Condensed tannin and cell wall composition in wine grapes: Influence on tannin extraction from grapes into wine

by

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ABSTRACT

Condensed tannins derived from the grape berry contribute to the organoleptic properties of wine, in particular, astringency, as well as wine colour and aging stability. The contribution of different grape tannin structures to wine quality is not well understood. In particular, the measurement of tannin in grapes is not indicative of the amount and type of tannin extracted into wine, which makes it difficult to predict the impact on wine quality. Tannin extraction is thought to be influenced by interactions between tannins and cell walls of the grape berry.

This study aimed to investigate the influence of grape tannin and cell wall composition on extraction of tannin into wine. Tannin distribution in terms of the distribution of polymer length or degree of polymerisation (DP), the concentration and subunit composition was determined in grape skin, seed and wine of Shiraz and Cabernet Sauvignon wine grapes. The polysaccharide composition and tannin binding capacity of cell walls and the amount of tannin extracted into wine at different grape maturity levels were also investigated.

The extent of variation in Shiraz skin tannin distribution and cell wall structure and its tannin binding capacity was also investigated across a range of environmental conditions, including; Shiraz grapes grown with low, medium and high vigour canopies on Schwarzmann rootstock in Sunraysia, Australia; Shiraz grapes grown on Paulsen rootstock and own roots in Sunraysia, Australia and Shiraz grapes grown on Schwarzmann rootstock in the cooler growing region of Glenrowan, Australia.

Determination of the tannin distribution in grape seeds, skin and wine provided a more thorough characterisation of tannin than has previously been reported.

Grape seed tannin distribution was similar between varieties, whereas skin tannin distribution was influenced by varietal and environmental factors such as season and vine canopy vigour. The distribution of wine tannin was similar to grape skin with a DP less than 20. These results suggest that tannin above DP 20 are not extracted from grapes into wine during winemaking as they remain entrapped within the cell wall. A more thorough characterisation of the variation and structure of individual tannins below DP 20 would help to elucidate the tannins which are most important to wine quality.

The polysaccharide composition of grape skin and whole berries (seeds removed) varied considerably, with differences also observed between Shiraz and Cabernet Sauvignon grapes. However, there was no consistent trend in polysaccharide composition associated with maturity for either variety. There was also no link between polysaccharide composition and the tannin binding capacity of cell walls. Characterisation of polysaccharide composition and tannin binding capacity did not provide any indication of the amount of tannin that might be extracted into wine. However, the amount of cell wall material measured in grapes correlated with the amount of tannin extracted into wine. The amount of tannin extracted into wine is most likely influenced by cell wall structure such as the thickness or density of the skin cell wall rather than the composition of tannins and polysaccharides. However, the ratio of anthocyanin to tannin may also play a critical role in the stability of tannin during extraction and wine aging.

DECLARATION

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STATEMENT OF AUTHORSHIP

Detailed characterization of proanthocyanidins in skin, seeds and wine of Shiraz and Cabernet Sauvignon wine grapes (*Vitis vinifera*).

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