viti-notes
[vineyard activity guides]

Research to Practice

Measuring soil porosity

Viti-note Summary:

- Equipment
- Timing
- Method

Soils need large pores and channels for adequate aeration and good drainage. Large pores that can be seen by the human eye are known as macropores. Mesopores and micropores are too small to be visible: they are respectively responsible for storing plant available water and holding the water that is unavailable to plant roots. The movement of air through micropores is very slow.

For good plant growth, the soil needs a balance of macro-, meso- and micropores. Soils with too many micropores will drain poorly and this will result in waterlogging. Clay subsoils often restrict water movement to depth and have a low porosity. Therefore, the porosity of the subsoil is often a good indicator of potential waterlogging of the surface soil.

Soil management can modify the porosity of a soil. Tillage and trafficking, particularly of wet soil, can destroy macro- and mesopores, while cover crops and mulches can maintain and stabilise these pores. There is a simple field method to measure soil porosity by counting the number of pores on a face of a clod of soil. This is described below.

Equipment

Shovel, fuse wire (0.1mm and 0.5mm diameter), recording sheet and pen.

Timing

This measurement is best undertaken when soil sampling is conducted. See Taking soil samples.

Method

Extract a moist sample of soil and on an undisturbed face on a clod, select a representative 25 mm^2 section (i.e. 25 mm x 25 mm). Count all pores in the size range 0.1-0.5mm using the 2 wires as a guide. Repeat 3 times at each site/depth.

NOTE: IF THE TOPSOIL IS VERY CRUMBLY (FRIABLE), THEN THE MACROPOROSITY IS GOOD, EVEN THOUGH IT IS DIFFICULT TO COUNT THE NUMBER OF PORES.

Optimal values are given in the table below.

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

Table 1. Irrigation classification and rate of soil water conductivity at varying soil pore levels. *See Cockroft for details

Number of soil pores (25 mm x 25 mm)	Soil water conductivity (mm/h)*	Irrigation classification
10	0.6	Poor
15	1.3	Acceptable for irrigation
20	2.3	"
25	3.5	"
30	4.9	Good for irrigation
40	8.5	"
50	12.9	Excellent

Acknowledgement

Further information

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

- Cockroft B, 1970. Estimation of soil permeability from counts of visible pores, Australian Journal of Experimental Agriculture and Animal Husbandry 10 (45), pp 460-1.

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