Controlled-release nitrogen

by BILL KNOOP, Ph.D. / Technical editor

We all know that plants cannot survive without nitrogen, however, the amount of nitrogen required varies from one species to another.

Woody plants, such as trees and shrubs, usually don't need any more than the environment can supply naturally. All flowering or fruiting plants, including most of the herbaceous annuals and perennials can't tolerate much nitrogen. If they receive too much nitrogen, most of their growth goes into stem and leaf growth rather than into the production of flowers and fruits.

Turfgrass is the exception to the "go slow" rule, for several reasons.

Needed for turf density

With all other factors being equal, the thicker or more dense a turf, the more nitrogen the turf needs to maintain that thickness. Turf density is directly related to the supply of nitrogen. In the average situation, if a turf does not receive any nitrogen from an outside source such as an organic or inorganic fertilizer, the chances are the turf will be thin and not have a good color. Nitrogen is needed for chlorophyll and the more chlorophyll in the plant, the greener it becomes.

When a turf receives the correct amount of nitrogen, it becomes denser, and is more able to:

- ▶ fight off weed invasions;
- ▶ tolerate foot traffic;
- ▶ endure athletic activity; and
- ▶ resist attacks from insects and diseases.

Excess N causes thin cell walls

Problems can result from over-application of nitrogen, most notably disease. When the plant takes up too much nitrogen, its cell walls become thin, which makes it easier for a fungi to invade. These plants also have a higher than normal water need.

Some soluble forms of nitrogen fertilizers have a higher salt index. If a turf receives too much of a nitrogen material that has a high salt index, "fertilizer burn" may occur.

How to choose

Nitrogen is available in two basic forms: inorganic and organic. Which do you choose? Look at it this way:

1. Plants have a preference for the inorganic—or

Before you apply

1. Perform a thorough soil test, with samples taken from around the entire property.
2. Know how much slowly-soluble nitrogen the fertilizer contains. The more the better.
3. The slowly-soluble products cost more, but they last longer, and do not tend to produce negative effects that may be attributed to soluble materials.

nitrate—form of nitrogen.

2. There are two primary organic forms of nitrogen. One is a man-made organic called urea, the other or others are all the naturally-occurring organic materials such as sewage sludge.

3. The organic forms are converted by bacterial action in the soil to the plant preferred nitrate form.

4. The soluble nitrate form is quickly available to the plant. This usually causes a rapid increase in the plant's growth rate. Again, the plant may develop very thin cell walls. The water requirement goes up but the overall effect is rather short lived. Nitrate nitrogen just doesn't last long in the environment. It's very leachable and may even be lost as a gas.

Nitrogen may either be a solid, a liquid or a gas. The goal of a fertilizer program, in addition to providing all the needed nutri-

Nitrogen sources vary

Coated nitrogen sources

1. Sulfur coated urea (SCU): release occurs as water moves through tiny cracks and pinholes in the sulfur coating.

2. Polymer coated urea (PCU): Urea granules with a polymer coating. Water diffuses through the coating to dissolve urea. Release affected by temperature; is more rapid in summer.

3. Sulfur and polymer coated urea: Polymer coating is added to the SCU as protection, and to slow the movement of water into the core. Combines cost advantage of SCU and improved release of PCU.

Synthetic nitrogen sources

1. Isobutylidenediurea (IBDU): release is controlled by water. Not affected by temperature as much as PCU; effective in cool seasons.

2. Urea-formaldehydes (UF): Organic molecules of varying size and solubility. Release of nitrogen is controlled by microbial breakdown; more rapid in warm months.

3. Natural organic: Many sources are available in this form, including sewage sludge and animal manures. Nitrogen is released by soil microorganisms. Temperature, soil pH, moisture influence the rate of nitrogen release from non-synthetic organic sources.

SOURCE: THE POTASH & PHOSPHATE INSTITUTE, NORCROSS, GA.

ents, should be to supply them at the same rate as the plant can use them. In order to get as much to the plant as possible, a nutrient that is completely soluble must be applied frequently in very small amounts. If the nutrients are being applied through an irrigation system, then using soluble material is easy.

Since most managers are only set up to use dry materials, the use of solubles may not be very practical.

Of all the mechanically-applied turfgrass nutrients, nitrogen is the most used. It's the key growth and color producer. In the past, high growth rates were ideal, but we have learned that plants, especially turfgrass, can be produced in higher quality with a slowly soluble or "controlled release" material.

Slow and steady wins the race

In most landscape situations, managers have found that it is desirable to use the slowly soluble nitrogen materials as a matter of routine. Most agree that plants are much better off if they grow at a slow, steady growth rate rather than at the accelerated rate produced by soluble nitrogen materials.

The goal of a fertilizer program: provide essential nutrients at the same rate as the plant can use them.

There are several turf areas—golf course putting greens and athletic fields—that need fairly high growth rates. Those rates might justify using a combination of quick and slow release nitrogen sources.

The source of nitrogen—soluble or slowly soluble— and the rate at which it is applied can be used by the landscape manager to control growth rates and other growth characteristics, such as turf density.

Nitrogen is nitrogen. The plant primarily uses the inorganic nitrate form no matter which form you buy. Conversion of nitrogen from its other forms to nitrate is a natural process that does not require any help from us. The bacteria are capable of "doing their thing." We do not need to add anything to the system to make this work. **LM**