GRAPE VINE TISSUE ANALYSIS

To determine the nutrient status of grape vines through grape tissue analysis, two sampling methods are generally recommended: sampling of petioles at the time of flowering, and sampling of leaf blades at the time of fruit ripening ('veraison'). This technical note discusses the advantages and disadvantages of each of these two sampling methods, and introduces a third option of sampling both petioles and blades at flowering.

Deciding When To Sample

Analysis at flowering has the advantage that intervention is possible to correct nutritional problems for the current crop. However, the period of rapid nutrient change in tissue from pre-flowering to fruit-set means that timing of sampling is important. Analysis of samples taken at the end of the growing season, when the fruit is ripening, is less problematic. Since these later analyses reflect the nutrient supply for most of the season, they are used for planning the next season's fertiliser programme.

Different Mobilities of Nutrients

Diagnosis of deficiencies is made more complex by the different mobility of some elements. *Mobile* nutrients such as nitrogen, phosphorus, magnesium and potassium are redistributed from older leaves to the growing points so that deficiency will be apparent in the older leaves first. *Immobile* nutrients such as calcium, boron and zinc are incorporated into older plant tissue and are not available for subsequent redistribution within the plant. Deficiency of these elements will therefore appear in the growing points of the vine first. Analysis of either petiole or leaf blade will give a reasonable estimation of nutrient status. However, petiole analysis best indicates the current movement of nutrients towards the leaf blade, and is sensitive to the status of 'mobile' nutrients such as N, P, K, Mg. Leaf blade analysis indicates the overall status of all nutrients including 'immobile' ones such as Ca and trace elements Mn, Zn, Cu, B.

Analysis of petioles at flowering will therefore only provide limited information regarding sufficiency of immobile elements, particularly boron. Analysis of the leaf blade at flowering will provide a better early warning for this trace element deficiency.

The **combined grape profile (CGP)** has been set up by Hill Laboratories as a cost-effective option for monitoring the more mobile elements in the petiole *and* the less mobile elements in the blade at flowering. The standard sampling regime of selecting leaves opposite the basal cluster from exposed shoots on the outside of the vine is maintained. The petiole and blade should be separated immediately after sampling and both tissue parts carefully identified in separate sample bags, with CGP written on the request form under "Other Tests" (for convenience place the bag containing the petiole inside the bag containing the blades). Analysis of either the petiole or leaf blade only is also still available.

Leaf analysis options are:

Plant part	Stage	Profile code	Elements
Petiole + blade	Flowering	CGP	Petiole = Nitrate-N,P,K,Mg Blade = N,P,K,S,Ca,Mg,Na,Fe,Mn, Zn,Cu,B
Petiole	Flowering/fruit ripening	BP(GPet),NO3(Pet)	N,P,K,S,Ca,Mg,Na,Fe,Mn,Zn,Cu,B,NO3-N
Blade	Flowering/fruit ripening	BP	N,P,K,S,Ca,Mg,Na,Fe,Mn,Zn,Cu,B

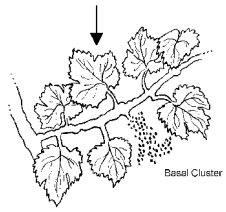
The **importance of nitrogen:** Research in Australia[2] has shown that “nitrogen is the nutrient that will have the most dramatic effect on yield and canopy growth in the vineyard, and fermentation time and wine quality in the winery.” Trials have been undertaken to gain an understanding of how application of this nutrient affects each growth stage, and to establish relevant interpretation for petiole and leaf blade levels.

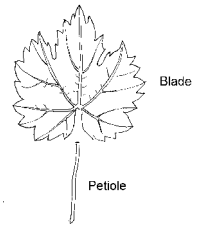
Total nitrogen levels found in the petiole appear to be less variable than nitrate-nitrogen levels measured. Confusion has arisen in the past when low nitrate-N but high total-N results have been reported for vigorously growing vines. For any given total-N value there can be a fairly wide range of nitrate-N values. The time of day when leaves are picked and degree of shading may be a factor contributing to the variability in nitrate-N.

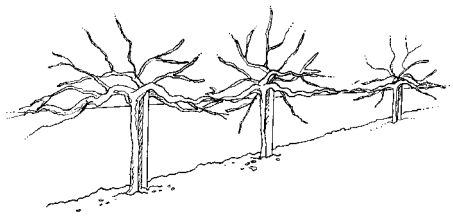
Interpretation of the early season petiole results should consider both the total-N and nitrate-N levels (see Table 1 below), but for the later season blade sample, total-N alone is sufficient. For the 2004-2005 season, we have modified the CGP test profile, so that the total N is accessed from the blade, and not the petiole, as this is thought to better reflect the overall N status.

Table 1. Interpretation of N status from petiole analysis at flowering

	Nitrate-N (Petiole)				
Total-N (Blade)		< 600	600 – 1500	1500 – 2500	> 2500
	1.5	Deficient	Deficient	Unusual	Unusual
	1.5 – 2.4	Marginal	Marginal	**Adequate**	Unusual
	2.4 – 2.8	Marginal	**Adequate**	**Adequate**	High
	2.8 – 4.0	**Adequate**	**Adequate**	High	High
	> 4.0	**Adequate**	High	High	High







Basal Leaf

Reference to the basal leaf is a generally accepted shorthand method of describing the leaf opposite the bunch, or the leaf from the same position on the shoot as a bunch if there were no bunches on the vine. This equates to leaf position four or five from the base of the shoot.

Youngest Mature Leaf

The youngest mature leaf is found at leaf number five or six back from the growing tip.

Flowering

Flowering is defined as when the majority of bunches (or clusters as they are sometimes referred to) on the vine are in full flower. This may be difficult to determine in cool climates where flowering can be spread over several weeks. It will vary with variety, rootstock and season.

Fruit set

Fruit set is defined as the stage of berry development where the majority of bunches on the vine have berries 3 to 5 mm in diameter. All unfertilized berries should have shed at this stage.

Veraison

The stage of development when berries begin to soften and colour

References:

[1] Fertiliser recommendations for horticultural crops. HortResearch HortNET, 1997.
2 Fertilisers for Wine Grapes, 3rd Edition, B.H. Goldspink & K.M.Howes, Dept. of Agriculture, Western Australia, April 2001.