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Fertilizing Lawns

Essential Elements

All plants require certain chemical elements for proper growth and appearance. Of these nutrients at least 16 are known to be essential elements. Table 1 lists the 16 known elements and the sources from which plants obtain them. All essential elements except carbon, hydrogen and oxygen are obtained from the soil and absorbed by plant roots. If limited nutrients are available in the soil, lawn growth and quality may be limited. However, essential elements can be added to the soil through fertilizer applications.

Table 1. Essential Elements Required by Lawn Grasses (From Southern Lawns).

Macronutrients		Micronutrients
From Air/Water	**From Soil**	**From Soil**
Carbon Hydrogen Oxygen	Nitrogen Calcium Phosphorus Magnesium Potassium Sulfur	Iron Copper Manganese Molybdenum Zinc Boron Chlorine

Lawns require the macronutrients nitrogen (N), phosphorus (P) and potassium (K) in the greatest quantities. Calcium, magnesium and sulfur are required less frequently and in smaller quantities. The micronutrients iron, manganese, zinc, copper, chlorine, molybdenum and boron are required in very minute quantities and less often than the macronutrients. Micronutrients are as essential as the macronutrients but are required in smaller amounts.

Types of Fertilizers

Fertilizers are identified by analysis and/or brand name. Many common commercial fertilizers are known by their grade such as 16–4–8, 10–10–10 or 6–6–6. The numbers indicate the percentage of each of these nutrients. A 16–4–8 grade, for example, contains 16% nitrogen, 4% available phosphate and 8% soluble potash. Thus, a 100-pound bag of 16–4–8 would contain 16 pounds of nitrogen, 4 pounds of phosphate, and 8 pounds of potash. These three constituents – nitrogen, phosphorus, and potassium – are called the primary plant foods; if all three are present, the fertilizer is a complete fertilizer. Complete fertilizers like 16–4–8, 12–4–8, 10–10–10, and 6–6–6 are commonly recommended for lawn fertilization.

Besides the primary elements (N, P and K) the fertilizer may contain secondary plant foods, such as calcium, magnesium, sulfur, manganese, zinc, copper, iron and molybdenum.

Both primary and secondary elements, if present, are listed on the fertilizer label. The label also tells the materials from which the fertilizer has been made. This information appears beside the "derived from" statement. An example of a mixed fertilizer containing several different sources of nitrogen is shown in Table 2.

Table 2. Example of a Fertilizer Label (From Southern Lawns).

Lawn (Turf-Type) Fertilizer 16-4-8 Guaranteed Analysis	
Total Nitrogen 8.50% Ammoniacal Nitrogen 2.00% Nitrate Nitrogen 0.90% Water Soluble Organic Nitrogen 4.60% Water Insoluble Nitrogen	16%
Available Phosphoric Acid (P2O5)	4%
Soluble Potash (K2O)	8%

In addition to complete fertilizers, some materials are used almost exclusively to supply nitrogen to the lawn for rapid growth and dark green color. These materials include ammonium nitrate (33% N), ammonium sulfate (20% N), IBDU (31% N), urea (45% N), calcium nitrate (15.5% N) and ureaform (38% N). Nitrogen fertilizers are used as frequently or more frequently than complete fertilizers.

For lawns, the best yearly fertilization program is based on soil analysis results and usually includes a combination of one or two applications of a complete fertilizer and several supplemental applications of a nitrogen fertilizer. The complete fertilizer supplies nitrogen, phosphorus, and potassium, while the nitrogen material supplies mainly nitrogen. **While nitrogen fertilization is based on the desired growth rate and type of turfgrass being grown, the phosphorus and potassium fertilization rate should be based on the analysis of a soil sample and the recommendations obtained from it.**

Fertilizer Application

Most fertilizers are applied at a rate determined by the type and amount of nitrogen present in the material. Nitrogen is the nutrient most used by the grass, and often is the material that burns the lawn when applied at excessive rates.

The pounds of actual N in every fertilizer can be determined by dividing the percent N listed on the label into 100. For example, in applying soluble nitrogen from ammonium sulfate, divide 20% (the N content of ammonium sulfate) into 100 to find out the number of pounds of fertilizer that will supply 1 pound of N. Since 100 divided by 20 equals five, apply 5 pounds of ammonium sulfate per 1000 square feet of lawn to supply 1 pound of actual nitrogen per 1000 square feet of lawn. If applying N in a 16-4-8 fertilizer and the nitrogen in the product is all slow-release organic nitrogen, one could apply 2 pounds of actual nitrogen. The calculation is the same as the first sample. Divide 100 by 16 (16 is the percent N in the fertilizer). The answer is about six, so 12 pounds of the 16-4-8 would supply 2 pounds of nitrogen.

An alternative method of calculating this rate is to divide the amount of nitrogen desired per 1,000 square feet of lawn by the percentage of nitrogen contained by the fertilizer source being used. For example, as illustrated below, you wish to apply 1 pound of actual nitrogen per 1000 square feet of lawn using a 16-4-8 fertilizer source, divide 1 pound nitrogen desired per 1000 square feet of lawn by 0.16 (or 16% N from the 16-4-8 fertilizer).

Rate of nutrient wanted divided by % nutrient (N) in fertilizer:

$$\frac{1 \text{ lb N}/1000 \text{ ft}^2}{0.16} =$$

6.25 lbs of 16-4-8 needed per 1,000 ft² to supply 1 lb N/1000 ft²

Therefore, 6.25 pounds of a 16-4-8 fertilizer should be applied per 1000 square feet of lawn to supply 1 pound of actual N per 1000 square feet of lawn.

Several fertilizer materials are listed in Table 3, and the rate of application for 1 pound of N is already calculated. For example, if using ammonium nitrate on the lawn, note that the table lists the rate of application at 3 pounds of material per 1000 square feet.

When a soil test of the lawn is not available, Table 4 can be used a guide for lawn fertilization. Table 4 shows two lawn fertilization programs (low and high maintenance) for each type of lawn grass for two regions of the southern United States. Note that most programs use a combination of complete fertilizers and nitrogen fertilizers, applied during different months of the year.

One program is a minimum- or low-maintenance recommendation that will produce a moderate quality lawn. The second program is a maximum or high-maintenance program that should produce a high-quality lawn. A program can also be chosen between these two extremes. The correct schedule is the one that produces the quality of lawn that you desire.

To use Table 4, find the particular lawn grass and part of the state, and then apply the fertilizer indicated during the month(s) recommended. For rates of various materials, refer to Table 3. For example, to obtain a desirable centipedegrass lawn in Piedmont and Mountain areas of the South, apply ½ to 1 lb of N/1000 sq. ft. in May and August. Supplemental iron (Fe) applications can be made in summer to provide green color without excessive lush grass growth.

Organic vs. Inorganic Fertilizers

There is much confusion over whether to use organic or inorganic fertilizers on lawns. Both types have advantages and disadvantages; however, the type of fertilizer makes no difference to the grass. Grasses absorb nitrogen only as nitrate (NO_3^-) or ammoniacal-nitrogen (NH_4^+). Organic nitrogen is not used directly by the plant but must first be converted to one of these chemical forms by soil microorganisms before plants can use them.

The advantages and disadvantages of organic or chemical fertilizers relate to the consumer, not the lawn grass. Inorganic and organic nitrogen fertilizers have advantages and disadvantages as listed in Table 5. Some common organic fertilizers and their nitrogen contents are listed in Table 3. Select a nitrogen source after considering the pros and cons of the various forms.

Table 3. A Guide to Rate of Fertilizer Materials to Use on Lawns (From Southern Lawns).

Nitrogen Fertilizers	%N	Pounds needed to supply 1 pound actual nitrogen per 1000 sq ft
Rapid N Release (Inorganic)		
Nitrate of Soda	16.0	6
Nitrate of Soda-Potash	15.0	7
Nitrate of Potash	13.0	8
Calcium Nitrate	15.5	7
Ammonium Nitrate	33.5	3
Ammonium Nitrate + Lime	18.0	5
Ammonium Sulfate	20.5	5
Mono-ammonium Phosphate	11-48-0	9
Diammonium Phosphate	18-46-0	5.5
Rapid N Release (Organic)		
Urea	45 - 47	2
Cyanamid	21	5
Slow N Release (Natural Organics)		
Sewage Sludge	6.0	16
Castor Pomace	4 - 6	25 - 16
Cottonseed Meal	7.0	15
Processed Tankage	5 - 10	20 - 10
Garbage Tankage	2 - 3	40 - 30
Slow Release (Synthetics)		
Ureaform	38	2.5
Nitroform	38	2
IBDU	31	3
Sulfur coated urea	36	3
Polymer-/Plastic-/Resin-coated urea	varies	varies
Some common potassium and phosphorus fertilizers include: Muriate of Potash (60% K_2O) Sulfate of Potash (50% K_2O) Potassium Carbonate (64% K_2O) Potassium Nitrate (44% K_2O) Superphosphate (20% P_2O_5) Conc. Superphosphate (46% P_2O_5) Sulfate of Potash-Magnesia (22% K_2O)		
CAUTION: Practically all inorganic fertilizers can burn grass foliage. These materials should be applied when temperatures are cool and watered off the turf immediately after application. If using organic N sources (slow		

Table 4. Lawn Fertilization Schedules for Various Turfgrasses & Geographical Areas in the Southern United States (From *Southern Lawns*).

Lawn Grass	J	F	M	A	M	J	J	A	S	O	N	D	Total Yearly N (lbs) per 1000 ft²
Piedmont and Mountain Areas of the Southern United States (See Notes.)													
Bermudagrass	--	--	N*	--	C	N	N	C	--	N*	--	N*	1-4 (1-6 if overseeded)
Carpetgrass	--	--	--	--	C	--	--	C	--	--	--	--	½-2
Centipedegrass	--	--	--	Fe	C	--	Fe	C	--	--	--	--	1-2
St. Augustinegrass	--	--	--	Fe	C	N+	--	C	Fe	--	--	--	1-3
Tall Fescue	--	C	--	--	--	--	--	--	C	--	C	--	1-3
Zoysiagrass	--	--	N*	--	C	--	N	C	--	--	N*	--	1-3 (1-5 if overseeded)
Coastal Plain, Gulf Coast and North Florida Areas of the Southern United States (see Notes)													
Bahiagrass	--	--	Fe	C	Fe	N	--	C	Fe	--	--	--	1-4
Bermudagrass	--	N*	--	C	N	N	--	C	--	N*	--	N*	1-4 (1-6 if overseeded)
Carpetgrass	--	--	--	C	--	N	--	C	--	--	--	--	½-3
Centipedegrass	--	--	Fe	C	--	Fe	--	C	Fe	--	--	--	½-2
St. Augustinegrass	--	--	--	C	N+	N+	--	C	--	--	--	--	1-4
Zoysiagrass	--	N*	--	C	--	N	--	C	--	N*	--	N*	1-3 (1-5 if overseeded)

C = Apply a complete fertilizer (e.g., 16-4-8 or 12-4-8) at 1.0 lb N/1000 sq ft. for high maintenance lawns or ½ lb N/1000 sq.ft. for low maintenance lawns. An additional potassium application at 1 lb K/1000 sq.ft. in late August through mid-September may increase turfgrass winter hardiness.

N = Water-soluble inorganic nitrogen source (e.g., ammonium nitrate or ammonium sulfate) is applied at 1.0 lb N/1000 sq ft. for higher maintenance lawns and ½ lb N/1000 sq.ft. for low maintenance lawns.

Fe = apply iron to provide dark green color without stimulating excessive grass growth. Ferrous sulfate (2 oz in 3-5 gal water per 1000 sq ft) or a chelated iron source may be used when temperatures are #80 F and good soil moisture present.

N* = overseeded with ryegrass for winter color. Apply ½ pound N per 1000 square feet

N+ = to reduce chinch bug problems, use a slow-release N source during the summer.

Notes:

1. Total yearly nitrogen rates listed per 1000 square feet are suggested guidelines. Actual rates depend on the desire aesthetics and location. Those desiring optimum aesthetics may choose the higher rates. The higher rate range also may be needed for lawns located in sandy soils and/or those with longer growing seasons nearer the coast.
2. Fertilizing centipedegrass in excess of 2 lbs N/1000 sq.ft. per year is not normally recommended as this often results in the disease/winter-kill phenomena termed ‘centipedegrass decline’ due to excessive thatch. Also, once established, centipedegrass should not receive additional phosphorus fertilizer unless soil tests suggest otherwise.
3. For northern (cooler) portions of each geographical zone listed, fertilize dates may be 1 to 2 weeks later in spring and 1 to 2 weeks earlier in fall; for southern (warmer) regions of each geographical zone listed, fertilizer dates may be 1 to 2 weeks earlier in spring and 1 to 2 weeks later in the fall than listed.

Table 5. Advantages & Disadvantages of Inorganic & Organic Nitrogen Fertilizer Sources (From Southern Lawns).

	Advantages	Disadvantages
Inorganic Nitrogen Sources	Readily available N Low cost per unit N Easily controlled N levels Little problem of residual N May have greater efficiency	Leaches readily Danger of fertilizer burn High salinity potential Must be applied frequently at low rates Usually acid forming
Organic Nitrogen Sources	Slow release of N Less subject to leaching Small danger of grass burn Applied infrequently at high rates	May be expensive Not released readily in cold weather Slow response May contain weed seeds (especially manure)

Supplemental Iron Application

Many times turfgrasses, such as centipedegrass, bahiagrass, zoysiagrass and St. Augustinegrass, turn yellow during the spring due to a lack of iron or nitrogen. However, fertilization with nitrogen is not always desirable since this often encourages disease and insect problems. Many times the addition of iron (Fe) to these grasses provides the desirable dark green color, but does not stimulate excessive grass growth, which follows nitrogen fertilization. Usually iron sulfate (2 ounces per 3 to 5 gallons of water per 1000 square feet) or a chelated iron source is used to provide this greening effect. The effect from supplemental iron application is only temporary (about 2 to 4 weeks); therefore, repeat applications are necessary for summer-long color. Do not apply iron when air temperatures are greater than 80º F or onto wet grass, and water-in immediately after application to minimize turf burn.

Precautions

All fertilizers may burn lawn grasses if improperly applied. Never exceed the recommended rate, or the lawn may be damaged. Always apply fertilizers when temperatures are cool and the grass leaves are dry and water thoroughly after application.

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