Soil pH, Soil Acidity and Lime Use

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Soil pH

Soil pH is a measure of the concentration of hydrogen ions in the soil. In chemical terms it is "the negative logarithm of the hydrogen ion concentration". After more than 40 years as a Consultant Soil Scientist I still don't understand this definition so it probably doesn't matter. Sufficient to know that pH 7 is neutral, less than 7 is acid and above 7 is alkaline.

Some soils are naturally calcareous (containing chalk or limestone) with a pH above 7 and may not need liming for decades or even many hundreds of years. But maintaining a satisfactory soil pH is basic to soil fertility. Lime is continually being lost from soil at between 500 and 1,250 kg/ha per annum (1,000 kg/ha = 3 ozs/sq yard). It is removed by crops, neutralised by the acidifying effect of nitrogen from fertilisers and manures and washed downwards in drainage water, especially on sandy soil. The majority of soils in the UK require lime addition every few years as they gradually turn acid. Commercial farmers are well aware of the importance of liming their land and it is just as important on allotment sites.

The target soil pH level

Vegetable, fruit and flower crops will tolerate a wide pH range but most perform best at around 6.3 to 7.0. At less than pH 6.0 there is a risk that most vegetable crops will be damaged by acidity. However, some such as potatoes prefer slightly acid soil at around 6.0 to 6.5 whereas others such as cabbage, cauliflowers and other brassicas and also blackcurrants prefer a higher level of around 6.8 to 7.2. Blueberries, rhododendrons, azaleas and some heathers are among the few that prefer particularly acid soil at about pH 5.0 to 5.7. Conversely, when pH is above about 7.0 to 7.3 there is increasing risk of trace element deficiency in many crops such as manganese deficiency in beetroot and parsnips or iron deficiency in raspberries.

How to measure soil pH

Accurate measurement of soil pH is always included in standard laboratory soil analysis as detailed on page 20 of issue 3, 2013 of this magazine. A lower, but entirely sufficient, level of precision can be had from on-the-spot soil pH testing kits costing only a few pounds. These are available from larger garden centres or by mail order. They are based on pH-sensitive colour change of a liquid or a paper test strip. It is often more reliable for the test to be done by a lady since ladies are less likely to be colour blind than men, especially in the green to red area.

What to use and how much

When soil pH is less than 6.5 it should be raised by addition of ground chalk or ground limestone, both of which are forms of calcium carbonate. The amount needed depends on initial soil pH and on the soil type. The table shows the quantity in metric and imperial amounts to raise pH to a suitable level. It should be very thoroughly mixed into the top 15 to 20 cm (6 to 8 inches) and since both materials are only sparingly soluble the best time to do it is autumn to allow winter rain to boost its activity. Liming land is not a precise science so there is no need to fret over getting it exactly right – the most important issues are i) get it done and ii) thoroughly mix it in. For fruit it is extremely important to correct acidity before

planting while the liming material can be mixed in. For established fruit check the surface 7.5 cm (3 inches) for acidity and spread around only a third of the amount recommended in the table. This will necessarily be spread on the soil surface and it should be moderately watered in to speed up pH rise.

Amount of ground chalk or ground limestone required to raise soil pH

Starting pH	**Sandy soils**		**Loamy soils**		**Clayey soils**	
	gms/sq m	ozs/sq yd	gms/sq m	ozs/sq yd	gms/sq m	ozs/sq yd
6.2	480	14	640	19	800	24
6.0	640	19	800	24	960	28
5.5	1,120	33	1,280	38	1,500	44

Application rates are based on Defra's Fertiliser Manual (RB209, 2010)

For a given starting pH clayey (heavy) soils need larger amounts than sandy (light) soils. However, sandy soils normally need repeat liming about every 4 to 6 years whereas clayey soils need treating only about every 8 to 10 years.

Can soil pH be lowered?

There is no practical way to reduce soil pH across an entire plot. However, provided the topsoil has a pH of no more than about 7.7 and does not contain clearly visible and significant amounts of chalk or limestone it is possible to manipulate a soil planting pit to successfully grow such as rhodos, camellias and blueberries. Acid peat is used and Irish sphagnum moss is the most effective. Simply excavate a pit of 60 cm (24 inches) diameter to 40 cm (16 inches) depth then mix a quantity of the excavated soil with an equal volume of sphagnum peat and replace the mixture to 50 cm depth to allow for settling over time. The shrub will grow well for many years although eventually as more of the root system penetrates the surrounding soil of higher pH its foliage will turn paler green as iron deficiency sets in.

In truth, trying to reduce pH is hardly justified so concentrate on maintaining a suitably high soil pH to support vigorous crop growth.