become shorter, light intensity becomes brighter, and night temperatures become cooler. These three variables, when combined, encourage production of storage carbohydrates that accumulate in the roots and discourage production of leaf tissue. These stored carbohydrates provide the energy for new top growth in early spring and reproductive (seedhead) tissue in late spring. Adequate fall root carbohydrate production also enables plants to withstand winter temperatures and, surprisingly enough, provides much of the vigor and warm temperature stress resistance the following summer. Research indicates that if fall root carbohydrates are not present in adequate quantities, long-term damage due to these reasons can be expected.

Warm-season grasses

Benefits of late fall fertilization of warm-season turfgrasses are less understood than with cool-season grasses. Growth of warm-season grasses start to decline once temperatures drop below 78 degrees.

General fertilization of non-overseeded warm-season grasses usually consists of applying 10 to 20 percent of the total annual amount of nitrogen during the fall months. This amount promotes desirable turf density and better recuperative ability in spring without sacrificing cold tolerance. A balance must be made between retaining desirable green color in warm-season grasses as late as possible without over-stimulating succulent grass growth which is more susceptible to low temperature damage.

The importance of timing

In general, cool-season grasses should be fertilized between mid-October and mid-November in northern areas of the transition zone and between mid-November and mid-December in southern areas of the transition zone. Late fall fertilization needs to be supported with early fall fertilization to provide adequate green tissue for the second application.

Warm-season turfgrasses such as bermudagrass and zoysiagrass should be fertilized no later than 30 days prior to the first anticipated frost. Fertilizing closer than 30 days to this frost date, especially with heavy nitrogen rates, results in succulent shoot growth at the expense of root growth. If such is the case, the plant is generally much more susceptible to problems such as direct low temperature kill and spring dead spot.

Warm-season grasses to be overseeded should not be fertilized for at least 30 days prior to overseeding. Fertilizing warm-season turf to be overseeded closer than 30 days to the first anticipated frost also encourages excessive turf growth that does not allow good ryegrass germination and establishment. Once the overseeded grasses germinate, at least two weeks should elapse before fertilizing. Do not exceed 0.5 pound of actual nitrogen per 1000 square feet until the warm-season grass goes completely dormant.

Rates and ratios

Research indicates that excessive nitrogen use in late fall contributes to problems previously mentioned. It has also been demonstrated that the relationship of nitrogen to phosphorus and potassium will influence these problems. Late fall fertilization should not exceed 1 lb. of actual nitrogen per 1000 square feet per application. This is especially true when quickly-available nitrogen sources are used. In this case, a split application of 1½ lb. actual nitrogen per 1000 square feet may be more beneficial than the single full rate.

A 1:1, or even better, a 1:2 ratio of nitrogen to potassium has consistently been demonstrated as the optimum. Excessive phosphorus at this time neutralizes the beneficial effects of the potassium and nitrogen resulting in less cold hardy plants. This is especially true for St. Augustinegrass. Therefore, late-season phosphorus applications are recommended only if soil test results indicate a deficiency. In addition, research suggests that a 4-1-6 ratio fertilizer is most desirable for late fall fertilization of bermudagrass. A 1-0-1 or 1-0-2 (such as a 15-0-15 or 15-0-30) ratio fertilizer has been successfully used on other warm-season as well as cool-season turfgrasses.

Other N sources

Nitrogen sources dependent on soil microbes to release nutrients are less effective for late fall fertilization since temperatures are not high enough for microbial activity. Soluble sources such as ammonium nitrate or ammonium sulfate and certain slow-release fertilizer sources such as IBDU are not temperature dependent, thus are able to release the nitrogen easier during late fall. If other nitrogen sources are chosen, use finer or microprilled grade fertilizer forms.

Iron applied in late fall often provides desirable green color and can favorably influence turf tolerance to cold temperatures. Benefits of iron applications are usually seen in soils with high pH (>7.0), high available phosphorus, or when turf rooting is restricted. One to two ounces of an iron source such as ferrous sulfate in one gallon of water is normally applied per 1000 square feet of turf. Chelated iron sources also are used.

The prime nutrients

Nitrogen is generally the most important turf nutrient. It is a major constituent of plant proteins and is vital for chlorophyll production. Most naturally-occurring nitrogen in turf soils is released in inadequate amounts for turf needs. In addition, this nitrogen is in a soluble form enabling it to move below the turfgrass rootzone out of the plants' reach.

Turf managers must constantly add some nitrogen on highly maintained turf, especially when clippings are routinely removed.

Phosphorus is a building block in photosynthesis and in the formation of necessary proteins. It is also involved in a complex carbohydrate transport system which moves energy to all parts of the plant for vital growth processes.

Phosphorus availability is highly dependent on the soil pH, with the range of 6.2 to 7.0 being optimum. Most sandy soils are inherently low in available phosphorus. A difficulty when dealing with phosphorus fertilization is its lack of mobility into the rootzone.

Potassium is essential in the transport of carbohydrates. It serves as a catalyst in numerous plant processes, and promotes sturdier plants with increased stress tolerance. Available soil potassium is held on the surface of clay and organic matter particles. It is less affected by soil acidity than either phosphorus or nitrogen. Almost as much potassium is needed for optimum turf health as nitrogen. High organic soils such as mucks and peats as well as sandy soils are typically low in potassium.

—Dr. McCarty □