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Factors Affecting Fertilizer Uptake

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There are numerous factors that affect how easily and well trees and shrubs will take up fertilizers. The most important of these is fertilizer form. Generally, inorganic, fast-release, or liquid forms are faster-acting than organic, slow-release, or dry forms. Compared to synthetic fertilizer formulations, most organic fertilizers contain relatively low concentrations of actual nutrients.

- **Soil composition**-- Soils high in clay particles will absorb (bind to their surface) more nutrients, while fertilizer will leach (wash through) faster through sandy soil. Organic matter in the soil increases its nutrient-holding capacity and contributes nutrients upon its breakdown.

- **Soil microorganisms**-- Some fungi and bacteria may "tie up" nutrients while others convert the fertilizer to a form that the plant can take up. Some microorganisms are involved in mutually beneficial (symbiotic) relationships with plants. Rhizobium bacteria grow within the roots of some plants. They convert nitrogen from the air into a usable form for the plant while obtaining nutrition from the host plant.

- **Soil pH**-- Extremes in pH affect availability of plant nutrients and the concentration of plant-toxic minerals. At low pH levels, calcium, phosphorus, and magnesium become unavailable and manganese can concentrate at toxic levels. At high pH values, phosphorus, iron, copper, zinc, boron, and manganese become less available.

- **Nutrient availability**-- Nutrients may be present but may first require conversion to an "available" form that the plant is capable of taking up and utilizing. Conversion to an available form is affected by soil microorganisms, pH, soil moisture and chemical reactions.

- **Soil moisture content**-- Most nutrients are taken up via the soil solution, so soil water is needed to dissolve them.

- **Soil aeration**-- Oxygen is needed in the soil to help roots with uptake processes. Where there is no oxygen, such as in flooded sites, sugar cannot be utilized by the plants to produce energy for nutrient uptake. Decomposed organic matter helps develop good air-water relationships in the soil.

- **Soil temperature**-- Nutrient uptake is faster in warmer soils than in cold soils.
- **Plant condition**-- Plants under stress will be less able to take up nutrients, generally due to a reduced or damaged root system.
- **Competition**-- If the roots of many plants occupy an area, a reduced amount of nutrients will be available for each. When using close spacing for vegetable plants, more fertilizer will be needed in a bed than in a conventionally spaced row garden. Weeds where present will take up nutrients intended for landscape or crop plants. Reduction of weeds will reduce fertilizer needs.

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