

INTRODUCTION TO SOILS

Introduction to soils

What is the soil/ growing media made up of?

What is the pH?

What nutrients should be available in the soil/ growing media?

Basic soil tests

- pH (SOIL): This is a measure of soil acidity and soil alkalinity on a scale of 0 (extremely acidic) to 14 (extremely alkaline). A pH of 7 is neutral. pH gives an indication of the availability of plant nutrients.
- Soil Texture - the relative quantities of the different types and sizes of mineral particles in a soil.



Potting Mixes

The standard for packaged potting AS3743-2003 mixes are:

- The standard specifies physical, chemical, biological, labelling requirements for potting mixes packaged for resale.
- Potting mixes both regular and premium quality are covered
- Requirements also included for specialist potting mixes labelled suitable for African violets, bulbs, hanging baskets, seedlings, orchids, acid-loving plants and plants sensitive to phosphorus.

The Horticultural industry uses a variety of media other than soils for the propagation and growth of plants. Media can be defined as objects in which micro-organisms or cells can experience growth. Rooting Media or Commercial potting or propagation mixes will have one or usually a combination of the following materials;

Soil: Ordinary well drained soil is used for the propagation of many deciduous species which are often field grown such as roses or fruit trees.

Sand: Good quality coarse sand is a common and highly regarded media for use in a variety of propagation and potting mixes.

Peat moss: Peat is indeed a moss and may be sphagnum moss or other species that are harvested from peat bogs in New Zealand, Canada or Ireland. Commonly used with sand as a quality propagation mix. Peat moss holds 10 - 20 times its weight in water and has a low pH making it highly useful in the propagation of acid loving plants.

Coir: A by-product from the coconut industry the coir is harvested from the outer husks of the coconut. It has a similar color and water holding capacity to peat, making it a useful and economical addition to potting and propagation mixes.

Vermiculite: This product is expanded mica an extremely light and insoluble mineral product with a high water holding capacity. These qualities make it an extremely useful ingredient in potting and propagation mixes including those used in hydroponic systems.

Perlite: A form of volcanic rock very light and insoluble. Often used on its own in hydroponic systems it also is well drained therefore useful in mist propagation systems.

Rockwool: Originally developed as an insulation material. This product is various rock sources that are melted and spun into fibre and then pressed into blocks with a binder added. This product is used extensively as a commercial propagation material for cuttings.

Crushed or shredded bark: This ingredient is a predominant feature in most commercial potting mixes. Species used include pine and eucalyptus.

Clay balls: Made from expanded clay these balls are used for hydroponic systems because they are light and hold large amounts of water and air.

Composts are an effective substitute for peat because the organic fraction

- Absorbs and releases water
- Slowly releases nutrients
- Assists in nutrient retention
- Suppresses the growth of plant pathogens
- Improves structural stability

Soil texture

Soil texture refers to the quantities of the various mineral particles found in the soil. These particles are grouped into the three main classes of sand, silt and clay. These minerals are defined purely according to size

Mineral	Size Range
Sand	2.0 - 0.06 mm
Silt	0.06 - 0.002 mm
Clay	less than 0.002 mm

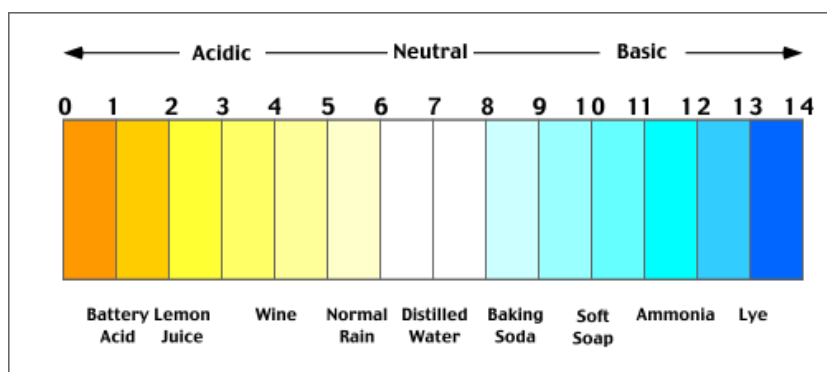
pH Testing

One of the most useful and regular tests carried out by horticulturalists is the pH test.

The pH is a measurement of the percentage of hydrogen ions in the soil the greater the percentage of hydrogen ion the higher the acidity level. The pH indicates the acidity or alkalinity of the soil. Different plants have differing optimum soil pH requirements. The majority of plants prefer a pH of around 6 to 7, which is very slightly acid. The soil pH is important in determining the availability of soil minerals. At pH extremes some minerals are “locked up” and cannot be used by the plants, whilst other minerals may become toxic. The application of different fertilisers can affect the pH of the soil.

Can a soil be modified to meet plant needs?

If a soil is too acid then it can be modified by the addition of lime or dolomite for sandy soils. If it is too alkaline then elemental sulfur may be added or better still the addition of green manure crops and animal manures also lowers soil pH.

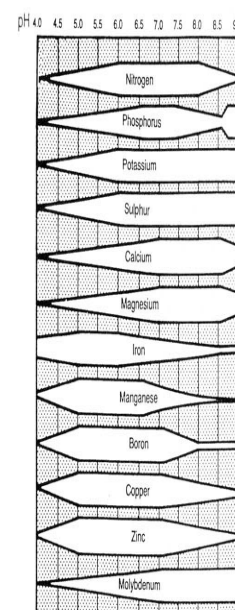


Soil fertility is directly influenced by pH through the solubility of many nutrients. At a pH lower than 5.5, many nutrients become very soluble and are readily leached from the soil profile. At high pH, nutrients become insoluble and plants cannot readily extract them. Maximum soil fertility occurs in the range 6.0 to 7.2.

Determining soil pH

- Put a small lump of soil on a clean surface
- Add a couple of drops of universal indicator from the test kit
- Mix the indicator with the soils
- Add some indicator powder. It can take a couple of minutes for the powder to change colour.
- Check the colour of the powder against the colour chart in the test kit. Green is the best colour because it shows the pH is near neutral. Natural light will give the most accurate results.
- Check the result against the nutrient chart below.

Organic matter can improve soil structure, water holding and nutrient uptake for the crop. Substances that are added to the soil are called ameliorants; they are anything that can be added to modify the soil.



Recommended soil pH for Growing Fruit and Vegetables			
Vegetable	Optimal pH	Vegetable	Optional pH
Artichoke globe	5.6-6.6	Okra	6.0-8.0
Asparagus	6.0-7.0	Onions	6.2-6.8
Avocado	6.0-7.0	Parsley	6.0-8.0
Beans	6.0-7.0	Parsnip	5.0-7.0
Beetroot	5.6-6.6	Peas	5.6-6.6
Broccoli	6.0-7.0	Peanuts	5.0-6.0
Brussels Sprouts	6.0-7.0	Peppers	6.0-8.0
Cabbage	5.6-6.6	Potato	5.8-6.5
Carrot	5.0-6.0	Pumpkins	5.0-7.0
Catnip	5.0-6.0	Radish	6.0-7.0
Cauliflower	6.0-7.0	Raspberry	6.0-6.5
Celery	6.0-7.0	Rhubarb	5.0-7.0
Chard	6.0-7.0	Rockmelon	6.0-7.0
Chilli pepper	5.0-6.0	Shallots	5.0-7.0
Chives	5.0-6.0	Spinach	5.0-7.0
Citrus	6.0-7.5	Strawberries	6.0-7.0
Cucumber	5.0-6.0	Sunflowers	6.0-7.0
Dill	5.0-6.0	Sweet corn	6.0-7.0
Eggplant	5.0-6.0	Swiss chard	6.0-7.0
Garlic	5.0-6.0	Tobacco	5.0-7.0
Gourds	5.0-6.0	Tomato	5.0-7.0
Kiwi	5.0-7.0	Turnip	5.0-7.0
Leek	5.0-6.0	Yam	6.0-8.0
Lettuce	6.0-7.0	Zucchini	6.0-7.0
Mint	6.0-7.0	Sweet potatoes	5.0-7.0

References:

sardi.sa.gov.au
 Soil Nutrient Testing: How to Get Meaningful Results
 Gardening Down Under Kevin Handreck

Animal manure and compost will improve the structure of the potting mix and mulch to reduce water evaporation. We are also using a seaweed extract at planting. Seaweeds strengthen the root system of plants and improve the cell structure of the plant making it less susceptible to insects, diseases and extreme weather conditions.

Today we are planting:

- Silver beet
- Beetroot
- Kale
- Spring onions
- Lettuce
- Herbs

There will be some planted as seeds and some as seedlings.

Fruit trees

Particularly citrus have shallow roots and shouldn't be disturbed. Digging around their base can damage the root system. I recommend fertilising once a month in pots and they can be given a citrus fertiliser or organic fertilisers like pelletised chicken manure. They can also be given Seaweed solutions on a regular basis which stimulates root growth. Mulch over the top to retain moisture and keep the root zone cooler.

MORE INFO

Written by Ray Redford, Horticulturist, February 2016 for Hume City Council's Live Green program.

Want more practical advice and workshops on how to 'live greener'?

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