

YAN analysis. It's a must.

ask the
AWRI

Every year, the AWRI helpdesk receives calls from frustrated winemakers dealing with fermentation issues, often where their ferments have not met expectations. Slow, sluggish, or even stuck fermentations are among the most common concerns. When winemakers report these problems, the helpdesk team's first question is usually: What was the YAN (yeast assimilable nitrogen) concentration at the start of fermentation? YAN analysis gives insight into the nitrogen status of grapes, musts and juices—specifically, the amount of nitrogen available for yeast to use during fermentation. While ensuring sufficient YAN alone will not guarantee a flawless fermentation, it plays a key role in ensuring the yeast start strong and continue to perform as the winemaker intends. In this column, AWRI Extension Specialist **Matt Holdstock** answers some of the key questions asked by winemakers on this topic.

When is the best time to analyse for YAN?

Measuring YAN in grapes/juice provides useful information about the amount of nitrogen available for yeast to use during fermentation. If YAN levels are low, adding DAP or other nitrogen sources can help prevent fermentation problems. The timing of YAN analysis is important and should be conducted as soon as possible after harvest. If this is not practicable, samples can be frozen and analysed when convenient. As soon as there is any sign of fermentation, nitrogen is already being utilised by yeast and/or bacteria, so to obtain the most accurate result, it is recommended that YAN analysis be performed on the last maturity sample taken prior to harvest, and before any fermentation commences.

If a juice has a very low YAN, does this always lead to a stuck ferment?

The minimum YAN concentration required for a healthy white ferment is generally considered to be 150 mg N/L. The further below 150 mg N/L the YAN concentration is, the greater the chance of

a fermentation problem (Henschke and Jiranek 1993). Below this concentration, it is recommended that juice or must be supplemented with additional nitrogen to prevent fermentation problems. In order to take action it is necessary to measure the initial concentration of YAN in the juice or must.

I have a small lab, can I measure YAN? What equipment do I need?

YAN can be quantified by independent analysis of ammonia (NH₃) and alpha amino nitrogen (αAN) – also referred to as free-amino nitrogen or primary amino acid nitrogen. These two components of YAN are typically analysed enzymatically using an ammonia enzyme kit and a kit that analyses for primary/alpha amino acid nitrogen. YAN is then calculated using the following equation:

$$[\text{YAN}] = 0.8225 * [\text{NH}_3] + [\alpha\text{AN}]$$

The equipment required to perform this includes volumetric glassware, calibrated pipettes and a spectrophotometer. If a laboratory is set up to analyse for malic and glucose + fructose by enzyme, it

should have all the equipment required to analyse for YAN. Ammonia analysis can also be performed using an ion selective electrode and αAN analysis can also be performed by high performance liquid chromatography and infra-red spectroscopy.

What is the best way to supplement a low YAN must?

YAN supplementation can be done in one of two ways in the winery. The most common (and probably most cost-effective) way is to add diammonium phosphate (DAP). This provides the must with an instant hit of inorganic nitrogen from ammonia, which exists as ammonium ions in grape must, and is preferentially used by the yeast over the nitrogen from the primary amino acids. The second way is to use a proprietary nutrient mix, which often contains DAP, but also includes varying mixtures of other compounds beneficial to yeast such as amino acids, yeast lysates, peptides, glutathione, organic nitrogen, vitamins and trace elements. These complex nutrient mixtures vary in their make-

up and as such contribute differing amounts of YAN to a ferment. Work by Ugliano *et al.* (2007) showed that when YAN is very low, other nutrients are also low and it can therefore be beneficial to supplement juices with proprietary yeast food that contains more complex forms of nitrogen, as well as vitamins, lipids and minerals.

When is the best time to supplement a ferment?

The best time to supplement a low YAN ferment is often a hotly debated question. Should you supplement straight away or should you wait 24 hours or until the ferment starts? Is there value in adding nitrogen later in fermentation? AWRI has had many discussions with winemakers over the years about the timing of nitrogen supplementation and has reached the conclusion that successful fermentations can be completed under many different timings. However, we do lean towards recommending early supplementation and having nitrogen available to support the large yeast biomass formation at the start of a ferment as the best approach to ensure yeast health for successful fermentations.

What YAN level should I be aiming for?

Numerous studies have shown that the availability of nitrogen can influence the production of various groups of volatile compounds and the aroma of the wine. Ugliano *et al.* (2007) found that for a Chardonnay wine the aroma and flavour can be drastically modified by changing the initial YAN concentration of the juice. In this study, low YAN juices produced more complex wines with less fruity aromas, moderate YAN juices produced cleaner and fruitier wines and high YAN sometimes led to very estery wines (Ugliano *et al.* 2007).

To prevent fermentation problems, the AWRI recommends an optimum YAN concentration for white juices of 250-350 mg/L and an optimum YAN concentration for red musts of 250 mg/L. The AWRI winemaking calculators (available as an app or from the AWRI website) can be used to calculate DAP additions to achieve a target YAN level.

For help with fermentation related issues or any other winemaking or viticulture questions, please contact the AWRI helpdesk on helpdesk@awri.com.au or 08 8313 6600.

References

Henschke, P.A., Jiranek, V. 1993. Yeasts – metabolism of nitrogen compounds. Fleet, G.H. (ed.) *Wine microbiology and biotechnology*. Chur, Switzerland: Harwood Academic Publishers: 77-164.

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