Influence of climate and variety on pre-fermentative cold maceration

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Introduction

Pre-fermentative cold maceration or ‘cold soak’ is a commonly practiced red winemaking technique that can improve colour, enhance fruit characters and overall complexity. The technique involves inhibiting the onset of fermentation by holding the must at low temperatures for a number of days. During this period, an aqueous extraction, as opposed to the alcoholic extraction, of compounds from the skins occurs. With growing pressure to reduce input costs and improve efficiencies, it is critical to understand the optimum conditions to implement a cold soak. Anecdotal evidence suggests that cold soaks are best utilised under certain conditions relating to climate and variety. This study is the first of its kind to concurrently determine if climate and variety influences the effectiveness of cold soak.

Materials and methods

Shiraz, Cabernet Sauvignon and Merlot (30kg each) were harvested from vineyards in two distinct Western Australian wine regions, Swan District (hot) and Mount Barker (cool). The mean January temperature (MJT); in 2013 was 24.9°C and 19.7°C respectively. Each parcel was split into treatments; ‘control’ (Ctrl) and ‘cold soak’ (CS), with three equal replicates (n = 3). The winemaking process was the same for all treatments except the must of the CS parcels were stored at 4°C for 5 days prior to commencing fermentation.

Chemical analysis

Qualitative analysis of volatile compounds (GC-MS) was conducted on the wines two months post-bottling. This allowed the ability to discriminate samples based on metabolic profile of volatile fermentation derived compounds. Interpretation was performed by a ratio of response. Spectral colour analysis (modified Somers assay) on wines was undertaken two (T1) and nine months (T2) post-bottling. A percentage of difference (observing >10% as notable) is used to indicate the degree of influence between treatments.

Sensory analysis

Descriptive sensory analysis was also performed at time periods T1 and T2. Colour, aroma and palate descriptors were scored on a zero to nine intensity scale. A simple linear regression provided a level of significance (P < 0.05).

Results

<table>
<thead>
<tr>
<th>Colour density</th>
<th>Total phenolics (mg/L)</th>
<th>Total anthocyanins (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>T2</td>
<td>T1</td>
</tr>
<tr>
<td>Ctrl</td>
<td>7.75</td>
<td>7.86</td>
</tr>
<tr>
<td>CS</td>
<td>6.76</td>
<td>6.72</td>
</tr>
<tr>
<td>% Difference</td>
<td>-12.77</td>
<td>-14.43</td>
</tr>
</tbody>
</table>

Sensory - Hot climate Cabernet was significantly influenced by the cold soak treatment with colour (depth and hue), aroma (chocolate) and palate (weight, texture and length) attributes enhanced by the cold soak and were persistent over nine months. Cool climate Merlot showed stylistic differences initially (T1) with cold soak enhancing colour and volatile profile but less confectionery and red berry aromas than the control. These differences were not observed at T2. No correlations between the sensory analyses and the volatile profiling were found for any of the wines.

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