

RIPENING OF MENCÍA GRAPE CULTIVAR IN DIFFERENT EDAPHOCLIMATIC SITUATIONS (D.O. RIBEIRA SACRA, SPAIN)

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ABSTRACT

Ribeira Sacra is a Spanish Denominación de Origen (D.O.) for wines, located in Galicia, NW Spain. The vineyards are planted on the valleys of the rivers Miño and Sil. The area is divided into five sub-zones with different edaphoclimatic characteristics: *Chantada*, *Amandi Ribeiras do Miño*, *Ribeiras do Sil-Ourense* and *Quiroga-Bibeí*.

The wines from D.O. Ribeira Sacra are typically young red wines produced with Mencía grape variety. During eight years (2002-2009) we have analyzed the chemical parameters that determine the quality of the grape during the ripening process of Mencía grape in the different subzones. The results showed the influence of *terroir* on the Mencía grapes composition.

KEYWORDS

ripening-mencía-Ribeira Sacra-Spain

INTRODUCTION

Ribeira Sacra is a Spanish Denominación de Origen (D.O.) for wines, located in the south of the province of Lugo and the north of the province of Ourense, in Galicia, NW Spain. The vineyards are planted on the valleys of the rivers Miño and Sil. The area is divided into five sub-zones, with different edaphoclimatic characteristics. *Chantada*, *Amandi*, *Ribeiras do Miño*, *Ribeiras do Sil-Ourense*, *Quiroga-Bibeí*.

The spatial climate variability in the Miño River Valley (Spain) was studied by Blanco-Ward *et al.* (2007). The climate in Ribeira Sacra is more Continental than Atlantic, with long hot summers and autumns. However, there is enough rainfall (800 mm) to keep the characteristically lush, green landscape. The vineyards are planted on terraces in the narrow valleys of the rivers and are characterised by the production of grapes with a very concentrated flavour. The wines from Ribeira Sacra D.O. are typically young red wines produced with Mencía grape variety (more than 70%) and others traditional Galician grape varieties. In our group have been carried out research on influence of *terroir* on the sensory characteristics of the Mencía variety in the D.O. Ribeira Sacra and environmental and genetic variation of phenolic composition of Mencía (Vilanova, Soto 2005; Vilanova *et al.* 2008).

The aim of this study was to know the influence of *terrior* on the Mencía grapes ripening from different geographic areas D.O. Ribeira Sacra. During eight years (2002-2009) we have analyzed the chemical parameters that determine the quality of the grape during the ripening process and at harvest. The results showed the influence of *terrior* on the Mencía grapes ripening.

MATERIALS AND METHODS

Plant material

Vitis vinifera Mencía grape grown in the five subzones from Denominaton of Origin Ribeira Sacra, was consider in this study during eight vintages (2002-2009).

Fig. 1 shows the geographic situation of D.O. Ribeira Sacra.

Several vineyards by each subzone of D.O. Ribera Sacra were analyzed. Tab. 1 shows the different vineyards studied, their orientation, inclination and their conduction system.

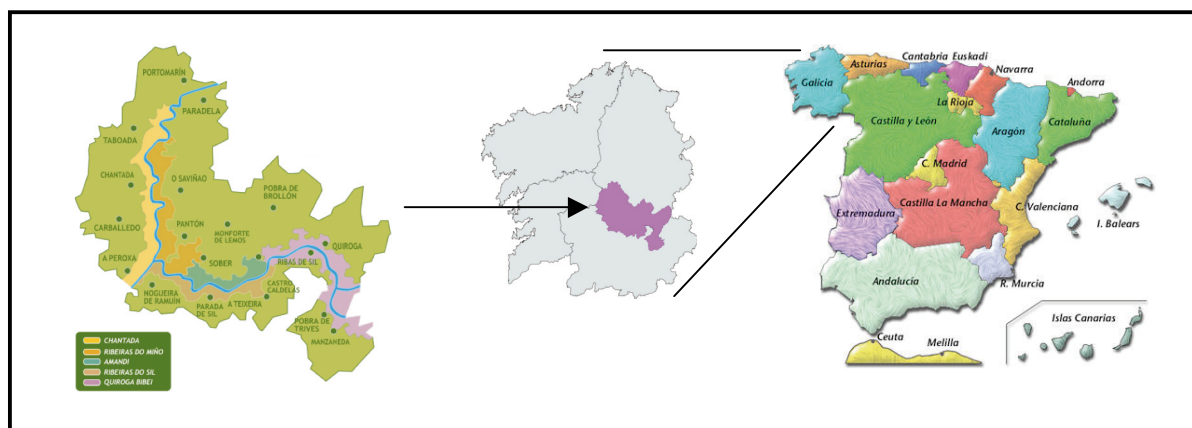


Figure 1. Denomination of Origen Ribeira Sacra from Galicia (Spain)

Chemical composition of musts during ripening

The Mencía grape was studied by analysis of the musts in the different vineyards during ripening season from the five subzones of D.O. Ribeira Sacra. During seven years (2002-2008) in different ripening stages, grape samples were obtained to know the evolution of °Brix (expressed as potential ethanol) and total acidity. In each vineyard a sample of 300 berries from different points were collected. Samples were kept frozen at -18°C until analysis could be completed.

In 2009 vintage the complete grape composition at harvest were studied. Analyses were carried out with Foss analyzer. The data obtained from the vintages was the average of triplicates for each vineyard/subzone.

Statistical analysis

A combined analysis of variance was performed using the XLSTAT statistical package (Addinsof, 2009). The effect of *terrior* was evaluated using *a priori* contrasts ($p < 0.05$). Dunnett's t-test (Dunnett 1955) was used to demonstrate significant differences among subzones.

D.O. Subzone	Village	Vineyard	Orientation	Inclination	Conduction sistem
Amandi	Sober	Doade	Southwest	Yes	Espalier
			South	Yes	Espalier
		Pinol	South	Yes	Espalier
Chantada	Chantada	Nogueira	East	Yes	Espalier
		San Fiz	East	Yes	Espalier
	A Peroxa	Carracedo	Southwest	Yes	Espalier
		Os Peares	Southwest	Yes	Espalier
Quiroga-Bibei	Quiroga	As Medas	Noroeste	No	Espalier
		Quiroga	West	No	Espalier
		Hospital	Southest	No	Free
		Montefurado	South	No	Espalier
	Ribas Sil	San Clodio	West	No	Espalier
	Trives	Piñeiro	Southest	Yes	Espalier
Ribeiras do Sil	A Teixeira	Cristosende	West	Yes	Free
		Abeleda	East	Yes	Espalier
	Castro	Alais	Southest	Yes	Espalier
Ribeiras do Miño	Panton	Espasantes	South	No	Espalier
		Budian	Southest	Yes	Free
		R. De Miño	South	No	Espalier
	O Saviñao	Mourellos	Southwest	Yes	Espalier
		A Cova	Southwest	Yes	Espalier
		Vilanova	South	Yes	Espalier
			South	Yes	Free
	Portotide	South	Yes	Espalier	
		South	Yes	Free	

Table 1. Characteristics of Mencía vineyard from D.O. Ribeira Sacra.

RESULTS AND DISCUSSION

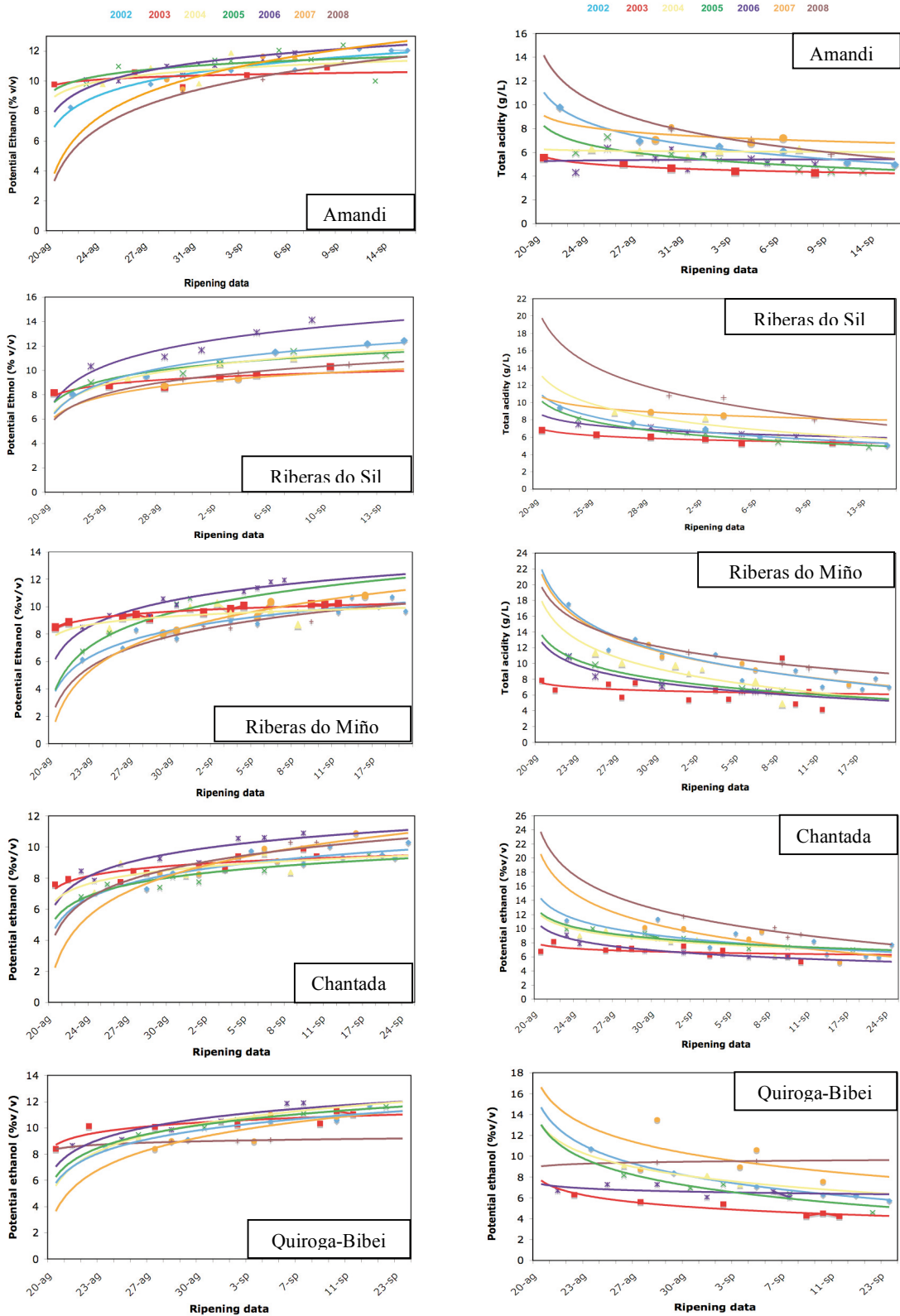
The mayor solutes that accumulate in grape berries are glucose and fructose. Sugars began to accumulate at veraison, increased rapidly thereafter, and levelled at the ripe stage. Acidity in grapes is determined by the amounts of tartaric and malic acids and the proportion of the salt forms of tartrate (Iland, Coombe 1988). Both acids are important for wine making, tartaric as the stronger and more stable acid while malic acid plays a significant role in the malolactic fermentation (Coombe, Iland 2004).

Fig. 2 represents the changes in °Brix, as potential ethanol, and total acidity during ripening of Mencía grape variety for different five subzones of D.O. Ribeira Sacra (2002-2008).

Terroir and vintage showed influence on Mencía grape composition. The total acidity calculated as percent tartaric acid decreased markedly during ripening of Mencía grape for different vintages in the five subzones, while potential ethanol increased.

Organic acids significantly affect the nature and content of other compounds in grapes, as well as grape and wine flavor, color and stability (Lamikanra *et al.* 1995). Changes in the principal organic acids are produced during grape ripening. The year of greater maturity representing by potential ethanol in all subzones studied was 2006 and the highest potential ethanol was for Riberas do Sil, where were achieved 14% v/v of potential ethanol. The year where the potential ethanol was lowest was 2003 for Amandi, Riberas do Miño, Riberas do Sil and Chantada. The 2003 vintage showed the lowest acidity for all subzones.

Figure 2. Changes in °Brix (as potential ethanol)(A) and total acidity (B) in Mencía grape during ripening in D.O. Ribeira Sacra



Quiroga-Bibeí showed the lowest maturation at harvest in 2008 vintage because shown the highest total acidity and lowest potential ethanol at harvest. The total acidity showed more variation among vintages in Quiroga-Bibeí, while it is more stable in Chantada, however the potential ethanol showed major stability in Chantada for harvest. The highest decreased of total acidity is showed in the subzones of Riberas do Miño and Chantada. In general, Amandi from D.O. Ribeira Sacra showed higher potential ethanol in all vintages studied than the other subzones.

Tab. 2 show the chemical composition of Mencía grape at harvest in 2009 vintage for the five subzones of D.O. Ribeira Sacra as well as the contrasts analysis 2009 vintage.

The chemical composition of Mencía grapes was influenced by the terroir because significant differences among subzones were found in glucose-fructose, °Brix, tartaric acid and color intensity. Amandi, with the first harvest data (11/09/2009) was the subzone with highest °Brix, glucose-fructose and color intensity in D.O. Ribeira Sacra.

The parameters that measure a color of red wines are the Folin index, intensity color and anthocyanin concentration. Anthocyanin concentration showed higher concentration for Amandi and Chantada than the other subzones of D.O. Ribeira Sacra, but not significant differences was found. The lowest concentration of anthocyanin was for Quiroga-Bibeí. According to some authors, the content, distribution and accumulation of anthocyanins in grape largely determined by grape variety (Vilanova et al. 2008; Masa et al. 2007)

Vintage 2009	Riberas do Sil	Amandi	Chantada	Riberas do Minho	Quiroga-Bibeí	<i>Contrast analysis</i>
Harvest data	22/9/2009	11/9/2009	22/9/2009	22/9/2009	16/9/2009	
Glucose-Fructose (g/L)	224.0	239.5	180.0	199.3	208.7	Amandi vs Chantada
°Brix	22.3	23.5	18.5	20.2	21.1	Amandi vs Chantada
Density	1.1	1.1	1.1	1.1	1.1	-
Total Acid (g/L)	2.4	2.6	2.5	2.4	3.4	-
pH	3.5	3.4	3.4	3.4	3.4	-
Tartaric Acid (g/L)	3.9	4.3	2.7	3.4	4.3	Amandi vs Chantada Quiroga vs Chantada
Malic Acid (g/L)	0.9	0.7	1.7	1.2	1.2	-
Volatile Acid (g/L)	0.2	0.2	0.1	0.2	0.1	-
Folin index	275.0	227.6	230.4	206.4	236.1	-
Color Intensity	5.3	6.7	3.8	5.0	3.9	Amandi vs Chantada Amandi vs Quiroga
Anthocyanins	64.0	88.0	90.0	78.0	53.0	-
Ammonia	222.0	166.0	226.0	162.5	220.7	-
Alpha Amino Nitrogen	207.5	104.0	244.0	142.3	153.7	-
Potassium	1290.0	1102.0	1151.0	1261.0	1215.3	-

Table 2. Chemical characteristics of Mencía grape at harvest (2009) from D.O. Ribeira Sacra.

At harvest the °Brix/acid ratio determine if the optimum wine quality can be predicted (Ought, Ally 1970). In our study tartaric acid showed differences among subzones, reaching the highest values for Amandi and Quiroga-Bibeí. The total acidity was higher for Quiroga-Bibeí (with harvest data 16/09/2009) than the other subzones, however not significant differences were found among subzones of D.O. Ribeira Sacra.

The highest °Brix/acid ratio was found for Riberas do Sil and Amandi in 2009 vintage (9.3 and 9.03 respectively) and the lowest was for Quiroga.Bibei.

The contrast analysis (Tab. 2) showed significance in glucose-fructose and °Brix for Amandi vs Chantada, tartaric acid for Amandi vs Chantada and Quiroga-Bibei vs Chantada and color intensity for Amandi vs Chantada and Amandi vs Quiroga.

CONCLUSIONS

Terroir and vintage showed influence on Mencía grape composition. The year of greater maturity representing by potential ethanol in all subzones studied was 2006 and the highest potential ethanol was for Riberas do Sil. In general, Amandi from D.O. Ribeira Sacra showed higher potential ethanol in all vintages studied than the other subzones. In 2009 vintage, Amandi, with the first harvest data (11/09/2009), was the subzone with highest °Brix, glucose-fructose and color intensity in D.O. Ribeira Sacra.

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