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# Technical notes

## **Complexity, texture and flavour ... or green, hard and herbal? Incorporation of stems and leaves in cool climate Shiraz fermentation**

In recent years there has been a resurgence of interest among winemakers, especially in cooler climate regions, in using whole bunch fermentations (including grape stems) for red wines. This technique has been most often used for Pinot Noir and Shiraz, but has also been applied to other red varieties such as Nebbiolo or even Cabernet Sauvignon. Many Victorian producers, notably in the Yarra Valley, have experimented with inclusion of differing proportions of whole bunches in their ferments, and varying amounts of uncrushed berries.

When whole berries are used, the phenomenon of carbonic maceration can occur, giving a different fruit flavour profile, often with more 'perfumed' or 'strawberry' aroma due to the presence of different amino acids available to be acted on by yeast. The presence of stems or stalks can allow additional tannins to be extracted, affecting astringency and mouth-feel, but they can also give rise to 'green' 'stemmy' aroma, and potentially bitterness.

An AWRI study touching on some of these effects has recently been completed using 2014 vintage Shiraz fruit from a premium Adelaide Hills vineyard owned by Shaw and Smith, whose assistance in this project is gratefully acknowledged. This work is part of a larger project on the effect of material other than grapes (MOG) on wine flavour, and investigations into 'green' flavour compounds in red wines.

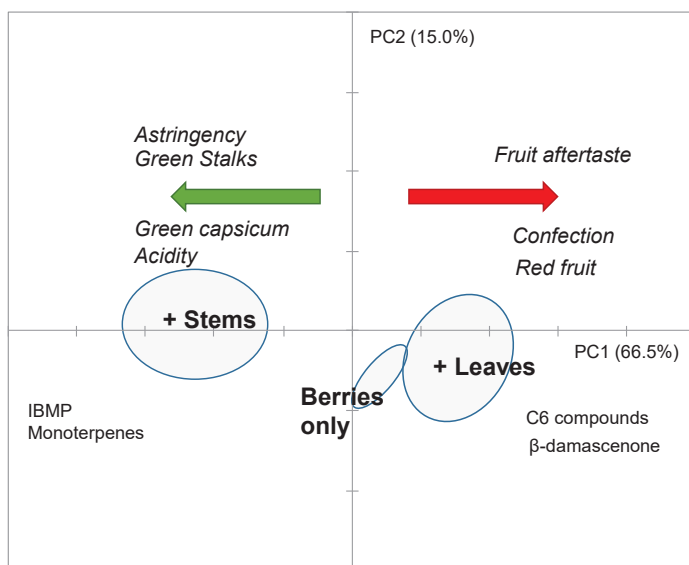
The project assessed the addition of stalks and leaves to ferments, but not the use of whole berries. The protocol involved carefully removing by hand all of the berries from around 500 kg of hand-picked grape bunches. A replicated winemaking study was performed with the following treatments:

- grape berries only
- grape berries plus grape stems (both the rachis and the peduncles – the part of the stalk that joins the bunch to the vine)
- grape berries plus the peduncles only
- grape berries plus grapevine leaves at a level equivalent to common levels of MOG in commercial ferments.

Following completion of primary and secondary fermentation, without any oak treatment, the wines were bottled. Approximately a year after bottling, a sensory descriptive analysis study and a comprehensive suite of chemical analyses were conducted.

The fermentation replicates were evaluated by a trained panel of nine highly experienced judges from the AWRI sensory descriptive analysis panel, in triplicate over three days. A set of 27 sensory attributes were rated by the judges to describe the appearance, aroma and flavour of the wines, including descriptors such as colour intensity, 'red fruit', 'dark fruit', 'confection', 'floral', 'green stalks' (tomato leaf), 'green capsicum', 'herbal' and 'cooked vegetal'. The palate terms 'astringency', 'bitterness', 'acidity', 'viscosity' and fruit flavour attributes were also rated. Following detailed statistical analysis, it was found that most of the attributes differed across the treatments, but not 'bitterness', 'cooked vegetal' or 'viscosity'.

Figure 1 shows the main differences for the *added stems* and *added grape leaves* treatments, compared to the *berries only* control. The *added stems* wines were rated higher in 'green capsicum' and 'green stalks' attributes, as well as astringency and acidity. The wines with added stems were higher in methoxyypyrazine compounds, as well as monoterpenes. In contrast, the *added leaves* treatment did not show any 'green' attributes, and was in fact rated higher in 'red fruit', 'confection' and 'fruit aftertaste' compared to the *berries only* wines. The *added leaves* gave generally higher amounts of the so-called C6 compounds (often associated with 'grassy' flavours), which derive from leaf tissue, as well as the potent fruity compound beta-damascenone, which has also previously been found in leaf material. The addition of the peduncles, not shown in Figure 1, gave somewhat elevated 'green' attributes, and also



**Figure 1.** Differences in sensory properties of Adelaide Hills Shiraz wines made from grape berries alone, grape berries plus stems and grape berries plus leaves. The main chemical compounds related to the sensory changes are also shown. (IBMP: isobutyl methoxyypyrazine.)

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a 'herbal' character. The observation of elevated methoxypyrazine concentrations is very interesting, as previously it was not considered a compound associated with Shiraz.

Overall, this study, from a single vintage experiment with a single lot of grapes, indicates that there can be numerous effects on wine sensory properties and chemical composition from including stems in a ferment. It was noteworthy and surprising that there was no enhancement of any 'green' character of the wine when leaves were added, and in fact the presence of leaves gave a fruitier wine than a wine made from grape berries alone. Further work will assess the inclusion of uncrushed whole berries, and a gradation of the amount of stems included. Assessing consumer response would also be of interest, as while the wines with added stalks were higher in 'green' flavour, they also were clearly higher in astringency, and the added 'weight' conferred by the stems to a wine could counterbalance any possible negative impact of the green character.

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