

## **Facts on Fertilizer: Learning Your N-P-Ks**

*The following is an article by Eugene Mayer, Scotts' manager of technical training and support. It originally appeared in T&O Service Tech's June 1996 edition. While the information may be a review for golf course superintendents, it is directed as a fertilizer primer for landscaping professionals.*

The proper use of fertilizer not only produces a healthier, more beautiful lawn, but it can also help professional lawn and landscape contractors keep costs under control, minimizing turf "damage control" that may be necessary if problems develop.

Trying to understand what's in a fertilizer product--and just which product to use--can be a bit daunting. After all, it's been a few years since most of us took that high school chemistry class.

Let's take a closer look at the ABCs of lawn fertilizers. Or perhaps we should say the NPKs: as in the chemical symbols for nitrogen, phosphorus, and potassium, the three major nutrients most lawn fertilizers include.

### **What is a fertilizer?**

Simply put, it's food for turf. And like food, some of it's good, some is better, and some is junk food. There are 16 essential nutrients required for plant growth, and these need to be in correct balance. Three of the 16 essential elements--carbon, hydrogen and oxygen--are taken primarily from air and water. The other 13 are normally absorbed from soil by plant roots. Fertilizers are needed to replenish the soil with these 13 nutrients, in the correct proportions.

The ideal fertilizer should completely meet the nutritional requirements of the plant it serves. That means providing all the necessary major, secondary, and minor elements the turf needs in correct proportions. The total fertilizer should be

- a) good physical properties
- b) nutrients available to the plant
- c) controlled release
- d) economical value
- e) proper balance of nutrients
- f) etc.

Those three numbers you find on most fertilizer product labels are a good place to start. They describe its grade, or the analysis of those three major nutrients. For example, a fertilizer claiming a 12-4-8 analysis would include 12 percent nitrogen, 4 percent phosphorus, and 8 percent potassium.

Professionals also talk about a fertilizer's ratio. The 12-4-8 analysis has a ratio of 3-1-2, or three parts nitrogen, one part phosphorus, and two parts potassium.

Now, a little quick math--adding 12, 4, and 8 and coming up with 24--tells us that there's a lot more to this fertilizer than just those three major nutrients. Typically, it may include various secondary and minor elements, along with inert, non-nutritional materials.

Why inert materials? The best way to make the nutrients easy to apply and stable is to convert them to a chemically reacted form, with inert materials.

### **How do I use the numbers?**

With thousands of research plots devoted to turf nutrition each year by The Scotts Company, universities, research stations, and other agencies, we are able to determine the correct ratio of fertilizers to use in respect to different soil types, grass species, and environmental conditions.

### Nitrogen

Nitrogen, the most-used nutrient for mature turfgrass, promotes growth and density, along with turf's deep green color. A good fertilizer should supply enough nitrogen to give a good initial greenup, then ration the remainder to the grass over an extended period to maintain its color and vigor at a maximum level, but limit growth to a reasonable rate. This can be accomplished by using controlled-release or slow-release forms of nitrogen.

How can you tell when your turf is suffering from a nitrogen deficiency? You'll see the older blades turn light green or yellow. They start dying at the tip, and progress along the blade's center until the entire leaf is dead.

Unfortunately, few fertilizers are compounded with nitrogen sources specifically designed for turf. They're based on nitrogen forms really intended to give agricultural crops the most vigorous growth possible.

There are three broad categories for nitrogen forms: natural organics, inorganics, and synthetic organics. With natural organics, nitrogen is bound into compounds such as decayed living matter, manures, bone meal, etc. Some think that because this is nature's way of binding nitrogen, natural organics are the best fertilizers, but actually, it makes no difference to the grass plant whether the nitrogen has been manufactured or derived from a natural source.

Inorganics, on the other hand, can take their natural, mineral form, or they can be manufactured in forms such as ammonium sulfate, ammonium nitrate, and calcium nitrate.

Synthetic organics are most widely used and accepted for turfgrass and horticulture use. They are manufactured specifically for turfgrass to provide a small amount of fast-release nitrogen with the remainder being a controlled-release form. Methylene urea is a synthetic organic source of nitrogen.

Nitrogen sources in fertilizers are also classified as water soluble or water insoluble. Water soluble sources are quick release; nutrients are available to the plant very quickly once they are applied to the soil. Water insoluble forms are slow release; the nitrogen must first be converted, usually by soil microorganisms, to a form available to the plant. This can take ten days or more, and the product can then apply nutrients for six to eight weeks, maintaining turf color and sustaining uniform growth over a long period of time.

## Phosphorus

Phosphorus is present in all living cells. It is utilized by plants to form nucleic acids. Phosphorus fertilizers are available in various forms and differ in the availability to the plant. Once applied, phosphates tend to be retained tightly by the soil and released gradually to the plant. Phosphorus is very important for root development, especially in new seedlings. Therefore, a fertilizer high in phosphorus and balanced with nitrogen and potassium should always be used when planting grass seed. These types of fertilizers are often referred to as starter fertilizers.

You'll recognize a phosphorus deficiency in new seedlings when they're slow to develop. With established turf, look for blades that appear a dull green and tend to turn purple in cold weather.

## Potassium

Potassium is found in both soluble and insoluble forms. For plant growth only the soluble forms are economically attractive. They occur primarily as potassium chloride or potassium sulfate. Potassium contributes vitality and hardiness to a plant and is considered a key to the prevention of disease and a prime factor in plant stress conditions such as cold and hot weather tolerance, and wear tolerance from traffic.

Potassium deficiency first appears on older leaves; blades become streaked with yellow, turn brown at the tips, and eventually die. The turfgrass also becomes more susceptible to disease and winter injury and decreases in wear tolerance.

## **Secondary and Minor Elements**

They're called secondary and minor because of the *amount* required for plant growth, but they're just as important and essential to healthy turfgrass.

Secondary elements include:

\*Calcium, which gives strength to the plant. It is an essential part in all cell walls and membranes and must be present for the formation of new cells. You can identify a calcium deficiency when new growth blades develop reddish-brown leaf margins that may curl and die.

\*Magnesium, which is essential for photosynthesis and limits winter injury. Deficiency is indicated when older leaves develop green or yellow-green strips which turn to bright red.

\*Sulfur, which with nitrogen makes new protoplasm for plant cells. You can identify a sulfur deficiency when younger leaves exhibit a light-green or yellowing. The leaf tips eventually turn brown and curl. Deficiencies are almost always associated with soils low in organic matter.

### **Minor elements include:**

\*Manganese, which activates enzymes involved in photosynthesis. Watch for yellow-spotted or chlorotic leaves on new growth to identify a deficiency.

\*Iron, which helps produce chlorophyll and enzymes. Chlorotic or even white young leaves are a symptom of iron deficiency.

\*Copper, which like iron, is important for the production of chlorophyll and enzymes. Stunted yellow plants with brown leaf tips indicate a copper deficiency.

\*Boron, which is needed for carbohydrate metabolism and sugar movement within the grass plant. A deficiency is characterized by slow growth, a pale green color on younger leaves, and poor plant quality.

\*Molybdenum, which helps control high concentrations of nitrates in the plant. A pale yellow, bleached, and withered appearance on older leaves indicates a deficiency.

\*Zinc, which regulates chlorophyll production and sugar consumption. There's a zinc deficiency when there's a yellow, white, or mottled appearance between the veins of the grass blade but the outside margins remain green.

\*And finally, chlorine, which is believed to be essential for photosynthesis. A deficiency is usually apparent when leaves become wilted and chlorotic.

Identifying the challenges that turfgrass faces, then determining the best fertilizer to meet them, can help professional lawn and landscape contractors improve the quality of their service--and improve their competitiveness. Of course, for those tough challenges, a Scotts Technical Representative is only a phone call away!

### Comparing Nitrogen Sources

Each of the three forms of nitrogen -- natural organics; inorganics; and synthetic organics -- has characteristic advantages and disadvantages.

*Natural organic* sources of nitrogen include compounds such as decayed compost, manures, blood meal, bone meal, etc. Some users feel that since this is a natural form of nitrogen, it is best. However, all nitrogen must be converted before it is useful to the plant, so it makes no difference whether the nitrogen is synthetically manufactured or derived from a natural source.

Natural Organics	
Desirable Features:	Undesirable Features:
Will not burn	Low analysis so a lot must be applied to achieve standard nitrogen rates
Long-lasting (2 months or more)	Takes several weeks to see a response, and response may be poor
Very little leaching	Soil temperatures must be above 55 - 60° for results
	May be an odor

	Could be contaminated with undesirable elements
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*Inorganic* nitrogen is immediately available to the plant, resulting in quick greening. It is in the form of a mineral or manufactured. Inorganics often cause a surge of top growth but lack the residual to develop plant roots, because the nitrogen rapidly leaches. Because of this, inorganics should be applied frequently and lightly to meet the plant's nutritional needs.

<b>Inorganics</b>	
<b>Desirable Features:</b>	<b>Undesirable Features:</b>
Rapid greening of turf	Rapid greenup may mean surge growth
Often have high analysis	Can burn turf
	Leach faster than other nitrogen sources
	Usually have an acidifying effect on soil

*Synthetic organics* are the newest type of nitrogen sources. Since they are created by a chemical reaction in highly technical production facilities, synthetic organics can exhibit the positive effects of other nitrogen sources. Methylene urea is a common synthetic organic source of nitrogen.

<b>Synthetic Organics</b>	
<b>Desirable Features:</b>	<b>Undesirable Features:</b>
Allow good greenup without unhealthy growth	Improperly created formulas will either be too slow or too fast to release the nitrogen
Often more efficient because of longer residual	
High analysis sources so the total application rate is reduced	