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First ampelometric study of autochthonous grapevines in Algeria: Germplasm collection of Mascara

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Summary

Ampelometric studies on 26 varieties of *Vitis vinifera* L. belonging to the germplasm existing in the collection of Tighennif (Mascara), the most important conservatory of local grapevine varieties existing in Algeria were carried out to characterize this gene pool, the phyllometric measurement method proposed by Martínez and Grenan was applied to establish a cultivar specific adult leaf.

Statistical analysis was performed to identify the most discriminating parameters, namely, size of angles and depth of the lateral sinuses in comparison to the lengths of the veins, especially those on the left side of the leaf. Thus, cultivars with common features such as 'Bezoul el Khadem' and 'Ahmar de Mechtras III', 'Toutrissine' and 'Aberkane' and 'Amellal' and 'Torki' were clustered together. For seven varieties the average leaf has been reconstructed.

K e y w o r d s : phyllometry, *Vitis vinifera* L., autochthonous grapevine, similarity, adult leaf.

Introduction

In Algeria, viticulture has experienced profound changes associated with political constraints, economic and social, of the country while the grapevines existed since the earliest antiquity (Larnaude 1948). The archaeological documents of viticulture according to Isnard 1951 are quite numerous to show the development of viticulture in Algeria since the 1st century of the Christian era with an estimated 2,000 hectares of vineyards with table grapes. The grape area has grown considerably during the French colonization to 400,000 ha in 1935 (Isnard 1951 et Aldebert 1959).

After independence the area decreased to 350,000 ha, including 4000 to 5000 ha of table grapes (Boudjellal Aouf, 1972).Currently, the vineyard area in Alegria is 94,025 ha (ITAF, 2003).

According to ISNARD (1951), Algerian grapevines have been poorly studied until the nineteenth century. Salmon (1848-1860) was the first who composed several native varieties of the Tlemcen region ('Courchi', 'Adari', 'Farana', 'Aneb Lekhal') to few Turkey varieties (as 'Chaouch') and probably Spanish cultivars (as 'Valensy rose'). Thereafter, other works were also focused on local varieties (Leroux 1894, Pulliat 1898 et Trabut 1899 in Viala et Vermorel 1909). The first study after independence on the Algerian ampelography is that of Levadoux *et al.* (1971).

Regarding identification of indigenous cultivars using molecular analysis, the only references are those of Laiadi *et al*. (2009) (collection of Skikda) and Riahi *et al*. 2010 on the Maghrebian varieties.

Characterization of the native varieties was carried out to facilitate their recognition, this contributing to the conservation and protection of varietal diversity maintained at ITAF (Mascara).

Material and Methods

Adult leaves were collected in 2010, between berry set and veraison, based on phenological stages of Baggiolinni (1952), of 26 native varieties (Tab. 1) of *Vitis vinifera* L., cultivated at the germplasm collection of ITAFV Tighennif (Mascara).

As shown by Galet (1956), Branas (1974), Dettweiler (1991), Martinez et Mantilla (1993) and the OIV (2001), 11 samples of each variety collected between the 8th and the 12th node of the main shoot is sufficient to constitute a representative sample.

Leaves were cleaned and then scanned with a model (HP Deskjet F2200 series) on both sides, making sure that each leaf is well flattened and represented with the petiole up according to Galet (1998).

Ampelometric measurements (Fig. 1) proposed by Martínez and Grenan (1999) were carried out with a free analysis software program (UTHSCSA Image Tool (IT) version 3.00, compdent.uthscsa.edu/dig/download.html) by using a specific calibration.

In addition the numbers of teeth by sectors (Fig. 2) were counted and morphological features were described according to OIV (2001): OIV 076, OIV 079, OIV 080, OIV 082 and OIV 083-1. The last two criteria were em-

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Table 1

Accessions studied

Accessions name	Origin	Berry colour
Aberkane	Kabylie	Black
Adadi des Bibans	unknown	White
Ahchichene	Kabylie	White
Ahmer de Mascara	Mascara	Red
Ahmar Mechtras II	unknown	Pink
Ahmar Mechtras III	unknown	Pink
Aïn el Couma	Tlemcen	White
Aïn el Kelb	unknown	White
Amellal	Kabylie	White
Aneb el Cadi	Kabylie	Black
Bouaber des Aures	unknown	Black
Bezoul el Khadem	Kabylie	Black
Bouni	Kabylie	White
El Wali	unknown	White
Farana	unknown	White
Farana Noir	unknown	Black
Ghanez	Kabylie	White
Muscat Adaa	unknown	Black
Muscat Noir	unknown	Black
Sbaa Tolba	unknown	White
Sidi Ahmed Draa el Mizen	unknown	White
Tadelith	unknown	Black
Tizi Ounine	Kabylie	White
Torki	//	Black
Toutrissine	inconnue	White
Valensi	//	White

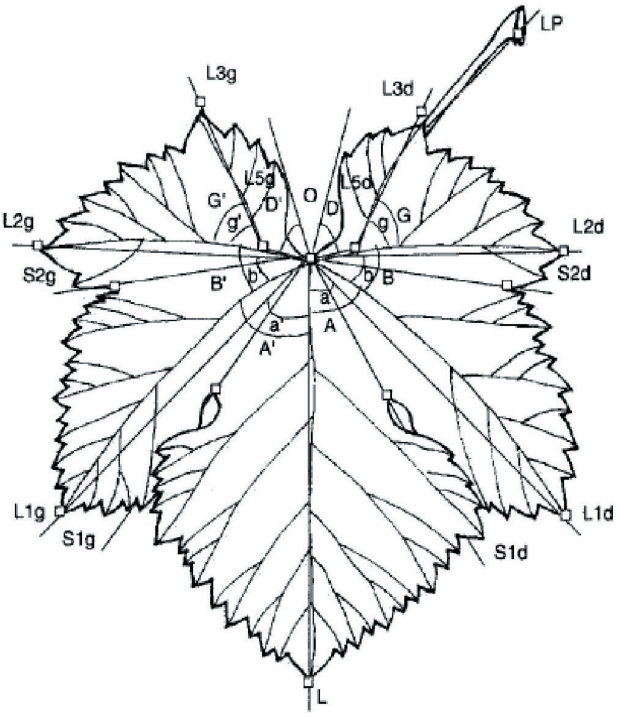

Fig. 1: The quantitative parameters measured at each leaf (Martínez and Grenan 1999).

ployed to describe the lower lateral sinus, degree of opening / overlapping of lower lateral sinus (CSLI) and shape of base of lower lateral sinus (FBSLI).

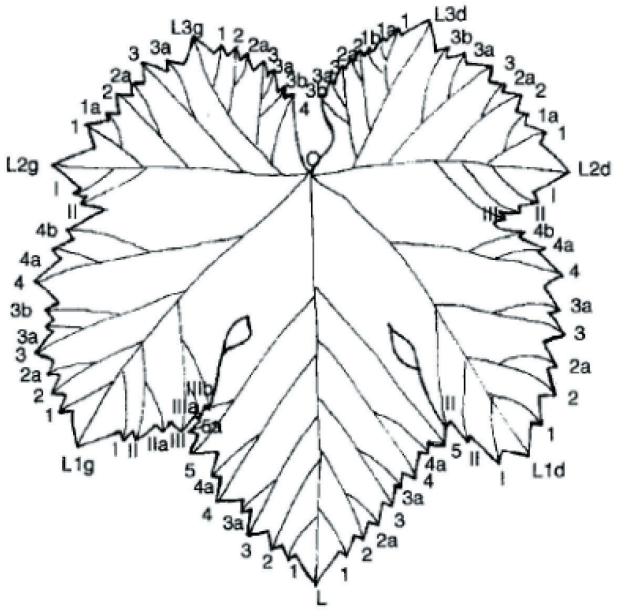

Fig. 2: Tooth numbering by sector (Martínez and Grenan 1999).

We based on studies by Martínez *et al*. (1997, 2006) and Santiago *et al*. (2005 a), to determine the following reports: Rel.1 = L1d/L; Rel.2 = L1g/L; Rel.3 = A+B+G; Rel.4 = A'+B'+G' Rel.5 = a+b+g; Rel.6 = a'+b'+g'; Rel.7 = (S1d+S2d)/ (L1d+L2d); Rel.8 = (S1g+S2g)/ (L1g+L2g); Rel.9 = S1d/L1d; Rel.10 = S1g/L1g Rel.11 = S2d/L2d; Rel.12 = S2g/L2g.

To compare statistic results with the synthetic leaf, we performed the reconstruction of the average leaf of only the most representative varieties using quantitative and qualitative data proposed by Martínez and Grenan (1999).

Quantitative variables were submitted to a principal component analysis (PCA) using SAS statistical software, version 9.2 (SAS Institute, Cary, NC) (Mission Biologica de Galicia), this model has been used for studies by several ampelographic authors such as Sotes *et al.* (1996); Martínez de Toda et Sancha (1997); Martínez *et al*. (2006); XL STAT (trial version) was applied for the construction of the dendrogram based on the degree of similarity and the program TANAGRA 04/01/37 (http://eric.univ-lyon2.fr/~ricco/tanagra/index.html) to calculate Cos^2.

Results and Discussion

The first three components indicated by PC1, PC2 and PC3 allowed grouping 73.27 % of the total variability observed by phyllometric characteristics.

The first axis (36.07 %) refers to the sum of angles and, therefore the leaf shape. It is defined by the variables A, A', B, B', G, G', Rel3, Rel4, Rel5 and Rel6. Our results corroborate those obtained by Santiago *et al*. (2005 a et 2005 b), and the strong correlation existing between the shape and angles mentioned by Tomazic et Korosec-Koruza (2003). The second axis (22.82 %) is expressing the lengths of the veins, therefore the size or dimension of the leaf. It is de-

fined by the variables L, L1d, L1g, L2d, L2g, L3d, L3g, L5d, L5g and S2g. These results are also consistent with those of Sotes *et al*. (1996) et Santiago *et al*.(2005 b). The third axis accounts for 14.5 % of the variance and is defined by the variables Rel7, Rel8, Rel9, Rel10, Rel11, Rel12, S1d, S1G, S2G, S2d, D and g. It mainly explains the depth of upper and lower lateral sinuses combined with length of veins. On axis 1 and 3, on the left of Fig. 3, cultivars are grouped that have small angles and lateral sinuses in average depth such as: 'Ahmar de Mechtras III', 'Bouni' and 'Bouaber des Aures'. On the right, there are cultivars that have open angles as 'Aberkane', 'Aïn el Kelb', 'Toutrisine', 'Farana' and 'Muscat Adda'. The latter has the shallowest lateral sinus of all varieties studied.

On axis 2, cultivars with the largest leaves such as 'Bouaber des Aures' are situated in the background, whereas 'Amellal' and 'Torki' who seem to have the smallest blades are located in the front of the figure. On axis 3, at the bottom of the figure the cultivars are grouped that have a rather acute angle D with lateral sinuses shallow as 'Muscat Adda' and 'Adadi des Bibans'.

Phyllometric data were used for hierarchical clustering. Three main clusters (A, B and C) are shown in Fig. 4 which reveal similarities between the cultivars studied:

The first includes eight cultivars. High similarity (0.9) between 'Bouni' and 'Bouaber des Aures', was stated, due to the shape and depth of the lateral sinuses. 'Ahmar de Mechtras III' and 'Bezoul el Khadem' display a degree of similarity of 0.7. Both are characterized by a leaf of medium size with sharp angles. According to Laiadi *et al*. (2009) the variety 'Bezoul el Khadem' grown in the collection of Skikda is related to 'Kabyle Aldebert', which is a synonym of 'Bouaber des Aures' (Laiadi *et al*. 2009).

'El Wali' and 'Aneb el Cadi' have an average degree of similarity of 0.5. It is likely that 'El Wali' is 'Louali'. According to Laiadi *et al*. (2009), 'Amokrane' is synonymous to 'Louali' that appears close to 'Aneb el Cadi'.

The second cluster is divided into two groups: The first includes 'Torki' and 'Valensi', which by their names, are introduced varieties, characterized by the highest similarity (0.75). 'Ahmar de Mechtras II' and 'Amellal' have a lower degree of similarity (0.6). These varieties are characterized by a smaller leaf and moderately open angles and average depth of the lateral sinuses.

The second group includes cultivars that are similar with respect to the shape and size of blade; this is the case of 'Aberkane' and 'Toutrisine' showing a degree of similarities of 0.65, and of 'Muscat Noir' and 'Sbaa Tolba' (degree of similarity 0.55). The latter variety is characterized by the least deeply indented sinuses. The 'Ahmar Mascara' stands out from the cultivars of the two clusters. Molecular characterization performed by Laiadi *et al*. (2009) showed that this variety takes several synonyms in the Mediterranean region such as: 'Teta de Vaca', 'Royal Gordo' or 'Ahmeur bou Ahmeur' as 'Flame Tokay' it is grown in America (Akkak *et al*. 2009).

The third cluster gathers the cultivars into three groups: The first consists of 'Aïn el Kelb' and 'Farana' with a rather

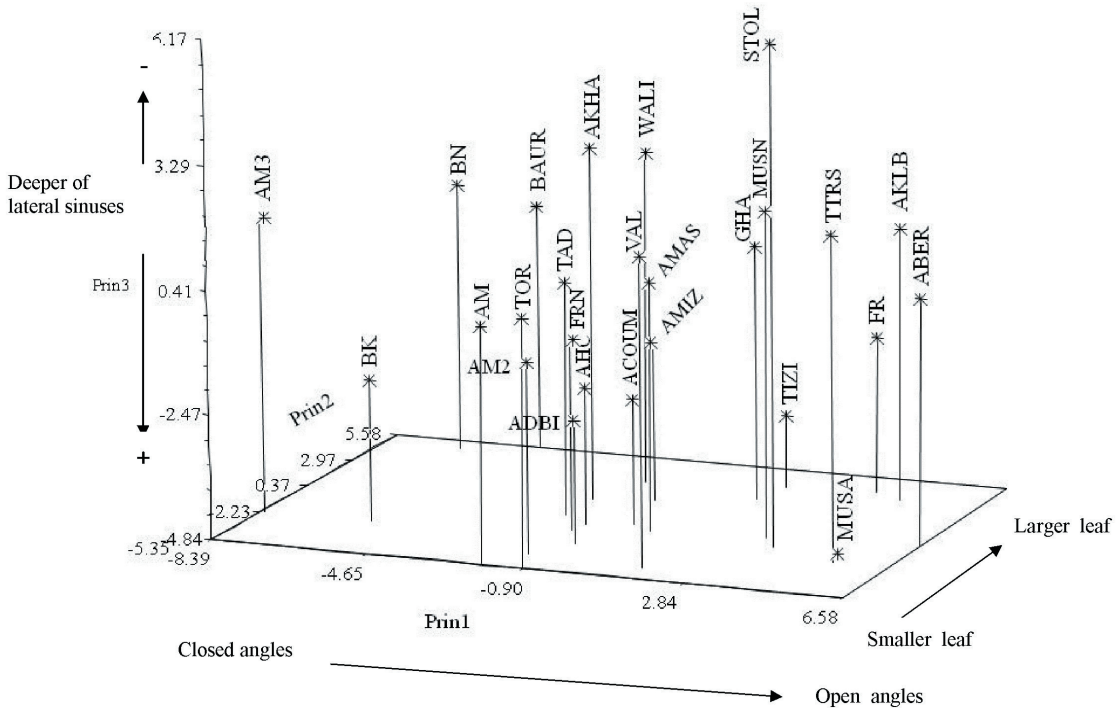

Fig. 3: The ACP projection of mature leaves of 26 cultivars in the first three axes. 'Aberkane': ABER, 'Adadi des Bibans': ADBI, 'Ahchichene': AHC, 'Sidi Ahmed Draa el Mizene': AMIZ, 'Ahmar de Mascara': AMAS, 'Ahmar de Mechtras II': AM2, 'Ahmar de Mechtras III': AM3, 'Aïn el Couma': ACOUM, 'Aïn el Kelb': AKLB, 'Amellal': AM, 'Aneb el Cadi': AKHA, 'Bezoul el Khadem': BK, 'Bouni': BN, 'Bouaber des Aures': BAUR, 'Farana': FR, 'Farana Noir': FRN, 'Ghanez': GHA, 'Muscat Adda': MUSA, 'Muscat Noir': MUSN, 'Sbaa el Tolba': STOL, 'Tadelith': TAD, 'Tizi Ounine': TIZI, 'Torki': TOR, 'Toutrisine': TTRS, 'Valensi': VAL.

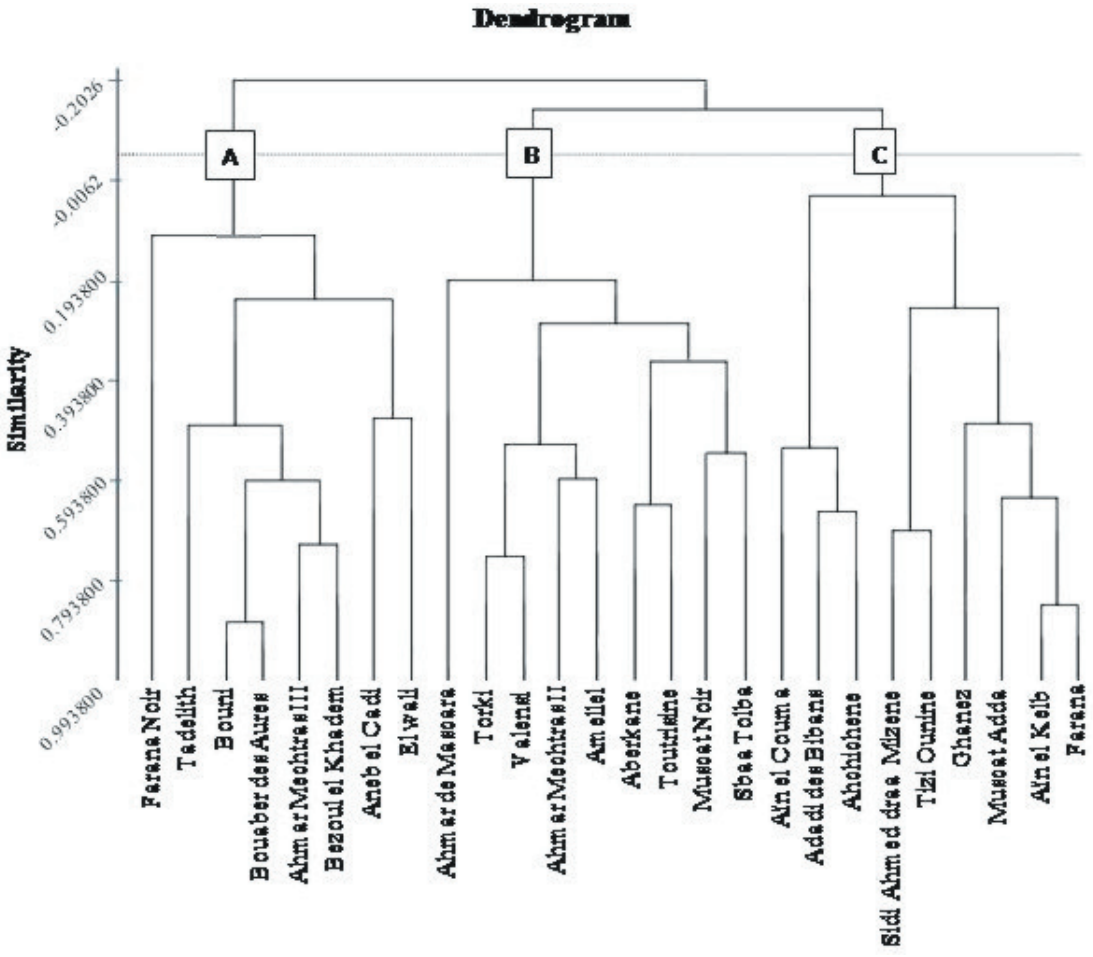

Fig. 4: Hierarchical classification of 26 cultivars according phyllometric parameters of adult leaves.

high degree of similarity (0.85). 'Ghanez' which is included in this subgroup is fairly close to 'Aïn el Kelb'. LAIADI (2009 unpubl.) found that the same variety grown in germplasm of Skikda, has a genetic relationship with the latter. The second subcluster includes 'Sidi Ahmed Draa el Mizen' and 'Tizi Ounine' with a similarity coefficient of 0.69. The third subcluster encompasses: 'Aïn el Couma', 'Adadi des Bibans and Ahchichene' with a similarity coefficient of 0.52 and 0.68 respectively.

In order to reconstruct the average leaf of cultivars according to the method of MARTÍNEZ and GRENAN (1999), we first examined the value of the squared cosines of the angle formed by a point and its projection onto the plane. It appears from the PCA for 53.84 % of the cultivars, the sum of the squared cosines of the first three axes is greater than 0.45 (although a few have recorded amounts of less than 0.1).

'Aberkane', 'Ahmar Mechtras III', 'Aïn el Kelb', 'Bezoul el Khadem', 'Bouni' and 'Toutrisine', appear well represented at the first axis that explained the angles and their sums; 'Adadi des Bibans', 'Ahmar Mechtras II', 'Amellal', 'Bouaber des Aures' and 'Torki' cultivars are well represented at the second axis expressing the size of leaf, and finally, 'Aïn el Couma', 'Sbaa Tolba' and 'Tizi Ounine' are well represented at the third axis set mainly the depth of the sinuses and especially relative to leaf size.

The reconstructed average leaf shapes for 7 varieties is shown in Fig. 5. Mean values of quantitative (Tab. 2) and qualitative (Tab. 3) parameters and the number of teeth have been taken into account. Cultivars that contribute most to the variances and the formation of the axes are those whose coordinates are farthest from their averages, that is to say, those with the highest coordinates, in absolute value.

Conclusion

According to the ampelometric discriminated parameters, greater differences were observed between cultivars: Leaves of 'Torki', 'Ahmar Mechtras II' and 'Valensi' had a very small blade while blades of 'Bouaber des Aures' and 'Bouni' were very large. The same was true for 'Toutrissine' and 'Aberkane' showing a blade with very open angles compared with those of varieties like 'Ahmar Mechtras III' and 'Bezoul el Khadem' that display highly acute angles. Finally, it is also the case regarding the shape of blade. This is perforated with deeper lateral sinuses in 'Muscat Adda' and 'Tizi Ounine' whereas the opposite was shown by 'Sbaa Tolba' which blades are slightly divided and with shallow lateral sinuses.

Considering the degree of similarity, the dendrogram revealed the convergence of varieties presenting the same

Table 2

Mean values for the length (cm) and angle parameters measured for the reconstruction of the average leaf according to the MARTÍNEZ and GRENAN (1999) method

	L	S1g	L1g	S2g	L2g	L3g	L5g	L5d	L3d	L2d	S2d	L1d	S1d	A‘	a‘	B‘	b‘	G‘	g‘	D‘
Aberkane	10,31	4,09	9,55	3,88	6,94	4,17	1,19	1,16	4,22	6,70	3,69	9,17	3,77	66,23	59,00	70,98	61,55	74,25	67,41	66,57
Adadi des Bibans	8,50	3,75	7,66	3,31	5,93	3,57	1,05	1,03	3,63	6,04	3,64	7,94	3,83	47,88	39,68	54,43	45,14	56,82	52,58	49,29
Ahchichene	9,80	4,21	8,79	3,82	6,83	4,62	1,55	1,21	4,17	6,69	3,91	8,70	4,80	54,08	46,53	60,33	50,06	58,17	52,50	48,55
Sidi Ahmed draa Mizene	10,71	4,42	9,61	4,01	7,34	4,76	1,20	1,20	4,84	7,33	3,90	9,65	4,52	49,69	39,02	60,66	50,35	62,72	57,97	64,06
Ahmar de Mascara	10,24	4,18	9,23	4,52	6,82	4,56	0,96	0,96	4,21	6,54	4,27	8,78	4,19	57,35	45,91	68,58	51,49	71,85	55,51	55,27
Ahmar Mechtras II	9,53	4,26	8,22	3,61	6,12	3,47	0,80	0,76	3,67	6,34	3,85	8,69	4,42	49,84	42,30	62,46	47,23	65,71	55,89	54,76
Ahmar Mechtras III	10,00	5,16	9,04	5,00	6,75	4,01	0,92	0,98	3,87	6,40	4,94	8,65	5,26	44,84	44,95	44,34	44,54	47,87	47,22	55,37
Aïn el Couma	10,17	4,40	9,01	3,74	7,05	4,27	1,24	1,31	4,20	6,87	3,77	8,93	4,33	52,13	45,72	59,54	51,98	63,26	56,20	56,81
Aïn el Kelb	11,94	4,38	10,35	5,03	8,07	4,97	1,15	1,28	4,95	7,85	4,57	10,38	4,29	66,33	49,94	71,73	59,23	70,64	61,26	64,78
Amellel	9,19	4,15	7,66	3,87	5,87	3,41	0,94	0,99	3,52	5,72	3,61	7,71	4,14	45,86	41,73	57,56	44,10	65,16	56,03	57,00
Aneb el Cadi	11,58	4,63	10,05	4,62	6,97	4,72	1,02	1,43	5,00	6,73	4,93	9,40	5,05	50,91	44,58	65,63	45,61	69,14	56,41	58,26
Bezoul el Khadem	9,47	4,02	8,59	4,27	6,62	4,41	0,75	0,72	4,33	6,54	4,19	8,83	4,16	44,44	38,72	47,37	40,57	55,95	49,53	62,24
Bouni	11,68	6,05	10,99	5,49	8,13	4,96	1,30	1,25	4,92	7,96	5,26	10,91	5,99	48,05	41,64	49,73	44,73	55,87	51,30	54,36
Bouaber des Aures	12,07	6,07	10,88	5,13	8,50	5,05	1,14	1,11	5,28	8,84	5,00	11,07	5,67	46,56	41,28	48,94	41,66	59,58	57,80	62,27
El wali	11,81	5,23	9,90	4,88	7,65	4,65	1,69	1,56	4,52	7,39	4,59	9,25	5,25	49,73	37,43	55,76	51,76	67,83	63,30	60,44
Farana	12,82	4,03	10,40	4,19	8,07	5,00	1,29	1,38	4,86	8,11	4,41	10,47	4,11	60,00	46,39	68,47	59,77	65,22	57,75	63,23
Farana Noir	10,32	4,22	9,03	4,24	6,87	3,99	0,92	0,98	4,04	6,82	3,91	9,00	4,67	51,27	42,10	57,52	47,44	61,44	56,40	63,04
Ghanez	11,40	4,91	10,27	4,54	7,63	4,84	1,15	1,21	4,75	7,52	4,67	10,66	4,85	57,39	46,25	65,49	55,24	64,90	59,35	60,20
Muscat Adda	10,65	3,12	8,97	3,37	6,70	4,35	1,12	1,31	4,38	6,83	3,68	9,06	3,11	67,86	58,93	66,76	51,47	61,65	55,39	51,88
Muscat Noir	10,58	4,79	8,75	4,34	6,85	3,96	1,34	1,35	4,10	6,85	4,20	8,81	4,35	61,26	47,85	73,74	64,18	64,40	61,05	55,00
Sbaa Tolba	11,09	5,25	9,05	4,42	6,30	4,02	0,89	0,80	4,04	6,54	4,57	9,44	5,10	59,16	47,91	69,89	58,24	74,39	67,92	61,54
Tadelith	10,96	4,44	9,35	4,57	7,05	4,09	1,04	1,04	4,04	6,92	4,57	9,37	4,48	51,84	44,18	59,34	51,58	56,23	57,08	56,94
Tizi ounine	11,37	4,03	10,26	4,05	8,20	5,11	1,50	1,37	5,09	7,97	3,67	9,79	4,20	52,79	38,98	66,01	52,01	65,27	60,37	55,56
Torki	9,13	4,17	8,17	3,83	5,85	3,59	0,71	0,77	3,44	5,77	3,81	8,18	4,05	53,72	47,71	58,00	50,23	58,14	56,08	57,48
Toutrisine	9,63	4,06	8,37	3,98	6,58	4,06	1,06	1,07	4,12	6,64	3,81	8,28	4,02	62,72	50,01	67,62	54,35	76,62	65,98	67,27
Valensi	9,28	4,14	8,12	4,01	6,25	3,98	0,70	0,73	3,83	6,19	4,11	8,04	4,10	59,76	52,50	61,70	51,16	66,09	59,93	68,04

	A	a	B	b	G	g	D	Rel1	Rel2	Rel3	Rel4	Rel5	Rel6	Rel7	Rel8	Rel9	Rel10	Rel11	Rel12
Aberkane	56,60	43,35	76,50	64,63	71,79	66,98	69,11	0,89	0,93	204,89	211,46	174,97	187,96	0,47	0,48	0,42	0,43	0,55	0,56
Adadi des Bibans	50,45	40,79	58,51	49,29	53,99	51,05	50,36	0,87	0,84	162,27	158,41	139,50	136,24	0,49	0,47	0,44	0,45	0,55	0,51
Ahchichene	57,17	48,19	61,42	50,92	58,44	53,54	53,12	0,89	0,90	177,02	172,58	152,65	149,09	0,58	0,52	0,56	0,48	0,59	0,56
Sidi Ahmed draa Mizene	48,86	41,94	56,95	45,05	66,05	65,51	67,64	0,90	0,90	171,85	173,07	152,50	147,33	0,50	0,50	0,47	0,46	0,56	0,55
Ahmar de Mascara	55,93	46,66	60,17	46,74	69,18	60,98	64,62	0,86	0,91	185,28	197,78	154,38	152,90	0,55	0,55	0,48	0,46	0,65	0,68
Ahmar Mechtras II	50,08	44,75	59,95	47,33	64,07	57,80	56,02	0,91	0,87	174,10	178,00	149,87	145,42	0,55	0,55	0,51	0,52	0,61	0,60
Ahmar Mechtras III	44,14	44,39	41,44	43,07	52,03	49,99	62,89	0,87	0,91	137,61	137,05	137,44	136,71	0,68	0,64	0,61	0,57	0,77	0,74
Aïn el Couma	53,99	43,89	59,65	49,29	60,94	56,60	52,92	0,88	0,89	174,58	174,93	149,79	153,90	0,51	0,51	0,49	0,49	0,55	0,53
Aïn el Kelb	60,86	49,40	74,77	60,18	69,76	61,90	60,89	0,88	0,87	205,40	208,71	171,48	170,43	0,49	0,51	0,42	0,42	0,58	0,62
Amellel	52,59	42,20	58,69	47,96	64,38	57,94	60,17	0,84	0,84	175,66	168,59	148,11	141,86	0,57	0,59	0,54	0,54	0,63	0,66
Aneb el Cadi	50,10	42,53	68,06	48,46	68,36	58,22	60,05	0,81	0,87	186,52	185,67	149,22	146,60	0,71	0,55	0,65	0,46	0,80	0,71
Bezoul el Khadem	49,16	41,92	47,87	43,56	53,71	48,80	68,16	0,93	0,91	150,74	147,75	134,28	128,82	0,57	0,56	0,50	0,48	0,66	0,66
Bouni	47,00	42,68	50,02	44,39	55,40	55,35	61,78	0,93	0,94	152,41	153,65	142,42	137,67	0,60	0,60	0,55	0,55	0,66	0,68
Bouaber des Aures	49,78	44,56	49,37	49,23	52,56	55,82	66,84	0,92	0,91	151,71	155,08	149,61	140,73	0,54	0,58	0,51	0,56	0,56	0,61
El wali	47,95	38,74	60,52	53,02	69,08	62,55	62,34	0,79	0,84	177,54	173,32	154,31	152,49	0,60	0,58	0,58	0,53	0,62	0,64
Farana	60,94	46,58	64,63	56,05	65,83	59,77	61,65	0,82	0,81	191,40	193,69	162,40	163,91	0,46	0,45	0,39	0,39	0,54	0,52
Farana Noir	54,91	47,48	57,99	52,21	57,82	56,27	55,13	0,88	0,88	170,72	170,22	155,95	145,94	0,54	0,53	0,52	0,47	0,57	0,62
Ghanez	63,19	52,33	68,66	53,82	63,73	59,06	60,64	0,93	0,91	195,58	187,78	165,21	160,83	0,53	0,53	0,46	0,48	0,62	0,60
Muscat Adda	65,08	55,27	68,52	54,14	62,62	51,07	42,06	0,85	0,85	196,22	196,27	160,48	165,79	0,43	0,41	0,34	0,35	0,54	0,50
Muscat Noir	56,79	46,66	68,31	61,08	68,93	61,97	59,43	0,84	0,84	194,03	199,40	169,70	173,08	0,55	0,59	0,49	0,55	0,62	0,64
Sbaa Tolba	65,66	50,72	78,57	58,45	74,41	69,23	63,65	0,85	0,82	218,64	203,43	178,41	174,07	0,61	0,63	0,54	0,59	0,70	0,70
Tadelith	50,32	44,34	58,27	49,24	59,27	55,84	62,59	0,86	0,85	167,87	167,41	149,42	152,84	0,56	0,55	0,48	0,47	0,66	0,65
Tizi Ounine	51,47	39,67	65,37	46,89	72,12	63,74	60,62	0,86	0,90	188,96	184,07	150,30	151,35	0,44	0,44	0,43	0,40	0,46	0,50
Torki	55,48	49,38	57,88	48,14	62,37	62,89	63,07	0,90	0,89	175,73	169,86	160,41	154,02	0,57	0,58	0,50	0,52	0,68	0,66
Toutrisine	65,79	54,36	69,69	55,80	78,12	66,43	73,15	0,86	0,87	213,59	206,96	176,59	170,34	0,53	0,54	0,48	0,49	0,58	0,60
Valensi	57,22	50,21	67,50	56,42	65,86	59,68	65,15	0,87	0,88	190,59	187,56	166,31	163,59	0,58	0,57	0,52	0,51	0,67	0,65

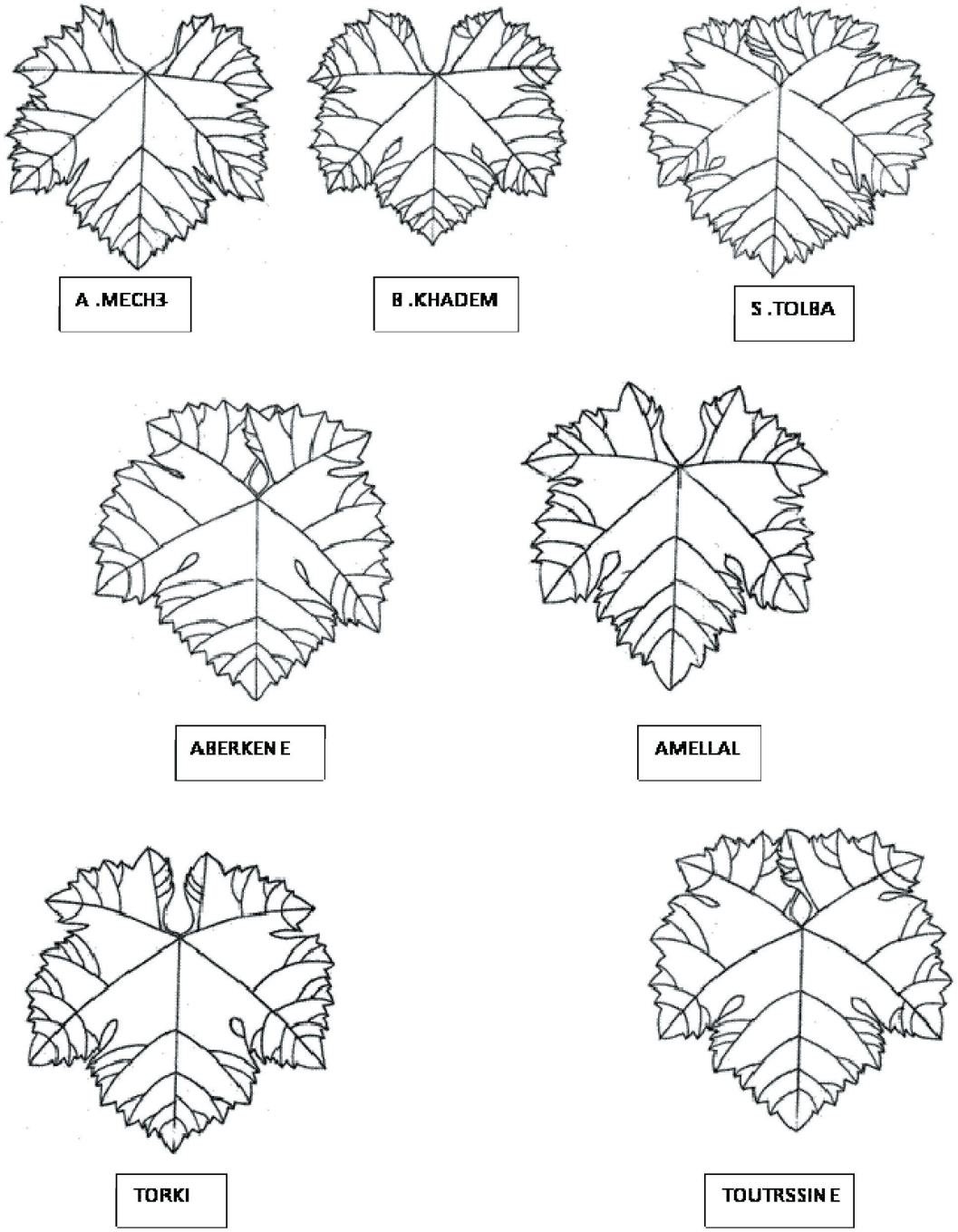

Fig. 5: Average leaf of 7 Algerian varieties.

Table 3

Qualitative parameters studied in the adult leaf for the representing seven cultivars

No. code – OIV-	076	079	080	082	083-1	CSLI	FBSLI
Aberkane	2	7	3	4	2	1	1
Ahmar de Mechtras III	4	1	3	1	3	1	3
Amellal	3	3	1	1	2	1	2
Bezoul el Khadem	3	3	2	3	2	3	2
Sbaa Tolba	3	7	3	3	1	1	3
Torki	3	3	3	4	1	1	3
Toutrissine	3	7	3	2	2	3	1

leaf characteristics (cited above): 'Bouaber des Aures' and 'Bouni', 'Ahmar Mechtras III' and 'Bezoul el Khadem', 'Torki' and 'Valensi'.

On the other hand only 'Ahmar Mechtras III', 'Bezoul el Khadem', 'Sbaa Tolba', 'Torki', 'Valensi', 'Toutrissine', 'Aberkane' represented the more significant measures in PCA, Cos^2. Therefore, they are reconstructed by the method of Martínez and Grenan. Finally it is important to emphasize the need for studying all other qualitative and quantitative parameters that are used by the standardized descriptor.

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