VitiNotes

Cooperative Research Centre for Viticulture

www.crcv.com.au 2006

Vineyard activities 2: Measuring soil pH

Soil pH refers to the acidity or alkalinity of the soil. It is a measure of the concentration of free hydrogen ions (H^+) that are in the soil.

Soil pH can be measured in water (pH_w) or a weak calcium chloride solution (pH_{CaCl}).

The pH range is 0–14, with a value of 7 being neutral. Soil pH values (as measured in a water and soil solution) indicate:

- strong acidity if less than 5.5
- moderate acidity at 5.0 to 6.0
- neutral between 6.5 and 7.5
- moderate alkalinity at 7.5 to 8.5
- strong alkalinity for values of 8.5 and above

The limited data available for vines suggests soil pH (as measured in a weak calcium chloride and soil solution) should be in the range 5.5–7.5 for best performance.

Soil pH outside the neutral range can influence the availability of specific nutrients to plants, as well as the activities of both beneficial micro-organisms and those that cause diseases.

The use of urea or ammonium-based nitrogenous fertilisers, can have acidifying effects on soils.

If use of these fertilisers continue, it is inevitable that soils in many vineyards will become more acidic over time.

However, given many Australian vineyards are established on alkaline soils, this may not prove problematic in the short to medium term.

Chemistry laboratories generally measure soil pH using both water and calcium chloride. The simplest method is to measure pH_w with a portable pH meter. Alternatively, grape growers can determine soil pH using a colorimetric test kit. Both of these methods are described below.

EQUIPMENT

- Colorimetric test kit (available from most garden centres), which includes mixing stick, plate, dye, barium sulphate powder, pH colour chart, instructions
- Teaspoon
- Recording sheet and pen

OR

- Hand held pH meter, clear plastic jar with screw-on lid, distilled water (not rain water),
- Recording sheet and pen

TIMING

Soil pH is best measured when soil sampling is conducted and is normally done at the same time as assessments for electrical conductivity.

Soil pH should be measured in the fibrous root zone (i.e. 0–20cm depth) as well as the deeper root zone (>20cm depth).

Make sure soil samples are taken inside the irrigation wetting pattern. Analysis of some mid-row samples also provide a good indication of the effect of vineyard management practices on soil pH.

Autumn and spring are the best times for soil sampling, as winter can be too wet and in summer the ground may be too hard. Although, soil sampling can be done at any time of the year.

METHOD

1) Take three surface and three subsoil samples from each site (as described in points 1–5 in *Vineyard activities 1 -Taking soil samples*). Make sure surface and subsoil are not combined, as they need to be analysed separately.

2) Crush large aggregates and remove any gravel so that you have a fine mix to test:

   a) Using a *colorimetric test kit*, follow manufacturer's instructions or, if not available, the general procedure below.

      1. Put half a teaspoon of soil on the plate.
      2. Add enough dye to saturate the sample and mix well.
      3. Sprinkle barium sulphate powder onto the soil and allow the colour to develop.
      4. Compare the sample colour with the pH colour chart.
      5. Record the results.

OR

   b) Using a *portable pH meter*, follow manufacturer's instructions and calibrate your pH meter prior to each use.

      1. Take jar lid and fill it level with soil. DO NOT COMPRESS THE SOIL. Pour into jar.*
      2. Add five jar lids of distilled water and screw lid on tight. Shake for five minutes then allow to settle for 10 minutes.
      3. Rinse the pH meter electrodes in distilled water and dry gently with a tissue.
      4. Take a reading by immersing the electrode in the water above the settled soil as per manufacturer instructions. Make sure the electrodes are fully covered. Take care to minimise electrode contact with soil at the bottom of the jar.
      5. Gently stir the solution with the electrode while allowing the reading to stabilise. Try not to unsettle the sediment. Record results as pHw.
      6. Rinse electrode before next reading.

*If you have scales and volumetric flask then the accuracy of the 1:5 soil to distilled water ratio can be improved by using 20g of air-dried soil and 100ml of distilled water. Jar lids are used in the field when scales are not available.

Note: The result from pHw are commonly higher by about 0.5–0.6 pH units than those gained using a colorimetric test kit or from pH_{CaCl} (see example below). Additionally, the quality of the pH meters may also impact on the accuracy of readings. If the pH is near critical levels you should have a more accurate laboratory test done. This involves measures using a calcium chloride solution that is more buffered against variability between samples than results gained from pH_w measurements. The results determined using calcium chloride are commonly 0.5–1.0 pH units lower than the pH determined in water. For example, pH_{CaCl} 5 = pH_w 5.9. The difference between methods is more obvious in acid soils and accuracy is much more critical in these cases.

FURTHER INFORMATION

Product or service information is provided to inform the viticulture industry about available resources, and should not be interpreted as an endorsement.

The information in this Vitinote has been trialed by viticulturalists as part of the Cooperative Research Centre for Viticulture's Viticare On Farm Trials project.

For information about On Farm Trials, visit www.crcv.com.au/viticare/

A key reference on these topics is:

- Nicholas P, (Ed.) (2004) Soil, irrigation and nutrition, Grape Production Series 2, SARDI, Adelaide.

Another useful reference is:

- Nicholas P, Magarey PA and Wachtel M, (Eds.) (1994) Diseases and pests, Grape Production Series 1, Hyde Park Press, Adelaide (a glove box edition of this book is also available).

Both of these publications are available from Winetitles, 08 8292 0888 or visit www.winetitles.com.au.

Also see:

- McNab S, (1995) Efficient fertiliser application. The Australian Grapegrower and Winemaker, No. 375, p34-5.
- Rayment GE and Higginson FR, (Eds.) (1992) Australian laboratory handbook of soil and water chemical methods, Inkata Press, Melbourne.

Water management for grapevine production: Research to Practice® and *Grapevine nutrition: Research to Practice®* are training programs whose delivery can be fine-tuned to suit each region. They include topics on soil management issues.

Visit the web site at www.crcv.com.au/viticare/vitinotes/ for updates and more Vitinote titles.

Acknowledgements

The Cooperative Research Centre for Viticulture would like to acknowledge those involved in the production of the Vineyard activity guides Vitinote series.

The CRC for Viticulture is a joint venture between the following core participants, working with a wide range of supporting partners.

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