FOOD FILES

Dr Russell Keast, Dr Gie Liem, Dr Leigh Francis and Damian Nandorfy

Unravelling the flavour of white wine

Wine is a complex beverage and quite subtle changes in aroma and flavour due to winemaking or vintage variation can greatly influence the market demand and a brand's reputation over time. As a natural product, it is hard to determine which compounds are responsible for certain wine flavours and how they might be controlled. Some aromas come from the grape berry, some are formed during fermentation and others are formed during maturation in a barrel or bottle. Even the choice of bottle closure – screwcap or natural cork – can strongly influence the bouquet of a wine over time. Although challenging, it is important to understand the relationship between wine chemical composition and sensory properties to help wine producers to tweak their practices accordingly.

In traditional flavour chemistry research, wine aroma compounds are identified one at a time using techniques such as gas chromatography-mass spectroscopy, but this approach does not reveal how odourants interact or help to uncover aromas that are signalled by multiple compounds simultaneously – a phenomenon known as configural odour processing. To investigate this complicated liquid a series of sensory descriptive analysis studies was conducted at the Australian Wine Research Institute in Adelaide. Statistically based experimental designs were used to identify interactions between odourants that shape the aroma of fruity Chardonnay wines. Using model wine systems that mimicked generic white wine, odourants were added or removed, in combination, to untangle the role each compound plays in the sensory properties of a glass of wine.

This approach found that peach aroma, which is highly desirable for many consumers, was directed by a small group of yeast-derived ester compounds, particularly ethyl octanoate. Interestingly, when this odourant was presented with another ester, ethyl butanoate, the aroma shifted from peach to a clear pineapple character. Another important interactive effect was found when several floral/citrus-smelling monoterpenes, which come from the grape berry, were combined with trace amounts of lactone compounds and the mixture became reminiscent of fresh apricot. This apricot character is common in several wine types, but is a hallmark of Viognier wines and is highly sought after by some winemakers.

However, not all aromas are desirable in wine. These experiments also showed that some compounds not only imparted cheesy and cardboard off-odours to wine but also had strong suppressing effects, diminishing the intensity of the fruity attributes. By identifying the roles of these odourants in specific wine flavours, advice can be provided to the wine industry on ways to modify or preserve their levels. For example, producers could select particular yeast strains to increase the concentration of esters or choose vineyard planting material or timing harvest to enhance levels of monoterpenes.

Nandorfy *et al* (2021) Understanding the interactive effects of volatile compounds contributing to stonefruit aroma nuances in white wine. Australian Journal of Grape and Wine Research (in press).

Situational desire for food

Some situations are so strongly connected to specific foods that being in such situations increases your desire for these foods. For example, walking into a pub may increase your desire for a beer. Being in front of an open fireplace while snow covers the world outside, may increase your desire for a hot chocolate milk. The more we are

exposed to a set combination of situation and food consumption, the more we ground the combination of situation, bodily response and desire for food in our memory and cognition. Such combinations can be so strong that only the sight of a situation, or us imagining being in a situation, can trigger a response such as a desire for specific foods or the initiation of a specific habit. For example, visualising a photo of Christmas in your family home may trigger that warm feeling of belonging. You imagine yourself eating food that is associated to that situation which subsequently increases your desire for Christmas pudding. A better understanding of how situational cues can reactivate an eating experience is important for sensory marketing, in which we try to evoke the senses and desire by providing a variety of situational cues.

In a recent paper in the journal Appetite, Papies and colleagues investigated how a given situation (e.g., cinema vs kitchen) can increase consumers' ability of imagining eating specific foods. By showing consumers (n=524) different combinations of food and situations and by having participants taste the actual foods, the researchers showed that consumers' ability to imagine eating the food played a crucial role in how much they desired the food. Simply put, the more vivid the imagination, the higher the desire for food. Such vivid imagination is more likely to happen when the situation is congruent with the food. For example, a photo of soup in a kitchen is congruent, whereas a photo of soup in a cinema is not. For sensory marketing it is important that the situational cues embedded in photos and descriptions of the situations, help consumers imagine they are eating the food. If this imagination is strong enough it could increase desire. Photos of food without an appropriate context, like food on a white background, or photos of food in isolation where they are usually eaten as part of a meal, make it more difficult for consumers to imagine eating the food and could therefore have a negative impact on food desire. The findings of this research can be used when selling food online. The COVID pandemic has seen a sharp increase in online food ordering and although we are slowly moving out of lockdown, it is expected that the increase in online food ordering will stay higher than it was pre-COVID.

Papies E. K. *et al.* (2022) Situating desire: Situational cues affect desire for food through eating simulations. *Appetite*, 168 https://doi.org/10.1016/j.appet.2021.105679

Rapid descriptive methods

Descriptive Analysis (DA) is considered the gold standard of objective sensory testing where a group of panelists (n=8-12) is trained to use sensory attributes that discriminate among a specific product set. These attributes are then anchored by reference standards ensuring that the panelists are using the attribute in a similar fashion. The construction and running of a DA panel takes considerable investment in time, expertise and cost which means it is out of reach for many SMEs and led to the development of 'rapid methods' as they do not require the time and cost involved with traditional DA. Check-all-that-apply (CATA) is a rapid method where the untrained consumers are given a list of attributes and are asked to either check if the attribute is present, while rate-all-that–apply (RATA) where they rate the attribute's intensity. Both CATA and RATA require more participants than DA (approximately 80 consumers) but all participants are untrained which greatly reduces time and cost.

A new study from the University of California compared traditional DA using highly trained panelists (n=10) with CATA and RATA using semi trained panellists (n=10-14). The authors aim was to see if CATA and RATA using a low number of panelists could perform as well as descriptive analysis with the thought

that CATA or RATA may be useful as a replacement in industry R&D projects. For sample preparation, soups were modified by addition of small amounts of fat, salt or MSG and panelists evaluated soups using each method to identify attributes and potential differences between soups. The performance of each method to identify attributes and differences was assessed.

Results showed that DA was the most powerful method at discriminating samples, but the time involved in data collection was also significantly more than RATA or CATA. The RATA method using an attribute reference list, simple intensity scale, and panelists with limited training also provided good discrimination. The authors suggest that RATA may be more appropriate than DA for industry based panels as DA may provide overdiscrimination which does not reflect the consumer liking.

Nishida *et al.* (2021) Comparing classical descriptive analysis with modified descriptive analysis, modified rate-all-that-applies and modified check-all-that-applies. *Journal of Sensory Studies* 36:e12684 https://doi.org/10.1111/joss.12684

Dr Russell Keast is Professor and Dr Gie Liem is an Associate Professor - both are members of the CASS Food Research Centre at Deakin University. Damian Nandorfy and Dr Leigh Francis work for the Australian Wine Research Institute.