

# Packaging choices affect consumer enjoyment of wines

Vince O'Brien<sup>1</sup>, Dr. Leigh Francis<sup>2</sup> and Patricia Osidacz<sup>3</sup>

## INNOVATION FOR SUCCESS

One essential ingredient for sustainable business success is to build a detailed understanding of your market and to identify what consumers value in your product. Value is the set of product attributes for which consumers are prepared to pay extra. This article provides a summary of recent performance data produced by the

Australian Wine Research Institute's closure benchmarking service. The key take-home messages are:

- closure technologies have a significant impact on white wine style
- wine flavour development under the closure is dictated by both the wine matrix constituents and the oxygen transmission rate property of the closures
- consumers' liking for wines is linked to the absence of closure-related faults.

<sup>1</sup>Group Manager Commercial Services, Australian Wine Research Institute (AWRI), PO Box 197, Glen Osmond, South Australia 5064  
Email: ([vince.obrien@awri.com.au](mailto:vince.obrien@awri.com.au))

<sup>2</sup>Research Manager Sensory, AWRI  
Email: ([leigh.francis@awri.com.au](mailto:leigh.francis@awri.com.au))

<sup>3</sup>Senior Sensory Scientist, AWRI  
Email: ([patricia.osidacz@awri.com.au](mailto:patricia.osidacz@awri.com.au))

## AWRI 2007 WHITE WINE CLOSURE TRIAL

The AWRI just completed the 24-month testing interval for a rigorous white wine closure trial which produced valuable insight into closure performance criteria for those involved. A 2007 unoaked Semillon wine, selected based on being free of any faults, low in phenolics and suitable for extended bottle storage, was bottled under carefully controlled oxygen management practices (the importance of managing oxygen ingress at bottling was highlighted in a previous article, O'Brien *et al.* 2009). The wine was then stored using best practice conditions at approximately 17°C and 55% humidity. Various tests have been conducted since bottling, including detailed quantitative sensory and chemical analysis at six-monthly intervals.

Figure 1 (see page 50) shows the 24-month sensory and some of the compositional analysis results for 10 different closure technologies in this trial on a principal component analysis (PCA) plot. The PCA plot allows an assessment of similarities and differences among the wines bottled under the various closures. Variables that were associated with each other are clustered close together in the graph. The wines plotted far from the origin were highest in those variables situated in close proximity.

Bottling with different closure technologies generated wines with quite different sensory properties after 24 months. Some closure technologies, such as the reference screwcap with tin/saran wadding, produced a wine with relatively high reductive, cabbagey and struck flint attributes, plotted on the top of the graph in Figure 1. The reductive character was associated with elevated levels of methane thiol, a potent mercaptan compound. The wine was also rated highly in fruit attributes, such as fresh citrus. It is important to note that, of course, not all wines will develop reductive characteristics under screwcap closures.



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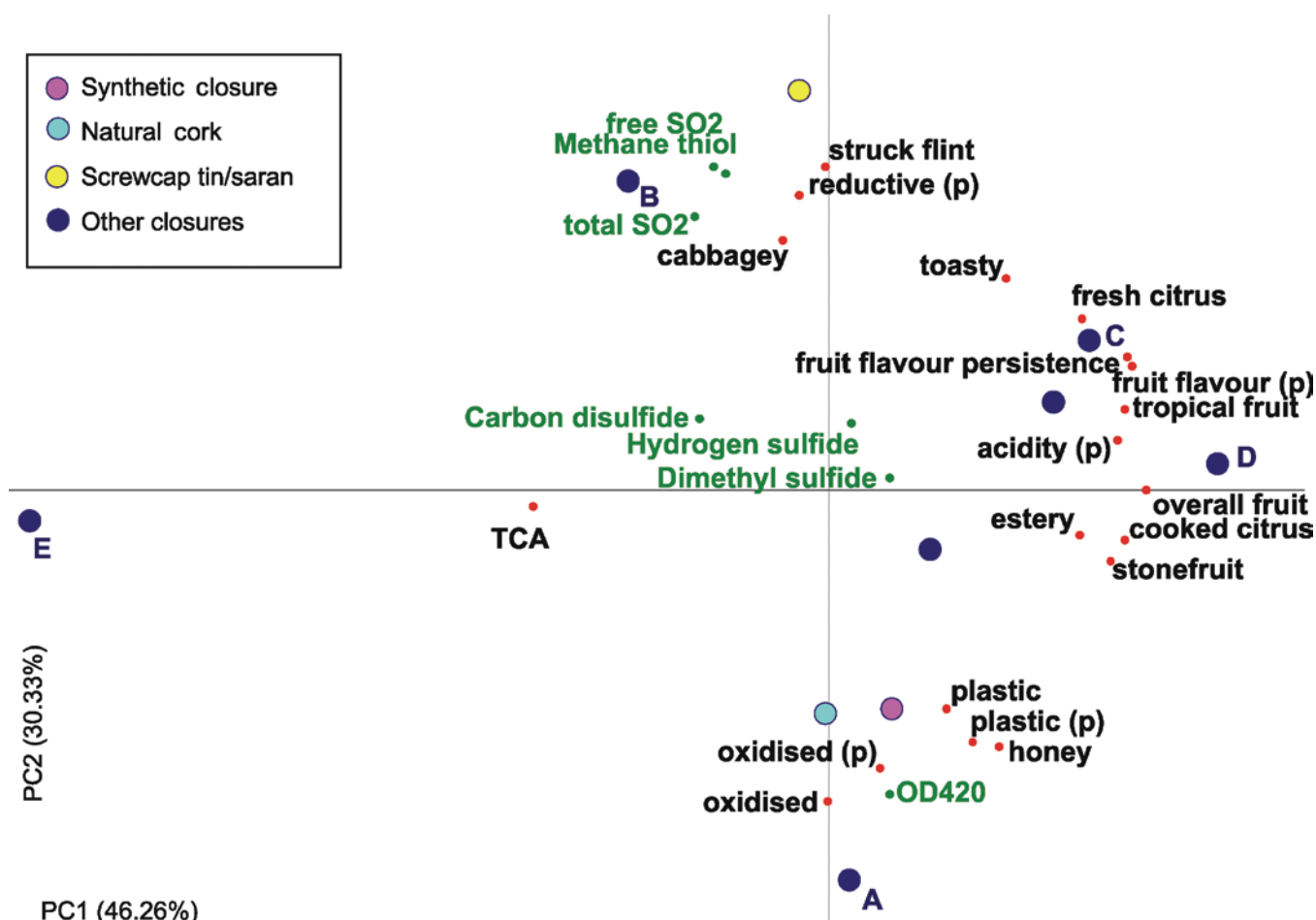


Figure 1. Principal component analysis plot of the sensory and compositional attributes of a 2007 Semillon wine bottled under 10 different closures for 24 months. The 10 wines are shown as larger symbols, with the sensory and compositional variables indicated by the small circles. Wines selected for the consumer test included the screwcap and the natural cork, together with closures A-E. (p) indicates palate attributes.

In fact, published surveys show less than 3% of wines are reductive in the marketplace. The risk of a wine developing reductive characters can be decreased through effective fermentation management practices and appropriate pre-bottling treatment.

Wines with highest fruit intensity developed under closures plotted in the top right quadrant of Figure 1. Wines with oxidised attributes developed under closures plotted towards the bottom of the graph, and these closures were also higher in OD 420 values (optical density at a wavelength of 420nm). Only one closure type was rated by the sensory panel as higher in TCA aroma, and plotted to the far left of the graph, and this wine was found to have less than 2ng/L of TCA, close to the sensory detection threshold. All other closures had no detectable TCA.

The wine style evolution under the different closures is consistent with different oxygen transmission rates (OTR) through the closures subsequent to bottling. Sensory and analytical results for closures plotted to the bottom of the graph, displaying cooked fruit and oxidised characters and high OD 420 data (indicative of browning), are consistent with those found for closures with high OTR values. The wines under different closure technologies with high fresh fruit characters and higher free and total SO<sub>2</sub> values are consistent with data obtained from closures with lower OTR values. Wines plotted higher on the graph with reductive

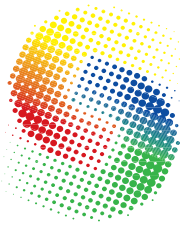
sensory attributes and elevated levels of methane thiol are indicative of very low oxygen ingress levels.

This study, together with the results of previous research, has shown clearly that bottling a wine under different closure technologies can have a significant impact on the properties of the ultimate product presented to the marketplace. The question arising from these results is whether the differences are sufficiently large to be of concern to wine producers. The differences in sensory properties were evident, but some attributes, such as degree of TCA, were not necessarily at all obvious. While they could be measured reliably using the highly experienced group of AWRI sensory panellists, they might not be considered at objectionable levels by some industry practitioners. We could be in danger of being too conservative and critical of minor, unimportant defects. Ultimately, what matters is whether the differences in wine styles that have developed under the various closures are significant enough to have an impact on the consumers' enjoyment of the product, and which closures maximise preferences. Quantitative consumer preference research provides answers to these questions.

#### QUANTITATIVE CONSUMER TESTING

Consumer acceptance tests have been used increasingly across many industry sectors, including the wine industry, to gain a robust understanding of what markets value.





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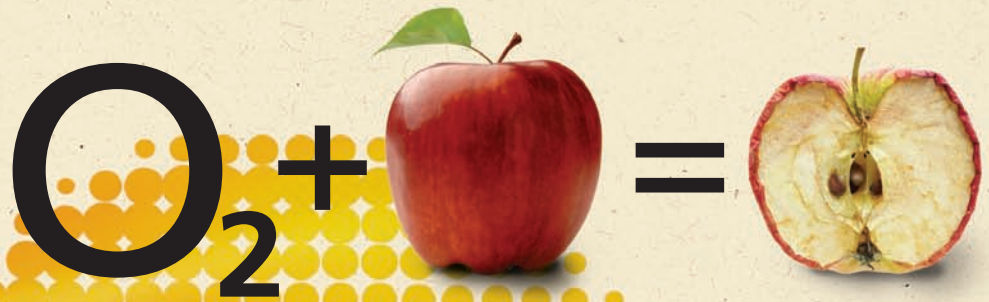
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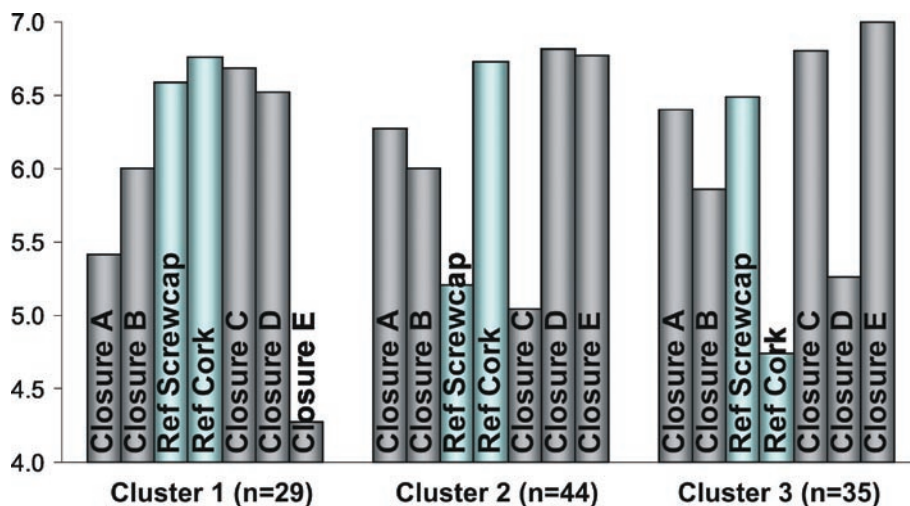


Figure 2. Consumer preferences segmentation for 108 Sydney consumers. Bars represent the mean liking scores for each wine in each cluster.

This is extremely important information to underpin product design, marketing strategies, packaging choices and continuous improvement efforts. Consumers are confronted by an enormous number of choices at the point of purchase and it is essential information for a business to understand the parameters that have a bearing on customers' purchasing decisions to maximise sales.

A number of key extrinsic determinants influencing purchase decisions were determined recently by a team from the University of South Australia Wine Marketing Group and the Australian Wine Research Institute, (Lockshin *et al.* 2009), and included the following:

- branding
- price
- wine show medals
- price discount
- alcohol level.

Flavour attributes have been found to be very important for consumer preference for wines, as determined by acceptance research conducted by the AWRI (Lattey *et al.* 2004; Lattey *et al.* 2007; Curtin *et al.* 2007). Consumers have been found to have strong and distinct preferences and these preferences can be reliably measured. In general, taste preference has been shown to be related to the absence of faults, such as *Brettanomyces*-related flavour or bitterness, and elevated fruit- or oak-related attributes. There are identifiable groups of consumers with preferences for different types of fruit flavours, levels of tannin-related

astringency or degrees of complexity.

Objective consumer preference assessments were conducted on a subset of seven closure trial wines at the 24-month testing point. The wines selected for consumer testing represented the widest range of the wine styles developed from the study, and included the screwcap and natural cork closed wines. The study was conducted with consumers tasting each wine separately and blind, with a break of several minutes before the next wine was assessed. One hundred and eight Sydney consumers assessed the wines, and were asked to record their overall liking of each, together with purchase intent and, after the test, demographic information and wine usage and attitudes data was recorded.

An initial analysis of the consumer results showed that there were no significant differences among the wines for either overall liking or purchase intent for the total population. All wines, on average, were rated in a narrow range from 5.95 to 6.23 on the nine point liking scale used. Although no significant difference was found in the total population data, as expected it was found that the consumers' opinions were not uniform. Three very different segments were identified and are shown in Figure 2:

Cluster 1, which contained 27% of the consumers, was negatively driven by oxidised and TCA attributes. That is, the wines with elevated oxidation and the wine with some TCA aroma were significantly less preferred. These consumers liked the wines with higher





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levels of fruit, estery, fresh citrus, and toasty attributes and were tolerant to the wines with struck flint attributes. Consumers in this segment were older, more experienced, regular wine drinkers more engaged with the product.

In contrast, Cluster 2, with 41% of the consumers, showed a low acceptance for wines that had higher levels of reductive, struck flint or cabbagey attributes. They did not respond negatively to the TCA-affected wine. This segment had slightly more males and younger consumers who consume significantly fewer glasses of wine per week. These consumers were less concerned about brands, taste descriptions and recommendations on the label.

Cluster 3, with 32% of the consumers, was not affected by the presence of oxidised, reductive or TCA attributes present. Liking for this group appeared to be influenced by an absence of simple fruit characters. These consumers have slightly higher income overall and spend more money on an 'everyday' bottle.

## TAKE-HOME MESSAGES

In summary, this study has shown that closure choice had an important impact on wine style. These results are consistent with those obtained in numerous other closure trials conducted by the AWRI.

The ultimate wine attributes that develop over time are a function of the wine matrix and the closure properties, and particularly the closure OTR. Differences that developed in the wines strongly affect consumers' liking of the product with different market demographics having different preferences. The fact that a substantial proportion of untrained consumers will react negatively to the presence of even low levels of TCA, oxidation and reduction, emphasises that attention to controlling these off-flavours is justified. Of course, some producers or closure suppliers might also argue that there is a niche market of consumers who are not sensitive to some defects,

or who might even appreciate such flavours at low levels. This highlights the importance of knowing both your market and the impact a closure will have on your wine matrix.

If you need help determining which closure is most appropriate for your wine and your market, contact Vince O'Brien at the AWRI Commercial Services, [vince.obrien@awri.com.au](mailto:vince.obrien@awri.com.au)

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