

South West Victoria SoilSmart Series: Soil acidity

Troy Clarkson (Ballarat)

June, 2003
LC0000
ISSN 1329-833X

Introduction

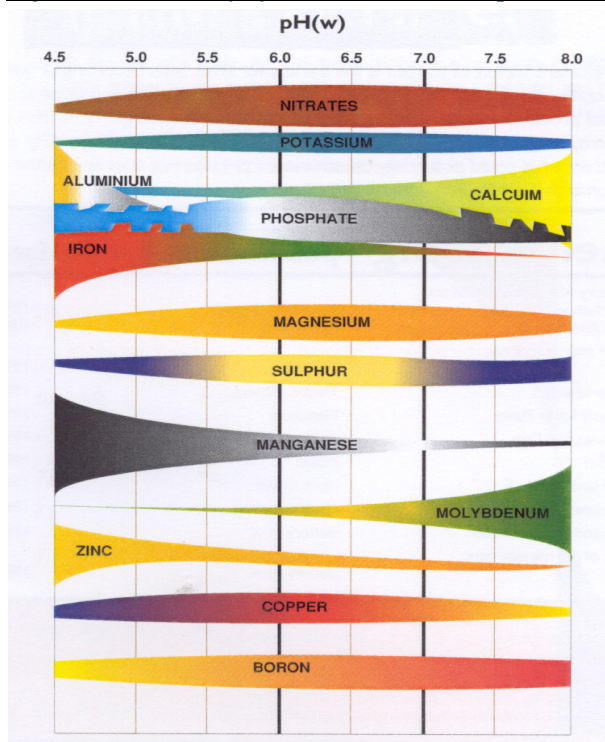
Soils become naturally acid over time and through general agricultural practices such as nitrogen fertiliser application and plant removal through grazing, cropping and hay and silage production.

Soil acidity is measured on a pH scale of 0 (acid) to 14 (alkaline), with 7 being neutral. Although a pH reading below 7 is classed as acid, productive agricultural soils are generally said to have a pH between 5.5 and 7.5(water).

A soil chemical test should always be used to identify the soils pH before deciding on the action required.

When a soils pH falls below pH(w) 5.0, production begins to be inhibited by the tie up of required nutrients (eg. phosphorus) and an increase in the availability of toxic elements (eg. aluminium) (Refer Figure 1). Plants tolerance to acidic soils and high aluminium levels varies between species. Some species, such as clovers, loose production much earlier than other tolerant species such as barley.

Figure 1: Availability of nutrients at various pH(w) levels



Managing acid soils

Lime or limestone (calcium carbonate) is a naturally occurring rock that is used to raise the pH of acid soils. The amount of lime required to increase the pH of a soil by one pH unit depends on the buffering capacity of the soil. The buffering capacity is a measure of the soil's ability to resist change in pH. A well-buffered soil becomes acid more slowly than a weakly buffered soil, but will require more lime to increase the pH value.

You need to use lime that is in very small particles so it will react quickly with the soil, this is called the finesse of the lime and is measured by the limes Neutralising Value (NV).

Neutralising value (NV) is a measure of the effectiveness of the neutralising substances. Liming materials are compared to pure calcium carbonate. For the purposes of comparison calcium carbonate is given a neutralising value of 100; ideally NV should be over 95.

Lime manufacturers have to specify the percentage of particles finer than 0.25 mm (a quarter of a millimetre in diameter). Very fine lime has 98-100 per cent fines (as they are called) and this is the grade you are recommended to buy (Refer table 1). The percentage is marked on the bag or invoice.

Table 1: The Neutralising values of some common lime products

Material	Neutralising Value
Calcium carbonate	100
David Mitchell Fine lime	98
Gambier Ag. Dolomite	99
Calcimo – dried lime	84
Gilleear Ag. Lime (3mm)	86
Gilleear Ag. Lime (5mm)	88
Kalari Lime Bridgewater	79
Kalari Lime Heywood	81
Kurdeez dried lime	90

For the quickest response from lime incorporate into the soil or top dress before cultivation. Incorporated lime in the right conditions (moist soil and high lime neutralising value (NV)) should begin working by 4 weeks. Ideally lime should be incorporated at least 3 – 6 months before sowing to allow the pH to have risen. Lime can be top dressed onto a permanent pasture paddock and will still have the desired effect but will require more time.

Applying lime to an acid soil:

- raises the soils pH to within the optimum range for agricultural production (Fig. 2);
- increases the availability of phosphorous and other macro-nutrients
- stimulates microbial and earthworm activity;
- stimulates nutrient cycle and nitrogen fixation;
- decreases toxicity due to aluminium and manganese;
- decreases the availability of the trace nutrients zinc, copper, boron and cobalt;
- increases the availability of the trace nutrients molybdenum and selenium;
- supplies the nutrient calcium; and helps to stabilise soil structure.

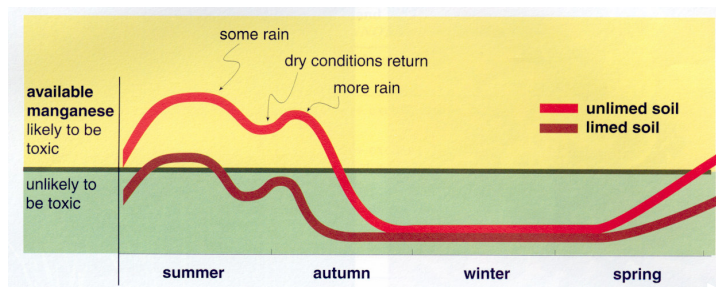


Figure 2: The soil pH trends throughout the different seasons in soils with and without lime (From Hollier & Hall 1997).

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.