EIT K-Forte (0-5-20) Trial
Summary

Introduction:

Potassium (K) is essential for vine growth and yield. Grape berries are a strong sink for potassium, particularly during ripening. Potassium can be applied to wine grapes to achieve improved colour, Brix and to bring forward harvest dates where necessary. This element can be used as a 'management tool' to aid in ripening varieties which struggle to achieve desired Brix or desired colour.

Increased colour and / or Brix are beneficial to the grape grower and the winemaker as a better product is passed from vine to wine. 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. These "fears" resulted from historical trials which showed excess potassium may have a negative impact on wine quality, mainly because it decreases free tartaric acid resulting in an increase in the pH of grape juice, must and wine. This is more critical in reds and has not yet been proven to be as critical in whites.

Sulphate of Potash (SOP), Muriate of Potash (MOP) and Potassium Nitrate have been the primary forms of potassium application in standard viticultural practices. Evidence to date shows that the use of such potassium based fertilisers has had a negative effect on wine quality; the primary reason being over-use of potassium, as well as the forms by which this element is delivered. 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".

K-Forte, a commercially available foliar potassium based product containing no nitrogen and balanced amounts of potassium and phosphorous (0-5-20), was assessed in trials on Merlot to determine its ability to increase colour and Brix of grapes in the 2004 season. Wine colour analyses as well as microvinification trials were subsequently carried out by Eastern Institute of Technology (EIT) on four chosen experimental lots of grapes.

Analysis of the end product (i.e. wine analysis) was requested in order to prove that K-Forte, unlike all other potassium fertilisers available on the market, has no adverse effect on wine quality, as well as to highlight any benefits of using the product such as improved colour of wine and other sensory attributes. The four lots of Merlot plots were processed to make four wines known as; Te Awa Control, Te Awa Trial, Tametea Control and Tametea Trial.

Results:

Table 1.1 Results summary

Sample	**Unfermented Juice**			**Final Wine**						
Harvested 31/03/2004	**Brix**	**TA**	**pH**	**Alc**	**Res Sugar**	**TA**	**pH**	**VA**	**SO free**	**SO2 total**
Te Awa Control processed 31/03/2004	24.3	7.45	3.28	13.3	2.5	5.20	3.59	0.64	14	31
Te Awa Trial processed 31/03/2004	24.1	7.34	3.32	13.5	2.1	5.10	3.55	0.48	3	6
Tametea Control processed /04/2004	23.8	5.4	3.38	13.4	2.2	5.40	3.53	.59	13	24
Tametea Trial processed /04/2004	24.9	5.15	3.34	14.1	2.8	5.70	3.35	0.54	18	36

Above results are expressed as outlined below:-
TA: Total acidity, determined titrimetrically and expressed as tartaric acid equivalent.
Alcohol: % vo;/vol
Residual sugar: g/L, determined by Rebelein method
VA volatile acidity: expressed as acetic acid equivalent
SO_2 free and total: ppm

The above table of results supports the interpretation that there is no appreciable difference between the control and K-Forte trial wines produced in each of the two microvinifications and hence no adverse effects of K-Forte with regard to alcohol conversion, residual sugar, pH, titratable acidity and volatile acidity.

In terms of Brix, the Te Awa trial showed no significant difference between trial and control in a year of high Brix. However results show a significant increase of 1.1 Brix in the Tametea Trial (24.9 Brix) over the control (23.8 Brix). Considering K-Forte was applied at a rate of 6L/Ha compared to the normal recommended rate of 8L/ha, this increase in Brix is quite generous. Furthermore, the areas in which this trial was conducted typically have a high potassium based soil type. The application of K-Forte did not negatively affect the vines growing in high potassium soils versus the control plots.

The Te Awa Merlot and the Tametea Merlot samples were harvested approximately one to two days apart, Te Awa before Tametea. The colour and the relative amount of phenolics of the grape berries was then determined.

Wine Colour Analyses:

Table 1.2 below shows the amount of light that the wine absorbs at two key wavelength, namely A520 nm and A420 nm. A520 relates to the concentration of red coloured pigments, whereas A420 relates to the concentration of yellow/brown pigments. The sum of these two figures (A520 + A420) represents the wine colour density value, relating to the visual description of the wines. In order to achieve higher accuracy, the wines were diluted 10 fold; this dilution has been taken into account when calculating the colour density values. Wine colour hue is expressed as the ratio of the measurements of A420 / A520. It expresses the hue (tint or shade) of the colour rather than its intensity.

Table 1.2 Wine colour analyses

Wavelength	Te Awa Trial	Te Awa Control	Tametea Trial	Tametea Control
A520nm	0.361	0.325	0.705	0.467
A420nm	0.295	0.263	0.516	0.349
(A520 + A420) x10	**6.56**	**5.88**	**12.21**	**8.61**
A420 / A520	**0.82**	**0.81**	**0.73**	**0.75**

The above results show that the K-Forte trial wines of each Te Awa and Tametea Merlots' are significantly deeper in colour than those from the corresponding control samples, with the trial sample of the Tametea Merlot showing the highest colour reading (12.21 compared to 8.61 – an increase of 3.6 over the control).

Regarding the colour hue or tint of the wines, the ratios A420/A520 show that both Te Awa wines tend to have a higher proportion of their overall colour as yellow or brown pigments when compared to Tametea wines. This does not mean however, that the absolute contribution of the yellow/brown components in these two wines are smaller than that of Te Awa wines, but that the red components are so much more intense.

The phenolic compounds were significantly different between the Te Awa and the Tametea Merlot, with the Tametea having a significantly higher amount of phenolic compounds (relative values) both per berry

and per gram berry weight. However differences in phenolics per berry or per gram berry weight, between control and trial samples in both trials, were not significant. Nor was there a significant difference realized in berry weights between the control and trial samples in the two Merlot blocks. This result proves that K-Forte does not increases berry weights in wine grapes which otherwise could cause poor quality wine.

Conclusion:

Independent analyses performed by the EIT have dispelled many of the myths surrounding K-Forte with regards to its potassium content and the effects of this potassium may have on wine grapes. The trial proved that K-Forte had no negative effects on pH, TA and phenolic aspects of wine quality with results showing no significant differences between the trial and control wines.

K-Forte was also successful in increasing wine colour with both Trial Merlot wines having higher wine density readings than the control wines. K-Forte also managed to increase Brix significantly in one of the trial blocks even at lowest rate of application of 6L/ha. Had K-Forte been applied at the higher recommended rate of 8L/ha then possibly more of a significant increase in colour as well as a more convincing increase in Brix may have been realised.

Furthermore, there was no significant increase in berry weights between the trial and control, further illustrating that K-Forte does not increase berry size and weight in wine grapes.

This trial is therefore very important as it is the first and only of its kind in which a foliar potassium containing product has proven to increase colour and Brix, without compromising wine quality. K-Forte can be effectively used as a tool in vineyard management in order to improve overall wine quality without any detrimental effects.