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AMPELOGRAPHIC AND AMPELOMETRIC CHARACTERISATION OF GRAPES OF VITIS VINIFERA L. NATIVE OF ALGERIA

El Heit KADDOUR[1*], Hamama ABDERAZAK[1], Belarbi BAROUDI[2], Meghezzi SAIDA[1], Sebki SALIMA[1], Agouazi OUNISSA[1]

[1]Laboratory of Natural Resources: Wine growing / Used Arboriculture. Faculty of Biological Sciences and Agricultural Sciences. Mouloud Mammeri, University. Tizi-Ouzou. 15.000, Algeria
[2]Phytotechnie Departement of E.N.S.A. (Ex: I.N.A) Hassen Badi. El.Harrach, Algeria)
*(Corresponding author:kaddy60023@yahoo.fr)

Abstract

Algeria has many indigenous varieties of vine that their valorization still remains to be undertaken. Homonyms and synonyms have been highlighted in studies of molecular characterization. Our study is part the objective of the ampelographic characterization of 15 cultivars of vines belonging to the collection of the regional station *with* Benchicao (Area of Medea), for identification and determination of the relationships between them and grouped according their similarities. This study is conducted using 112 quantitative descriptors and 14 qualitative descriptors established by the OIV. A statistical study was conducted to highlight the most discriminant parameters, namely, angles, depth of sinuses in relation to the lengths of veins. However, the principal component analysis and hierarchical classification have permits to group the varieties in 4 Groups more or less distinct, which we brought out the presence of clones among the individuals analyzed. This diversity of native varieties put to a severe test, risk extinction if their preservation is not undertaken immediately.

Keywords: diversity, Vitis vinifera L, varieties indigenous, valorization, characterization ampelographic, Ampélométric.

Introduction

The cultivation of the vine occupies an important place in the traditions of *Maghreb* peasant populations in general and Algeria in particular. Since its extension to Phoenician times, Carthaginian and Roman times, these productions especially wine have become a source of income next to the culture of the olive and fig trees. A wine export market and other crops have been established between the cities of North Africa and Rome. In Algeria, as a result of different mutations undergone by the agricultural area, the diversity of plant genetic resources is in a worrying state of regression or even of disappearance. This situation is to combine the effects of globalization, which has caused a reduction in the diversity of native varieties. In the perspective of identifying the diversity within native varieties and their possible conservation in collection, we took for our characterization study fifteen individuals of Vitis vinifera L., using different approaches (Ampelographic and ampelométric).

These minor local varieties are an important resource of genes for viticulture. Their genotypes may have an interest in winemaking in addition to the advantage of their adaptation to local conditions.The variability could be heterogeneous origin. It could be the result of domestication hermaphrodite directs the female individuals of *Vitis vinifera* subsp *sylvestris*, wild subspecies of *Vitis vinifera* L., or the produces of different crosses between domesticated varieties (native flore). But we have no doubt that this wealth could come from the introduction of non-native varieties from antiquity to the 19th century in the Mediterranean countries. These introductions may have been accidentally crossed with local varieties. This hypothesis corroborates with the results of work

characterization performed in Europe on the genetic variability of the specie in the Mediterranean (Grassi et al, 2008, 2003 Crespan et al 2006 ... De Mattia et al 2009, 2007, Zecca et al. 2009).
This varietal component as large and complex remains unknown, unexploited where many varieties are at risk of extinction (Imazio and al.2006).
This development necessary because of often imprecise descriptions related to abundant synonyms, eliminates the existing errors to level historical and Ampelographic
Our characterization answers the problems of risk of loss of genetic diversity in Vitis vinifera L. Indigenous varieties subject to progressive varietal erosion due to the ignorance of their agronomic and technological qualities, because this genetic diversity is poorly documented and most of these genotypes have been no studies to assess their importance.

Materials and Methods

The plant material is collected at the regional station of the Technical Institute of Fruits Trees and vine Benchicao (Medea). The 15 cultivars subject of this study are referred to as following: Ahmar Bou Ameur, Amellal, Bezoul El Khadem, Cherchali, Tiziouinine, Benchicao Ahmar, Muscat d'El Adda, Sid Ahmed Draa El Mizan, Ek.Has (Amokrane) Timeskine, Aneb El Kadi, Lakhdari, Ferrana black, Toutrisine and Adari.
The vines (10 repetitions per variety) were randomly arranged and planted in an experimental plot, cultivated in espalier and grafted with the rootstock SO**4**, with Guyot pruning. This plot is very homogeneous in terms of soil composition and topography.

Ampelographic parameters

All Ampelographic characters used in our study according to the codification of (OIV 1983) for a description of the adult leaves and budding are 15 in number and are: 067 (AG 06), 070 (AG 07), 071(AG 08), 072 (AG 09), 075 (AG 10), 076 (AG 11), 079 (AG 12), 80 (AG 13), 082 (AG14), 083-1 (AG15), 016 (AG 05), 007(AG 01), 008 (AG 02), 009 (AG 03), 010 (AG 04) .

Ampélométric parameters

Sampling of adult leaves was carried out between nouaison and veraison. Parameters Ampelographic were observed and measured on the herbaceous shoot, the mature leaf. We selected 10 sheets per variety. Several studies show that this is a sufficiently representative number of samples (Branas, 1974; Galet, 2000a et 2000b 1983; Dettweiler, 1991; Martínez et Mantilla, 1994). The selected leaves were between 8th and 12th node, counting from the base of the branch. The basis of measurements, according Cid-Alvarez et al. (1994) and Martinez and Grenan (1999), rests on 92 parameters (length of the ribs, angles, serrations, serrations reports) measured by individualizing those corresponding to the left side and those on the right side and that, in order to highlight any variations between the two sides of the sheet, completed by twenty (20) indices indentation on the left side and the right side (Fig .1).

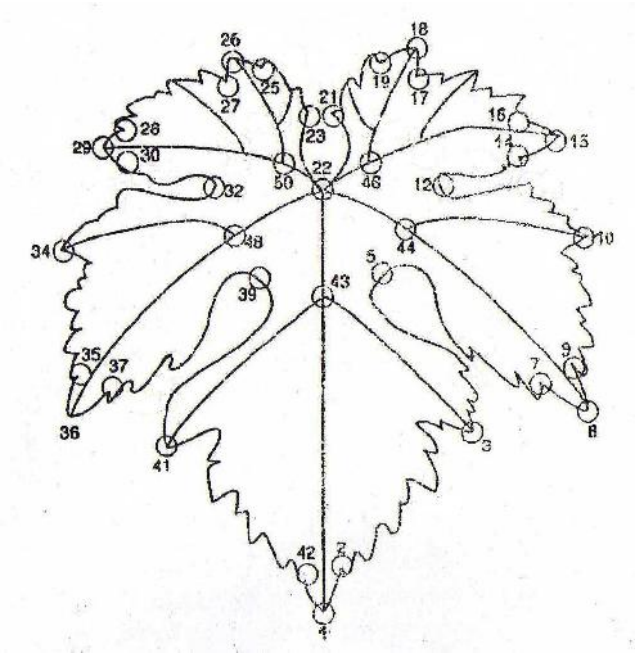

Figure 1. Schema of representative points of the sheet to calculate ampélométrics parameters (Romani et al 1992).

The leaves are dried, put in herbarium and were photographed with a Panasonic digital camera (Lumix DMC-FZ8) in similar lighting conditions, distance and speed.
The different measurements were performed by digital image analysis using the software tool 3 UTHSC. (Rotaru L., 2005).

Statistical Analysis

We conducted an analysis of variance, separately for each parameter using the XLSTAT 2012 software and software Stat.Box, 6.40 backed a factor analysis of correspondence (*AFC), a* principal component analysis (PCA) and a hierarchical classification (*C.A.H).*

Results and discussion

Ampelographic parameters

Descriptive study of Ampelographic parameters, it seems that the shape of blade (067 OIV parameter) and teeth (076 OIV parameter) and the distribution of anthocyanin ribs (OIV parameters 070.071) give a dispersion more at least importante of varieties studied, which is consistent with the results obtained by Cid-Alvarez et al, 1994 and Santiago et al., 2007.
The factorial analysis of qualitative variables shows that apart from the color of the ventral face of node, leaf shape and the shape of the serrations which have considerable contribution at discrimination more at least clear among the cultivars , the rest of the variables involved little the dispersal of individuals along the axes F1 and F2, but they could still make out the lot individually the following varieties: Ahmar of Benchicao, Sid Ahmed Dra El Mizan, Cherchali and Timeskine (Fig. 2).

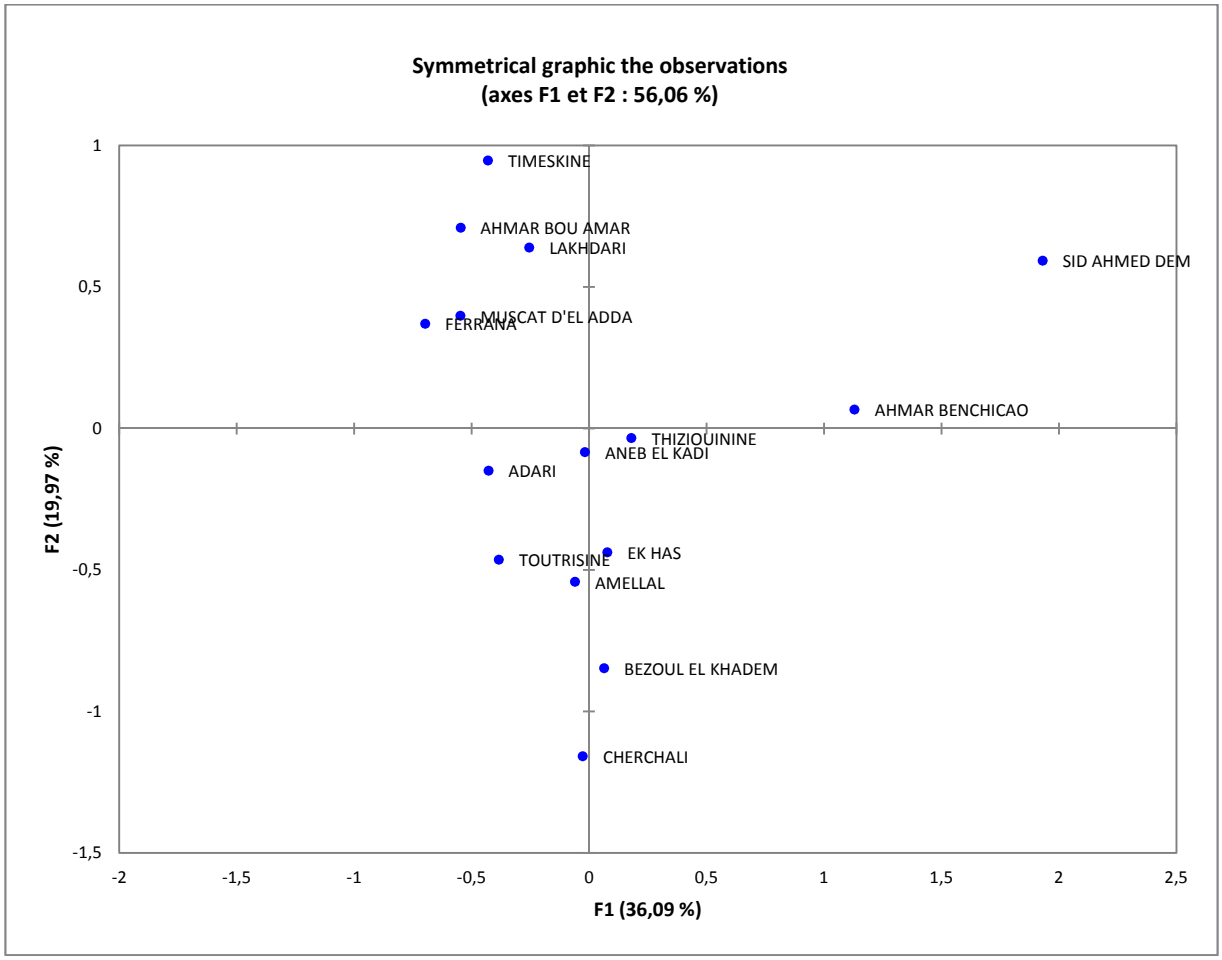

Figure 2**.** Graphical representation of the varieties studied (AFC)

Ampélométric parameters

The analysis of variance (ANOVA) at the 5% has enabled us to compare the averages in the fifteen varieties studied and showed that there are significant differences for most parametres ampélométric used in case of our study. Quantitative variables were able to differentiate between individuals studied with discrimination more or less apparent on two axes F1 and F2 that give us 50.04%. Especially varieties Ahmar Bouamar, Ferrana noir, Toutrisine and Adari (Fig.3).

AN (sheet width) X3g = (S1g S2g +) / (α + β) and parameters related to leaf angles are variables which the highest discriminatory power compared to other variables submitted to the study because according to (Martinez et al., 1997 Boursiquot et al.,1989), they are not influenced by climate, pedological nature of the soil and maintenance of soil

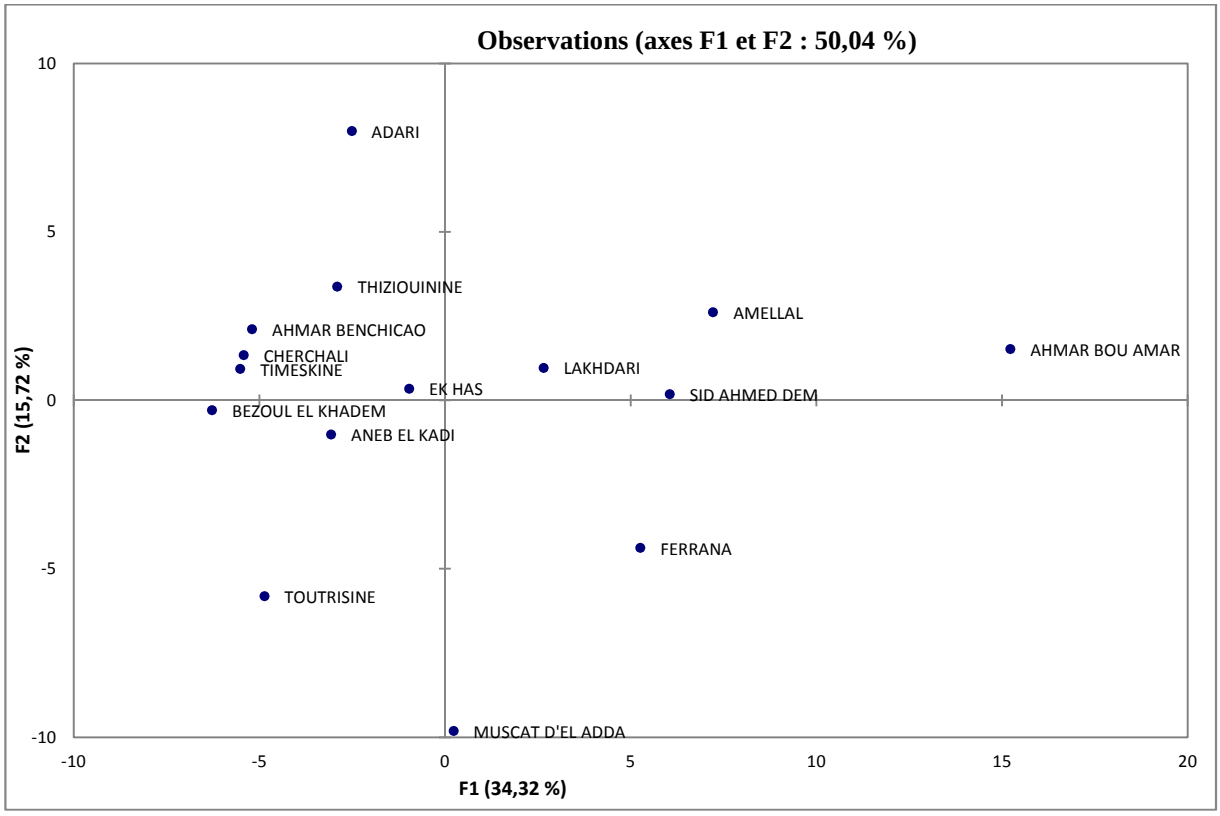

Figure -3: Graphical representation of the varieties studied (PCA).

Hierarchical clustering

The elaboration of the dendrogram of hierarchical classification of varieties (Fig.4) was performed with the principle of minimal loss of inertia. from Analysis of the dendrogram, following the method of Rotaru (2009), shows the existence of three optimal groups (classes):

Group 1: represented by varieties Amellal (w), Adari (w), Bezoul El Khadem (B),Tiziouinine, Ahmar of Benchicao (R),Cherchali (B), Timeskine (w), Aneb El Kadi (w), Lakhdari (w) and Ek.has (Amokrane) (w),

Group 2: includes grape variety Ferrana black berries.

Group 3: contains the varieties Toutrisine (w),Ahmar Bou Amar (R),Muscat d'El Adda(w),and Sid Ahmed Draa El Mizan (w).

The three main groups (branches) can be characterized as follows:

Group 1: The grapes Amellal, Adari are very close to each other, by what they have the highest index of similarity (0.998) and the nearest of1, so they are morphologically similar, because these varieties are white grapes.

Group 2 represented by Ferrana variety that is a black grape berries.

Group 3: the grapes varieties Sid Ahmed Draa El Mizan (w) and Ahmar Bou Amer (R) which are close to one another, but the first one is white and the other is a black grape variety. two different grape varieties by the color of their berries

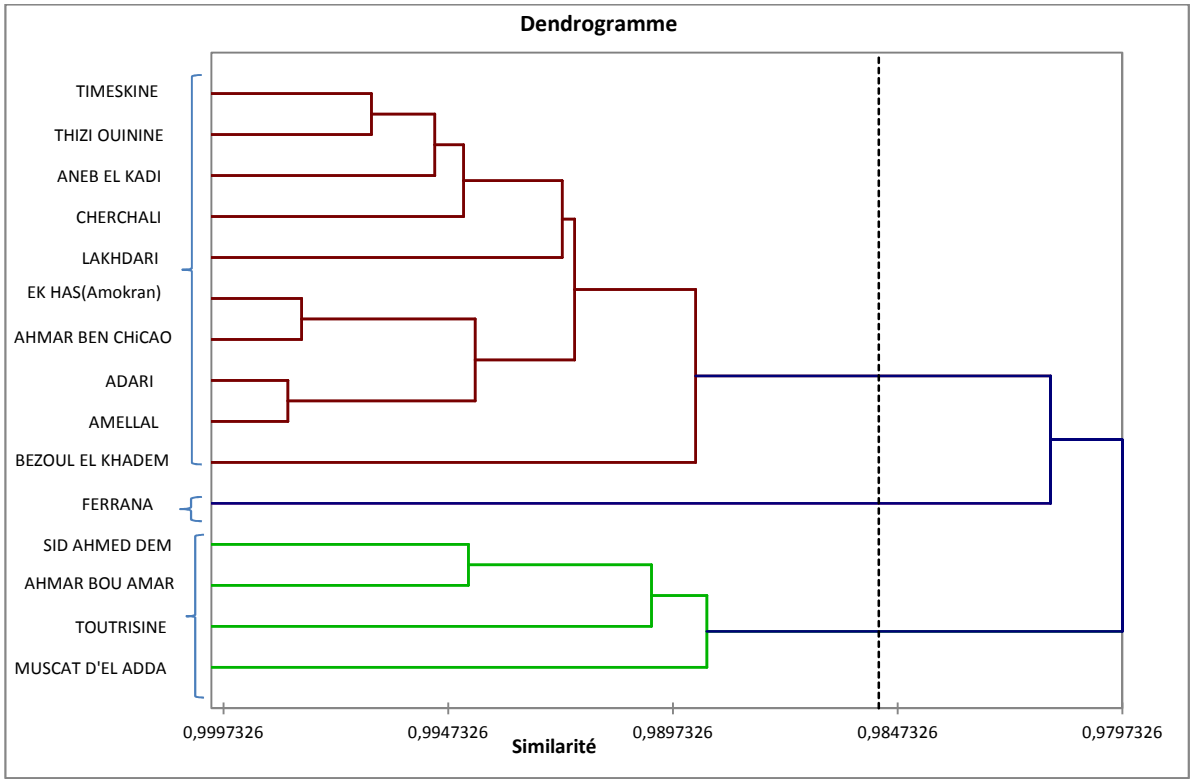

Figure 4: Hierarchical clustering

Conclusion

In conclusion,our characterization work by ampelographic and ampélométric both approaches are complementary, is a very useful tool for differentiating the varieties studied.

The ampelographic study of various organs of individuals studied showed the existence of a foliar polymorphism and morphological differences among cultivars studied.

Although the classic ampelography is still the most common method used in a practical way by many people especially vines specialists, ampélométric complements these data (Cid-Alvarez et al., 1994).

Through the results of various statistical analyzes of ampélométric parameters studied, it appears that the native varieties are phenotypically different.

Indeed, the analysis of the different parameters studied estimated that the angles and the reports are more effective for the differentiation between varieties.

Similarly, analyzes have highlighted the parameters Ng (Number of secondary teeth on the left side), AN (sheet width) X3g = (S1g S2g +) / (α + β), among the leaf parameters as a variable that has the highest discriminatory power compared to other variables subject to study.

The approach we have used appreciable if we take into account assessments formulated by Cid-Alvarez et al. (1994). According to him, the use of identification keys varietals from measurements or ampélométric data seems valid for a particular area or region defined with a limited number of varieties, because you should know that the components of the climate have much influence on the force which greatly influences on the parameters studied. Therefore, it is not possible to consider the development of a valid key. This led to the search for new and more accurate methods of characterization (Sefc KM et al., 2001), as the characterization through microsatellite markers that provides a useful advantage when it comes to establishing the kinship between cultivated and wild grape and end the problems of synonymy between varieties.

References

Branas J., 1974. Viticulture. Imp. Déhan, Montpellier. France.

Boursiquot J.M., Vignau L. et Boulet J.C., 1989. Ricerche sull'utilizzazione dell'ampelometria.Riv.Vitic.Eno., 1 , 37-52.

Cid-Alvarz N., Boursiquot J.M., Saa-Otero M.P. et Martinez L.R., 1994. Différenciation des cépages autochtones du Nord-Ouest de l'Espagne (Galice) et élaboration d'une clé de détermination basée sur l'Ampélométrie. Jour. Int. Scie. Vigne et vin. Vol. 28 No.1: 1-17pp..

Crespan, M and al., 2006. Malvasia dele Lapiri, Malvasia di Sardagna,Greco di Gerace, Malvasia de Sitges and Malvasia dubrovacka- synonyms of an old and famous grape cultivar. Vitis,45, 69-73.

De Mattia, F.and al., 2007. Genetic characterization of Sardinia grapevine cultivars by SSR markers analysis. *International Journal of Vine and Wine Sciences*, 41, 175–184.

Detweiller E., 1991. Preliminary minimal descriptor list of grapevine varieties. Institut für Rebenzüchtung Geilweilerhof. Siebeldingen.

Galet P., 2000a, Dictionnaire Encyclopédique des cépages. 762 p. Montpellier. France.

Galet P., 2000b, Précis de viticulture. 602 p. Montpellier. France.

Grassi, F. and al ., 2003. Evidence of a secondary grapevine domestication centre detected by SSR analysis. Theor Appl Genet 107:1315–1320

Imazio, S and al., 2006. Chloroplast microsatellites to investigate the origin of grapevine. Genetic Ressources and Crop Evolution, 53, 1003-1011

Martinez M.C. et Grenan S., 1999. A graphic reconstruction method of an average vine leaf. Agronomie 19:491-507pp.

Martinez M.C., Boursiquot J. M., Grenan S. et Boidron R., 1997. Étude ampélométriques des feuilles adultes de somaclones de cv. de Grenache N. Can. Bot. 75: 333-345 pp.

Martinez De Toda F et SANCHA J.C., 1997. Caractérisation ampélographique des cultivars blancs de Vitis vinifera L. conservés en Rioja. Bulletin de l'OIV (793-794), 221- 234pp. OIV : Office internationale de la, vigne et du vin. Le code des caractères descriptifs des variétés et espèces de Vitis.Ed. Dedon, Paris.

Romani L., Legido J.L.,Saa M.P. and Cid Alvarez N., 1993. Design and updating of a computer system for the ampelometric caracterization of grape vine varieties. J. Wine Research,4, n^{o} 3,197-203pp.

Rotaru L., 2005. The application of discriminant factorial analysis for the establishing
phenotypical homogeniti of Europeo-Americanes rootstock. Universitatea de Ştiinţe
Agricole şi Medicină Veterinară Iaşi. Hortic.: 287-292pp.

Santiago J.L., Boso S., Gago P., Villaverde V.and Martinez M.C., 2007. Molecular and
ampelographic characterisation of Vitis vinífera L. Albariño, Savagnin, Blanc and.Caiño Blanco. Spanish Journal of Agricultural Research 5(3): 333-340pp

Sefc K.M., Lefort F., Grando M.S., Scott K.D., Steinkellner H. and Thomas M.R., 2001. Microsatellite markers for grapevine: a state of the art. In: Roubelakis-Angelakis K.A. (eds), molecular biology and biotechnology of grapevine, Kluwer Academic Publishers. Amsterdam. 433-463pp.

Zecca, Gand al., 2010. Wild grapevine: silvestris, hybrids or cultivars that escaped from vineyards.Molecular evidence in Sardinia. Plant Biol(Stuttg). May 1; 12(3): 558-62