

# Soil testing and analysis

June 2005 - John Turner – Hill Laboratories

Grape growers and all other horticultural and agricultural production sectors are now being 'asked' to comply with the '**Code of Practice for Fertiliser Use**'.

The catch phrase used as the objective is "*Providing practical and specific guidance for safe, responsible and effective nutrient management*".

The objective is to outline a decision making process where the nutrient requirements are determined based on several sources of information including soil tests, leaf (or petiole) tests, fruit yield, quality and management observations such as vine vigour. Environmental impacts are assessed and this information is used to modify future nutrient application strategies. The goal is to achieve realistic production goals using appropriate inputs with minimal environmental impact.

**Soil tests** are used to estimate the nutrient supply to the crop from soil nutrient reserves. Best application of soil test information requires:

- Sample collection so that the sample is 'representative'
- Interpretation of results that includes consideration of factors that influence how soil nutrients are utilised such as moisture, temperature, pH, soil quality and physical structure, interactions between nutrients, rootstock...

**Petiole and leaf blade tests** are used to monitor the nutrient uptake by vines and to diagnose problems related to nutrient supply or nutrient status.

**Grape berry analysis** before harvest is another analytical technique that has been investigated for assessment of nitrogen content (ammonium and total N) and ratio with potassium as this affects the fermentation process and 'must' pH.

**Soil quality** testing has presented a challenge to nutrient testing laboratories. A recent development at Hill Laboratories has been to present a soil test profile that comprises the soil factors that support microbial activity and provide nitrogen as organic matter mineralises. Microbial activity and microbial biomass are very strongly influenced by soil temperature and other environmental variables.

Tests reported are Organic Matter, Total Carbon, Total Nitrogen, C/N ratio, Mineralisable N, Mineralisable N/Total N ratio.

The summary below is from '*The Nature & Properties of Soils*', Brady & Weil 13<sup>th</sup> edition, 2002 ('*Minimum data set to determine Soil Quality*').

## Physical Properties

Texture  
Rooting depth  
Drainage & WHC  
erosion

Retention and transport of water and nutrients  
Estimate of productivity potential and soil stability  
Water retention, potential for leaching, productivity & risk of erosion

## Chemical Properties

\*Total Organic Matter (OM)  
\*Active OM (AMN/TN)  
+pH

Carbon storage, potential fertility and stability of soil  
Structural stability and food for microbes  
Biological and chemical activity threshold definition

++Mineral N (NH <sub>4</sub> , NO <sub>3</sub> )	Plant available N (immediate), potential for N loss
+Extractable nutrients P, K...	Productivity and environmental quality indicators

Biological Properties

*Microbial biomass C & N	Early warning of management effect on OM, microbial activity potential
*Mineralisable N (AMN)	Soil productivity and N supply potential
Respiration rate	Microbial activity per unit of microbial biomass
Macro-organism numbers	Earthworms etc

- \* tests from the Organic Soil Profile
- + tests from the Basic Soil Profile
- ++ additional test requires special sampling and sample handling

**Saturated Paste vs. Normal soil test**

Saturated Paste extraction is simply a water extraction of the soil, as close as the laboratory can get to measuring the soil solution for nutrient and salts content. Mineral forms of elements in the concentrated water extract are measured. The additional test reports pH, EC, Nitrate-N, Ammonium-N, P, K, Ca, Mg, Na.

The Basic Soil test reports the nutrients extracted by reagents such as ammonium acetate (Ca, K, Mg, Na), sodium bicarbonate (P), Calcium sulphate (Cl) which is considered 'standard' for predicting nutrient status of soils in general.

There are specific conditions where the Saturated Paste test has advantages over the test methods traditionally used, these are soils that have high levels of sodium and/or chloride as reported using standard extractions and the EC (electrical conductivity) or soluble salts levels are either not at expected levels or there is reason to gain more information about the nature of the salts present.

Hill Laboratories does not provide interpretation guidelines for this test.