



REGIONAL DISCRIMINATION OF SHIRAZ USING TARGETED AND NON-TARGETED ANALYTICAL APPROACHES

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Abstract

Aims: Shiraz is the most widely cultivated grape variety in Australia, and is grown under a range of viticultural and climatic conditions. Given its importance to the Australian wine sector, a number of studies have been conducted in recent years which involved a comprehensive assessment of grape composition, in order to objectively predict wine quality and style outcomes. It was of interest to reanalyse this compositional database to determine if regional variation in Shiraz composition exists, and if so, to identify analytical approaches which might best discriminate the response of this variety to the unique growing conditions imposed by regional or sub-regional variables.

Methods and Results: For a preliminary regional study, Shiraz grapes were obtained from multiple geographical indices within South Australia, and analysed for a range of targeted volatile and non-volatile compounds, as well as by non-targeted near- and mid-infrared approaches. Using multivariate modelling, it was found that data generated using both the targeted and non-targeted analytical approaches could discriminate the samples on a regional basis. For a focused study on site diversity within the Barossa Valley, Shiraz grape samples were collected from a number of sub-regions, and from multiple locations within each vineyard (5-10). Grapes were micro-vinified, and grape and wine samples were further analysed for non-volatiles using targeted and non-targeted approaches. Grape samples were also assessed using near- and mid-infrared spectroscopy. It was found using the targeted analytical approach that within-vineyard variability exceeded between-vineyard variation for some measures, preventing discrimination of vineyards or sub-regions using multivariate modelling. However, using the data generated from multiple non-targeted analytical approaches, within-vineyard variation was substantially reduced. This enabled Shiraz vineyards to be clearly defined using a non-targeted 'chemical fingerprint' and showed some potential to discriminate the Barossa sub-regions. Mass spectra generated using the non-targeted profiling approach were further assessed, and enabled the identification of grape-derived compounds which were relevant to the sub-regional response.

Conclusion: Non-targeted profiling of grapes and wines showed the potential to discriminate geographical indices (region) as well as sites within a region, even though absolute differences in grape composition could be substantial. This indicates that certain aspects of grape chemistry are more sensitive to site- or region-specific variables than others. Further work could seek to identify individual compounds, or classes of compounds, which most consistently define the 'terroir' response for the Shiraz grape variety.

Significance and Impact of the Study: Using the results of this study, new methods could be developed to quantify the relevant grape or wine metabolites identified using the non-targeted approach, in order to apply these more broadly within studies which seek to objectively characterise 'terroir'.

Keywords: Shiraz, objective measures, grape and wine quality