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Relationships between Berry Sensory Assessment and Wine Quality
in *Vitis vinifera* L. Shiraz

by

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Abstract

Berry sensory assessment (BSA) is a technique that can help grapegrowers and winemakers make decisions about harvest date and grape product allocation. BSA as a structured technique has been used by grapegrowers, winemakers and researchers for the last thirteen years. However the number of studies reporting results of the effect of viticultural practices on berry sensory characteristics and wine quality is limited. This thesis examined the BSA technique through four different studies.

Study one is a combined review literature review and industry survey paper in which the methodology of Berry Sensory Assessment is presented and the research conducted using BSA is discussed. It also presents the results of a survey channeled to Australian grapegrowers and Australian and New Zealand winemakers about their experience using BSA, their perceptions on its use and their suggestions for improving the methodology. It was evident from the survey that 90% of grapegrowers and winemakers use BSA and they want to understand the link between BSA and wine quality. These results demonstrated the importance of BSA for wine producers and the need for further improvement.

The aim of study number two was to determine if berry sensory attributes and berry compositional variables could predict wine sensory attributes, wine compositional variables and wine quality in Shiraz. The analyses of berry and wine sensory attributes, compositional measures and wine quality using partial least squares regression and Pearson's correlations from two seasons identified several relationships between berry

sensory attributes and wine sensory attributes and quality. A significant negative relationship was identified between seed bitterness and wine savoury spice flavour for the two seasons. The berry sensory attribute pulp detachment from the skin was identified as a predictor of various wine sensory attributes (eg. the harder to detach skin from the pulp the higher intensity for wine body colour, rim colour and dark berry aroma) and wine quality scores in the season 2011.

The aim of study number three was to determine if berries stored at -20°C for three months could be used instead of fresh berries to conduct BSA. Being able to conduct BSA on frozen berries could help to reduce sensory fatigue in assessors by allowing them to evaluate samples over a longer time period and to schedule BSA away from the busy harvest period. The results of this study determined that sensory profile from Shiraz berries differed in five sensory attributes – pulp sweetness, pulp fresh fig flavour, skin colour extraction, skin bitterness and seed astringency - between fresh and frozen berries at three times of harvest, preventing the evaluation of these five sensory attributes in Shiraz frozen berries.

Study number four aimed to determine the effect of three rootstocks on sensory and compositional differences of Shiraz grapes and wines in comparison to a non-grafted control. The trial was conducted over two seasons. Berry and wine sensory and compositional differences were found between the grafted treatments and the non-grafted control. PCA was able to discriminate the wines from the four treatments in three groups of aroma compounds (acetate esters, ethyl esters and higher alcohols) in both

seasons. The results of wine quality scores from two seasons showed that the un-grafted treatment had the lowest quality and 110 Richter and Schwarzmann the highest.

The findings from this study identified relationships between the sensory and compositional variables in berries and wines that are affecting wine quality. It also showed that that the use of rootstocks has an impact on berry and wine sensory and compositional characteristics.

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma 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 references has been made in text.

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Sandra Milena Olarte Mantilla

Date

Journal of Papers Published as part of this Research

Olarte Mantilla, S.M., Collins. C, Illand, P.G., Johnson, T.E. and Bastian, S.E.P. (2012)

Review: Berry Sensory Assessment: concepts and practices for assessing winegrapes' sensory attributes.

Australian Journal of Grape and Wine Research 18 (3): 245-225

Presented in Chapter 2

Olarte Mantilla, S.M., Collins. C, Illand, P.G., Kidman, C.M., Jordans, C. and Bastian, S.E.P. (2013)

Comparison of sensory attributes of fresh and frozen wine grape berries using berry sensory assessment.

Australian Journal of Grape and Wine Research 19 (3): 349-357

Presented in Chapter 3

Olarte Mantilla, S.M., Collins. C, Illand, P.G., Kidman, C.M., Ristic, R., Hasted, A., Jordans, C. and Bastian, S.E.P.

Relationships between grape and wine sensory Attributes and Compositional Measures of cv. Shiraz.

[Manuscript in revision - American Journal of Enology and Viticulture]

Presented in Chapter 4

Olarte Mantilla, S.M., Collins. C, Illand, P.G., Kidman, C.M., Ristic, R., Boss, P.K.B., Jordans, C. and Bastian, S.E.P.

Wine quality in Shiraz (*Vitis vinifera* L) can be modulated by the use of rootstocks

[Submitted Manuscript]

Presented in Chapter 5

Each of these manuscripts is presented in the thesis in the form according to the author instructions for the associated journal.

This thesis has been prepared following the University of Adelaide specifications for a PhD thesis by publication format

Related Publications and Communications Arising During Candidature

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, C.M., Ristic, R., Boss, P.K., Jordans, C., Bastian, S.E.P. **Finding relationships between BSA (Berry Sensory Assessment) and wine quality: Case study – Shiraz /Rootstocks.** (seminar). 15th Australian Wine Industry Technical Conference. Sydney, July 2013.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, C.M., Ristic, R., Boss, P.K., Jordans, C., Bastian, S.E.P. **Relationships between sensory profiles and instrumental measurements in raw fruit to predict quality of final product.** 10th Pangborn Sensory Science Symposium (poster). Rio de Janeiro – Brazil, August 2013.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, C.M., Ristic, R., Jordans, C., Bastian, S.E.P. **Effect of rootstocks on Shiraz berry and wine sensory characteristics** (seminar). Crush symposium, Adelaide – November 2012.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, C.M., Ristic, R., Jordans, C., Bastian, S.E.P. **Linking Berry Sensory Assessment (BSA) to Wine Quality** (seminar). Treasury Wine Estates, Adelaide – November 2012.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, C.M., Ristic, R., Jordans, C., Bastian, S.E.P. **Linking Berry Sensory Assessment (BSA) to Wine Quality (seminar).** Hebrew, University of Jerusalem, Rehovot – Israel, September 2012.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, Jordans, C., Bastian, S.E.P. **Effect of rootstock on Shiraz berry and wine sensory characteristics.** 5th European Conference on Sensory and Consumer Research (poster). Bern- Switzerland, September 2012.

Olarte Mantilla, S.M., Collins, C., Iland, P.G., Kidman, Jordans, C., Bastian, S.E.P. **Berry Sensory Analysis – Should frozen wine grape berries be used in sensory evaluations?** 5th European Conference on Sensory and Consumer Research (poster). Bern- Switzerland, September 2012.

Olarte Mantilla, S.M., Collins, C., Bastian, S.E.P. **Berry Sensory Assessment (BSA) – should frozen wine grape berries be used in sensory evaluations? Is BSA important for winemakers and grapegrowers?** (poster). 17th International Symposium GiESCO. Asti (Alba) – Italy, September 2011.

Olarte Mantilla, S.M., Collins, C., Bastian, S.E.P. **Berry Sensory Analysis – Should frozen wine grape berries be used on sensory evaluations? Is BSA important for winemakers and grapegrowers?** (seminar). Crush symposium, Adelaide – September 2011.

Olarte Mantilla, S.M., Collins, C., Kidman, C.M., Ristic, R., Bastian, S.E.P **Wine quality and wine sensory assessment evaluation in grafted Shiraz** (poster). 14th Australian Wine Industry Technical Conference. Adelaide, July 2010

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Abbreviations

AGWA	Australian Grape and Wine Authority
ANOVA	Analysis of Variance
BSA	Berry Sensory Assessment
DA	Descriptive Analysis
CSIRO	Commonwealth Scientific and Industrial Research Organisation
GC-MS	Gas Chromatography- Mass Spectrometry
HPLC	High Performance Liquid Chromatography
ICPAES	Inductively Coupled Plasma Atomic Emission Spectrometry
LRI	Linear Retention Index
MFA	Multi Factor Analysis
PCA	Principal Component Analysis
PLS	Partial Least Squares
SARDI	South Australian Research and Development Institute
SO ₂	Sulphur Dioxide
TA	Titrateable Acidity
VA	Volatile Acidity