Kentucky bluegrass test plots at Rutgers University. Note natural genetic variance in color and resistance to disease.

Nutrients Affect Color and Vigor of Turfgrasses

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GENETIC INHERITANCE, the use the turf is subjected to, the medium in which it is grown and the management imposed upon it, are the critical factors in its performance. When this combination is right, the use of nutrients can be the catalyst to whatever end result you wish — either aesthetics or playing excellence.

Turfgrasses differ greatly in their natural color. Many good turfgrass stands have been ruined by the heavy use of fertilizers designed to improve color and turf vigor. Color sometimes has become the guideline for determining the health of the grass stand. Hopefully, golfers will learn that this is not true and will concern themselves more with playing quality.

Many nutrients affect turfgrass growth. Nitrogen, phosphorus, potassium, calcium, magnesium, manganese, iron, sulfur, boron, copper, and zinc determine the growth rate, and, therefore, the health and vigor of the turf plant. Many articles and research papers are available concerning the effect of nutrients on plant growth.

Although information on turfgrass is not abundant, there is enough to provide turf managers with good working guidelines. The important thing to remember is that the objective is not to create a nursery or a scenic park but to provide a surface for playing golf.

Soil tests are the basis for fertilizer recommendations, and they help to establish general guidelines. Bear in mind, however, that golf course turf is a very special commodity and that not everyone agrees on quantities of nutrients required for its best growth performance. A pH test provides information about whether the soil is acid, neutral or basic. A pH reading of 6.0 to 6.5, which indicates the soil is moderately to slightly acid, appears to be best for a number of turfgrasses.

This fits the requirement and is a good starting point, since few golf courses are established to a monostand.

Zoysiagrasses, Kentucky bluegrasses, annual bluegrasses, creeping red fescues, bentgrasses, bermudagrasses, and ryegrasses all grow well at pH 6.0 through 6.5. Although pH 6.0 may be on the acid end of the scale for most of these grasses, all the nutrients are readily available in the soil at this level. A pH of 6.5 is the level at which most nutrients are readily available to the plant. Of the eleven nutrients mentioned earlier, only phosphorus, calcium, manganese, sulfur and iron are inhibited to any degree at these pH levels. All of these materials are commercially available and can easily be applied in forms that are readily available to the plant.

Below the moderately acid level, the availability of calcium and magnesium is reduced. Phosphorus may also become insoluble because it forms compounds with iron and aluminum in the soil. At extremely low pHs, magnesium and aluminum solubility increases, and these elements may become toxic to the plant. At high pHs, copper and zinc become less available and iron and magnesium may become deficient; boron also becomes less available above pH 7.0.

Nitrogen, iron and sulfur show the quickest effect on turfgrass color. Potassium strengthens the plant considerably, but visual effects are not readily visible. Nitrogen, iron, potassium and sulfur are four main nutrients that are needed most after the plant has become well established. Used judiciously they can help grow a very fine quality golf course turf. By experimenting to determine the best combination of these materials for your specific area, a balanced nutritional program can be developed.

Nitrogen stimulates the plant's growth more than the other nutrients. As a result, nitrogen has become the most used and misused plant food.

Overstimulation weakens the plant to the point that it becomes more susceptible to heat stresses, traffic, insect and disease infections. In addition, the overstimulated grass also requires more attention in mowing, watering, aeration, vertical mowing and other maintenance practices.

By carefully controlling the amount of nitrogen, by exercising good judgment in the timing of all applications, and by carefully choosing the source of nitrogen, all contribute to the careful nurturing of this special purpose turfgrass.

Ideally, nitrogen should be made available as the grass needs it in a manner that allows a steady, consistent growth rate. The growth rate should be just enough to withstand traffic and recover quickly on greens, tees and fairways. Grasses growing at this pace will have plenty of natural color and will be vigorous enough to withstand a reasonable amount of environmental stress.

Talking about a constant nitrogen supply program is easy, but obtaining the desired result is more difficult. Nitrogen is available in different analyses and forms:

1. Soluble — forms which are readily soluble in water such as urea, ammonium sulphate, ammoniated phosphate, and other inorganic salts.

2. Slowly Soluble — microbial activity and/or soil chemical action is necessary for the nitrogen to be broken down into a form so that it is available to the plant. These include ureaform and natural organic fertilizers.

Merion bluegrass, heavily fertilized on the left side of a check strip. Professional and low-handicap golfers prefer the tighter lie of the check strip.

3. Slow Release — soluble nitrogen is coated with plastics, sulfur or other materials resistant to hydrolysis. The nitrogen becomes available slowly as the coating deteriorates.

It is very hard to continually achieve a predicted consistent release of the nitrogen with the slowly soluble and slow release types because they are all subject to effects of temperature, moisture and soil chemistry. However, as imperfect as they may be, judicious combination use of different nitrogen sources can bring desired results.

The main thing to remember is that nitrogen should be used principally to stimulate growth and not to add color. If color alone is needed, other nutrients can be used. Ferrous sulphate and chelated iron are examples, and they are easy to apply. The sulphate form is fast acting while the chelated form requires time to show color change.

Iron is likely to be deficient in heavily watered areas, poorly drained soils, or soils with a high organic matter content. Light rates applied on a regular basis while the plants are actively growing will help the turf retain color without noticeable effect on the growth rate.

Potassium is used by the plant in quantities second only to nitrogen. The amount of potassium required usually is about one-half to two-thirds of that of the nitrogen requirement. Potassium in adequate amounts promotes greater winter hardiness, better resistance to disease, and improves wear tolerance. Good levels of potash help combat brown patch, *Fusarium* patch, red thread, *Helminthosporium*, and dollar spot. Some of these are the same diseases which are encouraged by high nitrogen levels.

The need for greater potassium usage is especially more obvious in areas where warm-season grasses are being exposed to severe winters. Observations and research have indicated that adequate potassium levels in the soil at about the time of the last mowing of the warm-season grasses improve their winter hardiness.

Sources of potassium generally used are potassium sulphate and muriate of potash, otherwise known as potassium chloride. Potassium-sulphate is usually preferred because of its lower salt index, and because it contains sulfur, another required element.

Sulfur seldom was a problem in the past. It was supplied in adequate amounts when industry was allowed to discharge this element into the atmosphere. Then it returned to earth in precipitation. Now that there are EPA restrictions on smoke discharge, it is important to apply sulfur in quantities that will insure a proper supply for healthful grass growth.

Turfgrasses will show a distinct yellowing if they lack sulfur. In many cases it resembles nitrogen or iron deficiency. Research has shown there is a direct relationship between the sulfur requirement and the amount of nitrogen that is used. Some reports have shown that approximately 20 percent to 25 percent sulfur is required to balance the amount of nitrogen that has been applied.

Studies conducted in the Northwest have shown that sulfur has some properties that help to reduce disease. *Fusarium* patch has been minimized where adequate sulfur levels have been maintained, and observations have shown that sulfur may help to control *Ophiobolus* patch. Sulfur also helps to reduce the occurrence of dollar spot on warm-season grasses.

Dr. Roy Goss has shown that adequate sulfur levels have suppressed *Poa annua* infestations in bentgrass turf by helping to produce a more vigorous turf.

Some of the most dramatic results have been on soils that are deficient in phosphorus. This should have added emphasis, since a number of turfgrass managers have effectively reduced phosphorus in their fertility programs in an attempt to reduce *Poa annua*.

The remaining nutrients required for turfgrass growth can be obtained through use of micronutrient preparations that are readily available commercially. A good balance of nutrients in the soil is essential for the healthful growth of intensely managed turf.

Always remember that so long as the grass is actively growing, it will be green. The job of the turfgrass manager is to balance nutrients so that an even growth rate and a healthy turf can be maintained to provide the best possible playing conditions for the game.

Cherry Hills Superintendent Honored at Conference

James Young, Superintendent, Cherry Hills Country Club, Englewood, Colorado, was presented a plaque by the Golf Course Superintendents Association of America for his superb work in conditioning the course for the 1978 U.S. Open Championship. GCSAA President George Cleaver made the presentation upon completion of his address.

STIMPMETERS AVAILABLE

Stimpmeters are now available to university turfgrass workers engaged in research, teaching or extension. Price $15.00 each (includes mailing costs). Send requests to: United States Golf Association, Golf House, Far Hills, N.J. 07931.