



Soil pH and plant health in the home garden

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Home gardeners often notice nutrient deficiency symptoms in their garden plants, despite application of general fertilisers. This is often related to the pH of the soil. This Gardennote explains the basics of soil pH and its effect on nutrient disorders, as well as on pests and diseases in the home garden.

General

The pH of the soil is a measure of acidity or alkalinity. It basically indicates how sour or sweet the soil is. The pH scale ranges from 0 to 14, with 7 being neutral. Values below 7 indicate an acid soil, and above 7, alkaline. Because the pH scale is logarithmic, a pH change by 1 unit means it is 10 times more acidic or alkaline.

Typically, Western Australian soils have a pH range between 4 and 8.5. In the metropolitan area, soils are more alkaline near the limestone-based coastal sands. Soils further inland and in most agricultural areas are naturally acidic.

In agricultural regions, soils which were not very acid when cleared have become increasingly so through the continuous application of fertiliser.

In home gardens, where mineral fertilisers are frequently used, the soil pH may be acidic as well.

Significance of soil pH

Nutrition

Soil pH determines the nutrient availability to plants. Some nutrients become 'tied up' in the soil at certain pH levels. For example, acid soils can lead to deficiencies of phosphorus, calcium, magnesium and molybdenum, as well as toxic levels of manganese and aluminium.

Alkaline soils may lead to deficiencies in iron, manganese, boron, copper and zinc.

While most plants prefer neutral soil, some are suited to other pH levels. Examples of different preferences are:



Healthy flowers

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Soil pH	Ornamentals	Fruit	Vegetables
Acidic 4.5 to 6.0	Azalea Camellia Erica Gardenia Holly Hydrangea Magnolia Pelargonium Rhododendron	Blueberries Cranberries	Potato
Alkaline 7.0 to 8.0	Sweet Pea Cacti Choisya Geranium Gerbera Hebe Hibiscus Ivy Poinsettia Viburnum	Melon	Beetroot Chervil Leek Spinach



Healthy vegetables

A common pH-related condition in the metropolitan area is 'Lime-induced chlorosis' which is an iron deficiency caused by high pH levels. It manifests as yellow-white leaves on plants growing in limestone-based coastal sands. This condition is rectified by applying iron sulphate, which will also drop the soil pH.



Lime-induced chlorosis on citrus tree

Pests, diseases and soil pH

Strong and healthy plants which get sufficient water, nutrition and sunlight, will build up a natural resistance against pests and diseases.

It therefore pays to keep the soil pH around neutral to avoid certain nutrient deficiencies, which will weaken the plants and make them more vulnerable to pest and disease attacks.



Clubroot

There are a few diseases which are affected by soil pH. Clubroot, a disease of crucifers, can be controlled by increasing the soil pH, while common scab, a disease of potatoes, is more likely to cause problems in alkaline soils.



Common scab

When and how to test soil pH

Test your pH in autumn when the soil is relatively dry and is free of excessive organic material. This will give you some time to do adjustments, if needed.

When sampling, follow these guidelines:

- Do not mix different soil types, and sample into clean containers.
- Do not sample after heavy rain or after watering. If you have applied fertiliser, wait three to four weeks for the soil to adjust.
- Take the soil from the top 20 cm with a trowel, spade or auger and avoid weeds and plant roots in the sample.
- Select at least five random spots in the area to be tested, and mix the soil to get an average reading. Then take about a cup-full as a sub sample.

Soil pH test kits are available from many garden centres. These are relatively inexpensive and give home gardeners an approximate reading.

If you want more accurate results, take a sample to be tested to a soil laboratory (check in yellow pages) or to a nursery, which provides this service. Laboratories

may report a pH reading in water (H_2O) or in 1:5 calcium chloride ($CaCl_2$). Readings in calcium chloride are considered a better indicator of acidity.

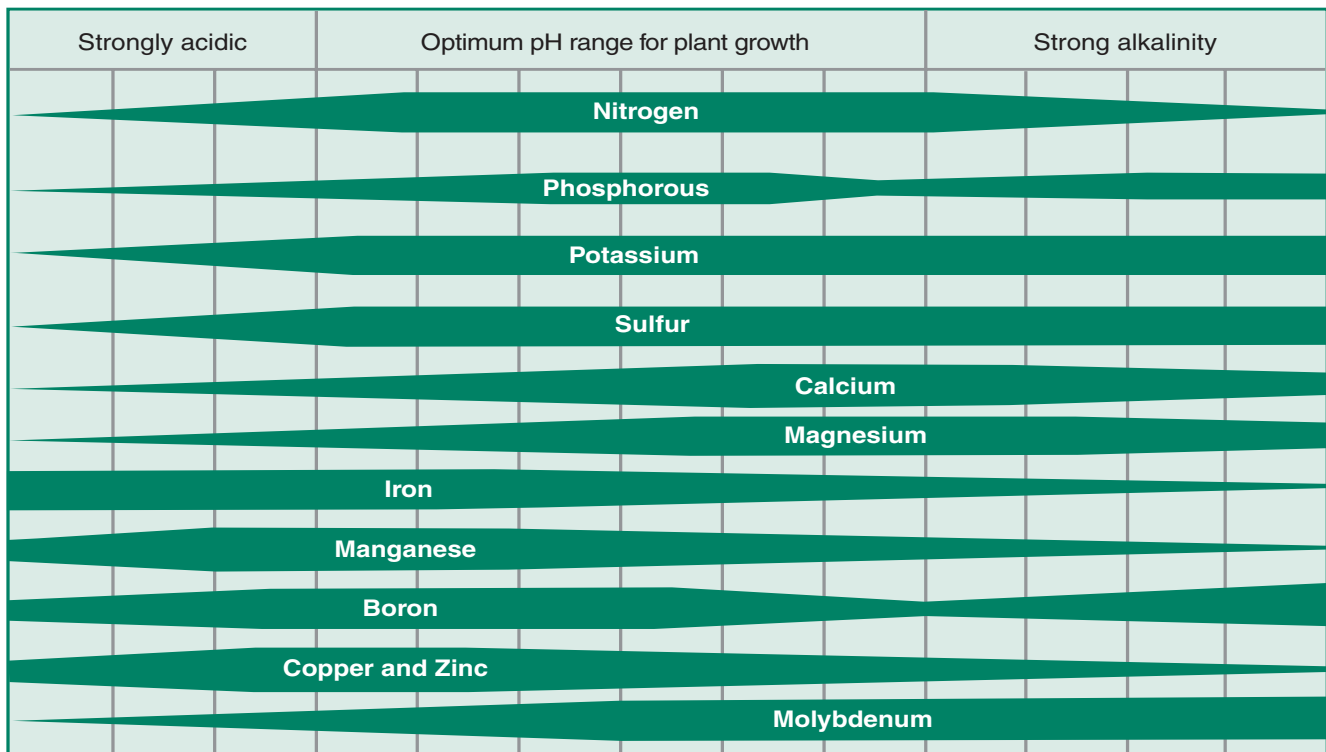
If flowering, hydrangeas (*Hydrangea macrophylla*) are good indicators of soil pH. A soil pH of 6 or below will produce blue flowers while a soil pH of 6.8 or higher will produce pink flowers.



A simple soil pH kit



Blue Hydrangea indicating acid soil conditions (Photo by USDA)



Nutrient availability and soil pH. Availability is least at the pH corresponding to the narrowest parts of the band and most at the widest.

Changing soil pH

Soil pH is generally corrected using iron sulphate (decrease) or lime (increase). There are some organic soil improvers on the market which are claimed to stabilise the pH on neutral. Make sure the soil additive is well worked and watered into the soil.

Acid soils

To increase the pH by one point, apply dolomite lime at 100 g/m² in sandy soils, and up to 250 g/m² in clay. The effect is probably not noticeable for two to three months.

Alkaline soils

To decrease the pH, iron sulphate is available from nurseries and hardware stores. Follow label instructions for the correct rate. Compared to lime, the effect is immediate.

Further Reading

Farmnote No. 78/2000 'The Importance of Soil pH'

Farmnote No. 68/2000 'Looking at Liming : test strips'

Farmnote No. 67/2000 'Looking at Liming : quality'

Farmnote No. 69/2000 'Looking at Liming : comparing lime sources'

Farmnote No. 80/2000 'Managing Soil Acidity in Agricultural Land'

Bulletin No. 4343 'Soil Guide - A Handbook for Understanding and Managing Agricultural Soils'.

When sending or delivering samples, the following information is required:

- Collector's name, location (where the specimen was found), full address, telephone number and e-mail address, description of the damage and date collected.

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