

Soil pH and Nutrient Availability

The desirable soil pH range for optimum plant growth varies among crops. Generally, soil pH 6.0-7.5 is acceptable for most plants as most nutrients become available in this pH range. Soil pH can be determined by mixing soil sample with water and then measuring the resulting aqueous solution.



Introduction

Soil pH is a measure of the acidity or alkalinity in soils. In the pH scale, pH 7.0 is neutral. Below 7.0 is acidic and above 7.0 is basic or alkaline. Soil pH affects nutrients available for plant growth. In highly acidic soil, aluminum and manganese can become more available and more toxic to plant while calcium, phosphorus,

and magnesium are less available to the plant. In highly alkaline soil, phosphorus and most micronutrients become less available.

When designing or planting new garden or landscape, it is helpful to check the soil pH as different plants thrive in different soil pH ranges. pH determination can give indication whether soil is suitable for the plants to be grown or it needs to be adjusted to produce optimum plant growth.

Soil pH can be measured easily and inexpensively at home or on-site using LAQUAtwin pH meters. There are three (3) LAQUAtwin pH meter models available, namely pH 11, 22, and 33. These pocket-sized compact meters allow two to five calibration points using either NIST or USA pH buffers. Among the above-mentioned models, the pH 33 meter has built-in temperature sensor that measures and displays temperature reading and automatic temperature compensation feature (ATC) that performs automatic calibration to the exact pH of the buffer at the measured temperature. Refer to the specifications of each meter model for more information.

Soil pH	Plant Growth
> 8.3	Too alkaline for most plants
7.5	Iron availability becomes a problem on alkaline soils
7.2	6.8 to 7.2 – near neutral 6.0 to 7.5 – acceptable for most plants
7.0	
6.8	
6.0	
5.5	Reduced soil microbial activity
< 4.6	Too acid for most plants

(Source: Colorado State University – CMG Garden Notes #222)

Method

Calibrate the LAQUAtwin pH meter according to manufacturer's instructions using at least two pH buffers that bracket the expected sample pH.

Sample Preparation And Measurement

The method described below is based on US EPA Method 9045D. This is also applicable for measuring pH of waste samples, which may be solids, sludges, or non-aqueous liquids. If water is present, it must constitute less than 20% of the total volume of the sample.

1. Add 20ml of pure water to 20g sample in a beaker or container. Stir for 5 minutes then cover.
2. Let the soil suspension stand for about 1 hour. Alternatively, filter or centrifuge off the water phase.
3. Measure the pH of water phase. Record the pH value and the temperature.

To obtain accurate results, standard buffer solutions and samples should be measured at the same temperature. If the electrode is coated with oily material from a sample, clean it with detergent and warm water.

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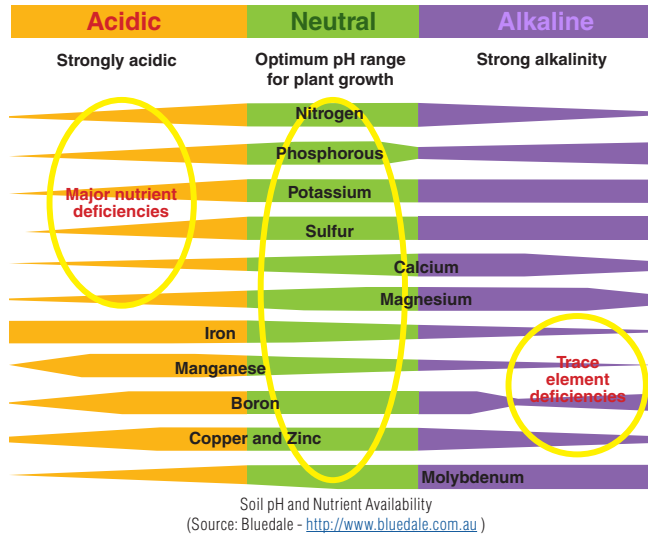
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pH 4.0-6.0	pH 5.0-6.5	pH 6.0-7.5	pH 5.0-7.5	pH 6.0-8.0
Potato	Apple Blackberry Cranberry Gooseberry Mango Melon Pineapple Pomegranate Watermelon	Apricot Cherry Grapevine Grapefruit Hazelnut Hop Lemon Lychee Mulberry Nectarine Peach Plum Quince Artichoke Bean Beetroot Broccoli Brussels sprouts Cabbage Calabrese Celery Chinese cabbage Chives Lettuce Millet Mushroom Mustard Onion Pea Peppermint Radish Spinach	Banana Rhubarb Strawberry Raspberry Carrot Sweet corn Cucumber Garlic Lentil Parsley Pepper Pumpkin Shallot Spearment Thyme Tomato Turnip	Avocado Asparagus Ginger Leek Mint Paprika Watercress

(Source: Gurumaganize.org)

Results and Benefits

The desirable soil pH range for optimum plant growth varies among crops. Generally, soil pH 6.0-7.5 is acceptable for most plants as most nutrients become available in this pH range. Soil pH is important because it affects the availability of nutrients to plants. Nitrogen, phosphorus, and potassium are the primary nutrients needed in fairly large quantities. Calcium, magnesium, and sulfur are secondary nutrients required by the plant in lesser quantities. Zinc and



manganese are micronutrients required by the plant in very small amounts. Most secondary and micronutrient deficiencies are easily corrected by keeping the soil at the optimum pH value.

Soil pH also affects activity of soil microorganisms. The population of bacteria that decompose organic matter declines and their activity is hindered in highly acidic soil, which results in accumulation of organic matter and the bound nutrients, particularly nitrogen.

Increasing Soil pH

Applying a material that contains some form of lime (calcium carbonate) like the

ground agricultural limestone and wood ashes can increase the soil pH. The finer the limestone, the more rapid it becomes effective. Different soils will require a different amount of lime to adjust the soil pH. Wood ashes contain high amounts of potassium and calcium, and small amounts of phosphate, boron and other nutrients. Although not as effective as limestone, these can drastically increase the soil pH with repeated use.

Decreasing Soil pH

Aside from ammonium-based fertilizers and organic matter, aluminum sulfate and sulfur are common materials used for decreasing soil pH. Aluminum sulfate is preferred as it changes the soil pH as soon as it dissolves in the soil because of the aluminum. However, too much of this is toxic to plant. Sulfur takes some time to produce effect as it needs to be converted to sulfuric acid by soil bacteria.

References And Suggested Readings

1. US Environmental Protection Agency Method 9045D Soil and Waste pH, Revision 4, November 2004
2. Changing the pH of your Soil. Clemson University Cooperative Extension. www.clemson.edu

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pH Pocket Meter Lineup

pH 11



WATER PROOF MICRO VOLUME 2 PT CAL 0.1 pH

pH 22



WATER PROOF MICRO VOLUME 3 PT CAL 0.01 pH

pH 33



WATER PROOF MICRO VOLUME 5 PT CAL 0.01 pH



Features

Flat pH sensor with automatic temperature compensation offers quick measurement of soils and waste samples

Applications include

Soils, Solids, Sludges, Non-Aqueous liquids, etc.

LAQUAtwin Pocket Ion Meter Lineup



<http://www.horiba-laqua.com>

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