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Characterization of grape berries of same local varieties in Morocco

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Abstract**—** *Ampelography is the first step in grapevine selection, in establishing the relationship between grape cultivars. In this study grape berries collected from grapevine grow in the Northwestern of Morocco. A total of 15 grape berries from 39 accessions were characterized using OIV descriptors. We calculate the Average quantitative parameters of the all berries collected. The analysis of variance for the quantitative parameters of the berries shows that the ratio Long/Width of the berries is the only character that shows the significant variations. A highly significant correlation of length with width and weight can be observed with respectively 0.860 ** and 0.873 **. Principal Component Analysis with Quantitative Berry Parameters show some trees of the same variety are grouped together but they are no a clear structuring of trees according to their varieties; this may be due to the problem of synonymies and homonymies generally very common in local varieties.*

Keywords**— *Vitis vinifera cv, Grape berries, synonymy, homonymy, Morocco.***

I. INTRODUCTION

The cultivated grape is believed to have been domesticated around 4000 BC from a perennial wild grape originally classified as V. sylvestris C.C. Gmelin occurring from north-eastern Afghanistan to the southern borders of the Black Sea and the Caspian Sea [1], [2]. However, based on a recent archaeological finding in the Zagros mountains of Iran, [3] suggested 5400–5000 BC as the probable period of domestication of the grape. Currently, over 6000 cultivars are documented, including wine, table and raisin types [4]. Moreover, the wide distribution and long cultivation history of the grape have led to the development of numerous cultivars that have many synonyms, a problem that plagues germplasm collections [5], [6]. Traditional methods of describing grape vine varieties based on the plant's vegetative and reproductive traits (ampleography) have contributed greatly to establishing the identity and relationships among *V. vinifera* cultivars [7], [8], [9], [10]. Nevertheless, ampelographic traits are often plastic, with a large genotype–environment interaction component rendering them less useful in classifying closely related cultivars. Nevertheless, cultivar names are often ambiguous owing to transliteration, the substitution of local or regional names for the original cultivar names, the presence of variants within cultivars (clones) and poor documentation of passport data, which includes ecogeographical, climatological and ethnographic information associated with germplasm accessions. The number of methods to classify and identify grape vine varieties has increased rapidly in the last two decades. Ranging from classical IUV-IBPGR-UPOV charts [11] (e.g. Anonymous 1983) to isoenzymatic markers [12], [13] or molecular characterization by DNA analysis [14], [15], [16], numerous methods to distinct between the different grape vine genotypes have been proposed. In Morocco, the grapevine as well as the olive tree, the fig tree and the cereals are cultures well adapted to the natural climatic conditions of our country located at the end of the western Mediterranean. During the last century, several factors have led to a progressive extinction for many local grape varieties and consequently to their genetic erosion. Currently, these varieties have become rare, little known, not inventoried, unexplored and threatened with extinction. Little study in Maghreb was carried to describe the cultivars of grapevine [17], [18], [19], [20]. This is not a study on the characterization of local berries of vines has not been made. Although the grape berries play an important role. The epicuticular wax layer of grape berries not only plays an important physiological role during berry development, but also impacts on the economic aspects of all viticultural commodities. The wax bloom scatters light and imparts a frosted appearance to the berry [21], which is considered attractive and desirable by consumers of table grapes [22].

After a short introduction to *vitis vinifera* cv and the methods of her characterization, the present work shows results obtained by using the grape berries for characterization of native cultivars of grapevine from Morocco.

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II. MATERIAL AND METHODS

Grape berries (*Vitis vinifera L. cv*) were collected at frequent intervals from vines grown in the North –West of Morocco. All of the plants were classified as minor or endangered varieties. The total number of accessions studied was 39 and 15 grapes berries for each tree. Ampelographic characters were described using OIV descriptors [23], [24]. Sampling was done at the time of fruiting. In each site surveyed and with the help of the farmers we collected for each variety named and recognized samples of fruits.

Principal Component Analysis (A.C.P) was done using SPSS Version 10 software.

III. RESULTAT AND DISCUSSION

Average quantitative parameters of the berries:

We measured for each berry: length, width, length-to-breadth ratio, weight, number of pips and Brix (sugar content).

In berries average lengths vary between 20.33 mm in Bezoul Elawda tree 2 and 11.48 mm in Zbarjel tree. Average widths varied between 17.89 mm in the Boukhanzir2 tree and 10.85 mm in the Fekas tree. The length-to-width ratio that gives an idea of the shape of the berry is greater than 1 in all trees except Taferyalt khal4, Maticha mferqa and Maticha mjemaa. For the average weight of the berries it varies from 0.70 g among the accessions of the variety Fekkas to 4.55 g at Muscat bayda. The number of pips is one in the feet Mouska Hamra1 and Fekas, one to two in the feet Taferyalt Kahla5, Aferyal Byad2, Taferyalt Byad4, Maticha Mferqa, Muska, Mouska Hamra2, Ineb Nhal, Fekas Khal, Ineb Byad2 and Boukhanzir2, from three to four pips at Bezoul El awda2 and Dibani2 and finally from two to three in the remaining feet. Sugar or brix ranges from 55% in Rjiyil dibi 1 and Taferyalt Kahla 3 vines to 29% in Feryal khall trees (Table.1).

Table 1. List of the quantitative parameters of the berries

Variety	Long (mm)	Width (mm)	Long/Width.	Weight (g)	Number of seeds	Brix
Feryal Khal1	17.494	16.081	1.087	3.5	2.67	29
Feryal khal2	17.444	15.665	1.113	3.214	2.06	51
Taferyalt kahla3	15.839	15.658	1.011	3.016	2.4	55
Taferyalt Kahla4	14.546	14.588	0.997	2.616	2.9	47
Taferyalt Kahla5	14.179	13.706	1.034	1.849	1.94	38
Taferyalt Kahla6	17.371	16.132	1.076	3.094	2.27	50
Taferyalt kahla7	14.8	14.393	1.028	2.156	2.6	40
Taferyalt kahla8	16.41	15.87	1.034	2.83	2.67	46
Aferyal Byad1	17.617	15.284	1.152	3.002	2.6	42
Aferyal Byad2	17.667	16.305	1.083	3.264	1.8	35
Taferyalt Byad3	13.061	12.361	1.056	1.718	2	49
Taferyalt Byad4	13.301	12.628	1.053	1.616	1.5	45
Dibi 1	18.302	16.908	1.082	3.64	2.06	45
Dibi 2	18.09	16.573	1.091	3.442	2.06	37
Echabel(Dibi)	17.028	16.857	1.011	3.51	2.8	37
Dibani 1	14.119	13.975	1.011	1.966	2.13	35
Dibani 2	13.643	11.773	1.158	1.491	3.13	46
Maticha Mferqa	11.536	12.381	0.931	1.362	1.2	47
Maticha Mjemaa	11.617	13.461	0.863	1.415	2.8	40
Mouska	16.975	14.873	1.141	2.627	1.87	35
Mouska Bayda	19.665	17.521	1.122	4.557	2.4	38
Mouska hamra1	14.792	12.532	1.183	1.848	1	46
Mouska hamra2	18.692	15.222	1.227	3.079	1.27	39
Ineb Nhal	13.246	12.506	1.059	1.478	1.8	35
Fekas khal	19.519	18.007	1.083	4.313	1.87	32
Fekas Byad	16.574	14.591	1.135	2.679	2.73	37
Fekas	11.535	10.85	1.063	0.708	1.1	38
Ineb Byad1	18.046	16.595	1.087	3.484	2.27	35

Ineb Byad2	16.697	15.557	1.073	3.203	1.93	43
Bezoul awda 1	16.195	11.035	1.467	1.709	2.6	40
Bezoul awda 2	20.338	15.712	1.294	3.305	3.27	42
Boukhanzir1	20.093	17.899	1.122	4.447	3.2	42
Boukanzir2	14.51	12.984	1.117	1.626	1.33	42
Boukhanzir3	16.868	15.997	1.054	3.128	2.6	40
Sbiyae Bnat	12.959	12.166	1.065	1.595	2.6	39
Rjiyil Dib 1	17.133	15.152	1.132	2.687	2.6	55
Rjiyil Dib2	14.557	13.968	1.042	1.997	2.47	47
Zbarjel	11.487	10.968	1.047	0.99	3	35
Sanso	15.327	13.289	1.153	1.967	2.47	40

Analysis of the variance of the quantitative variables of the berries:

We performed an analysis of variance for the quantitative parameters of the berries. The result obtained (Table 2) showed that the ratio Long / Width. of the berries is the only character that shows significant variations. The Long / Width ratio expresses the shape of the berries.

Table.2: Results of the analysis of the variance of the quantitative parameters of the berries

ANOVA à 1 facteur		
	F	Signification
Long/Larg. (B)	7.550	.000
long	2.016	.063
poids	1.962	.071
larg.	1.611	.147
Brix	.978	.502
Nbre de pépins	.825	.638

Analysis of the correlations of the quantitative parameters of the berries

We performed a correlation analysis for the quantitative parameters of the berries. Table.3 *shows* the results obtained.

Table.3: The correlation between the quantitative parameters of the berries

	Long (mm)	Width (mm)	Long/Width	Weight (g)	Number of seeds	Brix
Long	1					
Width.	.860**	1				
Long/Width.	.438**	-0.038	1			
Weight	.873**	.898**	0.172	1		
Number of seeds s	0.107	0.13	0.051	0.174	1	
Brix	-0.101	-0.078	-0.053	-0.087	-0.065	1

The correlation is significant at the 0.01 level (bilateral)

Thus, a positive and highly significant correlation of length with width and weight can be observed with respectively 0.860 ** and 0.873 **. Also a positive and highly significant correlation of 0.898 ** in width with weight.

Principal Component Analysis with Quantitative Berry Parameters

We used the means of the quantitative parameters of the grapes berries to perform a principal component analysis (Fig.1 & 2). Table 4 shows the percentages of the variance associated with each axis.

Table 2: Variances associated with the axes of the ACP of the characters of the grape berries

Total variance explained			
Component	Total	% of variance	% cumulated

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1	2.862	47.697	47.697
2	1.071	17.845	65.542
3	1.015	16.909	82.452
4	.931	15.523	97.975
5	.103	1.720	99.695
6	.018	.305	100.000

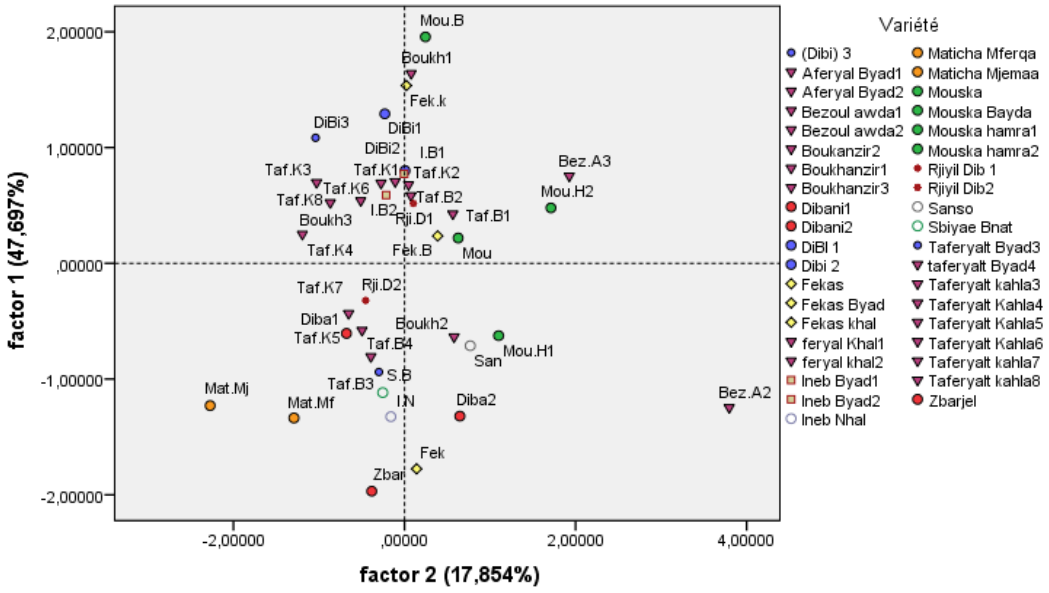

Fig.1: Projection in the plane (1,2) of the PCA of the quantitative parameters of the berries.

The figure .1 shows a not clear enough structuring of the various trees, In the trees of the Taferyalt variety we notice the formation of two groups like that of the previous ACP, but the points are almost all in the negative side of the axis 1 except the Taf tree. B1. We found it useful to eliminate the different trees of the Tarferylt variety and repeat the analysis without them, the result shown in figure .2.

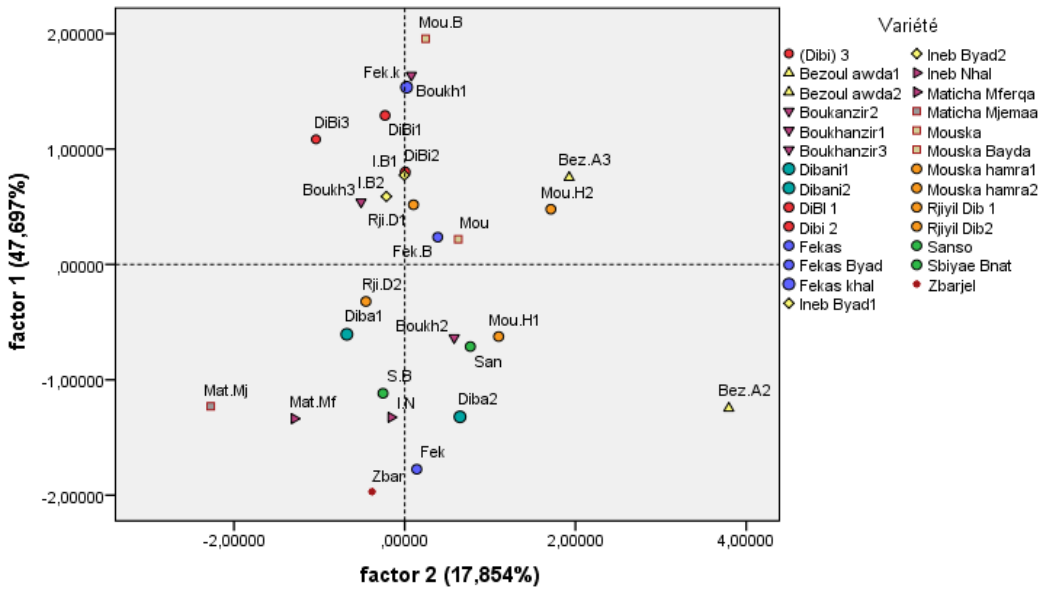

Fig.2: Projection in the plane (1,2) of the PCR of the quantitative parameters of the bays. (Without Taferyalt)

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From Fig. 2. We Note that some trees of the same variety are grouped together. This is the case, for example, of trees of the Dibi variety. Also we noticed that the two trees of the two varieties Maticha are a little closer. In general we do not see a clear structuring of trees according to their varieties; this may be due to the problem of synonymies and homonymies generally very common in local varieties. Grape (berry) has different shapes depending on the variety: it can be globose, flattened, elliptical, ovoid, elongated, etc. The shape of each grape is characteristic of the variety, the flesh or pulp is generally colorless, only some varieties have a tinted flesh; this flesh contains important percentages of sugar, various acids, and minerals. In general, the seeds, or seeds of the vine, are generally one or two, sometimes three, and exceptionally four.

IV. CONCLUSION

The use of berries for the characterization of trees of different local varieties proved to be a good means for the distinction between local varieties, however the low number of trees studied as well as the problem of synonymy and homonymies frequently encountered in local varieties leave this identification not weak. In the future this study must be completed by molecular analysis for better identification.

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