



Measuring soil pH

Viti-note Summary:

- Equipment
- Timing
- Method
- Timing

Other topics in this Viti-Notes series include:

- Measuring the infiltration rate of water into soil using the ring infiltrometer method
- A method for examining grapevine root systems
- Soil moisture monitoring
- Measuring soil porosity
- Measuring soil strength
- A method for assessing soil structure
- Taking soil samples
- *Measuring soil pH*
- Measuring soil salinity
- Measuring organic carbon in soil

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

- Strong acidity if less than 5.0.
- 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 suggests that soil pH_{CaCl} should be in the range 5.5-7.5 for best vine performance.

Soil pH outside the neutral range can influence the availability of specific nutrients to plants, as well as the activities of both beneficial and pathogenic microorganisms. Viticultural practices, such as the use of urea or ammonium-based nitrogenous fertilisers, can have acidifying effects on soils— if current commercial management techniques continue, it is inevitable that soils in many vineyards will become more acidic over time. However, given that 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 these methods are described below.

Equipment

Colorimetric test kit available from nurseries (includes mixing stick, plate, dye, barium sulphate, pH colour chart, instructions), teaspoon, recording sheet and pen.

OR

Hand held pH meter, clear plastic jar with screw-on lid, distilled water, recording sheet and pen.

Timing

This measurement is best undertaken when soil sampling is conducted and would normally be done at the same time as assessments for electrical conductivity. Soil pH should be measured in the fibrous root zone (ie. 0-20cm depth) as well as the deeper root zone (>20cm depth). Make sure the soil samples are taken inside the irrigation wetting pattern. Analysis of some mid row samples can also provide a good indication of the effect of vineyard management practices on soil pH.

Method

- 1) Take three surface soil and three subsoil samples from each site (as described in points 1-5 the *Taking soil samples* activity guide in this Viti-note series). Make sure surface soil and subsoil are not combined so that they can 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 manufacturers instructions or if not available the general procedure is as follows.

Measuring soil pH

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

OR

b) Using a portable pH meter

- Refer to instructions and calibrate your pH meter prior to each use.
- Unscrew jar lid and fill the lid level with soil. Do not compress the soil. Pour into jar.*
- Add 5 jar lids of distilled water and screw lid on tight. Shake for 5 minutes then allow to settle for 10 minutes.
- Rinse the pH meter electrodes in distilled water and dry gently with a tissue.
- 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.
- Gently stir the solution with the electrode while allowing the reading to stabilise. Try not to unsettle the sediment. Record results as pH_w.
- 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 results from pH_w are commonly higher by about 0.5-0.6 pH units than those obtained by 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 from 0.5 to 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.

Timing

The soil sampling can be done at any time of the year, although autumn and spring are the optimal times, as winter can be too wet and in summer the ground may be too hard.

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Further information

Nicholas, P. 2004. Soil, irrigation and nutrition. Adelaide: Winetitles.

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



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