

Potential for Natural Flavour Additives to  
Improve the Sensory Properties and Consumer  
Acceptance of Wine

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## Abstract

Flavour additives are routinely used in food and beverage industries to enhance aroma and flavour intensity, mitigate undesirable attributes and/or better meet consumer expectations. In Australia, the legislation governing wine production prohibits the use of flavour additives. However, the potential for flavourings to be used to overcome sensory deficiencies, is an attractive option for both the wine industry and consumers.

This thesis explores the sensory properties, composition and consumer acceptance of flavoured wines and the impact of bottle ageing.

Three key studies were undertaken:

1. An online survey to determine consumer acceptance of and attitudes toward the use of additives in wine and food;
2. An investigation into the impact of flavourings on the sensory profiles and consumers acceptability of flavoured wines; and
3. A maturation trial to explore the effect of bottle ageing on the composition and sensory properties of flavoured wines.

An online survey was administered nationally to determine Australian wine consumers' acceptance of the use of additives in food and wine production. Based on self-reported wine knowledge scores, consumers (n=1031) were segmented into low (n=271), medium (n=528) and high (n=232) knowledge segments. Surprisingly, irrespective of wine knowledge, consumers were significantly more accepting of natural flavourings, natural colour, and additives associated with health benefits (e.g. vitamins and minerals) than legally permitted winemaking additives (e.g. oak chips and tannins). Consumers were also asked to identify desirable flavours in wines and their responses indicated preferences for fruity characters; i.e. lemon and apple in white wines and blackcurrant and raspberry in red wines.

The influence of flavourings on wine sensory properties and consumer acceptability of flavoured wines was subsequently investigated. Based on consumer reported flavour preferences identified in the online survey, natural flavourings were added to four inexpensive commercial wines (two Chardonnay and two

Shiraz wines) to intensify selected aroma and flavour attributes. Descriptive analysis (DA) compared the sensory profiles of control and flavoured wines, and established an overall increase in the intensity of pleasurable attributes (e.g. citrus aroma or oak flavour) and/or a decrease in undesirable characters (e.g. green and earthy notes) in flavoured wines. Acceptance tests (n=218) were then held to assess consumer liking of flavoured wines. Segmentation based on individual liking scores enabled identification of three distinct clusters for each of the white and red wine tastings. For Chardonnay: Cluster (C) 1 liking was driven by passion fruit aroma; C2 by stone fruit aroma and oak flavour; and C3 by butter aroma and honey flavour. Drivers for Shiraz liking included: red fruit and confectionery aromas for C1; green aromas and oak flavour for C2; and confectionery and oak aroma for C3.

The final experiment investigated the impact of 12 months bottle ageing on the composition and sensory properties of flavoured wines. Flavour additives and control and flavoured wines were analysed by gas chromatography-mass spectrometry to identify the volatile constituents responsible for the modification of sensory profiles of flavoured wines. However, the volatile compounds identified as constituents of flavour additives were either not detected in flavoured wines or were present at similar concentrations to those of corresponding control wines. DA of control and flavoured wines was performed after bottling (t=0) and after 12 months of bottle ageing (t=1), to determine any changes in wine sensory profiles. At t=0, flavoured white wines exhibited enhanced fruit aromas and flavours, but differences in sensory profiles between control and flavoured wines were less apparent at t=1. Compared to the control wines, the impact of ageing on flavoured Shiraz wines was less obvious, such that sensory differences were still apparent between control and flavoured wines after bottle ageing.

The project provides the wine industry with information that might enable producers to better identify and meet the needs of their consumers, subject to appropriate legislative change.

## Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Yaelle Saltman

Date

## **Dedications**

I dedicate this thesis to the loving memory of my dad, (Professor) Michael Saltman, who passed away peacefully on October 26th 2016. Dad, it is a great privilege to dedicate my thesis in your honour. I have been dreaming of this moment for a very long time and I know that wherever you are, you are looking down right now and you are very proud.

I would also like to dedicate this thesis to my beautiful daughter. Noa, this thesis is dedicated to you, so you believe that you can do anything you set your mind to. Nothing will stop you achieving your goals, use that wonderful energy of yours to your advantage and you will fulfil all your dreams.



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