

Contribution to the sensory and volatile characterization of four traditional Galician red varieties

Contribution à la caractérisation sensorielle et à celle des composés volatils de quatre variétés traditionnellement cultivées en Galice

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Abstract

Galicia, a region sited in the northwest of Spain, is one of the most important wine production area, with five Appellations of Origin Controlled (AOC). In the last few years, there is a growing interest within the Galician winemaking industry in the recuperation of the denominated traditional or noble varieties, in order to endow differentiated and singular characteristics to the Galician red and white wines. Caiño is the name of some minor red *Vitis* grown in this region. This general name involves a group of red autochthonous cultivars, including Caiño Redondo, Caiño da Terra, Caiño Longo and Caiño Astureses, each of them with different characteristics.

The quality of these grapes is appreciated in winemaking but the majority of Caiño wines are elaborated blended with other varieties of Galician grapes (Mencia, Souson, Garnacha), because pure red Caiño wines present a high acidity that requires blending to balance them. Considerable research and development on the viticulture and enology of these varieties are still necessary, in particular in relation to the chemical aroma composition and the sensory properties of the corresponding wines.

In the present communication we contribute with the study of the aroma composition to a better understanding of the wines obtained exclusively from the four cultivars with the name Caiño. The other aim of this study was to establish the aromatic profile, in terms of attributes, that identifies the aroma of young wines from Caiño Redondo, Caiño da Terra, Caiño Longo and Caiño Astureses cultivars.

Key words: Red wines, Sensory analysis, Volatile compounds

Introduction

The majority of monovarietal Galician white wines are produced from Albariño, Treixadura and Godello grape varieties. There are important number of studies about the chemical composition of them, in grape, must and wine (Carballeira et al., 2001; Falqué et al., 2002; Vilanova et al., 2005; Vilanova and Vilariño, 2006). In the case of Galician red wines, Mencia is the principal variety employed, and, for this reason, exist some studies about its composition (Calleja and Falqué, 2005; Vilanova and Soto, 2005). However in this region there are cultivated a lot of red varieties that, traditionally, are employed blended, but they could be vinified to produce monovarietal wines with the characteristics that the actual consumer demands, wines with structure in mouth, high colour intensity and personal aroma. Besides, there is a growing market of red wines vinificated or aged in contact with oak so, the variety of grape employed to produce this kind of wine has to be able to permit this vinification process. Between the red grapes cultivated traditionally in Galicia, the name of Caiño involves a group of several varieties with different agronomic and enological characteristics. The name of these varieties changes in the different cultivar areas and this aspect causes a serie of difficulties to ensure their typification and varietal characterization. From the enological point of view, Vilanova *et al.*, (2007) published a study about the volatile composition of Caiño Longo, Caiño Tinto and Caiño Bravo wines, with different characteristics between them.

In the present study we contribute with the study of the volatile composition and sensory characteristics to a better understanding of the monovarietal wines from Caiño Redondo, Caiño Longo, Caiño da Terra and Caiño Astureses grapes varieties belongs to the germplasm bank of grapevines collected in Galicia, sited in the Estación de Viticultura y Enología de Galicia. Because the grapes of the four varieties were form the same vineyard and vinified in the same technology and conditions, the differences that might be found in the composition of their wines should only due to the variety of grape.

The volatile composition and the sensory profiles of each wine were compared to establish differentiation criteria as a fuction of the varieties from which the wines were made. The results obtained allowed defining a sensory profile for the four red varietal wines produced in a specific viticultural zone.

Materials and methods

Wines

The grapes employed in this study were grown in the same plot and harvested at phenolic optimum ripening. The monovarietal wines were vinified under the same traditional winemaking conditions. After alcoholic and malolactic fermentation, the wines were first racked and stored in stainless steel vats at controlled temperature (<10°C) during 6 months. Then the wines were bottled and analyzed. All fermentations were performed in duplicate.

Analytical procedure

About 50 volatile compounds, including aldehydes, higher alcohols, ethyl esters, acetates and acids, were positively identified and quantitatively determined by gas chromatography according to the methods describe by Blanco *et al.*, (2006).

Volatile compounds were identified by relative retention times of the chemical standards and quantification was carried out by the internal standard method.

Sensory analysis

The sensory panel was composed of seven tasters, all of them with a long experience in sensory analysis. Panelists scored the intensity of each attribute using a 5-point scale (0=not detected, 5= high intensity). Wine samples were presented in coded and were evaluated along two formal sessions.

Statistical analysis

The results obtained were analyzed using analysis of variance (ANOVA) to establish significant differences between the wines made from Caiño Redondo, Caiño da Terra, Caiño Longo and Caiño Astureses cultivars. All analysis were carried out using Statistica for Windows (1995), version 5.1.

Results and discussion

Table 1 set out the data for the concentrations of the main volatile compounds determined in the red wines analyzed in this study.

These compounds are responsible of the secondary aroma in wine, and the majority is produced during the alcoholic fermentation, so their concentration depends on various factors, such as yeast strain, fermentation temperature, degree of aeration, clarity of the juice, sugar content, etc. Methanol is not a secondary product; its origin is from the action of pectolytic enzymes, that they are present in the solid parts of the grape. In the case of red wines, the must is in contact with the skins until the end of alcoholic fermentation, so the methanol content is higher than in white wines. The concentration of this compound shows high significant differences between the four varieties, Caiño da terra wine presents a very low concentration, similar to a white wine, and the wine from Caiño Redondo cultivar has the higher content.

2-phenylethanol is described as “rose like” so it is a very important compound in wine aroma. The concentration of 2-phenylethanol is very high in the wines of the four varieties, especially in Caiño Redondo and Caiño Astureses. In all cases its content is upper its odor threshold, so these wines will show an important floral note.

Glycerol contributes to the smoothness of wine, not to the aroma (Kukec *et al.*, 2003). Caiño da Terra shows the higher glicerol content, a compound important especially in a red wine. Caiño Redondo has a very low content in this important compound.

According Simpson (1979), the concentration of 1-hexanol in wine is dependent primarily on the grape variety, so the fermentation conditions have little influence in its content. Versini *et al.*, (1994) established that the ratio between trans- and cis-3-hexenol contents could be considered as characteristics of the *Vitis vinifera* variety. In particular for Caiño da Terra, cis-3-hexenol was higher than trans form. The descriptors employed for these compounds are “grass”, “herbaceous”, “woody”, “green”, “bitter”, “fatty” (Moyano *et al.*, 2002) so the content of C₆ compounds could be low.

1-propanol, 1-butanol, 2-methyl-propanol, 2-methyl-butanol and 3-methyl-butanol are the most abundant higher alcohols and they are very important in the wine aroma. The descriptors employed to describe this group of compounds are “alcoholic”, “fusel”, “chemical”, so they tending to be unpleasant at higher concentrations. Rapp and Versini, (1991) established 350 mg/L as the suitable content for a quality wine, in this case all wines analyzed show a higher content, especially the wine from Caiño Astureses variety. Caiño Redondo presents the lower content of this group of compounds.

As a group, the ethyl esters of the C₆-C₁₂ fatty acids have an important influence on wine aroma. Typical descriptors employed for these compounds are “apple like”, “fruity”. The wine from Caiño Redondo variety shows the higher content of ethyl esters in contrast of Caiño da Terra with the lower content.

Acetate esters are produced during fermentation but their content has been correlated too with the variety of grape employed (Simpson, 1979). The presence of this group of compounds is positive for the wine aroma; they contribute with fruity and floral notes. They are more abundant in the Caiño Redondo and Caiño Longo wines.

Volatile acids have descriptors like “cheese”, “rancid” (Francis and Newton 2005), so it is important to avoid a high content of them. The wines from Caiño Redondo and Caiño Astureses grape varieties show the higher concentration of this group of compounds that during the storage could be esterified with the higher alcohols and increase the fruity aroma.

	Caiño Longo	Caiño Redondo	Caiño da Terra	Caiño Astureses	Sig
acetaldehyde	12.22	8.46	6.09	12.54	***
methanol	113.2	146.7	43.29	89.54	***
2-phenylethanol	46.15	65.06	56.93	65.18	***
glicerol	5.37	4.16	8.03	6.27	***
2,3-butandiol (l+m)	419	384	755	596	***
hexanol	2.14	2.07	3.82	2.92	***
trans-3-hexenol	0.106	0.081	0.080	0.100	***
cis-3-hexenol	0.016	0.034	0.160	0.024	***
ethyl acetate	25.98	27.47	31.16	25.95	***
ethyl lactate	223	207	114	245	***
diethyl succinate	2.16	2.58	2.72	3.72	***
ethyl miristate	0.060	0.245	0.083	0.040	***
acetoin	19.84	7.91	5.69	22.9	***
Total higher alcohols ¹	450	411	474	604	***
Total esters ²	1.31	1.45	1.22	1.39	***
Total acetates ³	0.44	0.45	0.27	0.25	***
Total volatils acids ⁴	5.07	6.23	4.31	6.12	***

Table 1 Mean concentration (mg/L) of the main volatile compounds in Caiño Longo, Caiño Redondo, Caiño da Terra and Caiño Astureses wines

¹(Σ propanol, 2-methyl-1-propanol, butanol, 2-methyl-butanol and 3-methyl-butanol), ²(Σ C₄C₂, C₆C₂, C₈C₂ and C₁₀C₂), ³(Σ isoamyl acetate, hexyl acetate and 2-phenylethyl acetate), ⁴(Σ C₄, iC₄, C₆, C₈ and C₁₀)
ns: no significant. Significant differences: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.0001$

Figure 1 shows the profile obtained after the sensory evaluation of the wines from the four red varieties.

Similar characteristics are obtained in visual phase for the wines from Caiño Redondo, Caiño Astureses and Caiño Longo varieties; however, Caiño da Terra wine shows a very different profile, a low intensity of color with high orange glints. In aroma, Caiño da Terra has different profile too, the descriptors employed to define this wine were dried vegetables, (hay, tea, tobacco), olive, asparagus, and chemical notes; the intensity of fruity and floral notes were very low for the wine from this variety. The other three monovarietal wines were defined with fruity, vegetal, spicity and floral notes. Caiño Astureses produced the wine with the most intensity positive notes, especially the intensity of floral and toasted descriptors. The wines from Caiño Redondo variety have an important contribution of pepper, cinnamon, anise, vainillin, liquorice, under the name of spicy notes. In taste, Caiño Redondo variety produces astringent, bitter and acid wines with high structure in mouth. The wines from Caiño da Terra variety presents a profile with low intensities for the majority of parameters evaluated in taste phase, however resulted the more alcoholic wines. Caiño Astureses and Caiño Longo showed a similar profile in this phase.

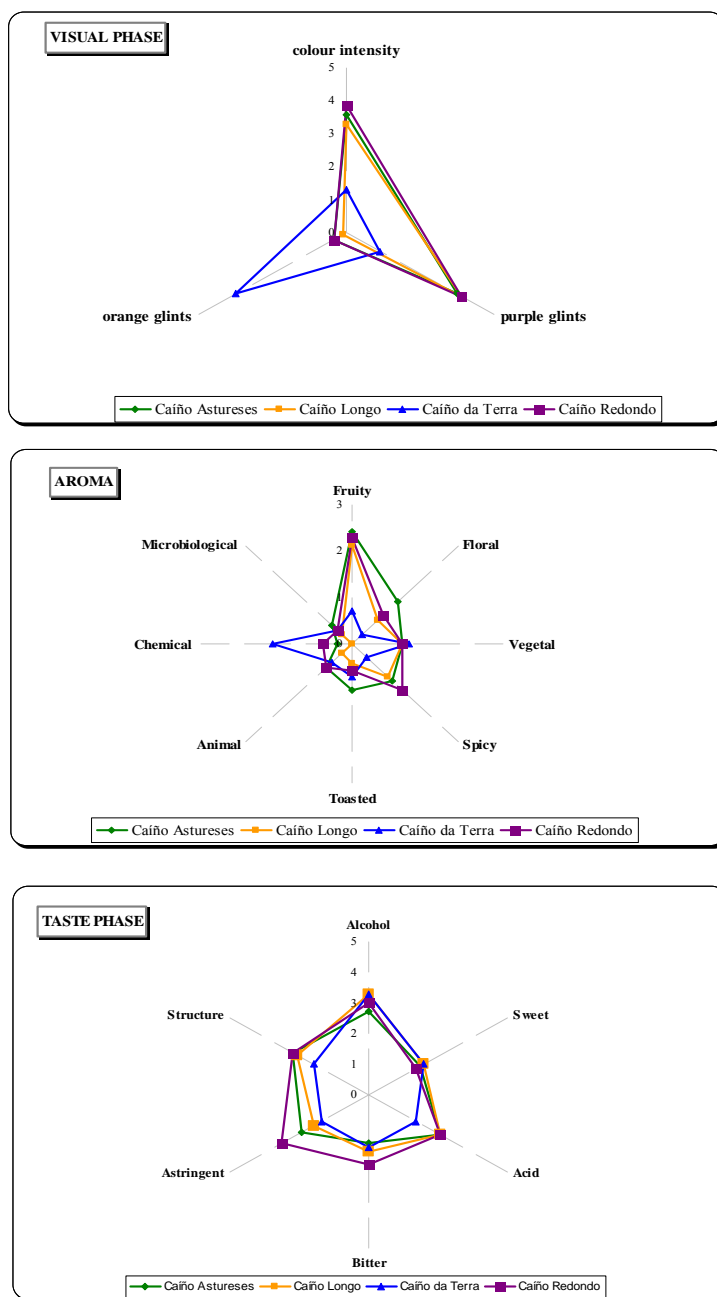


Figure 1. Sensory profile of Caiño Astureses, Caiño Longo, Caiño da Terra and Caiño Redondo monovarietal red wines

Conclusions

Significant differences were found between the wines obtained from the four cultivars both in volatile compounds as in sensory profile. The wine from Caiño da Terra cultivar has the lower content for the majority of aromatic compounds, so it is the most neutral variety. Caiño Redondo wine was the most aromatic with the higher contents in ethyl esters, acetates and volatile acids. The results obtained in terms of volatile compounds were after confirmed with those of the sensory analysis. Future investigations on these varieties will involve the determination of volatile compounds responsible of the primary aroma, and thus lead to a more complete understanding of flavor of them.

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