Environmental Influences on Grape Aroma Potential

Anthony Lloyd Robinson

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Words of Wisdom...

Wine in life -

“Wine to me is passion. It's family and friends. It's warmth of heart and generosity of spirit. Wine is art. It's culture. It's the essence of civilization and the art of living.”

Robert Mondavi (1913-2008)

“You have only so many bottles in your life, never drink a bad one.”

Len Evans (1930-2006)

Wine in practice -

If you want continuity, you must start with a special vineyard. No matter how much you believe in the technology of wine-making, it takes a fine vineyard to produce fine wine.”

André Tchelistcheff (1901-1994)

“In my opinion, the greatest grape is the noble Cabernet. Cabernet Sauvignon is the only variety that would be tolerated in heaven.”

Jack Mann (1906-1989)
Declaration

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

Anthony L. Robinson

26th May, 2011
Abstract

Understanding the source of wine volatile compounds and the mechanisms that influence their formation through grape growing, winemaking and storage is essential for wine businesses when developing strategies to produce wines with specific sensory attributes that appeal to target markets. The objective of this research was to develop a greater understanding of the environmental influences that drive flavour formation in grapes and translate this information into awareness of the limitations of site and region in producing wines to specification. A novel analytical method was developed utilising headspace solid-phase microextraction (HS-SPME) for the analysis of wine volatiles by comprehensive two-dimensional gas chromatography (GC × GC) time-of-flight mass spectrometry (TOFMS). The analytical technique was able to resolve and identify a substantially larger number of volatile compounds than current single dimensional GC-MS methodologies. While developing this method it became clear that there was a need to develop a greater understanding of wine matrix effects on SPME-based analyses of volatile compounds found in grape juices and wines of which ethanol and glucose had the greatest effect. Furthermore, the impact of shipping conditions in relation to wine composition and sensory characteristics was investigated to ensure sample integrity across the experiments. The HS-SPME GC × GC-TOFMS methodology was applied in conjunction with descriptive sensory analysis to field studies exploring the effects of site, viticultural management, and winemaking on wine composition and sensory characteristics. This study identified that site was a major influence on Cabernet Sauvignon wine composition and sensory characteristics leading to an extensive study exploring the composition and sensory attributes of a number of commercially produced Cabernet Sauvignon wines from ten wine growing regions of Australia. The results of the studies have enabled the integration of sensory and chemical data from
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Australian Cabernet Sauvignon wines which has revealed potential chemical markers of sensory attributes and compositional characters that are associated with Australian wine regions.
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Publications, Presentations, and Conferences

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Peer Reviewed Publications


Conference Presentations

Eurosense – Vitoria-Gasteiz, Spain 2010

Machado, B., Heymann, H., Robinson, A., Torri, L. ‘How many judges are required for Sensory Descriptive Analysis?’.

ASEV 61st Annual Meeting – Seattle, Washington, United States 2010

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INTERVITIS INTERFRUCTA IVIF-Congress – Stuttgart, Germany 2010 [Invited]

6th Symposium In Vino Analytica Scientia – Angers, France 2009
Robinson, A., Ebeler, S., Heymann, H., Trengove, R. ‘Influence of wine and juice macromolecules on the headspace partitioning of volatile compounds’.

ASEV 60th Annual Meeting – Napa, California, United States 2009

5th Symposium In Vino Analytica Scientia – Melbourne, Australia 2007

Conference Posters

14th Australian Wine Industry Technical Conference – Adelaide, Australia 2010

ASEV 60th Annual Meeting – Napa, California, United States 2009
Robinson, A., Ebeler, S., Heymann, H., Trengove, R. ‘Effect of ethanol and glucose on aroma compound partitioning between the headspace and wine matrix’.

Wicks, M., Robinson, A., Heymann, H. ‘Effect of simulated shipping conditions on sensory attributes and volatile compounds in six wines’.


Conferences
The following conferences were attended during the course of this PhD:
14th Australian Wine Industry Technical Conference (AWITC) – Adelaide, Australia 2010
ASEV 61st Annual Meeting – Seattle, Washington, United States 2010
7th International Cool Climate Symposium (ICCS) – Seattle, Washington, United States 2010
INTERVITIS INTERFRUCTA IVIF-Congress – Stuttgart, Germany 2010
ASEV 60th Annual Meeting – Napa, California, United States 2009
CASSS GCXGC 2009 Symposium – Portland, Oregon, United States 2009
ASEV Unified Wine and Grape Symposium – Sacramento, California, United States 2009
13th Australian Wine Industry Technical Conference (AWITC) – Adelaide, Australia 2007
5th Symposium In Vino Analytica Scientia – Melbourne, Australia 2007
ASVO ‘Finishing the Job - Optimal ripening of Cabernet Sauvignon and Shiraz’ – Mildura, Australia 2006