IDENTITY OF THREE GRAPEVINE VARIETIES FROM A REDISCOVERED VITICULTURE REGION IN NORTHWEST SPAIN

Pilar GAGO[1], José-Luis SANTIAGO[1], Susana BOSO[1], Virginia ALONSO-VILLAVERDE[1], Ignacio ORRIOLS[2] and María-Carmen MARTÍNEZ[1*]

1: Misión Biológica de Galicia (CSIC), Apartado de Correos 28, 36080 Pontevedra, Carballeira 8, El Palacio, 36143 Salcedo, Pontevedra, Spain
2: Estación de Viticultura e Enoloxía de Galicia (Xunta de Galicia), Ponte San Clodio s/n, Leiro, 32427 Ourense, Spain

Abstract

Aims: The old literature contains references to the varieties once cultivated in the Betanzos region (northwestern Spain) and three of them (Blanco Legítimo, Agudelo and Serradelo) were rediscovered during a survey work that began in 1987 and now form part of a collection held at the Misión Biológica de Galicia (MBG-CSIC). The aims of the present work were 1) to describe these three varieties, 2) to determine whether grapevines recently planted are indeed true representatives of these varieties and if so 3) to examine their agronomic and oenological potential.

Methods and Results: Ampelographic descriptions were made following the OIV method (OIV, 2009) and the reconstruction of 'mean leaves' (Martínez and Grenan, 1999). Ten microsatellite loci were also characterised. Having confirmed the supposed identity of the vines in the vineyards, their agronomic and oenological potentials in the region were investigated (fertility, weight of fruit, composition of must and wine). The ampelographic and molecular results showed the following synonyms: Blanco Legítimo = Albarín Blanco; Serradelo = Brancellao (Spain) or synonym Alvarelhão (Portugal); Agudelo = Chenin Blanc.

Conclusions: The vines supposed to be Blanco Legítimo and Agudelo recently planted in the Betanzos area had largely been correctly identified by their planters.

Significance and impact of the study: The identification of synonyms has repercussions for the commercial exploitation of these varieties. The implications for Blanco Legítimo are relatively reduced since its synonyms are also grown in minority areas; however, for Serradelo and Agudelo they are more serious because their synonyms are varieties already widely grown. Finally, the present results contribute to our knowledge of the history and movement of grapevine cultivars in Europe.

Key words: ampelography, history, genetic resources, Betanzos, synonyms

Résumé

Objectifs: La bibliographie ancienne contient des références sur les cépages cultivés dans la zone viticole de Betanzos (nord-ouest de l'Espagne). Trois de ces cépages (Blanco Legítimo, Agudelo et Serradelo) ont été repérés à partir d'un travail commencé en 1987. Ils font maintenant partie de la collection de la Misión Biológica de Galicia (MBG-CSIC). Les objectifs de ce travail sont : 1) décrire ces trois cépages, 2) déterminer si le matériel végétal planté récemment est représentatif de ces cépages, et dans ce cas 3) étudier leurs potentiels agronomique et œnologique.

Méthodes et Résultats : La description ampélographique a été faite selon la méthode proposée par l'OIV (2009) et la reconstruction de la 'feuille moyenne' selon la méthode de Martínez et Grenan (1999). On a aussi analysé 10 loci microsatellites. L'identité variétale des souches dans les vignobles a été confirmée. Les potentiels agronomique et œnologique ont ensuite été étudiés (fertilité, production et composition du moût et du vin). La caractérisation ampélographique et moléculaire nous a permis de détecter les synonymies suivantes : Blanco Legítimo = Albarín Blanco ; Serradelo = Brancellao (Espagne) et synonyme Alvarelhão (Portugal) ; Agudelo = Chenin blanc.

Conclusion : Le matériel végétal de Blanco Legítimo et d'Agudelo planté récemment dans la région de Betanzos a été sélectionné correctement par les viticulteurs.

Signification et impact de l´étude : L'indentification des synonymes a des répercussions sur l'exploitation commerciale de ces cépages. Les implications pour Blanco Legítimo sont relativement réduites puisque ses synonymes sont aussi cultivés dans des zones minoritaires ; néanmoins pour Serradelo et Agudelo, ils sont plus sérieux parce que leurs synonymes sont des cépages déjà largement cultivés. Ces résultats contribuent à une plus grande connaissance de l'histoire et de la circulation des cépages en Europe.

Mots clés : ampélographie, histoire, ressources génétiques, Betanzos, synonymies

manuscript received 8 September 2010 - revised manuscript received 2nd September 2011

*Corresponding author: carmenmartinez@mbg.csic.es

J. Int. Sci. Vigne Vin, 2011, **45**, n° 3, 245-254

INTRODUCTION

The well documented work of Huet de Lemps (1967) on the wines and vineyards of northwestern Spain shows that, in Medieval times, the only true vine-growing area of the Province of A Coruña was that of Betanzos (Fig. 1). References to viticulture in the area go back as far as the year 842 (Huet de Lemps, 1967). Writing in 1607, Cardinal Jerónimo del Hoyo (del Hoyo, 1607) describes how, during a huge fire in 1569, the people from Betanzos broke open their barrels to save the wine from the flames, causing it to flow like streams down the city's streets.

Casares (1843) records the cultivation of a grapevine variety known as Serradela in Galicia, although he does not mention the exact area where it was grown; he adds, however, that it was of little importance. The Spanish Ministerio de Fomento (1911), while informing of the arrival of phylloxera in Betanzos in 1907, also recorded that varieties known as Serradelo, Ruibal, Moscatel, Algudelo and Albillo (the first two red, the rest white) were grown in the area at that time. The same ministerial report indicates that there had been no replacement of the vineyards affected by phylloxera, even though the ministry had been petitioned to allow a nursery producing American vines to be established. García de los Salmones (1914) records the use of the varietal names Agudelo, Blanca Legítima, Roibal, Valdeorras and Serrade Negro in the Betanzos area, while Huet de Lemps (1967) records the use of names such as Blanco Legítimo, Agudelo, Guedello and Roibal after the phylloxera crisis.

In the last 20 years of the 20th century, viticulture practically ceased in the Betanzos area, and very few elderly growers had conserved any old varieties - in fact, even their names had been almost forgotten. However, between 1986 and 1992, the Spanish Research Council (Consejo Superior de Investigaciones Científicas [CSIC]) began a work to find and study old varieties of vine growing in Asturias and Galicia – including the Betanzos area (Martínez, 2007). This led to the creation of the CSIC grapevine collection in 1993, which gathers together all the varieties found in the above regions, including many plants that were centuries old. These plants are maintained at the Misión Biológica de Galicia (MBG) in the Province of Pontevedra. The collection contains varieties with the names Blanco Legítimo, Serradelo and Agudelo found in the Betanzos area.

Recent growth in interest in recovering Betanzos' viticultural tradition led to the protected geographical indication Vinos de la Tierra de Betanzos (IGP) (Fig. 1) coming into being in the year 2000 (DOGA, 2000). This led some viticulturalists to plant what they supposed were grapevines of the varieties Blanco Legítimo and Agudelo, collected from abandoned vineyards or very old isolated plants. However, the true identity of these grapevines was not known for certain. A further problem was the fact that it was not really known whether these varieties were unique to the area or maybe local synonyms of varieties grown elsewhere. In 2007, these doubts led the Fundación Juana de Vega (a non-profit organisation whose main aims are the modernisation of agriculture and stock-raising in Galicia and the provision of help in this respect) to request our group to investigate these matters.

MATERIALS AND METHODS

1. Plant material

The reference material used in this work belonged to three varieties of *Vitis vinifera* L thought to be traditional

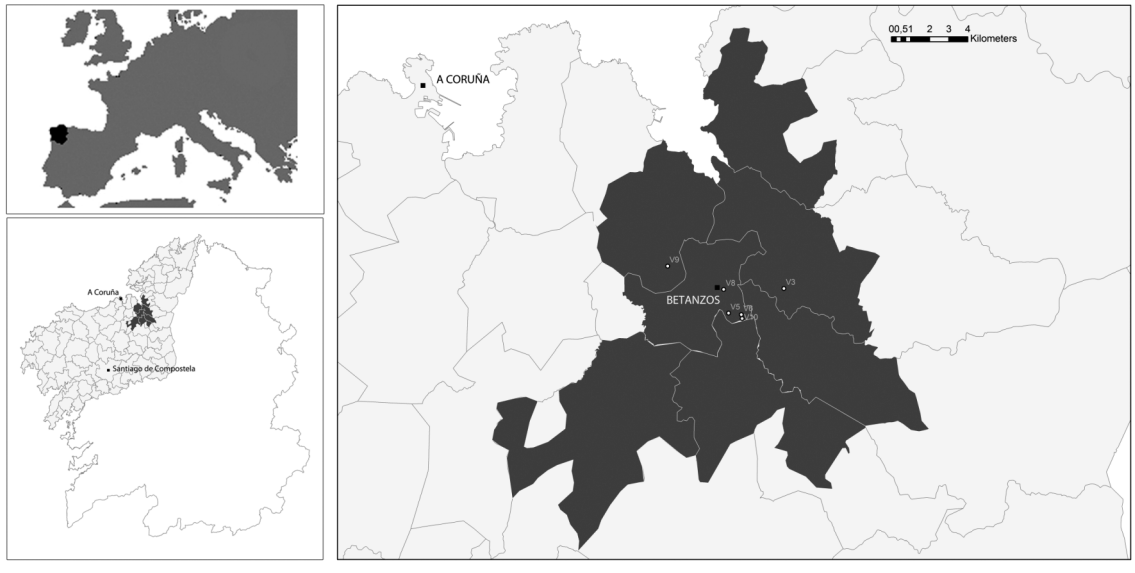

Figure 1 - Area of the Vinos de la Tierra de Betanzos protected geographical indication (IGP).

Table 1. Vineyards included in the study and number of plants checked.

Vineyard[1]	Altitude (m)	Plants examined[2]	
		Blanco Legítimo	Agudelo
V3	159	58 (1)	
V5	60	40 (5)	
V6	112	25	25
V8	16	35 (14)	
V9	85	20 (1)	
V10	87	25	25
	Total	203 (21)	50

[1]For location see Fig. 1
[2]In parentheses is noted the number of individuals rejected because they do not match up with the studied varieties.

cultivars of the Betanzos area (Province of A Coruña, northwestern Spain): Blanco Legítimo, Agudelo (both white) and Serradelo (red) (Fig. 1). The reference material was provided by 10 grapevines of each variety held in the CSIC collection at the MBG and grafted onto 110-R rootstocks. All these plants were cultivated, trained and pruned in the same manner.

The identity of the supposed Blanco Legítimo and Agudelo plants in the newly planted vineyards was checked by comparison with the above standards. Six new vineyards in the Betanzos area were selected and a total of 203 supposed Blanco Legítimo and 50 supposed Agudelo plants were examined (Table 1). No supposed Serradelo plants had been planted, so no comparison with reference material was required for this variety.

2. Taking of samples and variables measured

a) Molecular characterisation

Cuttings were taken from the 10 reference plants of each variety in the MBG collection and from all 203 supposed Blanco Legítimo and 50 supposed Agudelo plants in the vineyards during the dormancy phase of the annual cycle. DNA extraction, quantification, PCR reactions and the detection of amplification products were performed as described by Gago *et al*. (2009).

Varietal identities were confirmed via the examination of the six simple sequence repeats (ssr) proposed by the International Organisation of Vine and Wine (OIV): ssrVVS2 (Thomas and Scott, 1993), ssrVVMD5, ssrVVMD7 (Bowers *et al*., 1996), ssrVVMD27 (Bowers *et al*., 1999), ssrVrZAG62 and ssrVrZAG79 (Sefc *et al*., 1999); these have the corresponding OIV codes 801, 802, 803, 804, 805 and 806 respectively (OIV, 2009). To better determine the genotype of the reference material, four further ssrs were examined: ssrVVMD25, ssrVVMD28, ssrVVMD31 and ssrVVMD32 (Bowers *et al*., 1999). The variety Chardonnay was used as a reference variety for the transformation of data and the recording of OIV codes (2009).

b) Ampelographic characterisation

- Green shoots, shoots and young leaves

During flowering, samples of green shoots, shoots and young leaves were taken, both from the reference plants and the 203 supposed Blanco Legítimo and 50 supposed Agudelo plants. The following variables suggested by the OIV (OIV, 2009) were then measured: code 001, 002, 003, 004, 005, 016 and 051 (Table 2).

- Adult leaves

At bud setting and veraison, a leaf was taken at node 8 from a fruiting shoot from each of the 10 reference plants per variety. Ten leaves were also taken from each variety in each of the six vineyards with the supposed Blanco Legítimo and Agudelo plants after rejecting any plant not confirmed to belong to these varieties following the molecular analyses and ampelography of the young shoots. In all, a total of 21 Blanco Legítimo plants were rejected (Table 1); thus, 182 of the 203 plants examined had been correctly identified by the vine growers during the winter at the moment of the sampling. No Agudelo plant was rejected since all had been correctly identified by the planters.

The following OIV variables were measured (OIV, 2009): code 067, 068, 069, 070, 071, 076, 077, 078, 079, 080, 081-1, 081-2, 082, 083-1, 083-2, 084, 085, 086, 087, 088, 089, 090, 091, 093 and 094 (Table 2). The variables required for the reconstruction of mean leaves representative of each variety in each vineyard were then measured, following the method of Martínez and Grenan (1999).

- Clusters and berries

At fruit ripening, all the clusters on all 182 confirmed Blanco Legítimo and 50 confirmed Agudelo plants were harvested separately from each vineyard. From each of these lots, 10 clusters and 50 berries per variety were selected. The following OIV-recommended variables were then recorded (OIV, 2009): code 204, 208, 209, 222, 223, 225, 226, 227, 229, 231, 232, 235, 236 and 240 (Table 2).

c) Agronomic characterisation

The total number and production (kg berries/plant) of clusters produced by each variety in each vineyard was

Table 2. Variables proposed by the OIV (2007) for the description of young shoots, shoots, young and mature leaves, clusters and berries in the three studied cultivars. (Mo= Mode; Max-Min= maximum and minimum values from three year data).

	Agudelo		Blanco Legítimo		Serradelo	
Variables (OIV code)	**Mo**	**Max-Min**	**Mo**	**Max-Min**	**Mo**	**Max-Min**
Young Shoot						
Opening of the shoot tip (001)	5- Fully open	3-5	5- Fully open	5-5	5- Fully open	5-5
Distribution of anthocyanin coloration on prostrate hairs of the shoot tip (002)	2- Piping	1-2	2- Piping	2-2	2- Piping	2-2
Intensity of anthocyanin coloration on prostrate hairs of the shoot tip (003)	3- Low	3-3	3- Low	3-3	3- Low	4-4
Density of prostrate hairs on the shoot tip (004)	6- Medium/High	6-6	5- Medium	5-5	7- High	7-7
Density of erect hairs on the shoot tip (005)	1- None or very low	1-1	1- None or very low	1-1	1- None or very low	1-1
Shoot						
Number of consecutive tendrils (016)	1- Two or less	1-1	1- Two or less	1-1	1- Two or less	1-1
Young Leaf						
Colour of upper side of blade (4th leaf) (051)	3- Bronze	3-3	3- Bronze	3-3	1- Green	1-1
Mature Leaf						
Shape of blade (067)	3- Pentagonal	3-4	3- Pentagonal	3-3	3- Pentagonal	3-4
Number of lobes (068)	3- Five	2-4	2- Three	2-3	4- Seven	3-5
Colour of blade (069)	5- Medium green	5-5	5- Medium green	5-5	5- Medium green	5-5
Area of anthocyanin coloration of main veins, upper side of blade (070)	5- Beyond the 2nd bifurcation	2-5	1- Absent	1-3	1- Absent	1-1
Area of anthocyanin coloration of main veins, lower side of blade (071)	5- Beyond the 2nd bifurcation	2-5	1- Absent	1-1	1- Absent	1-1
Shape of teeth (076)	3- Both sides convex	3-4	2- Both sides straight	2-2	3- Both sides convex	3-4
Size of teeth in relation to blade size (077)	5- Medium	3-7	7- Large	5-7	5- Medium	3-7
Length of teeth compared with their width (078)	5- Medium	3-7	5- Medium	5-7	3- Short	1-5
Degree of opening/overlapping of petiole sinus (079)	3- Open	3-7	3- Open	3-7	9- Strongly overlapped	3-9
Shape of base of petiole sinus (080)	3- V shaped	1-3	3- V shaped	2-3	3- V shaped	3-3
Teeth in the petiole sinus (081-1)	1- None	1-1	1- None	1-1	1- None	1-2
Petiole sinus base limited by vein (081-2)	1- Not limited	1-1	1- Not limited	1-2	1- Not limited	1-1
Degree of opening/overlapping of upper lateral sinuses (082)	1- Open	1-5	5- Absence of sinus	1-5	3- Slightly overlapped	1-4
Shape of the base of upper lateral sinuses (083-1)	3- V shaped	1-3	3- V shaped	3-3	2- Brace shaped	1-3
Teeth in the upper lateral sinuses (083-2)	1- None	1-1	1- None	1-1	1- None	1-2
Density of prostrate hairs between the veins, lower side (084)	3- Low	3-6	3- Low	3-7	5- Medium	3-7
Density of erect hairs between the veins, lower side (085)	3- Low	1-5	5- Medium	3-7	5- Medium	3-7
Density of prostrate hairs on main veins, lower side (086)	3- Low	1-5	5- Medium	3-7	7- High	5-7
Density of erect hairs on main veins, lower side (087)	1- Very low	1-3	3- Low	1-5	1- Very low	1-3
Prostrate hairs on main veins, upper side (088)	1- Absent	1-9	1- Absent	1-9	9- Present	1-9
Erect hairs on main veins, upper side (089)	1- Absent	1-9	1- Absent	1-1	1- Absent	1-9
Density of prostrate hairs on petiole (090)	1- None	1-3	1- None	1-1	1- None	1-6
Density of erect hairs on petiole (091)	1- None	1-1	1- None	1-1	1- None	1-1
Length of petiole compared to length of middle vein (093)	3- Slightly shorter	1-7	1- Much shorter	1-5	3- Slightly shorter	1-7
Depth of upper lateral sinuses (094)	5- Medium	1-7	1- Very Shallow	1-7	5- Medium	3-7
Bunch						
Density (204)	5- Medium	5-7	3- Loose	3-3	3- Loose	1-3
Shape (208)	2- Conical	2-2	2- Conical	2-2	2- Conical	2-2
Number of wings of the primary bunch (209)	1- Absent	1-2	2- One or two	1-2	2- One or two	1-2
Berry						
Uniformity of size (222)	2- Uniform	2-2	2- Uniform	2-2	2- Uniform	2-2
Shape (223)	2- Globose	2-2.5	3- Broad ellipsoid	3-3	3- Broad ellipsoid	2-3
Colour of skin (225)	1- Green yellow	1-1	1- Green yellow	1-1	6- Blue black	6-6
Uniformity of skin colour (226)	2- Uniform	2-2	2- Uniform	2-2	2- Uniform	2-2
Bloom (227)	4- Medium/High	4-5	3- Low	3-3	5- Medium	3-5
Hilum (229)	1- Little visible	1-2	2- Visible	1-2	1- Little visible	1-1
Intensity of flesh anthocyanin (231)	1- None	1-1	1- None	1-1	1- None	1-1
Juiciness of flesh (232)	3- Very juicy	3-3	3- Very juicy	3-3	3- Very juicy	3-3
Firmness of flesh (235)	1- Soft	1-1	1- Soft	1-1	1- Soft	1-1
Particular flavour (236)	1- None	1-1	2- Muscat	1-2	1- None	1-1
Ease of detachment from pedicel (240)	2- Easy	2-2	1.5- Easy/very easy	1.5-1.5	1.5- Easy/very easy	1.5-2

Mo= Mode; Max-Min= maximum and minimum values from three year data

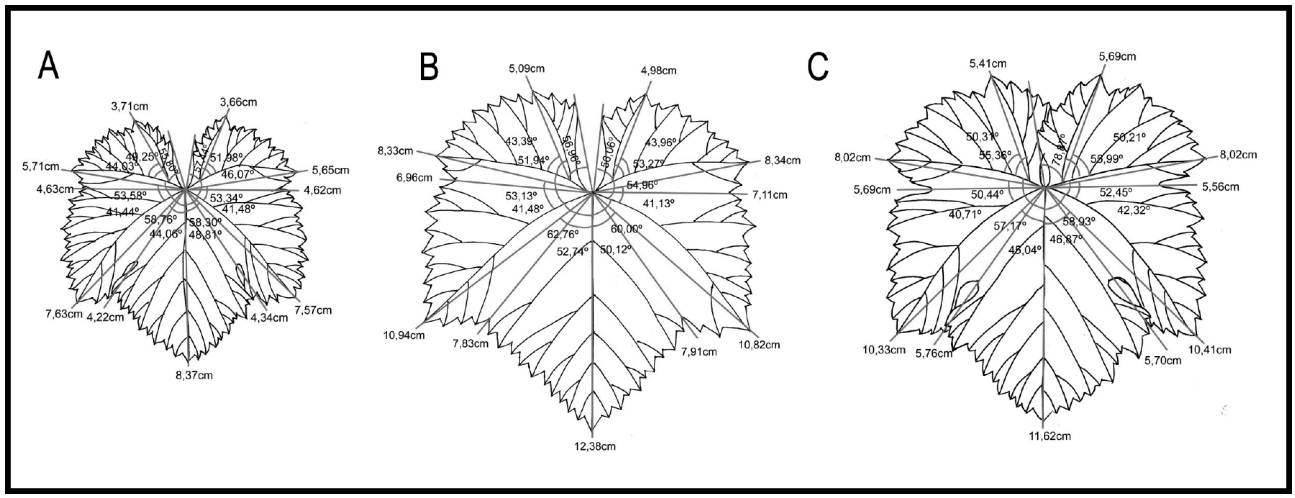

Figure 2. Average leaves of Agudelo (A), Blanco Legítimo (B) and Serradelo (C) following the method of Martinez and Grenan (1999) from the different vineyards.

recorded. Fertility indices were determined from the number of buds left on the plant after pruning and from the total number of clusters, using the following formula:

Index of fertility = (number of clusters / number of buds) x 10

Ten representative clusters were selected among the total production of each variety in each vineyard, and their weight (g), length and width (cm) measured.

d) Oenological characterisation

The ripening of the fruit was monitored for several weeks before harvest in each vineyard. Harvesting began on the same day (in October) in all vineyards when it was deemed that the majority of clusters had reached optimum ripeness. The harvest from each vineyard was then gathered together by variety and wine made. The winemaking process involved:

- Crushing and destemming;

- Addition of Aromax® (7 g/100 kg) (ascorbic and sulphuric acids);

- Pressing in a hydropneumatic press, adding the enzyme Vinozym FCE® for later racking;

- Static racking at 10 ºC for 24 h;

- Fermentation after the addition of selected, dried *Saccharomyces cerevisiae* (20 g/hl) (Excellence FW = FRUITYWINE from Lamothe-Abiet®);

- Fermentation, controlling temperature (18 ºC) and density;

- Décuvage at the end of fermentation and correction with sulphuric acid (20 mg/L);

- Conservation at 10 ºC.

Following crushing and destemming the must of both varieties was analysed to determine the probable alcohol content (%), total acidity (g/L tartaric acid), the pH, and the tartaric and malic acid contents (g/L). The resulting wines were analysed using official analysis methods (CE rule 2676/90) except for the measurement of alcohol content, total acidity, volatile acidity, pH and sugars, for which an FTIR analyser (Foss 120) was used.

RESULTS AND DISCUSSION

Table 2 shows the ampelographic results for the three varieties examined. Figure 2 shows the mean leaves reconstructed for each variety in each vineyard using the method of Martínez and Grenan (1999). Figure 3 shows photographs of the shoots, clusters and berries of the three varieties. Table 3 shows the size of the alleles for each of the 10 ssr loci analysed and the coding of the results according to the OIV system (OIV, 2009). Table 4 shows the mean values of the agronomic and oenological variables examined for Blanco Legítimo and Agudelo.

The majority (182/203; 89.66%) of supposed Blanco Legítimo plants examined were found to have been correctly identified by their planters. Their ampelographic and molecular characteristics coincided with those of the reference material held in the CSIC collection. All of the supposed Agudelo grapevines examined had been correctly identified.

Neither Blanco Legítimo nor Agudelo was found to be exclusive to the Betanzos area. Rather, they were found to be synonyms of other varieties grown in Galicia, other parts of Spain and even beyond. As suggested by Santiago *et al.* (2005) and Gago *et al.* (2009), Blanco Legítimo was found to be a synonym of Albarín Blanco (cultivated in

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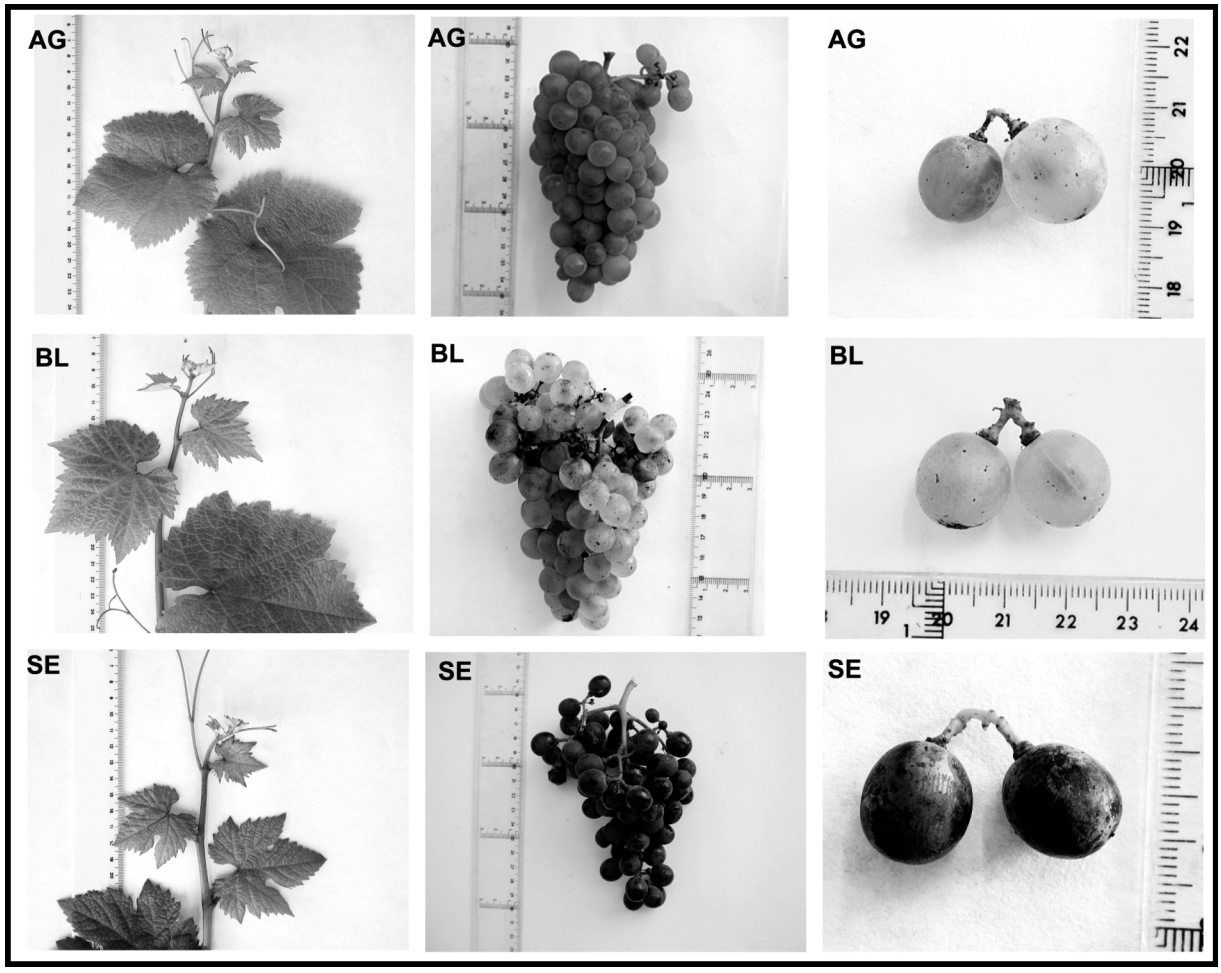

Figure 3. Typical shoot, cluster and berries for Agudelo (AG), Blanco Legítimo (BL) and Serradelo (SE).

the Cangas del Narcea area, in the southwest of the Asturias region), Blanco Verdín (cultivated in the Ibias area, in the southwest of the Asturias region), Raposo (cultivated in the Boiro area, in the southwest of the Province of A Coruña, Galicia) and Blanco País (cultivated in the Negueira de Muñiz area, in the northwest of the Province of Lugo, Galicia). A comparison of the ampelographic data for Blanco Legítimo and Albarín Blanco (described in Martínez and Pérez, 1999, 2000; Boso *et al*., 2010), and Blanco Verdín (described in Martínez *et al*., 2002, 2007) confirmed slight differences in terms of pubescence and the pigmentation of the main veins, etc. These might reflect clonal differences since Blanco Legítimo is originally from a coastal area while the clones of Blanco Verdín examined were from inland and more mountainous areas.

Comparison of the ampelographic data for Agudelo with those recorded by other authors (Galet, 1962, 2000; Institut Français de la Vigne et du Vin, 2007), and the comparison of this variety's molecular data with information held in international databases (Grape Microsatellite Collection, http://meteo.iasma.it/genetica/gmc.html; Greek Vitis Database, http://gvd.biology.uoc.gr/gvd/index.htm; Swiss Vitis Microsatellite Database, www1.unine.ch/svmd/; European Vitis Database, www.genres.de/eccdb/vitis/) showed that Agudelo is in fact a synonym of Chenin blanc, a variety originally from the area of Val de Loire in France (Institut Français de la Vigne et du Vin, 2007), where it has long been cultivated. According to Galet (1962), Chenin blanc has been grown around Anjou since at least 845; currently it is the fifth most grown white variety in France (Galet, 2000). It is also cultivated in the Spanish Denomination of Origin areas of Alella, Conca de Barberá, Penedés and Priorat.

The ampelographic and molecular data for Serradelo (thought to be from the Betanzos area but not currently cultivated) showed it to be a synonym of Albarello (see Gago *et al*., 2009), which, according to the latter authors, is also a synonym of the Portuguese variety Alvarelhão descrived by Truel (1983). The molecular profile of Serradelo also coincided with that of Albarello described by Díaz-Losada *et al*. (2008, 2010), and with the Portuguese Alvarelhão in Castro *et al*. (2011) and Martin

Table 3. Allele sizes (bp) at 10 loci in the three grapevine cultivars analysed. Profile for the same cultivars following the OIV codification (OIV, 2007). (1Notation of the OIV: BA1 means short allele of Barbera N 1, SI2).

		Agudelo				Blanco Legítimo				Serradelo				Chardonnay[2]	
Loci	*OIV Code*	*Size (bp)*		*OIV Notation*[1]		*Size (bp)*		*OIV Notation*		*Size (bp)*		*OIV Notation*		*Size (bp)*	
VVS2	(OIV-801)	128	148	BA1	SI2	128	148	BA1	SI2	128	148	BA1	SI2	132	138
VVMD5	(OIV-802)	226	230	MU1	GE1	220	238	AL1	CF2	220	224	AL1	CF1	232	236
VVMD7	(OIV-803)	239	257	CF1	GE2	239	257	CF1	GE2	239	239	CF1	CF1	239	243
VVMD25	-	240	248	-	-	240	248	-	-	238	248	-	-	238	254
VVMD27	(OIV-804)	171	185	CS1	CS2	177	185	CF1	CS2	181	185	PI1	CS2	177	185
VVMD28	-	233	247	-	-	233	245	-	-	233	257	-	-	217	227
VVMD31	-	206	212	-	-	200	212	-	-	200	208	-	-	210	212
VVMD32	-	257	271	-	-	241	253	-	-	241	257	-	-	241	271
VrZAG62	(OIV-805)	186	192	CH1	CF1	184	192	MU1	CF1	186	192	CH1	CF1	186	194
VrZAG79	(OIV-806)	247	251	CF1	GE2	245	247	CH2	CF1	251	259	GE2	CF2	243	245

[1]OIV notation: BA1 means short allele of Barbera N1, SI2 means long allele of Silvaner B2, etc.
[2]Chardonnay is the example cultivar runned as standard within the SSR analysis.

et al. (2011), which these authors also indicate to be a synonym of Brancellao from Galicia. This synonymy between Serradelo and Albarello is reported here for the first time. The Albarello variety is one of the longest grown in Galicia, and is considered one of its best red wine grapevines (Labrada, 1804; Casares, 1843). In the 19th century, Casares (1843) indicated Albarello to be a synonym of Brencellao, which he recorded as being then one of the most abundant in the Galician winemaking areas of Ribeiro, Amandi, Lemos, Quiroga, Valdeorras and Monterrei. Abela and Sainz de Andino (1885) also speak of Albarello being cultivated in Orense, and of a variety known as Albarella grown in the province of A Coruña. Fernández-Crespo (1897) also records the use of the name Albarello, which he indicates to be synonymous with Brencellao, which in turn he seems to identify as being the same as a variety he spells as "Sirat" that could be Syrah [direct quote: "El Brencellao o Alvarello (Sirat en Burdeos)… produce los afamados vinos de Amandi y Peares"]. However, molecular (Sefc *et al*., 2000; SIVVEM database: http://www.sivvem.monbyte.com/sivvem.asp) and ampelographic comparisons (Ministère de l'Agriculture, 1995; Galet, 2000) of Albarello or Serradelo with Syrah show that they are not the same. Notwithstanding, the coincidence of at least one allele of each of the six OIV ssrs examined (OIV, 2009) indicates they bear some relationship.

Although Albarello was once very important, the name is currently almost in disuse; indeed, it does not even appear in the official Spanish list of commercial grapevine varieties (BOE nº84, 2002), although this list still contains the little used synonym of Brancellao.

The identification of these synonymies has implications at the level of our knowledge of grapevine germplasm, and could also help to complete the history of cultivars in northwest Iberian Peninsula. Despite their geographical neighbouring, the genetic relationship among the main French and Spanish grapevine varieties is still not well known. In fact, recently, Boursiquot *et al*. (2009) have found that Cabernet Franc is related to two other very old and minor cultivars from Basque Country (western part of the Pyrenees), Morenoa and Txakoli; so this new information about the Chenin blanc should be taken into account in the future studies of the origin and relationships among several cultivars from France and the atlantic zone in Spain.

From a more practical point of view, the identification of these synonymies has also implications at the level of the commercial exploitation of these varieties. Despite the several synonyms discovered for Blanco Legítimo, this variety should maintain its commercial interest since all these synonyms are grown in small, nearby areas. Further, Blanco Legítimo is virtually unknown in the international arena despite its good winemaking qualities. The synonyms of Serradelo and Agudelo, however, are much better known internationally. Alvarelhão, the Portuguese synonym of Serradelo, is quite well known, while Chenin blanc, the synonym of Agudelo, is one of the world's most important varieties. It has long been cultivated in the Loire Valley, and in the second half of the 20th century it made its way to the new winemaking regions of California, South Africa and New Zealand. This could have a serious effect on any attempted commercialisation of these varieties' wines.

The agronomic and oenological data recorded (Table 4) show that, while Blanco Legítimo is less fertile than Agudelo (its clusters are smaller and lighter), the must of its berries and the wine that can be produced from

Table 4. Mean values of agronomic and oenological variables for Blanco Legítimo and Agudelo.

	Varieties	
Variables	Blanco Legítimo	Agudelo
Agronomic variables		
Production and cluster		
Weight (kg) berries/plant	1.33	2.20
Fertility	8.10	8.25
Number clusters/plant	12.29	14.36
Cluster weight (g)	155.75	203.79
Cluster length (cm)	9.68	10.94
Cluster width (cm)	9.51	8.81
Must		
Probable alcohol content (%)	11.96	10.50
Total acidity (g/L tartaric acid)	11.40	10.39
pH	3.10	3.09
Tartaric acid (g/L)	6.49	4.60
Malic acid (g/L)	4.59	5.20
Oenological variables		
Wine		
Density (g/m)	0.99162	0.99364
Alcohol content (%vol)	12.0	9.8
Extract (g/L)	23.8	22.3
Sugars (g/L)	1.3	1.2
Total acidity (g/L)	9.2	9.2
Volatile acidity (g/L)	0.44	0.39
pH	3.05	3.05
Tartaric acid (g/L)	3.0	2.7
Malic acid (g/L)	4.4	5.2
Lactic acid (g/L)	<0.2	<0.2
SO_2 free (mg/L)	21.0	16.0
SO_2 total (mg/L)	170.0	195.0
Glycerol (g/L)	7.1	5.5

it are of better quality. Blanco Legítimo reaches optimum ripening before Agudelo and is much more aromatic (it has a marked Moscatel aroma). Agudelo wines have less alcohol and are of greater acidity. It should be remembered that the area of Betanzos (43°16´N, 8°12´W, altitude 200 m) lies on the limit of where grapes can be grown given the reigning climatic conditions (annual rainfall 909 mm, mean annual temperature 12.1 ºC, thermal amplitude 9.6 ºC) (Martínez and Pérez, 2000), requiring that these grapevines be carefully nurtured if balanced wines with commercial potential are to be obtained.

CONCLUSIONS

The supposed Blanco Legítimo and Agudelo grapevines recently planted in vineyards of the Betanzos region match ampelographically and molecularly with reference plants of the same names held in the CSIC grapevine collection at the MBG. The varieties Blanco Legítimo, Agudelo and Serradelo, which are cited from long ago as varieties cultivated in the Betanzos area, are in fact synonyms of local names used in nearby areas (Blanco Legítimo = Albarín Blanco in Asturias; Serradelo = Brancellao in other parts of Galicia) and indeed of some internationally known names (Agudelo = Chenin blanc of France; Serradelo = Alvarelhão of Portugal). The identification of Blanco Legítimo, Agudelo and Serradelo as synonyms of international varieties has repercussions for their commercial exploitation. The implications for Blanco Legítimo are relatively reduced since its synonyms are also grown in minority areas and are in the process of being recovered for commercial purposes. For Serradelo, however, which was found to be a synonym of a widely planted Portuguese variety, they are more serious, as they are for Agudelo, which was found to be a synonym of Chenin blanc, a variety widely grown in France and certain parts of Spain. The present results contribute to our

knowledge of the history and movement of grapevine cultivars in Europe.

Acknowledgements: This work was partly funded by the phytogenetic resource grants awarded to our group over the years (RF99-010; RF02-004-C5-2; RF2008-00002-C02). Over the last three years, funding was supplied by the Fundación Juana de Vega. The authors thank Elena Zubiaurre, Iván González and Maria Soledad Taboada for technical assistance. This manuscript has been translated by a professional translator (Adrian Burton).

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