is a tendency for the grass to form seed heads, one possible correction would be to apply a quickly available source of nitrogen. If the condition is caused by an over supply of phosphorus it may be necessary to reduce the supply of available phosphorus in the soil. This could be done by adding chemicals that would make the phosphorus less available. Those most frequently used are iron sulfate, calcium nitrate, magnesium sulfate, and hydrated lime.