AWRI

The Australian Wine Research Institute

Measuring extractable tannin in grapes

Introduction

Recently published research has identified that the use of a 'wine-like' 15% ethanol extraction method when analysing grape tannins provides a strong indication of tannin concentration that is likely to result when those grapes are made into wine. The AWRI has developed a rapid and practical method for determining extractable tannins in red grapes, which involves gentle crushing of grapes by hand and analysis of the extract using UV-Vis spectral data. This capability is now available for access through the WineCloud.

Why is this important?

The concentration of tannins and anthocyanins in red grapes is an important factor in defining the colour and texture of red wines and is influenced by a wide range of factors. These compounds are present in the pulp, skins and seeds of grapes, but the degree to which they are extracted during the winemaking process can vary significantly.

Most grape analysis methods use an exhaustive extraction approach to maximise tannin extraction from the grapes. This typically involves the use of high power homogenisation equipment to break up the seeds and skins as much as possible. The reality of the winemaking process, however, is that the extraction environment is much milder and leads to a lower concentration of (predominantly skin) tannins in the finished wine.

The application of a 'wine-like' extraction method provides a good indicator for tannin concentrations that are extractable during fermentation and can provide winemakers with the information they need to make informed decisions for the processing of grapes and achieve specific targeted concentrations in the finished wines. For example, for grapes with a high level of extractable tannin, adequate extraction may be obtained through a short skin-contact period; whereas for grapes exhibiting a relatively low level of extractable tannin, extended maceration time or the use of targeted yeasts, known to increase tannin extraction (AWRI publications #1542, #1562), may be required.

An understanding of the extractable tannin component in grapes can be used for:

- More efficient viticultural management and improved harvesting logistics
- More objective fruit grading and allocation
- Enhanced ferment management to achieve desired tannin and colour profile
- Better understanding of factors influencing wine colour development and stability

How does extractable tannin compare to what I'm currently measuring?

The WineCloud already allows users to measure the total tannin component in grapes, but this only reflects the 'total tannin potential' of the grapes, rather than the actual tannin concentration that could realistically be expected to be extracted during winemaking.

A detailed study was carried out (AWRI publication #1616) to compare the total anthocyanins and tannin measured from extraction of grapes using two different methods:

1) The standard industry method – 50% acidified ethanol extraction of grape homogenate (Iland et al. 2004).
2) A new 'wine-like' extraction method which involves gentle crushing of 50 g grapes, adjusting to 15% (v/v) ethanol, pH 3.4 and extraction for 40 hours.

The grapes were vinified using a standardised winemaking procedure in triplicate 1 kg lots and the wines produced were analysed for tannin and anthocyanin using the MCP tannin assay and the modified Somers method respectively. The study included 39 batches of Cabernet Sauvignon and Shiraz grapes at different ripeness levels, from various regions within Australia.

Grape anthocyanin concentrations, measured using the two extraction methods, correlated strongly with the anthocyanin concentrations in the wines (Figure 1B, D). Grape tannin levels were strongly correlated with the tannin levels seen in the wines when the 15% method was employed (Figure 1A). When considered on a varietal basis, correlations between the grape tannins measured using the 50% extraction method and resulting wine tannins were strong (Figure 1C).

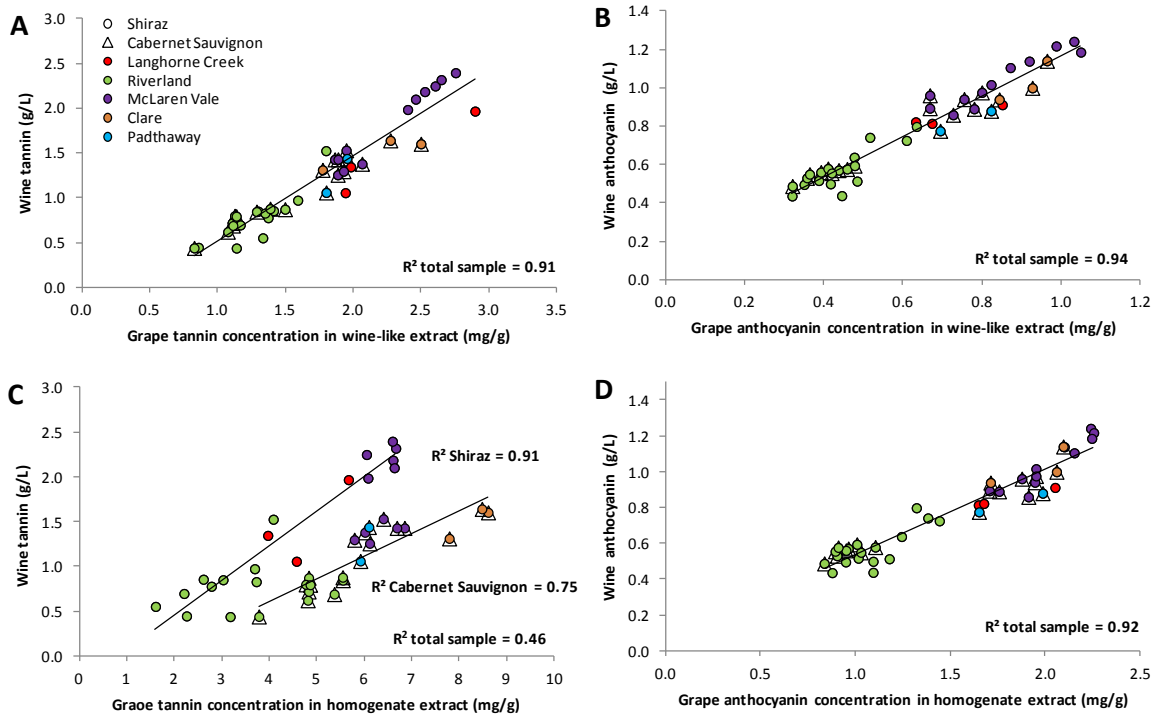

Figure 1. Correlation of grape tannin and anthocyanin concentrations, measured using two different extraction methods, with resulting wine tannin and anthocyanin concentrations

The actual concentrations of grape anthocyanins and tannins measured using the 15% method were very similar to those observed in the wines. The concentrations measured using the 50% method were very different to the levels seen in the wines: grape anthocyanins were approximately twice the final concentration in the wines and grape tannins tended to be significantly over-estimated compared with tannin concentrations in the wines. The relative difference between the grape and wine tannin concentrations was higher with Cabernet Sauvignon than with Shiraz.

Providing the capability to measure extractable tannin

A number of different methods are available for determining the tannin and anthocyanin concentrations in grapes and wine, but very few provide the capability to directly explore the relationship between the two. AWRI Commercial Services has built a calibration model that allows the prediction of extractable grape tannin concentration using absorbance values at three specific wavelengths (280 nm, 320 nm and 520 nm). The relationship between tannin concentration measured using the reference MCP assay and that predicted using UV-Vis data is strong, with the calibration model exhibiting a standard measurement error of 0.18 g/L total tannin.

The methods available through the WineCloud can be used to investigate both the 'total tannin potential' and extractable tannin components in grapes and provide a better understanding of the likely phenolic profile of the resulting wines. Being able to identify the optimal winemaking approach for any individual batch of grapes could be a very powerful weapon in the winemaker's arsenal.

Where can I find out more?

For more information on the relevance or application of phenolics, colour or tannin measurements, please contact Neil Scrimgeour.

Phone 08 8313 6600 **Fax** 08 8313 6601

Email thewinecloud@awri.com.au **Websites** www.awri.com.au www.thewinecloud.com.au

Address P.O. Box 197, Glen Osmond, South Australia 5064

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