FROM VINE TO WINE

Wine quality is often argued to start in the vineyard. The most common perception is that a stressed vine makes a great wine and many growers and winemakers would agree. The final answer comes from the winemaker as the winemaker dictates the style of the wine being made. Some winemakers prefer fruit from low yielding vines to attain intensity of flavour for the final product being produced and growers will need to assess the viability of growing such a crop. However if this low yielding crop is also a crop which provides to be problematic with slow or stuck fermentation, then the solution must come from the vineyard.

Equally, if there is a possibility to improve yield and wine quality by upgrading the flavour and bouquet within the parameters of the wine style required by the winemaker through the restructuring of fertiliser applications, then this is an avenue, which should be explored by growers.

Vineyard management appears to be the primary focus of many growers and advisers to the wine industry as a means of improving wine grape quality. Research has been done on canopy management; bunch thinning as well as rootstock selection on overall wine quality and vine productivity. However, vine nutrition is inevitably overlooked as an important aspect of vineyard management to improve wine quality. Existing research into vine nutrition has indicated that major gains can be made in wine quality and yield by having a greater understanding of the uptake of nutrients by the vine, the best fertiliser sources to supply those nutrients and the rate and timing of application required to achieve the desired result.

Growers must document all fertiliser inputs into the vineyard and monitor the vine's performance in response to those fertilisers. Tissue and soil analysis programs should be an integral part of the vineyard manager's decision making on fertiliser inputs and selection. This is where using a balanced analysis approach can assist vineyard managers in making an informed decision. In many cases there may be environmental pressures to reduce application rates and or be more selective about the sources of nutrients being used. Timing of fertiliser applications will not only influence yield and canopy, but also the time taken to complete fermentation and the final quality of the wine.

All elements are of equal importance in plant nutrition, however assessing vine requirements and the requirements of the winemaker for the wine style required are two very different aspects. There are many interactions and inter-relationships between elements; however the most important is that between potassium and nitrogen. Both potassium and nitrogen are critical for wine grape quality.

Nitrogen

Nitrogen is used by yeast to convert sugar into alcohol and in doing so, this imparts flavour and aroma compounds into the wine. The amino acid driven component of nitrogen has been known to have a greater influence on wine flavour and aroma than winery added nitrogen[1]. The rate of fermentation is also dictated by the concentration of nitrogen in the must[2]. The nitrogen applied to the vines between fruit set and veraison will have the greatest impact on nitrogen concentration in the juice at harvest[3].

Potassium

Potassium is important in sugar production (Brix) and colour but can have detrimental effects on acid balance of the finished wine if the rate of application is too high. It is very important to achieve and maintain a good balance between potassium and nitrogen in the must. This is best achieved by maintaining nitrogen and potassium nutrition in the vine based on leaf samples.

Potassium levels in the vines and in the wine is very critical as potassium can affect the tartaric acid and malic acid levels in the wine. This is more critical in reds and has not yet been proven to be as critical in whites. The evidence to date shows that the use of potassium-based fertilisers has had a negative effect on

wine quality. This has been for many reasons, the primary reason being over-use of potassium, as well as the forms by which this element is delivered.

Sulphate of Potash (SOP), Muriate of Potash (MOP) and Potassium Nitrate have been the primary method of potassium application in standard viticultural practices, however fertiliser technology has changed dramatically in recent times to better supply potassium in a form which is best utilised by vines as well as being more "winemaker friendly".

High potassium levels in wine have been proven to increase wine pH, lower acid levels and slow fermentation times. This is the caution supplied to growers at a vineyard level. However the benefits of potassium in wine and the necessity of this element for colour and brix are negated by the "fears" of overuse of this element.

The other important element is phosphorous. Phosphorous does not appear to have any significant effect on the wine making process, however it is important in berry set and development, that is, in providing a sufficiently large and stronger skin for maintaining juice volume.

This poses the question…. can potassium be used to enhance wine grape quality?

The answer is yes. Potassium can be applied to wine grapes to achieve improved colour, Brix and to bring forward harvest dates by one week at the least. Studies over the past five years in Australia and New Zealand have shown that the use of a commercial potassium product containing no nitrogen and balanced amounts of potassium and phosphorous (0-5-20) can increase colour and brix levels when applications are targeted to specific timings during the season, such as veraison and before harvest.

The example below is on Merlot, which is a difficult variety to ripen and colour evenly.

	Merlot Treated	**Merlot Untreated**
Harvest date	14/03/03	20/03/03
Average Final Brix	21.2	19.8
Colour per berry	27.62	19.92

Table 1. Comparisons of foliar potassium treated grapes (0-5-20) to untreated with potassium.

Treated grapes in Shiraz | Untreated grapes in Shiraz

The treated block was harvested 6 days prior (earlier) to the untreated block. This shows the untreated block was left to ripen for an additional six days in order to achieve the Brix level of 19.8. The colour per berry significantly favoured the treated block, where there is an increase in anthocyanin per berry of 7.7grams compared to where grapes were not treated with potassium.

The advantages of earlier harvest dates are the risks associated to leaving grapes on the vine longer such as infections of Botrytis and other diseases which become prevalent once sugar levels are elevated in berries and climatic conditions are conducive to these diseases. Increased colour and brix are beneficial to the grape grower and the winemaker as a better product has passed from vine to wine. Note in the photographs the difference in uniformity in colour between treated and untreated on Shiraz. Further to this, there were no negative effects

on the pH of the wine, nor were there any problems associated with the polyphenols according to the winemaker handling the assessment.

Summary
Vine nutrition is an important aspect of wine grape production. The underestimation of the importance of this management technique has lead to many other changes in field management in order to support vine production and attempt to achieve the desired outcomes. Fear of the use of certain nutrients such as potassium should be tempered with knowledge, understanding and the introduction of new technology. Nutrition needs to be allocated the same level of importance as any other aspect of vine production for profitability and viability in such a competitive, quality driven industry.

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