

A matter of place: Sensory and chemical characterisation of fine Australian Chardonnay and Shiraz wines of provenance

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Wine Australia

Introduction and Objectives

Establishing a fine wine image through regional typicality has been of interest to Australia, but previous research mainly involved unoaked experimental wines, which were not reflective of the retail wine market. This study explored the regional typicality of commercially available fine Australian wines, based on the hypotheses that sensory and chemical composition of varietal fine wines would discriminate by region, and further nuances within region would be explained by drivers of intraregional typicality.

Materials and Methods

Wine samples

Commercially available fine wines included **Chardonnay** (2015 vintage) from **Margaret River** (MRR, n = 5) and sub-regions **Wallcliffe** (MRA, n = 6), **Wilyabrup** (MRW, n = 5), and **Yarra Valley** (YVR, n = 6) and sub-regions **Dixons Creek** (YVD, n = 5), **Gladysdale** (YVG, n = 5); and **Shiraz** (2014 vintage) from sub-regions of **Barossa Valley (Northern Grounds)** (BVN, n = 9), **Southern Grounds** (BVS, n = 7)), and **McLaren Vale (Blewitt Springs)** (MVB, n = 8), **Willunga** (MVW, n = 7).

Descriptive sensory analysis (DA) by trained assessors (n = 10; n = 11)

Volatile composition was evaluated using headspace-solid phase micro-extraction-gas chromatography-mass spectrometry (**HS-SPME-GC-MS**) analysis on duplicate bottles.

Wine composition included **alcohol content**, **residual sugar (RS)**, **pH**, **titratable acidity (TA)**, and **tannin concentration** of red wines (MCP tannin).

Results

Regional typicality of fine Australian Chardonnay wines

- YV regions tended to be higher in ethyl esters, isoprenoids and acids than MR regions (Fig 1), and carbonyls described MR wines, especially MRW. YVG, YVD and MRR wines clearly separated from other regions.
- YVG was described by oak, vanilla, dough, furfural, oak-lactone, citrus acidity, lack of floral and tropical aromas and flavours and corresponding ethyl and acetate esters (Fig 1). A high concentration of diethyl succinate (caramel) with lower oak lactone concentration may indicate that YVG wines were aged in oak barrels with the presence of yeast lees decreasing the absorption of wood volatiles.
- YVD wines possessed high perceived heat, the presence of β -damascenone (stewed fruit aroma) α -terpineol, ethyl butanoate, ethyl 2-methylbutanoate, ethyl 3-methylbutanoate, corresponding tropical fruit and lack of oak-derived sensory attributes (Fig 1). Such fruity style is likely to derive from ethyl esters and acetate esters produced during alcoholic fermentation at lower temperatures.
- MRR wines were similar to YVG (Fig 1) and also contained higher concentrations of vegetal flavour and ethyl hexanoate (green apple, pineapple odours).
- Wines from MRA and MRW sub-regions possessed similar sensory and volatile attributes, albeit with a tendency towards higher oak-derived attributes (Fig 1), and might be the most complex from the studied wines.
- Stepwise discriminant analysis using the combination of ten variables (α -terpineol, honey aroma, TA, linalool, pH, floral and vegetal aromas, oak lactone, 3-methylbutanol and ethyl butanoate), correctly classified 100% of the wine set and complete separation of MR and YV Chardonnay wines was achieved. Leave one out cross-validation predicted the sub-regions with 84% accuracy.

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Regional typicality of fine Australian Shiraz wines

- BVN wines had a combination of savoury, cooked vegetable and barnyard aromas, moderate astringency and tannin texture, and were higher in 1-butanol, β -damascenone, and guaiacol (Fig 2).
- BVS wines were described by sweet oak, floral, and confectionery aromas, and hexyl acetate, 2-phenylethanol, and ethyl octanoate, as well as moderate astringency and moderately coarse tannin texture (Fig 2).
- MVB wines had higher astringency, coarser tannin texture (with corresponding higher MCP tannin), sweet oak, confectionery, and floral aromas, and 4-ethylphenol (Fig 2).
- MVW wines were moderate in savoury, floral and oak-related descriptors and had lower astringency with finer tannins (Fig 2), and the lowest ethyl ester concentrations, which is likely to be affected by lower fermentation temperature or the yeast strain used for alcoholic fermentation.
- Stepwise discriminant analysis using eight variables (α -terpineol, linalool, 2-phenylethyl acetate, 2-phenylethanol, 1-butanol, total anthocyanin, and floral and olive aromas) correctly classified 97% of the wine set. In fact, sub-regional classifications were 100% correct except for BVS (85.7%), whereby BVS5 was classified as MVB. With leave one out cross-validation it was possible to predict the sub-regions with 84% accuracy.

Although the wines of the MVB and the MVW districts were still well separated from BVN and BVS, a complete differentiation of MV and BV was not possible. Perceivable sensory differences between sub-regions may be subtle due to climatic similarities of BV and MV on one hand, and similar winemaking techniques pursuing the style of South Australian Shiraz on the other.

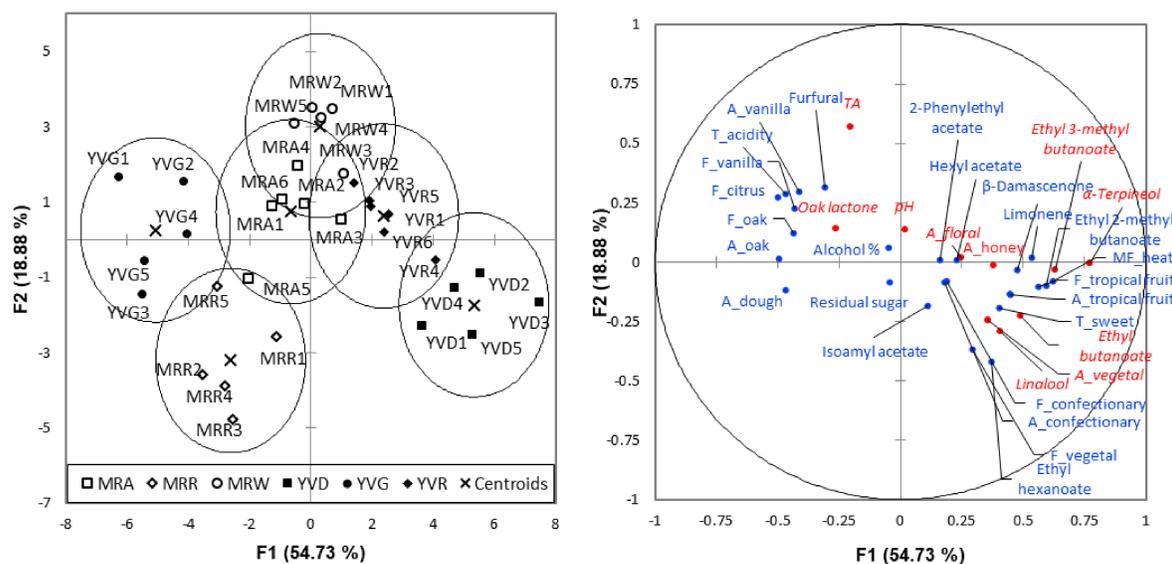


Fig 1. Stepwise discriminant analysis employing sub-region as grouping criterion. Projection of Chardonnay wine samples on the discriminant space selecting the first two discriminant functions as axes. The red italicised attributes were used in the model.

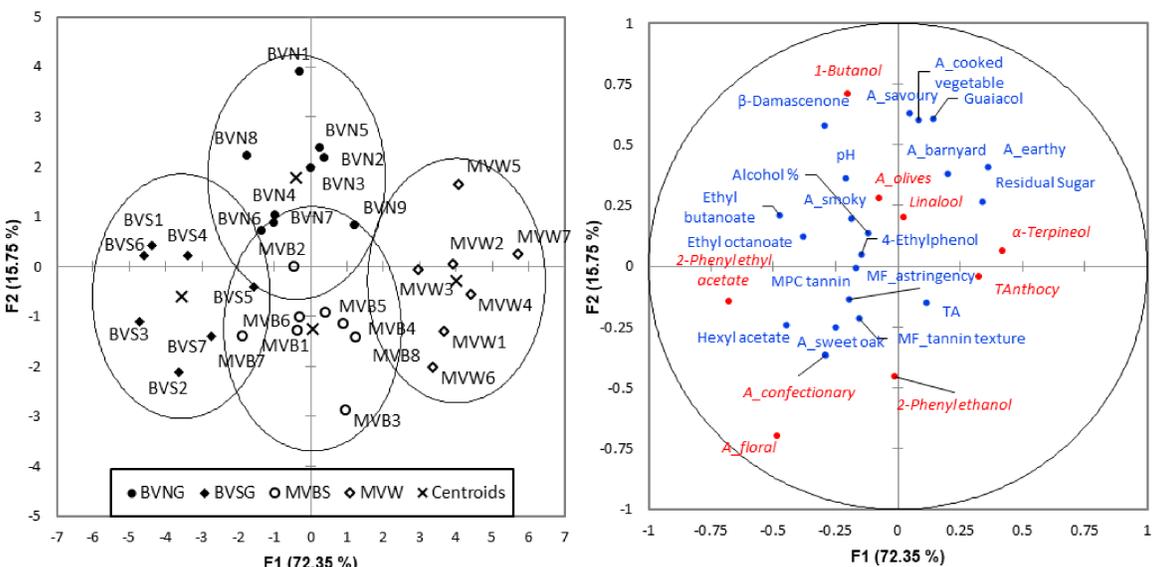


Fig 2. Stepwise discriminant analysis employing sub-region as grouping criterion. Projection of Shiraz wine samples on the discriminant space selecting the first two discriminant functions as axes. The red italicised attributes were used in the model.

Conclusions and industry implications

- For both grape varieties, there was large variability in wine styles among wines from the same GI, which was ascribed mainly to viticultural and winemaking techniques applied by wineries.
- Consequently, human intervention seemed to be an important component of regional/sub-regional typicality, which therefore cannot be determined solely on geographic origin of the fruit.
- Perhaps commercial wines made with less oak influence or that underwent extended bottle maturation would convey geographical differences more, although changing oak regime might be risky for wineries as consumers perceived the presence of oak as part of fine Australian wine character.
- Variation of wine styles emerging across wine regions, vintages, and viticultural and winemaking practices needs to be further explored.