

Wine Consumer Flavour Preferences

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1. INTRODUCTION

Wine companies have recognized the need to better understand consumer preferences to sustain and develop their business in a competitive global market. Such an understanding allows wineries to design wine styles that better respond to consumer needs, wants, and expectations.

Current knowledge about the development of preference for foods and beverage supports the fact that a particular wine style won't appeal to every wine consumer, considering the biological, cultural, and genetic variability existing among individuals. The intrinsic aromatic properties are only one component affecting preference. Extrinsic factors such as bottle label design or promotional cues are determinant in wine choice and purchase behaviour.

This paper reviews the current hypotheses for developing preference for wine, focusing on the sensory and cognitive dimensions affecting eventually consumer purchase and consumption behaviours.

2. HOW ONE LEARNS TO LIKE WINE

Understanding the development of food and beverage preferences has been the focus of many researchers from various disciplines interested in different development phases during the human lifespan. Rozin et al. [1] reviewed the biological, cultural, and individual factors affecting food likes and dislikes, highlighting the difficulty to assign particular food to particular mechanisms, partly because foods are consumed for multiple reasons". More recently, Blake [2] analysed the latest investigations and learning about the development of preferences for food flavours, from the neonate to the human adult, describing the multimodal aspects of flavour perception and how the perceptible and cognitive factors could affect the process.

Rozin et al. [1] categorized alcoholic beverages as "initially unpalatable substances" that the young adult eventually acquired a preference for. Wine can evoke sensory properties such as bitterness and unfamiliar aromas (e.g. oaky, green aromas), which are typically disliked by children when encountered in food [3, 4]. Liking for these unpalatable flavours require an associative learning process. Liking for alcoholic beverages and wine in particular develops at the end of the childhood or the beginning of the adult life, mainly because in our western societies, parents avoid to expose their children to alcohol for obvious child development and health-related reasons. However, within some Mediterranean cultures, wine could be part of the family diet, which could create some exposure to the concept of drinking wine for particular occasions (e.g.

meal, celebration) in the child's mind. Rozin [1] stated that preference for bitter products such as coffee, wine, or beer developed when the unpleasant sensory characteristics resulted with desirable post-ingestive consequences. However, to our knowledge, no thorough studies have been undertaken to understand the development of preference for wine during the adulthood, partly because "the complex multidetermination of likes and the massive role of culture have discouraged intensive investigation" [1].

It is believed that consumers who just started to drink wine tended to prefer sweeter and fruitier wines, sensory characteristics that were very familiar and for which, preference had been established during childhood. Evolution of preferences towards other wine styles could be affected by socio-cultural and environmental factors. Within a cultural group, consumers will tend to develop a preference for products that are familiar and safe (Rozin, 1977 cited by [2]). For example, consumers from a specific wine region will have greater exposure to local wines and will likely prefer the wines produced in this region rather than the wines from unknown wine areas. Rozin (1992, cited by [2]) stated that food preferences were defined by socio-cultural rules rather than being influenced by physiological needs. Although wine has some nutritional and health values as other commodity products, it also conveys social and symbolic values that can affect the shifts in drinking habits [5, 6]. Peer pressure, signs of status, or fashion could influence the evolution of preferences toward different wine styles, which would have been disliked otherwise.

Consumers' genetic heritage may interfere with the development of wine preference. Sensitivity to 6-n propylthiouracyl (PROP), a bitter taste compounds, might be related to likes or overconsumption of alcoholic beverages. Prescott et al. [7] reported that alcohol was more irritating for supertasters than non tasters; similar conclusions were made on some beers (Intranuovo and Powers, 1988, quoted by [8]) and wines [9]. Bartoshuk et al. [8] hypothesised that the wide range of retronasal olfactory sensations found in wine might also differ between nontasters and supertasters. Thus, PROP tasting could influence both positive and negative sensations in alcoholic beverages. However, the significance of the correlation between PROP sensitivity and dislikes of alcoholic beverages using behavioural and consumption measurement has yet to be demonstrated. Pretorius et al. [10] stressed the importance of characterizing consumers' olfactory repertoire, i.e. their ability to detect key wine aroma compounds that may impart different preference patterns. Research onto the genomics of smell could assist in developing screening tools to segment consumers on their olfactory abilities and therefore potential preference. However, Rozin [1] stated that sensory sensitivity were not good predictors of individual preferences. More research is therefore needed to validate the hypothesis of the Australian researchers.

Wine sensory characteristics, commonly referred to "taste", were reported as one of the most important factors in consumers' wine choice decision [11, 12]. However, consumers rarely have the opportunity in wine stores or supermarkets to taste the product prior purchase, which makes the act of purchasing a risky endeavour. Thus they tend to rely on non sensory factors to help them make the right choice. In the following section, we will review the literature investigated the sensory dimensions of wine flavour preference on the one hand and the cognitive dimensions on the other hand.

3. SENSORY DIMENSIONS OF FLAVOUR PREFERENCES FOR WINE

Until recently, wine producers were relying on internal or external experts to predict consumers' likes of their wine production [13]; alternatively, they would conduct consumer studies in central locations and would ask consumers to rate the product acceptability but also to analyse their liking score by answering several diagnostic questions on just about right scales [14]. These methods could not provide an objective description of the sensory attributes driving consumers' liking, but only grounds for further interpretation or extrapolation by product developers [14]. The emergence of collaborations between sensory and market research departments led to the increasing use of preference mapping techniques to identify and target consumer preferences.

Only few studies investigated the sensory attributes driving consumer preferences for particular wine styles, using preference mapping techniques; in these cases descriptive data were collected from a trained panel and liking data from wine consumers. We have selected six studies (Table 1), which were conducted in North America; two studies used red wines as stimuli while the others used white wines. Although the objectives of these studies were different, the sensory variability among the wines was different and the consumer population were recruited from various background and geographical origins, we looked for potential underlying sensory dimensions that could explain preferences for specific wine aromas. For simplicity, we will only consider the drivers of liking, independently of any identified consumer segments; these drivers could be positive or negative on consumers' preference.

For the two Chardonnay studies, both conducted in the USA, the fruity, spicy and vanillin/oak aromas were common drivers of liking, modulated across consumer segments as the optimal intensity for these attributes might differ between segments. For the two red wines studies, one conducted in the USA, the other one in Canada, the only common underlying dimension was vanilla/oak. Considering the discrepancies in the experimental designs used for these studies, it is interesting to note that vanilla/oak is identified as a driver of liking for both red and white wines. It was shown that vanilla/oak tended to be used to describe liking for wine whereas smoky/oak tend to reflect unpleasant sensory experience for consumers [15].

The Riesling study [20] compared drivers of liking in two tasting conditions: either the liking scores were collected on samples presented blind or on samples presented with an information sheet describing six parameters: vintage, appellation, label size, sensory information and magazine rating. In the blind condition, two liking segments were identified driven by 1) raisin, honey, sherry, melon and low in fruity aromas and by 2) grapefruit, peach, lemon rose and low in honey melon aromas. Interestingly, when the information was presented, a third consumer segment was identified, driven by cooked apple, sherry-like character (data not shown). This result highlighted the importance of the cognitive dimension in consumers liking and how extrinsic cues can affect one's sensory experience. This topic will be discussed in the next section.

Table 1. Publications investigating wine aroma preferences.

Authors	Wine category	Attribute analysis	Consumer evaluation	Aromas driving liking
Lesschaeve, et al. [14]	White wines 23 Chardonnay samples representing 14 wine styles	Descriptive analysis with 12 trained panelists; 16 aroma attributes	Central location tests, with 361 consumers. Liking rated on a 9 pt hedonic scale	Depends on consumer segments: Sweet, fruity, berry, overall aroma intensity, vanilla toasted oak, alcohol, spicy oak, lingering after-taste
Yegge et al. [16]	White wines: 12 inexpensive Chardonnay wines	Descriptive analysis with 14 trained panelists; 10 aroma attributes	Central location tests, with 126 consumers. Liking rated on a 9 pt hedonic scale	Depends on consumer segments: Fruity, floral, Caramel, spice, oak
Frøst et al. [17]	Red wines: 12 inexpensive red wines, 7 varieties or blends	Descriptive analysis with 12 trained panelists; 9 aroma attributes	Central location tests, with 57 consumers. Liking rated on a 9 pt hedonic scale	Vanilla/oak, Canned vegetables, and Green olives, berry, butter leather
Lesschaeve, et al. [18]	Red wines: 5 Merlot wines	Descriptive analysis with 8 trained panelists; 17 aroma attributes	Central location tests, with 41 consumers. Liking rated on a 100 pt linear scale	Depends on consumer segments: Burnt, smoky, pungent, grassy, cut wood, butter scotch, vanilla rawwood
Lesschaeve, et al. [19]	White wines: 8 inexpensive white wines	Descriptive analysis with 12 trained panelists; XX aroma attributes	Central location tests, with 115 consumers. Liking rated on a 100 pt linear scale	Depends on consumer segments: earthy, asparagus, banana butter, pine musty, mushroom
Lesschaeve, et al. [20]	White wines: 4 Riesling wines	Descriptive analysis with 10 trained panelists; 22 aroma attributes	Central location tests, with 46 consumers. Liking rated on a 100 pt linear scale. <i>Blind and informed</i> conditions	Depends on consumer segments: <i>Blind:</i> high rubber and musty pungent, earthy <i>Informed:</i> earthy, rubber, rose lemon grapefruit, pungent, cooked apple, sweet, licorice, raisin

3. COGNITIVE DIMENSIONS OF FLAVOUR PREFERENCES FOR WINE

Wine purchase is a challenging event since consumers are afraid to make a wrong choice about the product quality. In a purchase situation, consumers seek internal information to make their decision, based on their knowledge or familiarity with the product, or from external information such as the packaging [21-23]. Consumers look for quality cues as external information, which can be clearly identified (e.g. brand name) or can be deduced from other features (e.g. quality symbol, origin) [24]. This search for information contributes to the formation of hedonic and/or sensory expectations towards the product [24]. When making a purchase decision, consumers try to focus only on quality cues that they think are essential to convey correct sensory and hedonic expectations [25] and avoid dissonance between what was expected and what is experienced.

Wine consumers mostly rely on external information to make their purchase decision. Bottle labels tended to be the major utilized cue along with price and award [26-28]. Both front and back labels seemed to be important in the purchase decision, however some elements seemed more influential such as the wine company, the brand

name and the expert opinion [12]. If wine bottle labels triggered quality, it did not convey however appropriate sensory expectations. Indeed, Charters et al. [29] explored consumer responses to the information written on bottle back labels. Although most of the purchasers read the back labels, knowledgeable consumers did not succeed in matching the sensory description of the back labels with the appropriate wines. In this case, the back labels failed to communicate an objective sensory description of the wines.

Many research studies investigated the effects of the information liable to influence perceived quality such as packaging, food composition, product origin, making process, and price. Few studies were conducted on wine. D'Hauteville et al. [30] investigated the strength of a brand or the identity of a wine region on wine perceived quality, comparing responses from experts and naïve subjects. Results showed that the region effect on perceived quality could vary with the type of wines and the level of respondent expertise. Lange [31] studied the impact of three extrinsic cues (Appellation of Origin, Vintage, and Producer) on the perceived quality of four Burgundy wines. In all cases, the extrinsic information was more important on the overall liking of the wines than the sensory characteristics. The strength of the extrinsic cues was also observed on non-vintage Champagne wines [32]. More research is needed to determine if the prevalence of the non-sensory factors over the sensory attributes of the wine for consumers to express their likes or dislikes consumers' preference is dependent on the individuals wine culture, knowledge and involvement.

4. CONCLUSION

For a long time, wine producers have focused on wines sensory intrinsic properties to attract new consumers or keep the loyal ones. Wine quality has significantly improved thanks to the significant advances in oenology and viticulture practices, minimizing wine faults, enhancing viticulture techniques and fighting against vine diseases. The globalization of the wine market requires wine producers to offer distinct wines from the competition. The understanding of consumers' preferences for wine flavours and the non-sensory factors affecting wine purchase, consumption and repeat consumption will be critical to be successful on an export market, whether domestically outside of the original wine regions or abroad.

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