

Descriptive analysis of wines from *Vitis vinifera* cv. Albariño

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Abstract

BACKGROUND: Descriptive analysis is the method most used in sensory analysis for product characterisation. This method is used to identify and quantify different wine sensations and attributes. The aim of this study was to evaluate the effect of the vintage on sensory attributes the Albariño wines from Rías Baixas (Galicia, Spain) and characterise the typical sensory profile of Albariño wine.

RESULTS: All descriptors found could be included in six categories: fruity, floral, vegetal, balsamic, lactic and toasted. Significant differences were observed between the aroma descriptors of Albariño wines of different vintages. Apple, apricot, banana, citric, floral, grass, lactic, peach, pear, pineapple, ripe fruit, toasted and tropical fruit were the common descriptors across vintages. Therefore, these attributes may qualitatively be considered as typical descriptors of Albariño wines from Galicia. No significant differences were found for aroma intensity of apricot, grass, ripe fruit and tropical fruit. These descriptors may quantitatively be considered as typical descriptors of Albariño wines. The 2003 and 2005 vintages were the more complex vintages because they displayed a high number of descriptors with 'adjusted frequencies' greater than 10%.

CONCLUSION: By using sensory descriptive analysis of commercial wines from four vintages, we obtained a sensory profile of Albariño wine. Fruity, floral and grass defined the aroma of Albariño wines.

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Keywords: Albariño; aroma characterisation; sensory descriptive analysis; vintage

INTRODUCTION

Wine is a complex mixture of water and various chemicals including alcohol, phenolic compounds, organic acids, volatile aroma compounds and residual sugars, all of which can contribute to the sensory characteristics of the product.^{1,2} Different techniques have been developed to determine the volatile composition of wines. However, the wine aroma does not depend solely of concentrations of different compounds; perception is very important too. Sensory analyses must be used to evaluate wine quality.

Descriptive analysis is the sensory method most utilised in sensory analysis for product characterisation. Sensory descriptive analysis has been widely used by researchers to describe the sensory characteristics of food products. This method allows different sensations and attributes in food products to be identified and quantified by persons with training and experience.³ The qualitative component comprises the descriptive terms, attributes, which define the sensory profile of the product.⁴ The quantitative component measures the intensity and frequency of each descriptor perceived.^{5,6}

Quantitative descriptive analysis techniques for the objective characterisation and discrimination of products have been applied to wines in recent

decades and have become standard practice in sensory evaluation.^{7–9}

This methodology has been applied to show influence of environmental characteristics¹⁰ and characterise different wines, such as Chardonnay,¹¹ Semillon and Sauvignon Blanc,¹² Cabernet Sauvignon,¹³ Shiraz,¹⁴ Touriga Nacional,¹⁵ Mencia¹⁶ and Albariño.¹⁷

Some authors have concentrated only on aroma because preliminary evaluation of their wines revealed very small differences in taste.¹⁸

Albariño (*Vitis vinifera* L.) is one the most important Spanish white grape cultivars. It is an interesting variety for wine regions in Atlantic climates. The Rías Baixas appellation, located in Galicia (north-western Spain) is the largest region in the world which grows the Albariño cultivar. In general, young white wines produced with Albariño grapes are mainly characterised by their fruity and floral odours.^{17,19–21} In a previous study, we described the most important wine descriptors of this cultivar in different geographic areas.¹⁷

This study examines the effect of vintage on the sensory attributes of wine. Albariño wines from four consecutive vintages were selected. The objectives of this research were to: (1) establish

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aromatic descriptors from each vintage; (2) examine the variation in sensory descriptors between years; and (3) characterise the typical sensory profile of Albariño wine.

MATERIALS AND METHODS

Wine samples

Seventy-seven commercial wines of *Vitis vinifera* cv. Albariño of the Rías Baixas appellation (Galicia, Spain) were selected from four consecutive vintage. The wines were selected at random: 12 were from the 2003 vintage, 30 from the 2004 vintage, 12 from the 2005 vintage and 23 from the 2006 vintage.

Sensory analysis

The wines were analysed for several properties by conventional quantitative sensory descriptive analysis using seven trained panellists from Rías Baixas appellation. All the judges were experienced wine tasters and all had previously participated in similar studies.¹⁷

The sensory analysis was performed in a professional room in accordance with the ISO 8589 standard.²² This consisted of 10 independent tasting booths and had the usual conditions necessary for the sensory evaluation of wine. A constant volume of 30 mL of each wine was evaluated in wine-taster glasses at 12 °C as required by the ISO 3591 standard.²³

During training the judges generated descriptive aroma terms using wines from the study. The aroma terms were reduced to 16 from the 2003 vintage, 30 from the 2004 vintage, 26 from the 2005 vintage and 29 from the 2006 vintage. Then synonymous, hedonic and irrelevant attributes were eliminated. Thirteen aroma descriptors were used in all vintages.

During the analysis the judges smelled the different wines and indicated if the different descriptors were perceived and the intensity of each aroma attribute was rated on a structured line scale (with points anchored as none, moderate and high) ranging from 0 to 5 used by the panel to score the specific aroma properties of the wines. This experiment was carried out in duplicate in independent sessions. The tasting sessions were held in March and April of each vintage.

In order to determine the importance of descriptors and to represent the response of the entire panel, the 'adjusted frequencies' (AFs) were used.^{24,25} It expresses the frequency of reporting a note by a panel, as adjusted by the intensities assigned to it, and was calculated as $AF = \sqrt{F \times I}$ where F is the number of times the descriptor was mentioned divided by the total number of times that descriptor could be mentioned, expressed as a percentage; and I is the sum of the intensities given by the whole panel for a descriptor divided by the maximum possible intensity for this descriptor, expressed as a percentage.

This calculation method also allowed us to take into account descriptors which are rarely mentioned

but which are very important in terms of perceived intensity and descriptors with low perceived intensity but which are mentioned often. The classification of descriptors according to the size of the means allowed us to eliminate a number of descriptors whose geometrical means were relatively low.

Data analysis

All statistical analyses were performed using the Enterprise Guide 3 System Software (SAS Institute, Cary, NC, USA). Analysis of variance (ANOVA) and Fisher's least significant differences (LSD) multiple comparison tests were performed to determinate the significant differences of common aroma descriptors among vintages. Principal component analysis (PCA) was conducted in order to show groupings of the vintages and the inter-relationship of the variables. The mean of common aroma attributes with significant differences among vintages for the 77 tasted wines was calculated. Pearson's correlations between attributes were also calculated.

RESULTS AND DISCUSSION

Albariño wines from four vintages were evaluated for their sensory characteristics according to the intensity and frequency of aroma descriptors.

Table 1 shows aroma descriptors of Albariño wines from four consecutive vintages (2003–2006). All the descriptors could be included in six categories: fruity, floral, vegetal, balsamic, lactic and toasted. Aroma descriptors from fruity categories were the most important in the 2003, 2004 and 2005 vintages, accounting for 62.5%, 50% and 53.8% of total descriptors. In the 2006 vintage, fruity and floral categories accounted for 55.1% of total aroma descriptors.

This study shows how the general sensory descriptors of the Albariño cultivar can be influenced by the climatologically conditions in different vintages. Fisher *et al.*²⁶ used a descriptive analysis of commercial wines to show the impact of vintage and wine producing region on the sensory properties of *Vitis vinifera* cv. Riesling wines.

Thirteen aroma descriptors were common in all vintages: apple, apricot, banana, citric, floral, grass, lactic, peach, pear, pineapple, ripe fruit, toasted and tropical fruit. From a qualitative standpoint, these attributes can be considered as typical descriptors for young Albariño wines. In a previous study on the influence of geographic origin on aromatic descriptors of Spanish Albariño wine¹⁷ different aromatic profiles were identified between geographical areas and six sensory attributes were significantly different between the wines (ripe fruit, pineapple, banana, pear, citrus fruit and floral).

Table 2 shows the aroma descriptors with AFs greater than 10%. In this case, the 2003 and 2005 vintages were the most complex vintages because they displayed a high number of descriptors with $AF > 10\%$

Table 1. Aroma descriptors for commercial Albariño wines from four consecutive years, 2003–2006

2003	2004		2005		2006	
Apple	Aniseed	Melon	Aniseed	Metallic	Aniseed	Kerosene
Apricot	Apple	Metallic	Apple	Orange	Apple	Leather
Balsamic	Apricot	Mint	Apricot	Peach	Apricot	Mineral
Banana	Balsamic	Moor	Balsamic	Pear	Banana	Mint
Citric	Banana	Orange	Banana	Pineapple	Citric	Orange
Dry fruits	Camomile	Peach	Citric	Ripe fruit	Dry fruit	Peach
Floral	Caramel	Pear	Dry fruit	Smoke	Dry grass	Pear
Grass	Citric	Pineapple	Dry grass	Toasted	Ethanol	Pineapple
Lactic	Dry fruit	Pomelo	Ethanol	Tropical	Flower	Red pepper
Peach	Dry grass	Quince	Floral	Yeast	Fruit	Ripe fruit
Pear	Ethanol	Ripe fruit	Fruity		Grass	Toasted
Pineapple	Floral	Toasted	Grape fruit		Honey	Tropical fruit
Ripe fruit	Fruity	Tropical fruit	Grass		Jasmine	Vanilla
Toasted	Grass	Yeast	Honey		Lactic	
Tropical fruit	Lactic		Lactic		Laurel	
Yeast	Liquorice		Mango		Spices	

Common descriptors in all vintages are shown in bold in column 1.

Table 2. Adjusted frequencies greater than 10 obtained for aroma descriptors of Albariño wines from four vintages (2003–2006)

Descriptor	Adjusted frequencies >10			
	2003 (n = 12)	2004 (n = 30)	2005 (n = 12)	2006 (n = 23)
Aniseed	–	–	12.32	–
Apple	30.37	20.35	20.78	–
Apricot	–	–	13.99	–
Balsamic	24.98	–	19.67	–
Banana	14.75	–	11.56	–
Citric	23.72	27.06	23.87	13.40
Dry fruit	18.97	–	–	–
Dry grass	–	–	10.33	–
Ethanol	–	–	15.36	–
Floral	33.09	16.66	22.35	21.64
Fruity	–	18.79	27.45	24.45
Grass	27.81	24.71	29.06	27.49
Lactic	18.93	–	14.62	–
Peach	16.07	–	13.45	–
Pear	18.93	–	–	–
Pineapple	20.23	11.36	10.65	–
Ripe fruit	27.91	12.56	21.50	15.90
Toasted	18.17	–	15.79	–
Tropical fruit	14.19	10.97	15.79	17.39
Yeast	14.21	–	–	–

(15 and 17 respectively). Citric, floral, grass, ripe fruit and tropical fruit were the aroma descriptors with AF >10% for the four vintages studied. In terms of each vintage, floral aroma in the 2003 vintage, citric aroma in 2004 vintage and grass aroma in 2005 and 2006 vintages were the aroma descriptors with AF >10%.

If we arbitrarily take the most important descriptors with grand AF >20, then Albariño wine is defined by apple, citric, floral, grass, pineapple and ripe fruit in the 2003 vintage; apple, citric and grass in the 2004 vintage; apple, citric, floral, fruity, grass and ripe fruit in the 2005 vintage; and floral, fruity and grass in the 2006 vintage. In this case, only grass aroma would

Table 3. Intensity of common aroma descriptors of Albariño wines from 2003–2006 vintages

Descriptor	Means of intensity				Level of significance
	2003 (n = 12)	2004 (n = 30)	2005 (n = 12)	2006 (n = 23)	
Apple	1.07 ^a	0.71 ^{ab}	0.62 ^b	0.34 ^b	**
Apricot	0.25 ^a	0.17 ^a	0.37 ^a	0.30 ^a	NS
Banana	0.47 ^a	0.11 ^b	0.40 ^a	0.15 ^b	**
Citric	0.77 ^{ab}	0.89 ^a	0.68 ^{ab}	0.45 ^b	*
Floral	1.22 ^a	0.52 ^b	0.75 ^b	0.74 ^b	**
Grass	0.97 ^a	0.88 ^a	0.82 ^a	0.89 ^a	NS
Lactic	0.62 ^a	0.29 ^b	0.40 ^{ab}	0.21 ^b	*
Peach	0.52 ^a	0.17 ^b	0.42 ^{ab}	0.26 ^{ab}	*
Pear	0.72 ^a	0.21 ^b	0.15 ^b	0.29 ^b	**
Pineapple	0.77 ^a	0.38 ^b	0.28 ^b	0.18 ^b	**
Ripe fruit	1.02 ^a	0.50 ^a	0.82 ^{ab}	0.58 ^{ab}	NS
Toasted	0.58 ^a	0.24 ^b	0.47 ^{ab}	0.20 ^b	**
Tropical fruit	0.55 ^a	0.39 ^a	0.46 ^a	0.64 ^a	NS

Statistical significance of treatments is given by * $P < 0.05$, ** $P < 0.01$ and NS, not significant. Mean values were separated using the LSD test ($P < 0.05$) where a, and b indicate statistical outcomes. Dissimilar letters in a row of vintage means denote a statistically significance between the means.

be common to the four vintages studied, with AF >20.

Table 3 shows the intensity of common aroma descriptors from the four vintages studied. No significant differences were observed among the vintages for apricot, grass, ripe fruit and tropical fruit. Quantitatively speaking, these descriptors can be considered as typical descriptors for young Albariño wine. However, grass and ripe fruit are the dominant common descriptors, from the 2003 vintage, in terms of perceived intensity. Tropical fruit had a high intensity in the 2006 vintage and apricot in the 2005 vintage. The LSD test shows statistically significant differences between the means. The 2003 and 2006 vintages were closer in aroma descriptors.

Table 4. Pearson correlation matrix (*r*) of common attributes

	Apple	Banana	Citric	Floral	Lactic	Peach	Pear	Pineapple	Toasted
Apple	1.00	–	–	–	–	–	–	–	–
Banana	0.65	1.00	–	–	–	–	–	–	–
Citric	0.70	0.11	1.00	–	–	–	–	–	–
Floral	0.67	0.81	–0.04	1.00	–	–	–	–	–
Lactic	0.91	0.89	0.42	0.85	1.00	–	–	–	–
Peach	0.61	0.98	–0.01	0.89	0.87	1.00	–	–	–
Pear	0.74	0.56	0.12	0.91	0.78	0.65	1.00	–	–
Pineapple	0.96	0.63	0.55	0.78	0.91	0.64	0.88	1.00	–
Toasted	0.78	0.97	0.29	0.80	0.95	0.94	0.60	0.74	1.00

High positive correlations are shown in bold.

Pearson correlations (pair-wise) between common attributes with significant differences among wines were analysed (Table 4). Some collinearity (correlation) was observed between sensory attributes, although the collinearity across the data set was not as extensive as might have been expected for sensory data. Strong positive correlations were found between peach and banana ($r = 0.98$), between pineapple and apple ($r = 0.96$), between toasted and banana ($r = 0.97$), and between toasted and lactic ($r = 0.95$).

Many ‘fruity’ attributes considered similar in nature (e.g. banana, peach, pineapple) were highly collinear. This may mean that the panel was well trained to use fruity attribute, but was not split over a number of attributes when rating the same property. No strong negatively correlated relationship was observed between aroma attributes in this study.

PCA was applied to all the wine samples to obtain a more simplified view of the relationship between vintages analysed. Figure 1 shows the PCA performed on the data. The first two principal components (Prin 1 and Prin 2) accounted for 91.63% of the variance (Table 5). Apple, banana, floral, lactic, peach, pear, pineapple and toasted were the descriptors that contributed most to the positive first axis. The second component consisted mainly of the contribution of apple and citric for the positive axis and peach for the negative axis. Four groups of samples could readily be differentiated using the two principal components. A good separation of Albariño wines

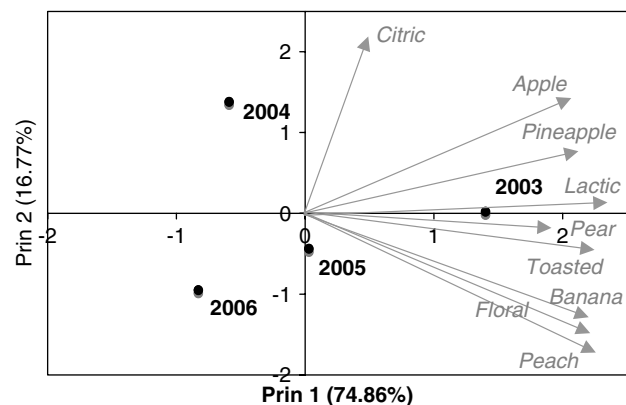


Figure 1. Principal component analysis (PCA) of Albariño wine aroma descriptors from four consecutive vintages (2003–2006).

Table 5. Principal component analysis: eigenvalues of the correlation matrix

Prin	Eigenvalue	Difference	Proportion	Cumulative
1	6.7373	5.2277	0.7486	0.7486
2	1.5095	0.7563	0.1677	0.9163
3	0.7531	0.7531	0.0837	1.000

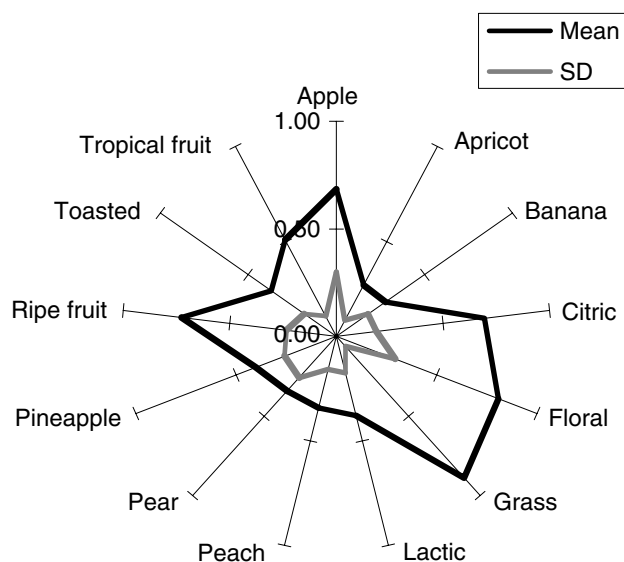


Figure 2. Sensory profile of young Albariño wine by sensory descriptive analysis. Mean and standard deviation (SD) of sensory attributes.

from different vintages was observed. Boselli *et al.*²⁷ showed the effect of vintage in red wines from different Italian wine regions.

A graphical representation of the typical sensory profile of young Albariño wine is shown in Fig. 2. The plot shows the mean values ± standard deviation of four consecutive years for the sensory descriptors. Albariño wine was characterised by grass, floral and fruity descriptors. Apple, citric and tropical fruit were the most important fruity descriptors. The fruity descriptors were generally higher in number.

CONCLUSIONS

By using sensory descriptive analysis of commercial wines from four vintages, we obtained a sensory profile

of Albariño wine. Fruity, floral and grass defined the aroma of Albariño wines. Apple, apricot, banana, citric, floral, grass, lactic, peach, pear, pineapple, ripe fruit, toasted and tropical fruit were the common descriptors across vintages. Therefore, quantitatively speaking these attributes can be considered as typical descriptors for young Albariño wines. There was a vintage effect on the aroma of Albariño wines.

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