The importance of timing: fertilizing less than 30 days before a frost will result in low temperature kill, left, and spring dead spot, right.

LATE-SEASON FERTILIZATION

Objectives of proper fertilization include year-round turf production, adequate vegetative growth and quality shoot growth.

by L.B. McCarty, Ph.D., University of Florida, Gainesville

Late-season fertilization helps maintain turf color and density longer. Improved turf density promotes a more competitive turf that can better crowd out weeds, and helps turf recover from summer heat or pest damage.

Fall fertilization was not previously widely used due to the concern that excessive shoot growth would deplete root carbohydrate reserves and reduce the turf's cold tolerance. New research suggests an opposite trend—if appropriately timed and moderate nitrogen amounts are used. The ratio of nitrogen to other nutrients such as phosphorus and potassium also influences root growth and temperature tolerance.

Spring green-up

Proper late-season fertilization also provides spring turf recovery by promoting earlier spring color, increasing turf density, and improving turf appearance. Less follow-up spring fertilization is required since the fall-fertilized turf has a more desirable appearance following winter. In many instances, proper late-season fertilization also increases the plant's ability to withstand heat and droughty conditions the following summer.

Cool-season turf needs

Maximum fall fertilization effects are obtained with the cool-season turfgrasses grown in the transition zone.

Add the majority (approximately 80 to 90 percent) of the total annual nitrogen applied during fall and winter months. Reasons for this are related to the temperatures that affect turf growth. Cool-season grasses have optimum top growth when temperatures are in the middle 70s to low 80s and optimum root growth when soil temperatures are in the high 50s.

The amount of sunlight plants receive is also important. In fall, days

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 □

'Bridge products' for late-season fertilization

Two concerns often voiced by landscapers and lawn care companies regarding late-season fertilization are:

- higher precipitation and decreasing nutrient uptake by the plant during this time of year create a potential for leaching and run-off of soluble fertilizers; and
- soil micro-organisms and macro-organisms don't react well to harsh chemical changes in their environment, so heavy doses of soluble salts in the soil can have detrimental effects.

Landscape professionals might respond to these concerns by using chemicals more judiciously and by exploring alternative products and technologies.

Until recently, landscape professionals had to choose between synthetic fertilizers and natural (organic) products, each with its own set of strengths and weaknesses. But a new category of fertilizers called "bridge products" combine organic material with a moderation of environmentally-safe synthetic ingredients. They have all the safety and benefits of natural fertilizers without sacrificing the high nitrogen and lower cost of synthetics.

Bridge products are an advantageous choice for late-season fertilization. In addition to providing nutrition for the plant, fall fertilization benefits soil life: bacteria, protozoa, nematodes, earthworms, insects, fungi and algae.

Bridge products provide a combination of water insoluble nitrogen (WIN), quick-release nitrogen and organic material to create the optimum soil condition for fall and winter. The quick-release nitrogen in bridge products is available to the plant immediately, regardless of temperature. Yet the amount of quick-release nitrogen is balanced with slowly-available organic sources in order to minimize waste or leaching.

The long-term benefits of bridge products lie in the slow release, water insoluble nitrogen. WIN breaks down gradually through microbial activity and thus will not leach excessive nitrogen. If temperatures fall below those required for organic breakdown, unused WIN is stored in the soil until microbial activity resumes in the spring.

Results of late-season fertilization can be observed in the head start it gives in spring. The stores of nitrogen and other essential nutrients enhance root growth and promote early spring green-up.

Bridge fertilizers are made from materials that enhance macro- and micro-organisms in the soil, each of which plays a synergistic role in plant life functions. For example, the earthworm—probably the single most important macro-organism in soil—keeps the soil aerated and creates channels for water distribution and root growth. Bacteria and fungi are also necessary to maintain balance in the dynamic soil environment.

Bridge products work well with IPM, a system that allows for reduced and more efficient usage of pesticides and other chemical products. Through agronomic practices—such as judicious use of chemical treatments and close monitoring of turf—IPM promotes healthy, fertile soil. By promoting a balanced soil and turf environment, bridge products can reduce the need for more frequent application of ecologically harmful chemicals to control insects and weeds.

Beneficial nematodes, bacteria and fungi help keep their turf-damaging close cousins in check. Soil micro-organisms also break down organic and mineral materials in the soil, making them available to nourish plants. Keeping this dynamic environment in balance is the secret to successful, economical turf management.

A two-year study by Dr. Charles Peacock, associate professor of crop science at North Carolina State University, found that bridge products are effective fertilizers. Organic materials used as fertilizer bases provide an energy source for soil micro-organisms, enabling them to continue their soil-building activity; this in turn provides optimum conditions for plant growth.

—J. Mark Nuzum □

J. Mark Nuzum is president of Harmony Products, Chesapeake, Va., a leader in developing bridge products. Formerly a division of Nitrex, Harmony was formed in January 1989 to research, develop and market environmentally sound products for professional and consumer use.

Iron application is preferred for providing late fall green color for warm-season grasses such as centipedegrass, bahiagrass, and St. Augustinegrass.

Consider the species

Not all turf species should be fertilized late in fall due to excessive damage that often occurs during the winter.

Centipedegrass and bahiagrass should not only be fertilized earlier in the season; annual nitrogen rate should be minimum for both turf species. Problems such as centipedegrass decline have consistently been associated with heavy annual nitrogen use and late fall nitrogen fertilization. Potassium fertilization of these species is, however, recommended in fall to promote rooting and cold hardiness. One to two pounds of potassium should be applied 30 to 45 days prior to the first killing frost.

As mentioned above, iron applications to centipedegrass and bahiagrass often provide the desirable green color without resulting in undesirable effects.

A light fertilization of St. Augustinegrass may be applied in early- to mid-fall but is not recommended in late fall. No more than 1½ lbs. actual nitrogen should be applied at this time. St. Augustinegrass has less natural temperature tolerance than most other warm-season grasses, therefore, is not normally grown where temperatures fall consistently into the teens. Iron application to St. Augustinegrass also often provides desirable green color without undesirable effects. **LM**

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