

Soils and Fertilizers for Master Gardeners: Glossary of Soil and Fertilizer Terms¹

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This article is part of a series entitled *Soils and Fertilizers for Master Gardeners*. The rest of the series can be found at http://edis.ifas.ufl.edu/topic_series_soils_and_fertilizers_for_master_gardeners.

Introduction

This publication contains the definitions of important soil and fertilizer terms used throughout the Soils and Fertilizers for Master Gardeners EDIS series.

A

Adsorption: The removal of nutrients in solution by attachment to soil particles.

Aggregates: Many soil particles held together in groups (can also be called peds).

Ammonium N ($\text{NH}_4^+\text{-N}$): A water-soluble form of nitrogen (N) that is present in some fertilizers. Ammonium N ($\text{NH}_4^+\text{-N}$) can be converted to ammonia gas and lost to the atmosphere if left on the soil surface. Therefore, fertilizers containing $\text{NH}_4^+\text{-N}$ should be watered in.

Anions: An atom or molecule that has more electrons than protons and possesses a negative charge. Several nutrients

exist in the soil solution as anions (e.g., nitrate [NO_3^-], phosphate [PO_4^-], sulfate [SO_4^-]).

B

Bulk density: The mass of dry soil per unit bulk volume (e.g., 1.3 g cm^{-3}).

C

Cations: An atom or molecule that has more protons than electrons and possesses a positive charge. Many nutrients exist in the soil solution as cations (e.g., calcium [Ca^{2+}], potassium [K^+], magnesium [Mg^{2+}]).

Chelate: A nutrient existing as a complex molecule containing carbon, hydrogen, and a metallic ion, which has a prolonged period of plant availability.

Complete fertilizer: Fertilizer blends classified as a complete fertilizer must contain nitrogen (N), phosphorus (P), and potassium (K). For example, 8-2-12 would be considered a complete fertilizer containing 8% N, 2% P, and 12% K. Complete fertilizers may also contain other nutrients; however, the presence of additional nutrients is not a requirement.

1. This document is SL 277, one of a series of the Department of Soil and Water Sciences, UF/IFAS Extension. Original publication date December 2008. Revised January 2009 and May 2018. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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Controlled-release fertilizers: Water-soluble inorganic fertilizers that have been modified to allow for controlled release of nutrients over time. The rate, pattern, and duration of nutrient released from a controlled-release fertilizer is well documented (Shaviv, 2000). In many controlled-release fertilizers, the water-soluble fertilizer materials are encapsulated in a plastic or polymer coating. Nutrients are released over 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. It is important to choose a controlled release fertilizer that has a release rate that matches the plants' nutrient needs. Typically, nutrient release from controlled-release fertilizers increases with increasing temperature and soil moisture. Examples of controlled release materials are Osmocote and Polyon.

D

Denitrification: The conversion of nitrate (NO_3^- -N) to a N gas by microbes, where NO_3^- -N can be lost to the atmosphere.

Desorption: The detachment of nutrients from soil surface, putting the nutrient into soil solution.

Dissolution: When a nutrient in solid form dissolves into a liquid, dispersing the nutrient throughout the solution.

F

Fertilizer blend: Most fertilizers are sold as blends, where several fertilizer materials are mixed together to achieve a specific fertilizer grade. The materials used to create the fertilizer blend are listed on the fertilizer label. Usually this information is identified on the fertilizer label by the words "derived from".

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_2O_5 , and 5% K_2O . In a 50 lb bag of 10-5-5 fertilizer, there are 5 lbs N, 2.5 lbs P_2O_5 , and 2.5 lbs K_2O .

Fertilizer ratio: The fertilizer ratio is the proportion of nutrients among the grade. For example, a 10-5-5 fertilizer has a ratio of 2-1-1, or 2 parts N, 1 part P_2O_5 and 1 part K_2O .

H

Horizons: A vertical layer of soil within the soil profile that possesses individual soil properties (e.g., color, texture, fertility) in each subsequent layer.

I

Inorganic fertilizers: Inorganic fertilizers are materials that are mined or synthesized from non-living materials. Examples of inorganic fertilizers include ammonium nitrate, concentrated superphosphate, and potassium chloride. Most inorganic fertilizers are considered *quick-release* or *water soluble*, unless these products have been altered (see Slow-release Fertilizer and Controlled-release Fertilizer sections).

L

Leaching: The downward movement of soil solution through the soil profile.

M

Macropores: Large soil pores with a diameter of ≥ 0.1 mm.

Macronutrient: A chemical element that is required for plant growth in large amounts. The plant macronutrients include carbon (C), hydrogen (H), oxygen (O), N, P, K, calcium (Ca), magnesium (Mg), and sulfur (S). Plants typically obtain C, H, and O from the air and water and the other macronutrients from the soil solids.

Micropores: Small soil pores with a diameter of < 0.1 mm.

Micronutrients: A chemical element that is required for plant growth in small amounts. The plant micronutrients include boron (B), chlorine (Cl), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn).

Mineralization: The transformation of nutrients from an organic form to an inorganic form, which is plant available. Examples are the transformation of N in plant residues or organic soil into plant available N (resulting in ammonium); also the transformation of organic P to plant available P (resulting in soluble orthophosphate).

N

Nitrate N (NO_3^- -N): A water soluble form of N that is present in some fertilizers. If not managed properly, this form of N can be a concern for water quality. The chemical properties of NO_3^- -N allow this N form to be leached (or moved downward) through the soil. Nitrate leaching often impacts groundwater and springs. High NO_3^- -N concentrations in groundwater can be a human health hazard. Nitrate may also lead to degradation of sensitive water bodies.

Nitrification: The conversion of $\text{NH}_4^+\text{-N}$ to $\text{NO}_3^-\text{-N}$ by soil microbes.

O

Organic fertilizers: Organic fertilizers are materials that are derived from living materials. Examples of organic fertilizers include animal manures, composted materials, and plant residues. Organic fertilizers are usually considered to be “slow-release” fertilizers because many of the nutrients must be broken down by soil microbes before they become available for plant uptake.

P

Particle density: The mass of solid particles in a unit volume of soil particles.

Pore space: The portion of soil occupied by gas or liquid.

Precipitation (chemical): When a nutrient that is dissolved in solution forms into a solid. Precipitation occurs when the amount of a nutrient in the soil solution reacts with other constituents in the soil solution, forcing the formation of a solid and removing that nutrient from both the soil solution and plant availability.

Primary Consumers: Second trophic level in the soil food web; obtain energy by eating primary producers or residues from primary producers.

Primary producers: First trophic level in the soil food web; consists of photosynthesizers (e.g., plants, mosses, algae, lichens, and photosynthetic bacteria).

R

Runoff: The portion of rainfall or irrigation that exceeds the soil infiltration capacity and flows over or just below the soil surface.

S

Secondary consumers: Third trophic level in the soil food web; obtain energy by feeding on primary consumers.

Secondary plant nutrients: This term refers to plant nutrients other than N, P, and K, which are required by plants for optimum growth. These nutrients include Ca, Mg, S, Mn, B, Fe, Zn, Cu, Mo, and Cl. Some fertilizer materials will contain one or more of these secondary plant nutrients, which will be listed on the fertilizer label.

Slow-release fertilizers: Fertilizers that will release nutrients gradually over time. Slow-release fertilizers can be inorganic or organic. Examples of inorganic slow-release fertilizers are sulfur-coated urea and Nitroform. Organic fertilizers contain slow-release nutrients, but, not all nutrients in organic fertilizers are slow-release. Research has shown that organic fertilizers can also contain water-soluble/quick-release nutrients.

Soil fertility: The ability of soil to supply essential nutrients to meet plant requirements.

Soil food web: The interconnection of organisms that live all or part of their lives in the soil.

Soil solution: The water phase of soil and its solutes/nutrients. The soil solution can be taken up by plant roots within a certain range of wetness (field capacity) or dryness (permanent wilting point).

Soil structure: The physical arrangement of soil particles into soil aggregates. Soil structure is described by the shape of the soil aggregates and how they form in the soil profile (e.g., platy, columnar, granular, blocky, prismatic, or massive).

Soil taxonomy: The hierarchical classification system used for soils, made up of six categories (soil order, suborders, great groups, subgroups, families, and series).

Soil texture: The relative proportion of sand, silt, and clay particles in the soil. Note that soil texture does not include organic matter.

T

Trophic levels: Levels in the food chain consisting of primary producers, primary consumers, secondary consumers, and tertiary consumers; passing energy from one level to another.

V

Volatilization: The conversion of a solid or liquid to a gas. An example is the loss of ammonium into the atmosphere as ammonia gas.

W

Water insoluble N: This chemical description is another term for *slow-release N*.

Water soluble: This term indicates that the fertilizer material will dissolve in water. Once dissolved, nutrients in the fertilizer are available for uptake by plant roots. The terms *water soluble* and *quick-release* are synonymous.

Weathering: The physical breakdown and chemical alteration of rocks and minerals at the surface of the earth with time.

References

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