

Gardening & Soil pH

All plants have different pH preferences. The pH level of the soil directly affects soil life and the availability of essential soil nutrients for plant growth. Whether you're planting for commercial or recreational reasons, knowing the pH of your soil can help you choose the right mix of plants and allow the right treatment for your soil.

Soil Life

Soil life refers to the living organisms that live in soil and break organic materials down into simpler forms. Soil bacteria, a microscopic soil occupant responsible for the decomposition of organic material into simpler nutrient forms that become food for plants, thrives at about 6.3 – 6.8 pH. Fungi, mold and anaerobic bacteria, on the other hand, prefer a more acidic environment, making acidic soil more prone to souring and putrefaction.

Availability of Nutrients

While soil life plays an important part in fertilizing soil, the pH of your soil determines the form nutrients will take, as well as their availability for plant absorption. Table 1 illustrates the relationship between soil pH and the availability of various soil nutrients. When soil is acidic, minerals such as zinc, aluminum, manganese, copper and cobalt are soluble and available for plant uptake; however they can also be excessive in presence and therefore, toxic to plants. Alkaline soil on the other hand, may contain a higher quantity of bicarbonate ions, and this can affect optimum growth in plants by interfering with the normal uptake of other ions.

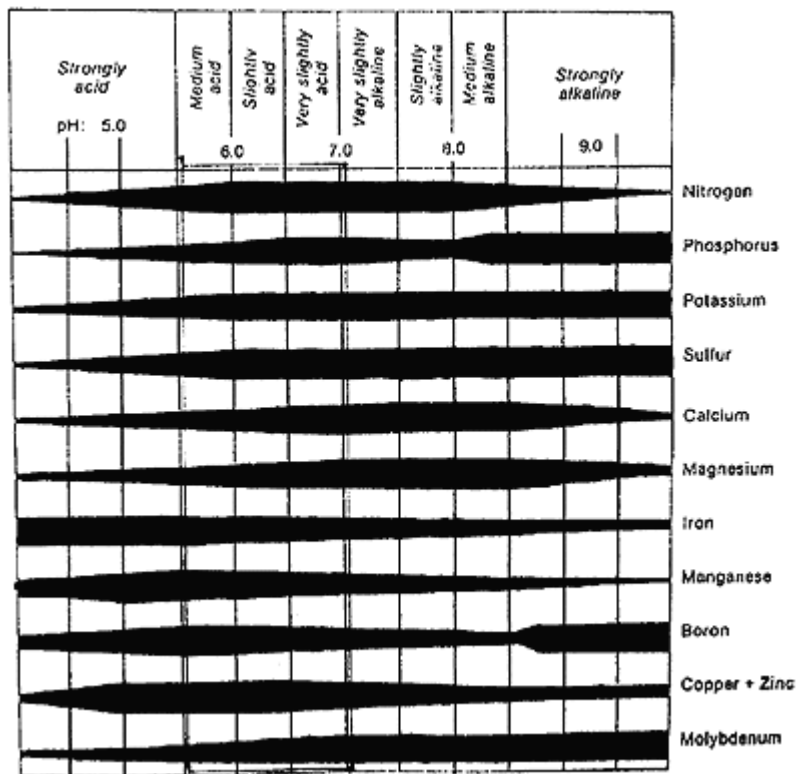


Table 1. The effect of soil pH on availability of plant nutrients (From *Hunger Signs in Crops*, edited by H.B. Sprague, 1964, pg. 18)

The Preferred pH Levels

The most common range of soil pH is 4 to 8 pH, and the range for optimal availability of plant nutrients for most crops is 6.5 to 7.0 pH. Here are the pH ranges preferred by some of the common garden plants:

Vegetables	Ideal pH	Garden Plants	Ideal pH	Herbs	Ideal pH
Artichoke	6.5 - 7.5	Ageratum	6.0 - 7.5	Basil	5.5 - 6.5
Asparagus	6.0 - 8.0	Alyssum	6.0 - 7.5	Chives	6.0 - 7.0
Beans	6.0 - 7.5	Aster	5.5 - 7.5	Fennel	5.0 - 6.0
Beet Root	6.0 - 7.5	Azalea	4.5 - 6.0	Garlic	5.5 - 7.5
Broccoli	6.0 - 7.0	Calendula	5.5 - 7.0	Ginger	6.0 - 8.0
Brussel Sprouts	6.0 - 7.5	Candytuft	6.0 - 7.5	Marjoram	6.0 - 8.0
Cabbage	6.0 - 7.5	Carnation	6.0 - 7.5	Mint	7.0 - 8.0
Carrot	5.5 - 7.0	Celosia	6.0 - 7.0	Parsley	5.0 - 7.0
Cauliflower	5.5 - 7.5	Chrysanthemum	6.0 - 7.0	Peppermint	6.0 - 7.5
Celery	6.0 - 7.0	Columbine	6.0 - 7.0	Rosemary	5.0 - 6.0
Chicory	5.0 - 6.5	Coreopsis	5.0 - 6.0	Sage	5.5 - 6.5
Chinese Cabbage	6.0 - 7.5	Cosmos	5.0 - 8.0	Spearmint	5.5 - 7.5
Corn	5.5 - 7.0	Crocus	6.0 - 8.0	Thyme	5.5 - 7.0
Cress	6.0 - 7.0	Daffodil	6.0 - 6.5		
Cucumber	5.5 - 7.5	Dahlia	6.0 - 7.5		
Garlic	5.5 - 7.5	Day Lily	6.0 - 8.0		
Horseradish	6.0 - 7.0	Delphinium	6.0 - 7.5		
Kale	6.0 - 7.5	Dianthus	6.0 - 7.5		
Kohlrabi	6.0 - 7.5	Forget-Me-Not	6.0 - 7.0		
Leek	6.0 - 8.0	Forsythia	6.0 - 8.0		
Lentil	5.5 - 7.0	Foxglove	6.0 - 7.5		
Lettuce	6.0 - 7.0	Gladiola	6.0 - 7.0		
Mushroom	6.5 - 7.5	Gypsophilia	6.0 - 7.5		
Mustard	6.0 - 7.5	Holly	5.0 - 6.5		
Onion	6.0 - 7.0	Hyacinth	6.5 - 7.5		
Parsnip	5.5 - 7.5	Iris	5.0 - 6.5		
Pea	6.0 - 7.5	Lavender	6.5 - 7.5		
Peanut	5.0 - 6.5	Lilac	6.0 - 7.5		
Pepper	5.5 - 7.0	Marigold	5.5 - 7.0		
Potato	4.5 - 6.0	Morning Glory	6.0 - 7.5		
Potato- Sweet	5.5 - 6.0	Nasturtium	5.5 - 7.5		
Pumpkin	5.5 - 7.5	Pansy	5.5 - 7.0		
Radish	6.0 - 7.0	Petunia	6.0 - 7.5		
Rhubarb	5.5 - 7.0	Pinks	6.0 - 7.5		
Shallot	5.5 - 7.0	Poppy	6.0 - 7.5		
Soybean	5.5 - 6.5	Portulaca	5.5 - 7.5		
Spinach	6.0 - 7.5	Primrose	5.5 - 6.5		
Tomato	5.5 - 7.5	Roses	5.5 - 7.0		
Turnip	5.5 - 7.0	Salvia	6.0 - 7.5		
Water Cress	5.0 - 8.0	Snapdragon	5.5 - 7.0		
Watermelon	5.5 - 6.5	Sunflower	5.0 - 7.0		
		Sweet Pea	6.0 - 7.5		
		Sweet William	6.0 - 7.5		
		Tulip	6.0 - 7.0		
		Viola	5.5 - 6.5		
		Zinnia	5.5 - 7.5		

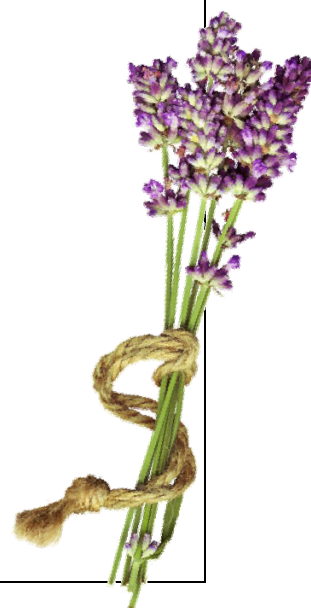


Table 2. Ideal soil pH for different plants ("pH Levels in Garden Soils", The Gardener's Network, (<http://gardenersnet.com/>))



Testing Your Soil

One of the easiest ways to correct the pH of your soil (both acidic and alkaline) is by adding compost. The alternative is to add an alkaline source (such as ground limestone) to acidic soil, or an acidic source (such as pine needles or peat moss) to alkaline soil. But before you begin, you need to know the pH of your soil, and the only way to know is to test it.

Soil pH can change throughout the year due to factors including rain type and depletion of certain nutrients. You should therefore monitor your soil pH before planting, during the preparation of beds, and regularly in random areas of your plot throughout the growing season.

One of the most convenient and accurate ways to test soil pH is by using a simple electronic meter. Soil testing for many applications rarely requires accuracy of more than a few tenths of a pH, so a simple, compact pH tester like the Eutech EcoTestr pH 1 easily meets requirements, and is very economical in instances where several samples and tests are taken. pH accuracy is affected by temperature fluctuations, so you may want to consider the EcoTestr pH 2 for Auto-Temperature Compensation if your area of residence experiences seasonal changes in temperature. To test with an EcoTestr pH 1 or pH 2:

1. Scoop up loose soil samples with a clean, dry plastic jar. Avoid touching the soil with your hands to prevent contaminating the sample.
2. Remove any stones and crush any clumps of soil to prevent breaking the delicate tester's glass electrode bulb.
3. Mix your soil sample with distilled water (1:1 ratio) in a clean jar to form an emulsion. Cap the jar tightly and shake vigorously a few times. Allow the mixed sample to stand for 5 – 10 minutes so the salts in the soil can dissolve in the distilled water.
4. Remove the cap of your EcoTestr, switch it on and submerge the electrode bulb fully into the wet soil slurry.
5. Take the reading when it stabilizes. Press the HOLD button to freeze the reading for recording. Press HOLD button again to release the reading. Repeat for higher accuracies, if desired.

(A convenient, but slightly costlier alternative is the pHSpear, which allows you to measure your soil pH by simply wetting your soil with some distilled water and inserting the probe of the pHSpear to get a reading. NOTE: Sample soil should still be examined for small stones. Even though the spear tip is ruggedized hard surfaces like stones and pebbles can cause breakage)



Caring For Your pH Tester

An electronic pH Tester requires very little maintenance, and will serve you well for a long time if treated right. Here are some tips on maintaining your pH tester:

1. Calibrate your tester regularly, about once a week if you use the tester 2 or 3 times per week. Calibrating your EcoTestr is very easy. Simply dip your tester into a pH buffer solution (available from your Eutech vendor) and press "CAL". The tester detects your buffer value and auto-calibrates.
2. Rinse your tester after each use, and keep the electrode conditioned for next use by soaking it in tap water or electrode storage solution. **NEVER store your electrode in deionized water, solvents, acids or pH 10 buffer! This will kill your electrode.**
3. Do not use your tester in liquids at temperatures above 80°C, or with high concentrations of heavy metals, sulfides, proteins or oil.

For more information on easy pH testing with Eutech's pH testers and meters, visit our website at www.eutechinst.com or drop us an email at eutech@thermofisher.com.

Sources:

Owen, M (n.d.) *Acid or Alkaline? What pH means in gardenspeak*, PlanTea: The organic plant food in tea bags. (<http://www.plantea.com>)

Sprague, H.B., ed. (1964) *Hunger Signs in Crops: A Symposium*, David McKay Company, Inc.

Stout, Allen (2007) *Sustainable Agricultural Technologies: Keys to Understanding Soils and Soil Testing For Sustainable Soil Management*, Serf Publishing Inc.

Unknown (n.d.) *pH Levels in Garden Soils*, The Gardener's Network (<http://gardenersnet.com>)