Fertility Requirements of Bermudagrass

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What is the major problem limiting development of good turf? I'm asked this question quite often and I'm sure you are, too. Think about it for a second. Is it nematodes, weeds or diseases? Possibly, in your particular case it could be one of these.

But as you look at many golf courses over the state, or hundreds of golf courses over the country and around the world, we find that these are not the major problems. They are secondary problems of pest invasion. the major problem are the basics. The basic management principles of providing the grass with what it needs to grow and produced the desired turf.

The three basics of turf management are watering, fertilizing and mowing. Let's say those again: WATERING, FERTILIZING and MOWING. These are what you must provide for the grass so that it can grow an develop the desired turf.

You say, what about nematodes, weeds, diseases, etc.? I classify all of these in a category just after these basic three and call it Pest Control. This includes weed control, insect control, disease control, nematode control, and you could also include vandal control. These are all outside organisms which attack the turf. They are not involved in providing the physiological essentials to the plant system. In fact, good management of the three basics will minimize invasion by outside organisms and have an effect on need for pest control.

I don't mean to minimize the importance of pest control, because if your grass is being eaten up by worms, nematodes or disease, that's your biggest problem and, it must be corrected immediately.

Our concern for the next few minutes this morning is with one of the three basics, fertility requirements. In particular — fertility requirements of bermudagrass.

I'm not going to give you specific information on exactly what fertilizer is required in every particular case. We will first discuss BASIC PRINCIPLES upon which our fertility recommendations are based. Then I'll give a few specific personal ideas, and at the end we will discuss specific questions from the audience.

Some of the points to be discussed are the following:

1. Objectives of the fertilizer program.
2. How do we know *what* to fertilize with?
3. How do we know *how much* to apply?
4. How *often* do we apply?
5. What *materials* or *mixes* should we apply?
6. Special considerations.

OBJECTIVES

There are quite a few reasons why we fertilize our golf course turf and effects we want to get from our program, but listed below are some of the most important ones.

1. Color.
2. Uniform density of turf — day to day and month to month.
3. Traffic tolerance.
4. Disease tolerance.
5. Minimum thatch development.
6. Good putting quality.
7. Enable turf to withstand changes in weather — hot, cold, wet, dry, etc.

WHAT NUTRIENTS DOES THE GRASS PLANT NEED? How do we determine what fertilizer nutrients

How do we determine what fertilizer nutrients the grass plant needs? If we chemically analyze grass tissue up to

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36 elements may be found. Of these, 17 have been determined to be essential to the life functions of the plant.

Three of these are supplied by air and water (C,H,O). The rest enter the plant through the root system as salts in the soil solution.

Our soils are storehouse or a "Bank," if you will, for these nutrients. Just as some bank accounts contain more money than others some soils are better storehouses of nutrients than others.

The grass plant is continually drawing nutrients from the soil to supply its needs. And, just like your checking account at the bank, if you continue to draw on it without replacing, eventually you are going to run into trouble. You can't withdraw indefinitely without depositing.

Our soils in Florida are usually poor banks; poor storehoses for nutrients. many of the nutrients come into short supply before others and must be added as fertilizers. We determine which one or ones of the nutrient

elements is in short supply and limiting growth by a combination of the following techniques:

1. Plant response. (Deficiency symptoms, growth response.)
2. Soil analysis.
3. Plant analysis.

Turfgrasses are very intensively managed plants on golf courses. This fact combined with the low nutrient storage of our soils means that bermudagrasses in Florida require a lot of fertilizers.

HOW MUCH TO APPLY?

How do we determine how much of a given nutrient we should give a plant to produce optimum growth response — in accordance with our OBJECTIVES?

A combination of several approaches have been used and are being used by research workers and professional turf growers.

1. Trial and error additions of nutrients and note response.
2. Systematic, well designed experiments, designed statistically to give you optimum nutrients levels.
3. Analysis of grass tissue. See how much of each nutrient is removed by mowing and strive to replace it.

A study made several years ago by O. J. Noer, at the Memphis Country Club showed that the ratio of $N:P^2O^5:K^2O$ in putting green grass clippings was about 3:1:2. Another similar study in Florida produced a ratio of approximately 4:1:2.

From this data we see that a ratio approximating a 3:1:2 to 4:1:2 is present in putting green grass leaf tissue. So, regardless of how much total material is applied, we need to keep the soil nutrient storehouse provided with these nutrients in sufficient quantities to supply this ratios.

In many of our Florida soils, nutrient holding capacity is so small that we must apply these exact ratios of nutrients over the period of a season to break even.

As far as total amounts of nutrients required, the following ranges can be given (listed are pounds of nitrogen, but it should be noted that we are considering proportionate amounts of P^2O^5 and K^2O):

1. Greens: 12 to 26 pounds of nitrogen per thousand square feet per year.
2. Fairways: 4 to 12 pounds of nitrogen per thousand square feet per year.

To be more specific, it can be said that most greens should receive about 24 to 26 pounds and most fairways about 9 pounds of nitrogen per thousand square feet per year.

FREQUENCY OF APPLICATION

Closely coupled with rates of application is frequency of applications — how often to fertilize.

Much depends on the materials used. For example, light rates of soluble fertilizers are sometimes applied daily through the irrigation system. On the other hand, slowly available materials are sometimes used only once per month. The objective is to maintain uniform color growth rate, etc. from day to day.

The common practice with most of our fertilizer mate-

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rials is to fertilize greens every 14 days and fairways 6 to 8 weeks.

WHAT MATERIALS TO APPLY

Any discussion of nitrogen fertilization must be accompanied by: thorough understanding of the nitrogen cycle in nature and micro biological transformations of nitrogen in the soil, as shown on slide No. 1

The various forms of nitrogen present in the soil are closely related and constantly changing, as indicated by the arrows on the slide.

These forms of soil nitrogen relate directly to the form of nitrogen listed on the fertilizer tag. Nitrate nitrogen in the soil is the main form taken up by the plant roots and is subject to leaching by heavy rains. Ammonium nitrogen is rapidly changed to nitrate in most soils, but as ammonium, is moderately resistant to leaching.

Water soluble organic nitrogen (WSON) is usually urea and for most practical purposes behaves similarly to ammonium nitrogen in the soil. Water insoluble organic nitrogen (WION) is considered to be relatively "slow release" nitrogen. Additions of this form as fertilizer are additions to the organic nitrogen pool of slide No. 1 To be taken up to the plant, organic nitrogen must be changed to ammonium, and further to nitrate.

Major inorganic nitrogen sources include ammonium nitrate, ammonium sulfate, ammonium phosphates, potassium nitrate, and calcium nitrate. organic nitrogen sources include activated sewage sludges processed tankage, other plant and animal residues, and various urea formaldehyde materials.

Phosphorus fertilizer materials include simple super phosphate concentrated super phosphate, mono ammonium phosphate, di ammonium phosphate, and ammonium poly phosphate. Super phosphate and ammonium poly phosphates are more effective than the ammoniated super phosphates in high pH soils.

Major potassium sources are potassium chloride, potassium sulfate, potassium carbonate, and potassium nitrate. Potassium is a very important nutrient and its importance overlooked. It is subject to heavy leaching losses in acid sandy soils of Florida. potassium nutrition plays a key role in turf disease resistance and cold hardiness.

This very briefly introduces some of the individual fertilizer *materials* we can use. We've also said something about *how often* to apply, *how much* to apply, and *what* to apply.

This might be a good time to look back at our *objectives* in fertilizing, and visualize, if you will, what you consider to be the perfect turf. This perfect turf is the objective of all our turf management efforts. For our purposes here, it is the objective of our fertilizer program.

There is more than one route to attain this objective. In other words there is more than one fertilizer program which will produce the perfect turf. variations in a program can be in rates, frequencies, pure materials, mixes, organics or inorganics.

My preference is to use complete fertilizer mixes which include some of the nitrogen as organics. Advantages of this approach are:

1. Minimize or eliminate danger of burn. No matter what the reason, the golfer finds no excuse for fertilizer burn.
2. Balanced nutrition with each feeding.
3. Combination of slowly available and rapidly available materials give good base density and color of turf without excessive growth flushes.
4. Good fertilizer condition, no caking.
5. Fewer materials to store and for laborers to keep straight.

Fertilizers used for greens should have small particle size but not dusty. It should be fairly low in total nitrogen so a uniform distribution of fertilizer can be attained.

Materials used in the summer should contain a higher proportion of organic nitrogen than that used in the winter. A higher proportion of nitrate must be used in the winter.

SPECIAL CONSIDERATIONS

Seasonal modifications in the fertilizer program include increasing nitrate in cool weather, increasing potash before coldsnaps, and light applications of urea, nitrate and potash to help grass overcome cold snaps.

For most practical purposes the same fertilizer materials applied as liquids or solids are equally effective. This leads us to the possibility of applying fertilizers through irrigation systems.

There are no agronomic drawbacks to this method of fertilizing. The rapid advances in sprinkler irrigation equipment and design and the increasingly difficult labor situation will make fertilizing with our automatic irrigation system quite commonplace in only a few years. ■

"As I grow older, I pay less attention to what men say. I just watch what they do."
– A. Carnegie

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