# Fertilizer Guide

*Early December* color response from a late October application of nitrogen in New Jersey. (Photo courtesy of Dr. Ralph Engel)

## Part 2: A Balance Between Health and Appearance

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Traditionally, turfgrass managers have applied fertilizer during spring and fall using leaf color and amount of growth as a guide to the rate and the frequency of application.

Although promoting good color and stimulating shoot growth are important objectives, frequently overlooked are nutrient influences on carbohydrate reserves, root growth, and the plant's ability to tolerate disease and environmental stress.

### Timing applications

An important objective in the timing of fertilizer applications should be to build carbohydrate reserves and promote root development. The response of warm-season and cool-season turfgrasses differ in this respect.

The predominant cool-season turfgrasses (bluegrass, ryegrass, fescue and bentgrass) initiate and develop their root system in the early spring and fall. For this reason, fall and winter applications of nitrogen are important to a fertilization program because they will increase carbohydrate reserves and root growth. Fall fertilization will also improve turf density by promoting greater rhizome and tiller growth.

In addition to regular fall fertilization (September and early October in Ohio), a relatively new concept called late fall fertilization is being included in many maintenance programs. Late fall fertilization is applied when shoot growth slows or approximately at the time of the last regular mowing of the season. Nitrogen applied at this time greatly enhances the photosynthetic production of carbohydrates. These carbohydrates are stored for use the following growing season

# for Turf

providing spring green-up and an energy source for turfgrasses to recuperate from environmental and mechanical stress.

Another advantage of late fall fertilization is it reduces the need for high amounts of spring-applied nitrogen. Excessive spring fertilization can actually reduce carbohydrate reserves and

> Applications of potassium will increase turf hardiness and tempers the stimulation of nitrogen applications.

root development by stimulating rapid shoot growth. Shoot growth takes priority over roots for carbohydrate utilization.

Both spring and summer fertilization should be used to maintain the color and density produced with fall fertilization the previous year. Fertilization at these times *should not* produce succulent plant tissue which can increase the severity of turfgrass disease and reduce the plant's ability to withstand heat, drought, mowing or wear stresses.

Applications of potassium will greatly contribute to the hardiness of the plant and help "temper" the stimulating effects of nitrogen applications.

In contrast, most of the root growth in warm-season grasses (such as bermudagrass, zoysiagrass and St. Augustine) occurs during the spring and summer. Fertilization during these periods will stimulate root growth. However, only moderate applications of fertilizer should be made in early spring in areas where warm-season grasses experience winter dormancy.

Bermudagrass and St. Augustine are subject to spring root dieback following spring green-up. Heavy fertilization during early spring may result in an additional stress during this critical survival period.

Like cool-season turfgrasses, warm-season turfgrasses accumulate carbohydrate reserves in the fall when shoot growth slows. Care must be taken with the timing of fall fertilization since it may decrease low temperature hardiness if applied late. Maintaining adequate potassium levels in fall will increase the tolerance of warm-season grasses to low temperatures.

As with cool-season turfgrasses, indescriminate use of nitrogen fertilization in the summer can increase injury of warm-season grass subjected to disease or environmental stress.

Potassium will aid warm-season turfgrasses in tolerating heat, cold, mowing, and wear stresses, and reduce their susceptibility to turfgrass diseases.

## Turf fertilization rates

The annual nitrogen requirement (lbs. per 1,000 square feet) for turfgrasses should be determined by considering length of growing season, level of quality desired, purpose of the turf, and species and cultivars present.

The length of growing season or number of days (months) between the last killing frost in the spring and the first in the fall will vary greatly depending upon location. Along the Gulf of Mexico and in parts of Arizona and California, the average growing season is more than eight months. In contrast, it is less than four months in parts of Maine and Minnesota. The longer the length of growing season, the greater the amount of nitrogen need to maintain turfgrass quality.

The rate of fertilization should be tailored to meet the expectations of the user of a particular turfgrass site. Because the level of quality is subject to interpretation, residential lawn fertilization can range from promoting a weed-

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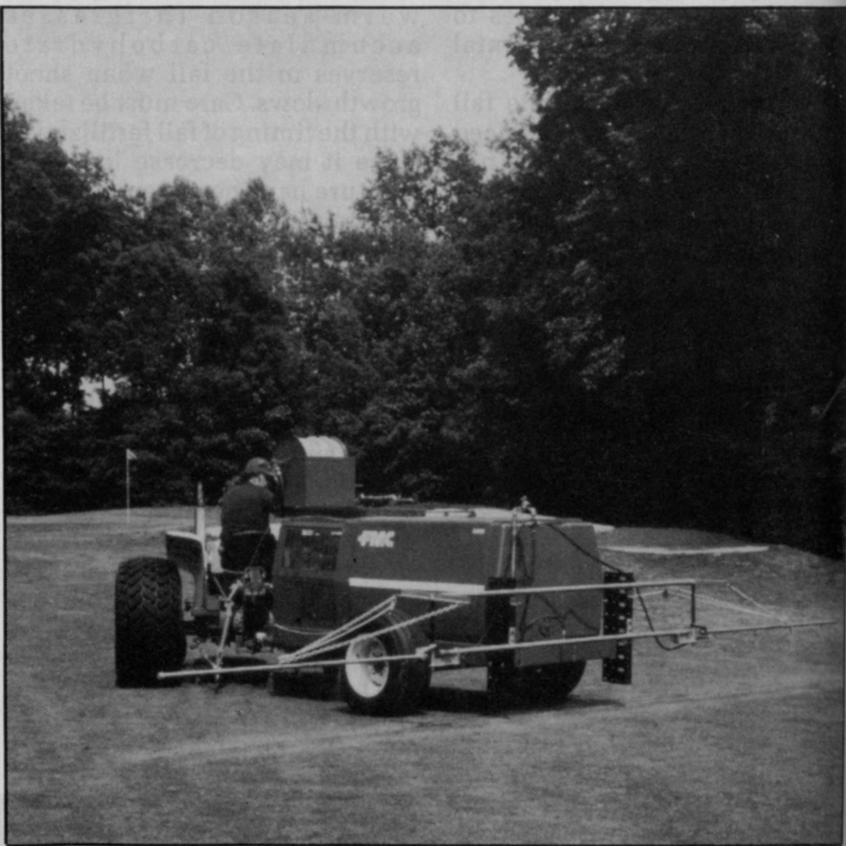

***Low-pressure spray*** *boom used for liquid applications of fertilizer to large turf areas.*

free turf of acceptable color and density to a season-long turf of premium appearance.

The function of turf in an area, whether aesthetic or recreational, also influences nitrogen fertility level. The rate of fertilization of bentgrass, for instance can vary from 4.0 to 10 lbs. nitrogen per 1,000 square feet between a home lawn and a golf green.

Turfgrass species vary in amount of nitrogen required for maximum quality. Low fertility cool-season grasses include sheeps, hard, and red fescues. Kentucky bluegrass is considered medium fertility and bentgrass high fertility. Improved cultivars of bermudagrass will require more nitrogen than common bermudagrass.

Cultural practices, such as irrigation and clipping removal may create a need for additional nitrogen. Supplemental watering of turfgrasses will increase the rate at which nitrogen is leached from the turfgrass root zone. Losses of nitrogen are substantial when quick-release sources are applied to soils high in sand content.

Collection of clippings follow-

**Clipping removal reduces nitrogen levels about 20 percent.**

ing mowing has been estimated to remove approximately 20 percent of the nitrogen applied to the turfgrass. As a result, additional nitrogen should be applied to maintain the same quality as where the clippings are not removed.

Phosphorus and potassium have been routinely applied along with nitrogen in fertilizers with ratios such as 3:1:2, 5:1:2, or 4:1:1. Rather than applying phosphorus

# Fertilizer

**Table 1. Annual Nitrogen Requirement of Turfgrasses***

| Species | Length of Growing Season | Nitrogen per Season lbs./1000 sq. ft. | Variations in Management |
|---|---|---|---|
| Cool Season: | | | |
| sheeps & hard fescue | 4-8 | 0-3 | low maintenance; roughs |
| red fescues | 4-8 | 1-3 | low maintenance to good care |
| Kentucky bluegrass | 5-12 | 2-8 | |
| bentgrasses | 4-8 | 1-4 | medium care, lawn, fairways |
| bentgrass, greens | 5-12 | 6-15 | clippings removed, forced growth |
| Warm Season: | | | |
| zoysia | 6-10 | 1-6 | adequate cover |
| common bermuda | 7-12 | 2-8 | most variable |
| St. Augustine, Bahia | 10-12 | 2-8 | warm areas, lawns |
| bermudagrass, fairways and tees | 5-12 | 4-9 | good management |
| bermudagrass, greens | 8-12 | 8-20 | may rest over winter |

*Adapted from William H. Daniel and Raymond P. Freeborg's Turf Managers' Handbook.

and potassium each time nitrogen is applied, take a soil test and determine if they are really needed.

Since many soils contain high levels of phosphorus, little, if any, response may be obtained when phosphorus is applied to established turf. Soil pH correction may be a better solution than adding more phosphorus.

The rate of nitrogen applied also depends upon the time of application and the nitrogen source.

Applications of quick-release nitrogen sources in spring or fall are commonly limited to no more than 1.0 lbs. nitrogen per 1,000 square feet. Summer applications of quick-release sources are frequently limited to no more than 0.5 lbs. nitrogen per 1,000 square feet.

In contrast, applications of nitrogen using controlled-release sources are generally made at rates from one to three pounds nitrogen per 1,000 square feet.

The longer residual of controlled-release nitrogen sources reduces the need for more frequent applications required when using quick-release sources. The extra cost of controlled-release products may be balanced by the savings in time and labor.

## Method of application

Fertilizers can be applied in either dry or liquid forms. The choice of either liquid or dry equipment for fertilizer application has been the subject of great controversy, particularly in the lawn care industry.

Research has shown turf responds equally regardless of the method of application. The choice of application method should be based on the turf manager's perception of efficiency, convenience, and personal preference.

Two types of spreaders are used to apply granular (dry) fertilizer; gravity and centrifugal.

Gravity or drop spreaders drop the fertilizer, agitated by a mixing bar inside a trough, through a series of slots to the turf below. The centrifugal or broadcast spreader drops the fertilizer from a hopper onto a spinning disk which propels the fertilizer ahead and to the sides of the spreader. The centrifugal spreader applies a wider swath of material allowing the turf manager to fertilizer large areas more quickly than with drop spreaders.

Fertilizer is either dissolved or suspended in water for liquid

The extra cost of slow-release products may balance with time, labor savings.

application.The amount of water varies normally from 1-5 gallons per 1,000 square feet.

The equipment for liquid fertilization is broadly classified into either low-pressure spray booms or high-pressure or hydraulic sprayers. Both types of sprayers feature a tank holding the fertilizer and water, pump to build pressure, strainers or screens to keep solids from clogging the pump or nozzle, and nozzles which deliver the spray to the turf in a particular pattern.

Low-pressure spray booms, operating at pressures of 15-60 lbs. per square inch, deliver one gallon or less per 1,000 square feet. This type of sprayer is used mainly on golf course fairways.

High-pressure sprayers can create spray pressure of several hundred pounds per square inch and use a hose and hand-held nozzle for directed application. High-pressure systems are common in lawn care.

One of the latest controversies in sprayer technology is the advent of low-volume, high-pressure sprayers. The idea is to increase the concentration of fertilizer or chemicals and reduce the amount of water applied. Since less water is used, tank trucks can be smaller, cheaper, and more fuel efficient. The concept is fairly new and is being tried by a limited number of lawn care companies. WTT