Brandy and Cognac: Consumption, Sensory and Health Effects

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Brandy in a Global Spirit Context

Market Trends

According to Euromonitor, the global spirit market in 2014 was estimated to be around 21 billion liters. Brandy and Cognac sales contributed to 8% of the global spirit sales at approximately 1.6 billion liters, making it the third largest category, after vodka and whisky that sold around 4 billion and 3 billion liters, respectively. The IWSR reported that the retail value of brandy and Cognac sales in 2013 amounted to 31.4 billion USD. The top markets for brandy are Brazil, Germany, Russia, India, and the Philippines, while substantial volumes are also sold in the United States, South Africa, China, and the Ukraine. In comparison, the main markets for Cognac, according to the Bureau National Interprofessionel du Cognac (BNIC), are the United States, Singapore, China, the United Kingdom, Germany, Hong Kong, France, the Netherlands, Norway, and Finland. Interestingly, sales in the Western markets are driven by the more affordable VS category while the Eastern market sales are driven by superior quality Cognacs. Over recent months, numerous Cognac producers have announced a decline in their profits, largely attributed to the Chinese government's crackdown on luxury spending and gifting, which has resulted in a slowdown in the country's Cognac and high-end Scotch market. Nevertheless, the region remains a priority export market.

Consumer Trends

Volume and sales trends indicate that there is a growing consumer penchant for expensive luxury spirits. Yet, according to Euromonitor's trend forecast for 2014 and beyond, Cognac will be seen less as a traditional drink that can be given as a gift and will feature more prominently in the mixology arena. Younger Cognac and Armagnac products in the VS category are increasingly being consumed in tall drinks and cocktails. Brandies that contain larger portions of more neutral column distilled spirits, such as South African blended brandies, can be also served very successfully in long mixed drinks and is often consumed mixed with cola soft drinks. Modern mixology trends move toward using ingredients that complement the fruity, sweet, and spicy attributes of brandy. The wide variety of combinations, featuring botanicals, fruit juices, confectionary ingredients, and spices being used in brandy cocktails, demonstrates the versatility of the product category.

In contrast, premium pot distilled brandies and older Cognac and Armagnac products are generally consumed neat or diluted with water or on ice to preserve the flavor complexity. Brandy, Cognac, and Armagnac have also become part of the fine dining experience as food pairing partners due to its smoothness and rich flavors.

Production of Brandy

Grape Varieties Used for Brandy Production

A wide variety of grape cultivars are used to produce Cognac, Armagnac, and brandy. Cognac is made mainly from the cultivars 'Ugni Blanc' and 'Folle Blanche' and Armagnac with 'Folle Blanche', 'Ugni Blanc', 'Baco', and 'Colombard'. Brandy produced in other countries is made not only from the previously mentioned cultivars but also from 'Chenin Blanc', 'Arien', 'Flame Tokay', and many other cultivars. The unique character of the individual cultivars contributes to the distinctive taste profiles of the eventual brandies.

Base Wine Production

Base wine, or the wine made specifically for the production of brandy, Cognac, and Armagnac, differs significantly from table wine. First, the grapes are picked early to ensure high acid concentrations and lower sugar levels (18–20° Balling). The addition of sulfur dioxide is common practice with the production of table wine. However, the addition of sulfur during the production of base wine for brandy is uncommon. For example, the level of total sulfur in the base wine must be lower than 20 mg l^{-1}. Otherwise, a reaction between sulfur and copper of the pot stills results in the undesirable formation of copper sulfate. In other countries, such as Spain, the base wine is transported over long distances from the point of winemaking to the point of distillation. Consequently, sulfur is used to protect the base wine from oxidation. The levels of volatile acidity and total phenolic content must be below 0.7 g l^{-1} and 250 mg l^{-1}, respectively, depending on the regulations per country. The yeast sediment that forms during the fermentation of the base wine is either included or not in the distillation process, depending on the style of brandy produced.

Distillation Process

The base wine is now distilled, and during this process, the alcohol concentration is increased from 9–11% to 72% alcohol by volume (abv) for Cognac and brandies from South Africa and other countries or 53–60% abv for Armagnac. In this process, depending on the method used or style that is needed, the wine is heated in a still until it separates into its components, which evaporate at various points on the temperature scale. The more volatile the component, the lower the temperature at which it evaporates, leaving behind the impurities and heavier compounds.

For Cognac and some brandies, distillation is performed in copper pot stills in a two-phase process that creates a complex spirit. In the first phase, the base wine is distilled into low wine. The alcohol concentration of the low wine is between 28% and 30% abv. This is essentially a concentration process resulting in

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the removal of a large proportion of water and soluble solids from the wine. The second stage of distillation involves distilling the low wine into brandy. Three fractions of the liquid are drawn in sequence. These fractions are known as the heads, hearts, and tails, respectively. The heart fraction is the most important, as it is rich in desirable aromas and flavor compounds and it is this fraction that is retained for maturation.

Although the main apparatus used for the production of brandy is the pot still, distillation can also be carried out using a column still (continuous distillation). Armagnac from France, Spanish brandy, and several brandies from the United States are produced with column stills. This apparatus is composed mainly of stainless steel and not copper, although some stills are modified to consist both materials. Distillation takes place continuously and not in batches as with the case of pot still distillation, and the distillate obtained has an alcohol concentration ranging from 50% to 90% abv. Distillates having a high (80–90%) alcohol concentration is less aromatic than that obtained from pot still distillation. The decision made as to what apparatus should be used for the production of brandy is dependent on the style of brandy desired.

Maturation and Blending

After the distillation process, the distillate is placed in oak barrels to mature. These barrels vary with regard to their size, type of wood, and the length of the maturation period that is determined by the laws and regulations that govern each country. After maturation, the brandy is blended with distilled water to decrease the alcohol concentration, and additives such as caramel, sugar, and oak infusion may in certain instances be added. Again, these additions are dependent on the legal classifications of each country.

Sensory Perception and Flavor Chemistry

The sensory perceptions that form part of the brandy, Cognac, and Armagnac consumers' product experience include appearance, aroma, and mouthfeel. These perceptions are the response to a complex chemical structure that is influenced throughout the entire brandy production process as described earlier in the text.

Color and Appearance

Brandy color hues range from greenish tints to straw yellow, golden, and topaz. Brandy can also differ in terms of color intensity, from lightly colored to dark, but never hazy or opaque. Brandy color is influenced by barrel maturation and color rectification with flavorless caramel. The color of brandy has a significant impact on how the aromas and mouthfeel of the product are perceived. Both Cognac and Armagnac color hues tend to darken with aging; young products are typically described as golden or honey in color, while older products are described as amber or mahogany.

Brandy Aroma: Origin and Perception

The compounds responsible for brandy aroma can be traced back to those originating from the grapes and formed during alcoholic fermentation, which are subsequently concentrated into the heart fraction during distillation. Cognac literature also describes the formation of notes such as cocoa and grilled nuts, derived from the cooking process that occurs as the base wine is heated for distillation. Compounds that are extracted, formed, or modified during wood maturation also have a significant contribution to the flavor profile of brandy, Cognac, and Armagnac.

Aroma compounds that originate from grapes include six-carbon alcohols, terpenes, aldehydes, and products of carotenoid degradation such as α-ionone. These compounds typically impart fruity, floral, and green aromas. The presence of grape-derived compounds is influenced by the grape cultivar, terroir, climate, and viticulture and harvesting practices.

Esters are one of the major fermentation-derived flavor compounds contributing to brandy aroma and are known to impart fruity aromas. The final ester content of brandy is influenced by several factors: the ester composition of the base wine, the occurrence of malolactic fermentation during base wine production, the presence of yeast lees during distillation, and the point at which the heart fraction is cut during distillation. Other by-products of alcoholic fermentation that contribute to brandy aroma, through synergistic and masking effects, are higher alcohols, volatile medium- and long-chain fatty acids, and aldehydes.

During Cognac distillation, the heating process can result in ester and terpene hydrolysis. Maillard reactions and Strecker degradation processes can also take place as a result of the heating process, leading to the formation of furans, pyridines, pyrazines, aldehydes, and acetals, all of which can contribute to Cognac aroma.

The most important aromatic compounds that can affect brandy aroma, as a result of wood maturation, are oak lactones, phenolic aldehydes, and furanic aldehydes. The quantities at which these compounds can be found in brandy depend not only on the wood species used but also on the seasoning and toasting practices during barrel manufacturing. Wood maturation affects brandy aroma through flavor compounds present in the wood that are directly extracted from wood lignins into the spirit, where they can undergo further conversions. Alcohol in the spirit can also react with wood lignins to form new flavor compounds, as well as modifications of spirit congeners carried over from distillation.

The wood species used during barrel maturation have been found to impact significantly vanilla, woody, caramel, burned/toasted, green, tails, and rubbery aromas. Oak wood tends to have more intense woody notes due to the presence of *cis*- and *trans*-β-methyl-γ-octalactones, which do not occur in other wood species. Wood toasting has been associated with an increase in vanilla, woody, spicy, caramel, burned, toasted, dried fruits, and smoke notes. However, this is not a linear effect, as degradation of oak lactones and furanic aldehydes at very high toasting temperatures can result in a decrease in woody and vanilla characters. Wood toasting has also been found to have a decreasing effect on fruity, green, tails, and glue-like aromas in brandy. These characters are further decreased during the maturation process. As the maturation period lengthens, the vanilla, woody, rancid and spicy, toasted, smoke, and caramel notes become more intense. Reports have indicated that most of the flavor evolution that takes place during brandy maturation occurs within the first 3 years of maturation.

In Cognac production, the presence of 'rancio' notes is an indication of the age and refinement of the product. This term refers to a complex set of aroma notes that develop during the

maturation process and is the result of a mixture of aromatic methyl ketones and compounds resulting from the oxidative degradation of oak components after at least 10 years of maturation.

Evaluation of Brandy Aroma

Due to the volatility of the flavor compounds at the alcohol level of brandy, it is recommended not to swirl the product prior to nosing as is commonly done during wine evaluation. Instead, brandy aroma can be best appreciated by starting to hold the glass a few centimeters away from the nose. Here, the delicate fruity and floral notes can be observed without being overpowered by ethanol. Gradually, the product can be brought closer to the nose to introduce first the sweet and nutty flavors and finally the heavier woody flavors. Aroma wheels have been developed for South African brandies and Cognac and Armagnac as aroma recognition aids during product evaluation.

Brandy aroma wheel

The South African brandy aroma wheel categorizes the types of aromas perceivable in brandy into a two-tiered system shown in Figure 1. Although the aroma wheel was developed for South African brandies, the wheel is representative of the characteristics that can be perceived in brandies from other countries. The fruity, muscat, floral, woody, toasted, nutty, sweet, and spicy characters indicated on the aroma wheel are considered as positive and, therefore, adding to quality. In contrast, characters such as tails, green, rubbery, and solvent-like detract from quality.

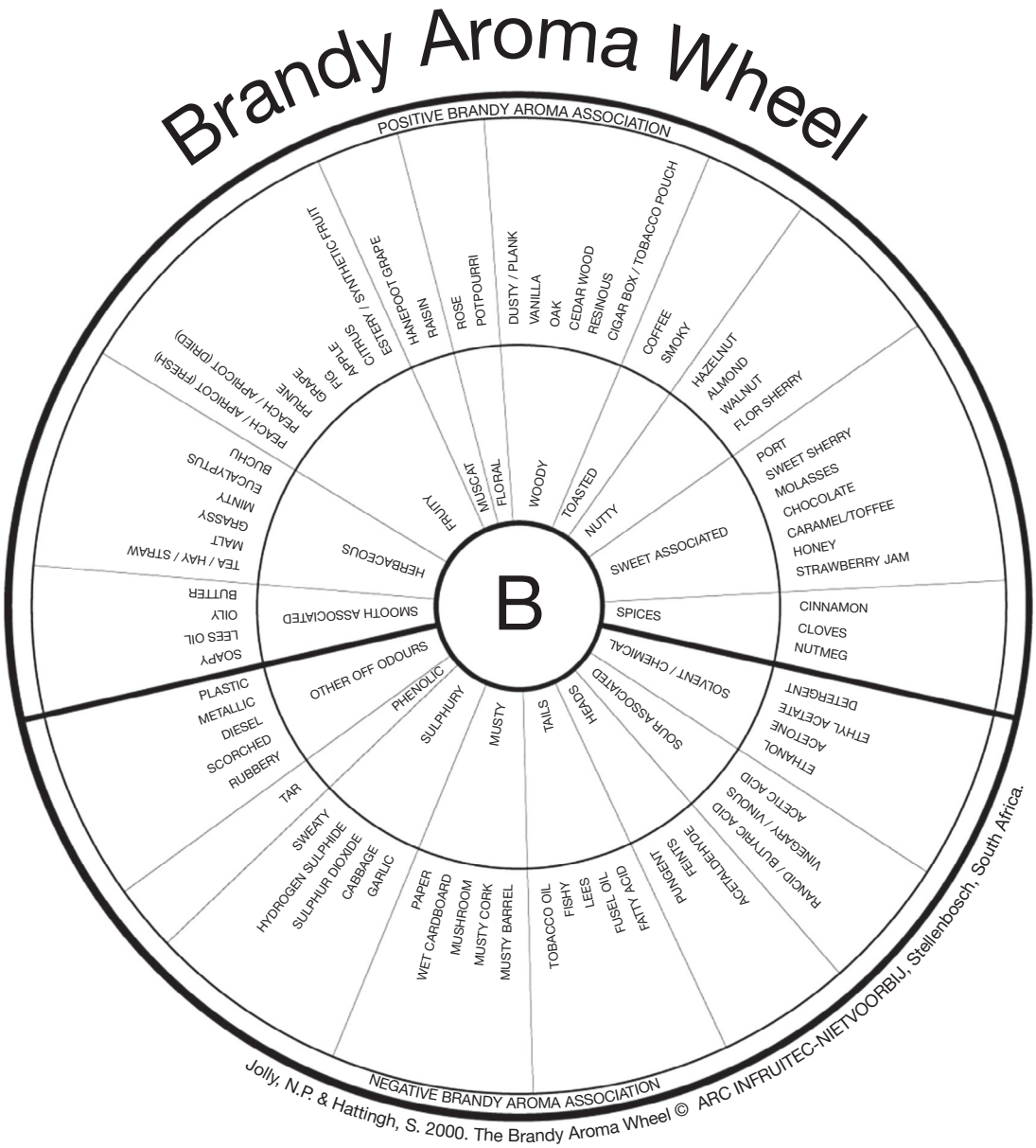

Figure 1 Aroma wheel developed for South African brandies. Reproduced from Jolly, N. P. and Hattingh, S. (2001). A brandy aroma wheel or South African brandy. *South African Journal of Enology and Viticulture* **22**, 16–21.

Cognac aroma wheel

The Cognac aroma wheel was developed by the BNIC and includes over 60 aromatic notes. Unlike the brandy aroma wheel, where the tiers are organized into aromatic families that contribute positively and negatively to brandy quality, the Cognac notes were categorized into four families corresponding to the four seasons: spring, summer, autumn, and winter (Figure 2). The reasoning behind this unique format was to encourage consumer engagement in Cognac appreciation. Prior to the development of the seasonal aroma wheel, the flavor developments that occur during Cognac maturation have been modeled for each of the four main aroma families: fruity, floral, woody, and spicy.

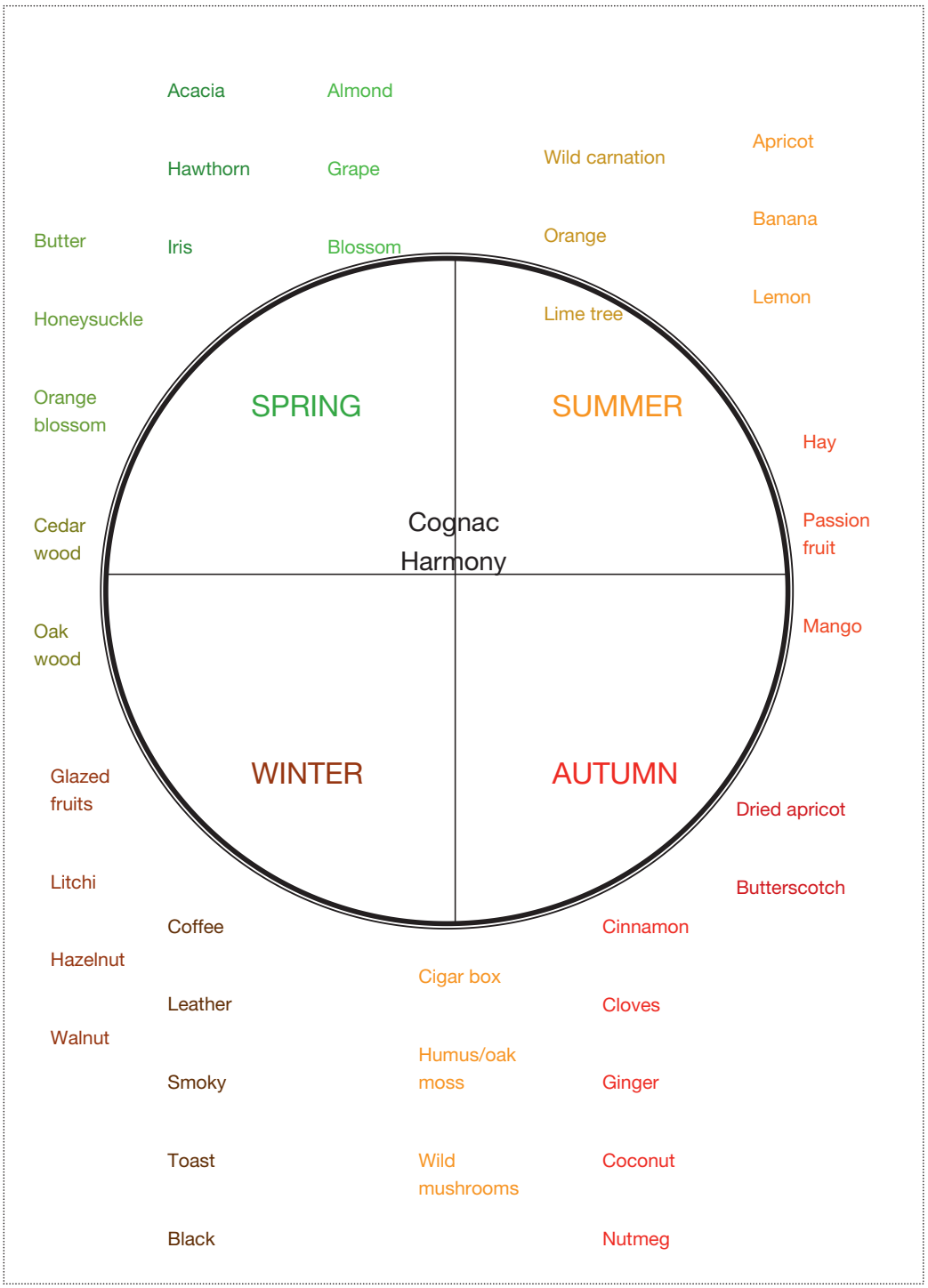

Figure 2 The cognac aroma wheel (Lenoir J (2009) *Cognac Aroma Wheel*. Second International Cognac Summit. Bureau Interprofesionel du Cognac).

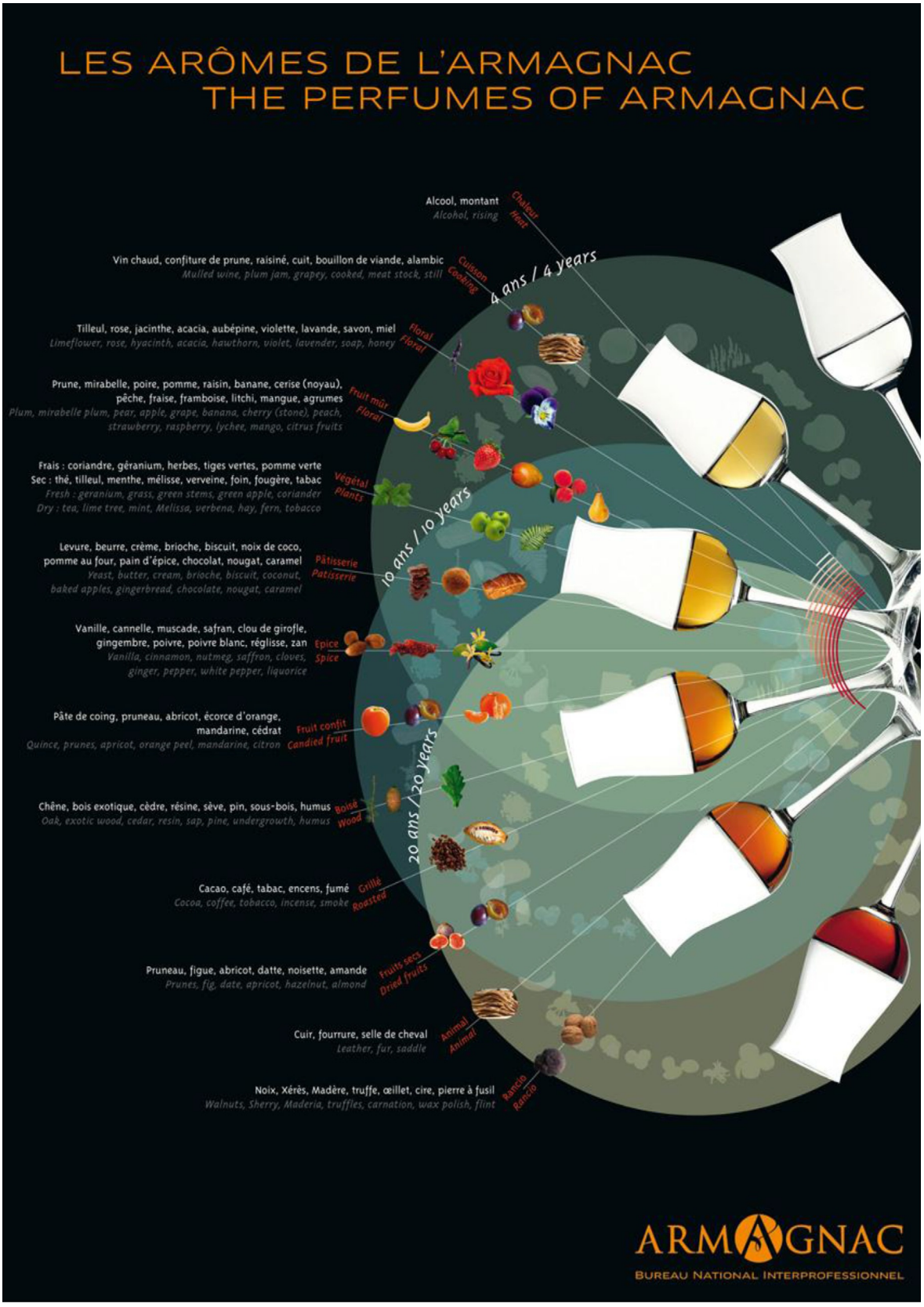

Figure 3 Aroma wheel developed for Armagnac (Bureau National Interprofessionel de l'Armagnac).

Armagnac aroma wheel

Similarly, the Bureau National Interprofessionel de l'Armagnac (BNIA) developed an aroma wheel for Armagnac evaluation. The Armagnac wheel is organized into three overlapping circles that illustrate the flavor evolution that takes place during Armagnac aging (Figure 3). The first circle shows the notes associated with Armagnac products aged for up to 4 years, followed by those associated with 10-year-old products, and finally 20-year-old products. The wheel also includes a color chart showing the variety of color hues associated with Armagnac, ranging from pale to amber.

Brandy Mouthfeel Perception

Brandy mouthfeel develops during wood maturation as low-molecular-weight and hydrolyzable tannins are extracted from oak. These compounds impact the perception of smoothness, burning, astringency, bitterness, and body. As brandy matures, its body and flavor complexity increases, whereas astringency and alcohol burn decrease.

A Comparison of the Cardioprotective Effects of Brandy and Wine

It is well-known that moderate alcohol consumption has a beneficial influence in decreasing the incidence of coronary heart disease. In fact, several epidemiological, case–control, and cohort studies suggest that there might be a causal relationship. Recent reports also indicate an association between light to moderate consumption of red wine and a decreased incidence of diabetes and reduced risk of cardiovascular disease and consequential mortality.

The health benefits of wine are thought to be linked to interactions between the antioxidant, polyphenol, and ethyl alcohol contents that are especially prevalent in red wine. These compounds are known to have anti-inflammatory, anti-atherogenic, and vasorelaxant properties and can also contribute to preventing lipid toxicity, decreasing aggregation of platelets, which leads to blood clotting, and improved blood viscosity.

A South African study recently compared the health effects of the moderate consumption of brandy, which contains more ethyl alcohol and less health-promoting polyphenols than wine, to those of moderate consumption of red wine in healthy adults. The consumption of both wine and brandy resulted in a significant increase in high-density lipoprotein (HDL) cholesterol, which favors heart health.

However, evidence suggests that not everyone may benefit from the health benefits of moderate alcohol consumption; gene–environment interactions may play a role in whether consuming moderate amounts of alcohol has a positive or negative effect on an individual's cardiovascular health. For instance, it has been found that moderate consumption of both red wine and brandy resulted in a significant increase in triglyceride levels in individuals carrying risk-associated, low-penetrance mutations of the HFE gene, previously shown to underlie hereditary hemochromatosis.

Genotyping performed as part of personalized risk assessment may identify a high-risk genetic subgroup of individuals likely to derive less benefit from alcohol consumption. Nutrition intervention may be more effective to lower cardiovascular risk when the genetic background is taken into consideration to identify of gene–environment interactions. This type of assessment may be particularly relevant to patients expressing the metabolic syndrome: a constellation of cardiometabolic risk factors including central obesity, hypertension, impaired glucose tolerance, and dyslipidemia (high triglyceride levels and/or low HDL levels). Further investigations into the role of genes and environment, in assessing mechanisms underlying the benefits of alcohol use and cardiovascular disease risk, may lead to the development of standardized limits for safe alcohol consumption, guided partly by individual genotype.

See also: Alcohol: Metabolism and Health Effects; Alcohol: Properties and Determination; Brandy and Cognac: Manufacture and Chemical Composition; Gin; Rhum–Ron–Rum: Technology and Tradition; Vodka; Whisky, Whiskey and Bourbon: Composition and Analysis of Whisky; Whisky, Whiskey, and Bourbon: Products and Manufacture; Wines: Champagne and Sparkling Wines – Production and Effervescence; Wines: Madeira, Port and Sherry Fortified Wines – The *Sui Generis* and Notable Peculiarities. Major Differences and Chemical Patterns; Wines: Types of Table Wines; Wines: Wine and Health; Wines: Wine Production; Wines: Wine Tasting.

Further Reading

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