Survey of Yeast Assimilable Nitrogen Status in Chardonnay and Shiraz Grapes from the Granite Belt 2012 Vintage

Vintessential Laboratories, PO Box 2244, Dromana, VIC, Australia

Yeast Assimilable Nitrogen (YAN) is necessary for yeast growth and fermentation activity in grape must. It is comprised of two major components, amino acid nitrogen (AAN) and ammonia nitrogen (AN). Maintaining an adequate supply of YAN is essential for a successful fermentation, as both deficiency and excess of nitrogen can cause problems. Low YAN levels can lead to slow or stuck fermentations due to poor fermentation vigour, with associated increased production of hydrogen sulphide. High YAN levels can result in increased fermentation vigour, which can lead to increased volatile acidity in the final wine. Residual nitrogen at the completion of fermentation can also increase the risk of microbial instability. Several studies have confirmed that a typical must requires a minimum YAN of 140mg/L to successfully complete fermentation (Bell & Henschke, 2005). This value should be used as a rough guide though, as higher concentrations may be required depending on yeast strain, must sugar content and fermentation conditions.

YAN status was determined for Chardonnay and Shiraz grape samples from the Granite Belt during the 2012 growing season. 22 samples were received from 9 wineries. Samples were analysed for ammonia nitrogen by enzymatic analysis and amino acid nitrogen by NOPA assay.

YAN Values and Relationship with Variety

YAN values were found to vary considerably, from 61 to 190mg/L, with an average (all samples) of 130mg/L. The average Chardonnay YAN value (150mg/L) was higher than Shiraz (120mg/L), this difference was mostly attributed to the higher AAN component of YAN in Chardonnay samples, as illustrated in figure 1.

50% of Chardonnay samples and 70% of Shiraz samples analysed had YAN values below 140mg/L.

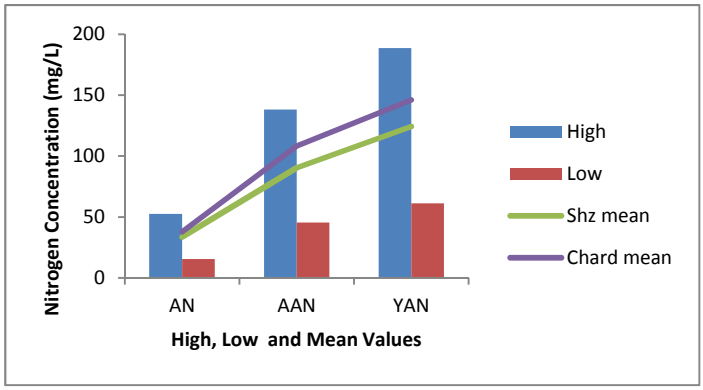

Figure 1: Range of AN, AAN and YAN values with averages.

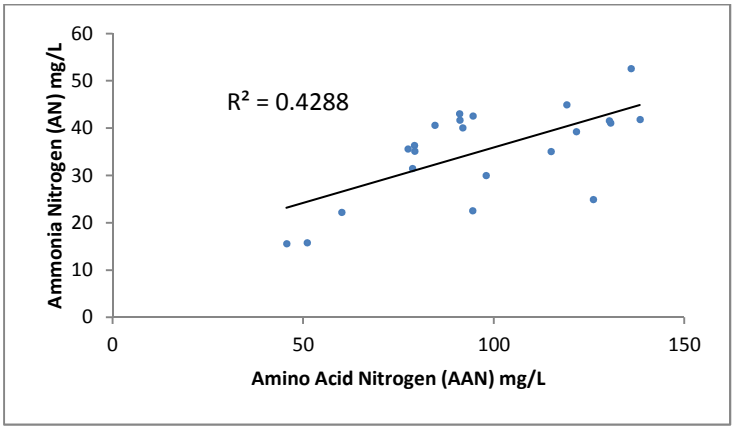

Figure 2: Relationship between AN and AAN concentration.

Relationship between AN and AAN

AAN was more abundant than AN in the samples analysed (figure 1). The relationship of AAN to AN has a correlation coefficient of only 0.43, indicating a low correlation between the two YAN components. This finding is consistent with Butzke (1998), who could not find a correlation between AAN and AN in a study of >1500 must samples. As such, analysis of one component alone cannot be used to accurately predict total YAN.

Changes in YAN during Shiraz Berry Development

Five vineyards submitted Shiraz grape samples from the same block and variety several times during the growing season. The changes in AN, AAN and YAN values are illustrated in figure 3. The general trend was for AN levels to decrease (in 3 of 5 vineyards), AAN levels to increase (in all vineyards) and YAN values to increase (in 4 of 5 vineyards). This is consistent with Iland *et al* (2011), who states that changes in concentration of total nitrogen content increase during berry development. Most of the increase takes place after verasion, the largest increase being during the period from mid to late ripening. Typically, arginine (a component of AAN) content continues to increase from verasion until harvest, and ammonium decreases.

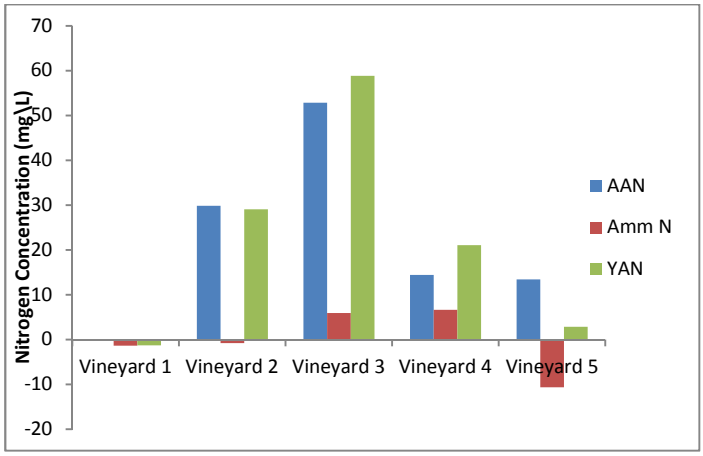

Figure 3: Changes in YAN during Shiraz berry development.

Relationship between YAN Values and Vine Age

YAN values were found to generally increase with increasing vine age (figure 4). There was considerable sample to sample variance however and the increase observed was less significant for vines greater than 15 years old.

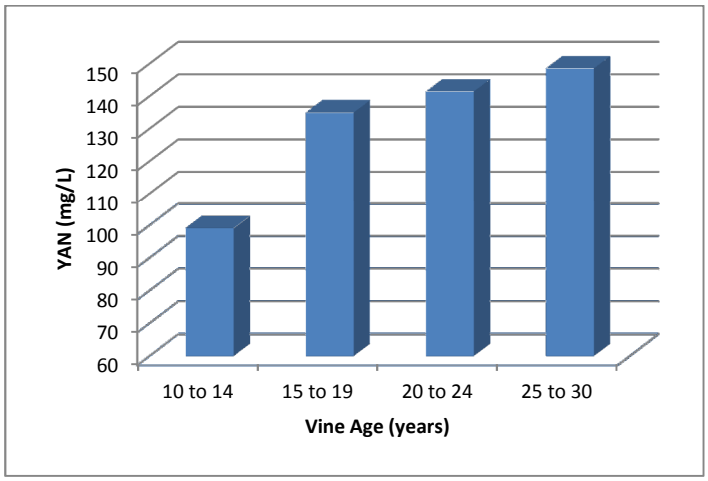

Figure 4: Average YAN values for each vine age range.

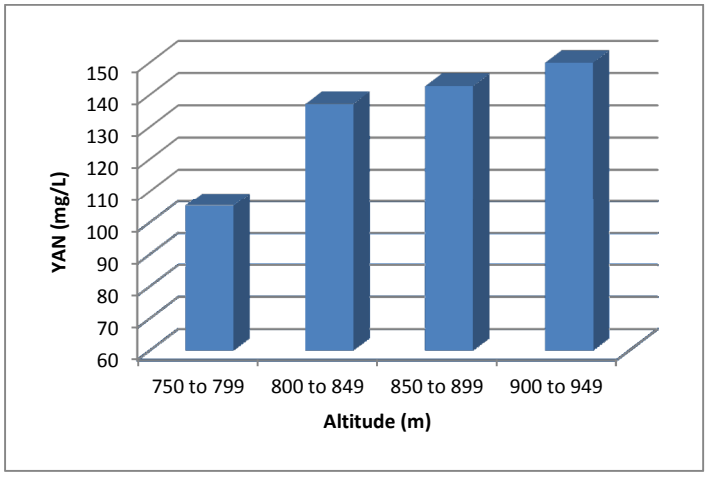

Figure 5: Average YAN values for each altitude range.

Relationship between YAN Values and Altitude

The Granite Belt has an altitude ranging from 700m to over 1200m, with all vineyards participating in the survey located more than 750m above sea level. There was a relatively small variance in reported altitude of individual vineyards and it was found that as altitude increased, so did average YAN values. A similar trend was found in a study conducted on the Mornington Peninsula in Victoria (Vallesi & Howell, 2001).

Conclusion

There are many factors that can affect YAN concentration in grapes and must. This survey identified some of these factors, including variety, geographic location, vine age and stage of berry development. Other factors affecting YAN concentration include rootstock, soil type and nutrient status, seasonal variation and juice clarification practices. Sample numbers received for the survey were low, so while the results did not reveal relationships with high levels of statistical significance, the trends identified and discussed were consistent with previous research.

Over 50% of samples analysed had YAN levels below 140mg/L, the generally accepted required concentration for a successful ferment. This indicates that nitrogen supplementation may be required at the juice/must stage. The variance in YAN levels highlights the importance of analysing YAN in must prior to fermentation and adding optimum doses of supplements (eg. DAP), as opposed to adding an arbitrary amount of nitrogen regardless of nutrient status. The timing of YAN analysis is also important and should be done just prior to fermentation. Earlier YAN analysis may give misleading results due to the changes in nutrient levels during berry development and juice clarification. Following these guidelines will help to avoid the problems associated with excess or deficient nitrogen levels.

References

Henschke, P.A. and Bell, S. *Implications of nitrogen nutrition for grapes, fermentation and wine*. Australian Journal of Grape and Wine Research (2005).

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Acknowledgements

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