Consequences of extended maceration for red wine colour and phenolics

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Details of numbered figures that need to be deleted from the thesis titled ‘Consequences of extended maceration for red wine colour and phenolics’ by Venetia Joscelyne, because of copyright issues

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Abbreviations

*a*  position of colour between magenta and green
ACT  Australian Capital Territory
ANOVA  analysis of variance
a.u.  absorbance units
AWRI  Australian Wine Research Institute
*b*  position of colour between yellow and blue
BSA  bovine serum albumin
C  control maceration treatments
C*  chroma
CIE  International Commission on Illumination (Commission Internationale d’Eclairage)
CS  cold soak when spoken about generally. For Grenache and Shiraz experimental wines this specifically means the pre-fermentation maceration treatments (with plunging) held at 10ºC for 3 days. For Pinot noir experimental wines this specifically means the cold soak treatment (without plunging) held at 0ºC for 3 days
CSP  cold soak with plunging. For Pinot noir experimental wines this specifically means the cold soak treatment with 20 plunges once daily held at 0ºC for 3 days
DA  descriptive analysis
DAP  diammonium phosphate
DCMA  4-dimethyl-aminocinnamaldehyde
DF  dilution factor
DW  dry weight
ΔE  delta E
EM  extended maceration
F  Friedman value
GAE  gallic acid equivalents
GI  Geographical Indication
GWRDC  Grape and Wine Research and Development Corporation
hº  hue angle
ISO  International Organization for Standardization
L*  degree of lightness
LAB  lactic acid bacteria
MCPT  methyl cellulose precipitable tannin (assay)
mDP  mean degree of polymerisation
MLF  malo-lactic fermentation
NSW  New South Wales
NT  Northern Territory
PCA  principal component analysis
PMS  potassium metabisulphite
PPO  polyphenol oxidase
PS1  1-week post-fermentation extended maceration treatment
PS3  3-week post-fermentation extended maceration treatment
RDI  regulated deficit irrigation
RP-HPLC  reversed-phase high performance liquid chromatography
RS  reducing sugars
RT  retention time
SA  South Australia
TA  titratable acidity
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>TLC</td>
<td>thin layer chromatography</td>
</tr>
<tr>
<td>TSS</td>
<td>total soluble solids</td>
</tr>
<tr>
<td>VA</td>
<td>volatile acidity</td>
</tr>
<tr>
<td>VSP</td>
<td>vertical shoot positioning</td>
</tr>
<tr>
<td>WA</td>
<td>Western Australia</td>
</tr>
<tr>
<td>WCD</td>
<td>wine colour density</td>
</tr>
<tr>
<td>WCH</td>
<td>wine colour hue</td>
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Abstract

The consequences of pre-fermentation and post-fermentation extended maceration (EM) on colour, mouthfeel and phenolic composition were investigated in Pinot noir (2004), Grenache (2006) and Shiraz (2007) (*Vitis vinifera* L.) wines. Experimental wines were made using cold soak, post-fermentation EM, and standard fermentation treatments (C). Cold soak treatments included a 3-day cold soak at 10°C (CS), with an additional comparison of plunging effects for the 2004 wines (CSP). Post-fermentation extended maceration treatments were 1- or 3-weeks on skins in 2004 (PS1 and PS3 respectively), and 3-weeks in 2006 and 2007 (PS3). A variety of chemical and sensory test methods were used to determine changes in phenolic components and organoleptic properties between treatments of all 3 varietals as they aged in the bottle.

Among other results, it was determined if wines made with a period of cold soak had increased colour intensity, and increased concentrations of monomeric anthocyanins and pigmented polymers compared to control wines. It was also determined if wines made with a period of post-fermentation EM had increased concentrations of the flavan-3-ols (+)-catechin and (−)-epicatechin, and tannin, decreased colour intensity and modified mouthfeel compared to the other wine treatments.

A greater understanding of Australian red winemakers’ opinions on EM regimes and their use in Australian wineries was obtained by survey. Survey results confirmed that EM is used extensively in Australian wineries but that winemakers have poor understanding of the consequences of EM regimes for red wine properties. The survey confirmed that winemakers are concerned about the economic cost and logistic pressures associated with the use of EM regimes during vintage. Wines made using EM need to spend longer in fermentation vessels, which are in high demand during this time. Findings from this study provide winemakers with more information to consider before making decisions about their use of EM regimes.

Survey findings showed more winemakers would use EM regimes if logistic and economic pressures did not apply. However, results suggest that even if winemakers did adopt EM practices, some may not achieve what they believe to be the outcome of these regimes, such as improved colour or mouthfeel properties. For instance, results showed that cold soaking did not make a difference to wine colour compared to conventional fermentation maceration. Even without cold soaking red must, winemakers may be able to achieve the
same or very similar wine organoleptic characteristics at a reduced cost. Similarly, no significant effects of plunging during cold soak were observed.

Post-fermentation EM visibly reduced wine colour intensity and imparted a browner hue to the wine compared to red wine that was pressed off skins upon reaching dryness. This EM regime is therefore unlikely to benefit winemakers who are seeking to produce highly coloured wines. However, prolonged maceration post-fermentation did increase the intensity of perceived bitterness and increased the concentration of wine flavan-3-ols and tannins. Winemakers may therefore influence the desired balance between the extraction of these wine phenolics (and the associated outcome for taste and mouthfeel properties) and economic considerations by varying the duration of maceration post-fermentation.
Statement of authorship

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

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying, subject to the provisions of the Copyright Act 1968.

Venetia L. Joscelyne
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