SL266

UF UNIVERSITY of FLORIDA
IFAS Extension

Soils & Fertilizers for Master Gardeners: The Florida Gardener's Guide to Landscape Fertilizers[1]

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Introduction

While the soil generally provides most of the nutrients needed for optimum plant growth, there are times when fertilizers are needed. Fertilizers contain one or more essential plant nutrients and can be applied to landscapes to improve plant growth and quality or to correct a nutrient deficiency. There are many fertilizers available to consumers at local lawn and garden centers. With so many choices, it's easy to get confused. This publication provides information about fertilizers and associated fertilizer terminology to help consumers make educated decisions when purchasing fertilizers and using them in the home landscape or garden.

What Fertilizers are Available?

There is no easy answer to this question because there are many different fertilizers available to the homeowner or gardener for use on landscape plants, lawns, and vegetables. Fertilizer selection will vary depending on location and store. For the most part, garden centers sell **fertilizer blends**, where several nutrient sources are mixed together to create a fertilizer for a specific purpose. The materials used to create the fertilizer blend are listed on the fertilizer label (Figure 1) and are identified by the words "derived from". Blends are created to achieve a specific fertilizer **grade**. The fertilizer grade is the percent (by weight) of nutrients in the fertilizer. For example, a 10-5-5 fertilizer has 10% N, 5% P^3, and 5% K. in a 50 lb bag of 10-5-5 fertilizer, there are 5 lbs P, and 2.5 lbs K.

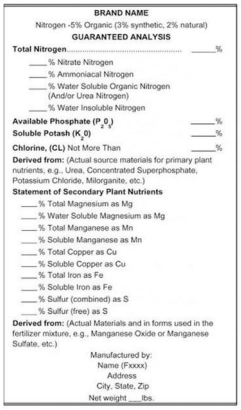
BRAND NAME
Nitrogen -5% Organic (3% synthetic, 2% natural)
GUARANTEED ANALYSIS
Total Nitrogen ____%
____% Nitrate Nitrogen
____% Ammoniacal Nitrogen
____% Water Soluble Organic Nitrogen (And/or Urea Nitrogen)
____% Water Insoluble Nitrogen
Available Phosphate (P_2O_5) ____%
Soluble Potash (K_2O) ____%
Chlorine, (CL) Not More Than ____%
Derived from: (Actual source materials for primary plant nutrients, e.g., Urea, Concentrated Superphosphate, Potassium Chloride, Milorganite, etc.)
Statement of Secondary Plant Nutrients
____% Total Magnesium as Mg
____% Water Soluble Magnesium as Mg
____% Total Manganese as Mn
____% Soluble Manganese as Mn
____% Total Copper as Cu
____% Soluble Copper as Cu
____% Total Iron as Fe
____% Soluble Iron as Fe
____% Sulfur (combined) as S
____% Sulfur (free) as S
Derived from: (Actual Materials and in forms used in the fertilizer mixture, e.g., Manganese Oxide or Manganese Sulfate, etc.)
Manufactured by:
Name (Fxxxx)
Address
City, State, Zip
Net weight ___lbs.

Figure 1. All fertilizers sold in Florida must carry a label like this generic one.

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Fertilizers available to consumers for use in the landscape will also have variable properties depending on brand and formulation. Many fertilizer materials are **inorganic** or synthetic. Examples of inorganic nutrient sources that may be used in blends include ammonium nitrate, ammonium phosphate, and potassium chloride. Other fertilizer materials are **organic**, including animal manures, composted materials, and plant or animal residues.

In addition, fertilizer materials may be water-soluble (soluble or quick-release), slow-release, or controlled-release. **Water-soluble** fertilizer material dissolves immediately in water. Once dissolved, nutrients in the fertilizer are available for uptake by plant roots. Most of the inorganic fertilizer materials are soluble, unless they have been formulated to be slow- or controlled-release. **Slow-release fertilizers** will release nutrients slowly for a period of time ranging from weeks to months. Examples of synthetic slow-release fertilizers are sulfur-coated urea and Nitroform®. Organic fertilizers also contain slow-release nutrients; however, not all nutrients in organic fertilizers are slow-release. Soil microbes must convert these slow-release fertilizer nutrients to forms that can be used by plants. In contrast, **controlled-release fertilizer** materials are soluble inorganic fertilizers that have been modified to allow nutrients to be released over a specific time period. In a controlled-release fertilizer, the water-soluble fertilizer materials are encapsulated in a plastic or polymer coating. Nutrients are released with time; the amount of time it takes for nutrients to be fully released depends on the nature of the coating, contact with moisture, and temperature. Typically, nutrient release from controlled-release fertilizers increases with increasing temperature and soil moisture. Examples of controlled release materials are Osmocote®, Nutricote®, and Polyon®.

Reading the Fertilizer Label

Now that you know the types of materials available to you, let's discuss how to read the label. You should always read the label thoroughly so you can make the most informed decision possible. This document will go through two examples of materials that can be purchased at a typical "big-box" chain store.

Example 1: All Purpose Fertilizer

The first example is an "all purpose" ornamental fertilizer listed for use on all flowers, trees, shrubs, vegetables, and houseplants (Figure 2). The label on the box lists that is it a water-soluble fertilizer, so immediately we know that the material will dissolve in water and all nutrients will be in a plant available form. The grade is 24-8-16, which means that, by weight, it contains 24% N, 8% P, and 16% K. It has a fertilizer **ratio** of 3 parts N to 1 part P to 2 parts K. (To determine the fertilizer ratio from the fertilizer grade, divide all numbers on the grade by the lowest number. For example, for a 24-8-16 fertilizer, divide all numbers by 8 to get a 3-1-2 grade.)

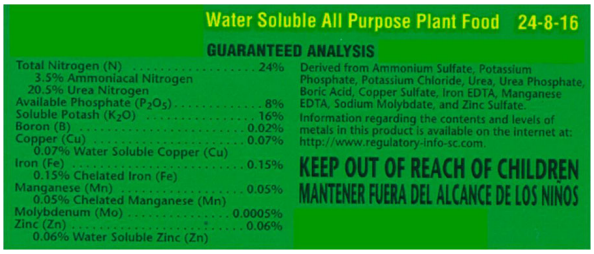


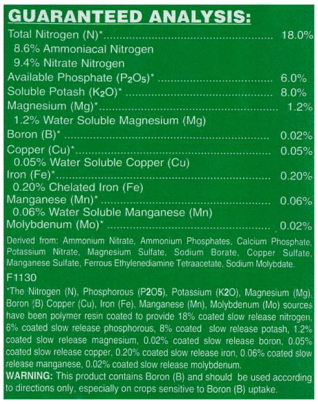
Figure 2. Fertilizer label for an All-Purpose ornamental fertilizer.

According to the label, 3.5% of the total N in the box is ammoniacal N (ammonium) and the remaining 20.5% is urea (3.5% + 20.5% = 24% total N). In the "derived from" statement, ammonium sulfate, urea, and urea phosphate are the sources of N. (Note: Fertilizers containing ammoniacal N or urea should be watered in to prevent N loss to the atmosphere). The sources of P are potassium phosphate and urea phosphate. The sources of K_2O are potassium phosphate and potassium chloride.

This fertilizer also contains the following plant micronutrients: 0.02% boron (B) as boric acid, 0.07% copper (Cu) as copper sulfate, 0.15% iron (Fe) as iron EDTA, 0.05% manganese (Mn) as manganese EDTA, 0.0005% molybdenum (Mo) as sodium molybdate, and 0.06% zinc (Zn) as zinc sulfate. The term *EDTA* in iron and managenese EDTA indicates that the nutrient is in **chelated** form. Chelated forms of nutrients exist as a complex molecule containing carbon and hydrogen that have a prolonged period of plant availability. The other elements are listed as water-soluble.

Example 2: Controlled-release Shrub Fertilizer

Our second example fertilizer is a complete shrub fertilizer with minors (Figure 3). The label indicates that the material is polymer resin coated, indicating that it is a controlled-release material. The grade is 18-6-8, which means that, by weight, it contains 18% N, 6% P, and 8% K. It also has a fertilizer ratio of 3 parts N to 1 part P to 1.3 parts K.



GUARANTEED ANALYSIS:

Total Nitrogen (N)*	18.0%
8.6% Ammoniacal Nitrogen	
9.4% Nitrate Nitrogen	
Available Phosphate (P_2O_5)*	6.0%
Soluble Potash (K_2O)*	8.0%
Magnesium (Mg)*	1.2%
1.2% Water Soluble Magnesium (Mg)	
Boron (B)*	0.02%
Copper (Cu)*	0.05%
0.05% Water Soluble Copper (Cu)	
Iron (Fe)*	0.20%
0.20% Chelated Iron (Fe)	
Manganese (Mn)*	0.06%
0.06% Water Soluble Manganese (Mn)	
Molybdenum (Mo)*	0.02%

Derived from: Ammonium Nitrate, Ammonium Phosphates, Calcium Phosphate, Potassium Nitrate, Magnesium Sulfate, Sodium Borate, Copper Sulfate, Manganese Sulfate, Ferrous Ethylenediamine Tetraacetate, Sodium Molybdate.

F1130

*The Nitrogen (N), Phosphorous (P2O5), Potassium (K2O), Magnesium (Mg), Boron (B) Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo) sources have been polymer resin coated to provide 18% coated slow release nitrogen, 6% coated slow release phosphorous, 8% coated slow release potash, 1.2% coated slow release magnesium, 0.02% coated slow release boron, 0.05% coated slow release copper, 0.20% coated slow release iron, 0.06% coated slow release manganese, 0.02% coated slow release molybdenum.

WARNING: This product contains Boron (B) and should be used according to directions only, especially on crops sensitive to Boron (B) uptake.

Figure 3. Fertilizer label for a controlled-release shrub fertilizer.

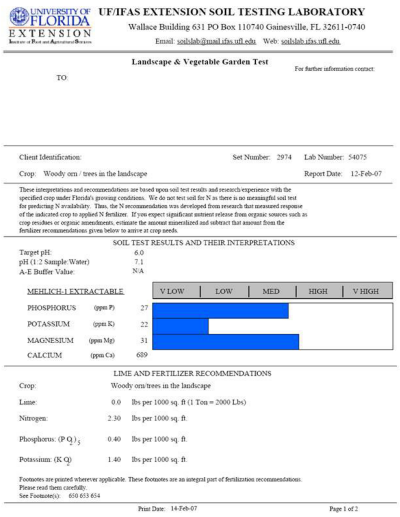
According to the label, 8.6% of the total N is ammoniacal N (ammonium) and the remaining 9.4% is nitrate N, both of which are water soluble forms of N (8.6% + 9.4% = 18% total N). In the "derived from" statement, ammonium nitrate, ammonium phosphate, and potassium nitrate are the sources of N. However, the normal quick-release action of water-soluble N is tempered by the fertilizer coating in this case. Note the statement (below the "derived from" statement) indicating the percentage of nutrients that are coated, and thus in controlled-release form. In this fertilizer, all the nutrients are controlled-release because the percentages exactly match those on the upper part of the label. The sources of P_2O_5 are ammonium phosphate and calcium phosphate. The source of K_2O is potassium nitrate.

This fertilizer also contains the following plant nutrients: 1.2% magnesium as magnesium sulfate, 0.02% boron (B) as sodium borate, 0.05% copper (Cu) as copper sulfate, 0.20% iron (Fe) as ferrous ethylenediamine tetraacetate (EDTA), 0.06% manganese (Mn) as manganese sulfate, and 0.02% molybdenum (Mo) as sodium molybdate. In this case, only the Fe is in a chelated form, the rest are water soluble (but are all coated).

Choosing a Fertilizer

Before you decide to use a fertilizer, you should have your soil tested. Most county Extension offices offer a pH test, while the University of Florida Extension Soil Test Laboratory (http://soilslab.ifas.ufl.edu) offers tests for pH, lime requirement, P, K, and Mg. (For more information about soil testing and how to take a soil sample, see *Landscape and Vegetable Garden Test Information Sheet,* http://www.edis.ifas.ufl.edu/SS18). The soil pH test is sufficient if you plan to use a complete fertilizer. This is because complete fertilizers are usually applied to meet the N requirements of plants and N rate recommendations are based on research on plant response to N fertilizer rather than the amount of N measured in a soil sample. However, the results of a full soil test will help you decide what level of P and K, if any, will benefit your plants.

An example of the soil test results for woody ornamentals growing in the landscape is shown in Figure 4. (Before selecting a fertilizer, it is important that you read the entire soil test report, including the footnotes. The footnotes will provide important information about application methods and rates.) This sample soil test report indicates that plants would respond to applications of P and K. However, more K is needed than P.



UF/IFAS EXTENSION SOIL TESTING LABORATORY

Wallace Building 631 PO Box 110740 Gainesville, FL 32611-0740

Email: soilslab@mail.ifas.ufl.edu Web: soilslab.ifas.ufl.edu

Landscape & Vegetable Garden Test

For further information contact:

TO:

Client Identification: Set Number: 2974 Lab Number: 54075

Crop: Woody orn / trees in the landscape Report Date: 12-Feb-07

These interpretations and recommendations are based upon soil test results and research experience with the specified crop under Florida's growing conditions. We do not test soil for N as there is no meaningful soil test for predicting N availability. Thus, the N recommendation was developed from research that measured response of the indicated crop to applied N fertilizer. If you expect significant nutrient release from organic sources such as crop residues or organic amendments, estimate the amount mineralized and subtract that amount from the fertilizer recommendations given below to arrive at crop needs.

SOIL TEST RESULTS AND THEIR INTERPRETATIONS

Target pH:		6.0
pH (1:2 Sample:Water)		7.1
A-E Buffer Value:		N/A

MEHLICH-1 EXTRACTABLE		V LOW	LOW	MED	HIGH	V HIGH
PHOSPHORUS	(ppm P)	27				
POTASSIUM	(ppm K)	22				
MAGNESIUM	(ppm Mg)	31				
CALCIUM	(ppm Ca)	689				

LIME AND FERTILIZER RECOMMENDATIONS

Crop: Woody orn/trees in the landscape

Lime:	0.0	lbs per 1000 sq. ft (1 Ton = 2000 Lbs)
Nitrogen:	2.30	lbs per 1000 sq. ft:
Phosphorus: (P_2O_5)	0.40	lbs per 1000 sq. ft:
Potassium: (K_2O)	1.40	lbs per 1000 sq. ft:

Footnotes are printed wherever applicable. These footnotes are an integral part of fertilization recommendations. Please read them carefully.

See Footnote(s): 610 653 654

Print Date: 14-Feb-07 Page 1 of 2

Figure 4. An example fertilizer test report for woody trees grown in the landscape.

In most cases, the complete fertilizers available to consumers for use on landscape plants will not be available in the exact ratio needed to meet the N, P, and K requirements of landscape plants. When most available complete landscape fertilizers are applied to meet the N recommendations based on the soil test, P and K will be over-applied. The concern here is that if applied excessively to the point of leaching or runoff, P can contribute to water quality problems. Please note that fertilizers labeled for use on turf will have a different ratio of N, P, and K than the fertilizers labeled for ornamental plants. This is because the Urban Turf Fertilizer Rule limits the amount of N and P that can be applied to turf. For more information, see the 2007 fact sheet on this topic published by the Florida Department of Agriculture and Consumer Services:
http://www.flaes.org/pdf/Urban_turf_fact_sheet.pdf

Final Thoughts on Landscpae Fertilizers

Knowing fertilizer terminology and understanding the fertilizer label will help you make informed choices if you decide to use fertilizer in your home landscape or vegetable garden. Since improper fertilizer use can contribute to water quality problems, always follow best management practices (BMPs) described in UF-IFAS lawn and landscape publications. Have your soil tested to determine the need for fertilizers and always follow University of Florida fertilizer recommendations. For more information about fertilizer recommendations for Florida lawns, landscape plants and palms, see these EDIS publications: *Fertilization and Irrigation Needs for Florida Lawns and Landscapes* (http://edis.ifas.ufl.edu/EP110), and *Fertilization of Field-grown and Landscape Palms in Florida* (http://edis.ifas.ufl.edu/EP261).

Additional Notes:

3. Phosphorus and potassium in fertilizers are always listed on the fertilizer label in their oxide forms (P_2O_5 and K_2O, respectively). For simplicity, P_2O_5 and K_2O are listed as P and K in this publication; however, the numbers in the fertilizer grade actually represent the percentage by weight of these nutrients in their oxide forms.