SL 256

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Soil pH and the Home Landscape or Garden [1]

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Introduction

Soil pH is a measure of the acidity or alkalinity of the soil. On the pH scale, a value of 7 is considered neutral, pH values less than 7 are acidic, and pH values greater than 7 are alkaline. (Soils may be referred to as sour [acidic] or sweet [alkaline]). Homeowners and gardeners alike are interested in soil pH because soil pH will ultimately affect the growth and quality of landscape plants. It does this by influencing (1) the chemical form of many elements in the soil and (2) soil microbial processes. For example, landscape plants may exhibit nutrient deficiency or toxicity symptoms as a result of soil pH. In acidic soils, the availability of plant nutrients such as potassium (K), calcium (Ca), and magnesium (Mg) is reduced, while the availability of potentially toxic elements such as aluminum (Al), iron (Fe) and zinc (Zn) are increased (Figure 1). In alkaline soils, iron, manganese (Mn), zinc and boron (B) are commonly deficient. Soil pH can also affect soil bacterial and fungal activity, enhancing or inhibiting the development of soil-borne plant diseases or how efficiently they function as decomposing organisms. The purpose of this publication is to explain soil pH and provide strategies to make the most of the pH in your home landscape or garden.

The median soil pH for Florida soils is 6.1, which is characterized as slightly acidic (Figure 1). However, Florida soils can vary widely in pH depending mainly on the material from which the soil formed. For example, soils that formed under pine flatwoods can be quite acidic. In contrast, soils formed from high Ca materials, such as limestone, marl, or sea shells, tend to be alkaline. This condition is common to coastal soils and the soils of south Florida. It is also common to encounter alkaline soils in the home landscape as a result of calcium-rich building materials (i.e., concrete, stucco, etc) that may be left in the soil following construction.

Determining Soil pH

Soil pH can be determined by sending a soil sample to a reputable lab such as the University of Florida Extension Soil Testing Laboratory (http://soilslab.ifas.ufl.edu). Some county Extension offices also test soil; locate your local Extension office (http://solutionsforyourlife.ufl.edu/map/).

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All chemicals should be used in accordance with directions on the manufacturer's label.

(See EDIS publication SL136/SS187 *Landscape and Vegetable Garden Test Information Sheet* [http://edis.ifas.ufl.edu/SS187] for information about how to properly take a soil sample). Once you received the results of a soil pH test, you can determine which plants are best suited for your soil. In Florida landscapes, strongly alkaline conditions are considered to be a greater problem than strongly acidic conditions.

Most common landscape plants are well suited to a wide range of soil pH. For example, popular woody shrubs and trees (e.g., pittosporum, viburnum, oaks, pines) will grow well in acid to moderately alkaline soils. In addition, several common home lawn grasses can tolerate wide ranges in soil pH. The best pH range for vegetable and flower gardens on sandy soil is between pH 5.8 and 6.3. If your soil pH is between 5.5 and 7.0, no adjustment in pH needs to be made. However, there are a few acid loving plants, including azalea, blueberry, and gardenia that will not do well in soils with pH greater than 5.5. *The Florida-Friendly Plant List* provides information about the soil pH tolerance of many landscape plants that are well suited to growing conditions in Florida. *The Florida-Friendly Plant List* is available at (http://fyn.ifas.ufl.edu/materials/list.pdf)

or through your county Extension office.

Changing Soil pH

The best advice regarding soil pH is to choose landscape plants that are suited for the natural pH of your landscape soil. While there are soil additives that can raise or lower the pH of soils, the effects of these materials is often very short-lived. In addition, if your soil pH is within 0.4 of a pH unit of the ideal range, adjusting the pH will probably not improve plant performance. However, if you are still determined to change your soil's natural pH to grow a specific plant, you have the following options.

Raising the pH of Acidic Soils

To raise the pH of acidic soils, add a liming material like calcium carbonate or dolomite. Dolomite has the added benefit of supplying Mg, which is often deficient in Florida soils. Have your soil tested before applying any liming materials to the soil because many natural and urban soils in Florida have an alkaline pH. If a soil pH test indicates that your soil is acidic, consider having a lime requirement test performed. The lime requirement test will measure your soil's natural ability to resist changes in pH. This test is offered as part of the standard landscape and garden soil test offered through the University of Florida Extension Soil Testing Laboratory (http://soilslab.ifas.ufl.edu). Results of this test will indicate exactly how much lime you need to apply to reach a target pH. You will then be able to apply the correct amount of agricultural limestone.

In order for lime to be effective, it should be thoroughly mixed into the soil. This is easily accomplished before planting a garden or landscape. When applying lime to established landscapes or turf, the incorporation can damage plant roots. In this case, lime should be surface applied and watered in.

Lowering the pH of Alkaline Soils

Unlike liming, lowering the pH of strongly alkaline soils is much more difficult. In fact, there is no way to permanently lower the pH of soils formed from high Ca materials such as marl or limestone, as well as soils severely impacted by alkaline construction materials. Under these circumstances, it is best to select plants which are tolerant of high pH conditions to avoid continuing plant nutritional problems.

The soil pH can be temporarily lowered by adding elemental sulfur. Bacteria in the soil act to change elemental sulfur into sulfuric acid, effectively neutralizing soil alkalinity. However, the effects of elemental sulfur are localized to the area that was amended and the effect is temporary. Soil pH will begin to rise shortly after soil bacteria exhaust the added sulfur supply. This effect will require repeated applications of sulfur to ensure the soil remains at the desired pH. This is where sulfur addition can get tricky. If too much sulfur is added, or if it is added too frequently, it can actually injure or kill your plants. Therefore, it is important to never apply

sulfur in excess of 5 to 10 pounds of sulfur per 1,000 square feet per application. Adding sulfur at high rates or too frequently, can actually result in damage to your plants. If you decide to apply sulfur, make sure to monitor your plants.

Some sulfate containing materials (e.g., ammonium sulfate, iron sulfate, aluminum sulfate) can also be used to lower the soil pH. These are often included in so-called "acid-forming fertilizers" commonly applied to azaleas. However, not all sulfate materials (e.g., calcium sulfate [gypsum], magnesium sulfate [Epsom salt], potassium sulfate) will acidify soil. Alternatively organic materials such as peat or manure also reverse the effects of alkaline soil pH on some landscape plants. Since these materials decompose with time, annual or semi-annual applications are usually required.

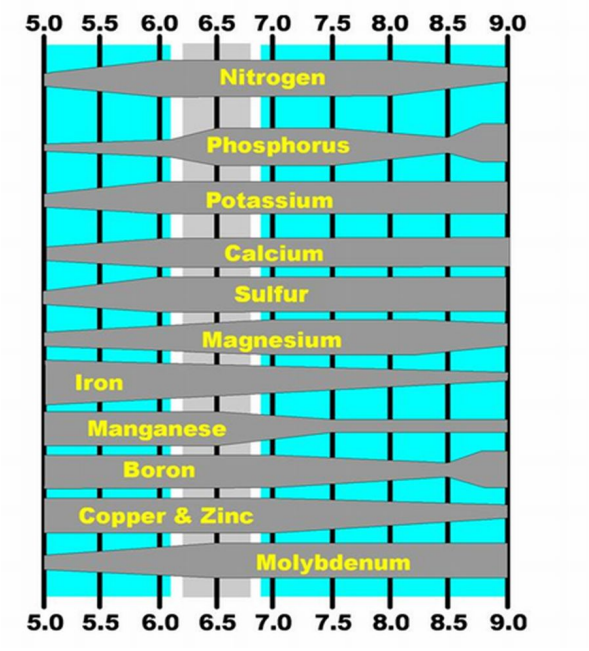

Figure 1. The effect of soil pH nutrient availabilty. Credits: Jianjun Chen, University of Florida

Summary

Consider the pH of your soil when selecting new plant material for your home landscape or garden. Take action to correct soil pH only when it is substantially higher or lower than required by the plants you are growing. To avoid damage to your landscape plants, always have your soil tested for pH and/or lime requirement before adding lime or sulfur to the soil. Finally, if you are determined to grow plants that are not suited for your soil pH, consider growing them in pots where you are able to amend small volumes of soil to reach the desired pH.