

## Valorization of Grapevines (*Vitis vinifera* L.) Cultivated in a Coastal Oasis

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**Abstract:** The grapevine (*Vitis vinifera* L.) is one of the most widespread species in the oasis of Chénini. The valorization and the conservation of this threatened species remain a preoccupation of oasis population. Eight local varieties have been collected for its description based on pomological (bay and bunch weight) and physicochemical characteristics (pH, level of major minerals, rate of sugars) of its fruits. The characterization showed that the majority of these varieties have large bay and bunch and offer a juice rich in minerals, acid and relatively sweetened. Thus, these varieties deserve a particular attention for a better valorization before its integration in programs of genetic improvement.

**Keywords:** Chemical characterization, Oasis, Pomological characters, *Vitis vinifera* L.

### 1. Introduction

The oases are known by their specific biodiversity. There are three stages of cultures: palm trees, fruit trees and herbaceous cultures (Riou, 1990). Under the influence of the arid Saharan climate and the insufficiency of water, the oasis system became very unstable. This situation is accentuated by the industrialization of agriculture and the development of the human activity (orientation of other more attractive economic sectors). All these causes led to a strong reduction of the genetic diversity of the cultivated species (Zaharia, 2003).

For fruit trees, the main causes of loss of the genetic resources are the abandonment of the small farms and the replacement of the indigenous varieties by introduced modern and improved ones.

The grapevine (*Vitis vinifera* L.) is among the fruit trees threatened of disappearance. Although local varieties have the advantage of being adapted to the edaphic conditions, the current situation of the Tunisian vineyard is very disturbing (Maigre, 1995). The viral diseases, the erroneous denominations and the inaccurate numbers of the varieties generated the gradual disappearance of some of them (Ben Salem and Ghorbel, 2000). Nowadays some indigenous cultivars are marginalized. Others are completely loosed (Ben Abdallah *et al.*, 1998). Given this rapid degradation several efforts are deployed for the conservation of these resources. This work must start by the collection of plant material then its characterization and its identification before its integration in programs of genetic selection (Zitoun, 2000).

The objective of this work is to collect and characterize some local varieties based to pomological and physicochemical parameters.

### 2. Materials and Methods

Eight local varieties, called referring to their color, their shape or the locality where they were cultivated, are studied: Médina (V1), Mguergueb (V2), Khalt (V3), Sawoodi (V4), Akhal (V5), Bezzoul Kalba Akhder (V6), Bezzoul Kalba Ahmer (V7) and Miski (V8). The samples of fruits were harvested at physiological maturity (when the grapes become colored). These samples were carried out between August and September 2004 in the oasis of Chenini (one of the principal oasis in Gabes). For morphological characterization, the bunch and the seed weight were measured for the 8 cultivars using a precision weighing device with an accuracy of 0.1mg. Weights values corresponded to the average of three measurements. For physicochemical characterization, five mature bunches and 25 bays per bunch were randomly taken for each variety. These bays are seeded and crushed using an electric mixer. The juice obtained is used for various analyses. The following parameters were studied: the pH, the levels of different minerals using a spectrophotometry of atomic absorption and the analysis of sugars by High Performance Liquid Chromatography (HPLC) using the column C18 to the separation of the various components. Statistical analysis was followed by an analysis of variance (ANOVA) and the varieties were classified by means using Newman and Keuls test at 95% confidence interval.

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### 3. Results

#### 3.1. Morphological characters

**Table 1** shows the mean value and the standard error of bay (wb) and bunch weights (wc). The cultivars showed significant differences in these parameters ( $p < 0.001$ ). The measurements varied respectively from 3.41g (cultivar V1) to 6.37 g (cultivar V8) and from 1202.49 g (V6) to 470.04 g (V8).

#### 3.2. Physicochemical characterization

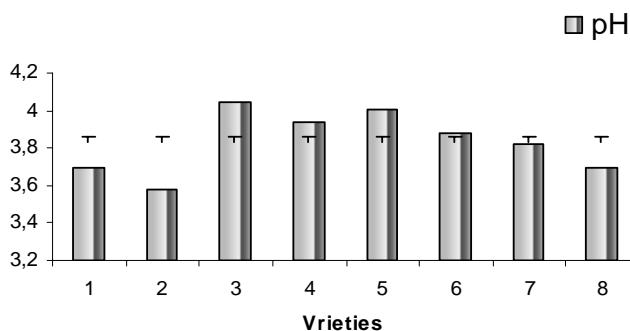
Variations of the physicochemical characters were significant ( $p < 0.05$ ) except for the character pH ( $p = 0.16 > 0.05$ ). The lowest pH value was obtained for V2 (3.6) and the highest one for V3 (4.04) (**Fig. 1**).

The potassium content varied from 1.7 g/l for the cultivar V2 to 4.4 g/l for the cultivar V1. For the sodium, calcium and magnesium contents, the values varied respectively from 0.1g/l for V1 to 0.71g/l for V4, from 0.1 g/l for V5 to 0.25 g/l for V2 and from 0.12 g/l for V3 to 0.23 g/l for V1 (**Fig. 2**).

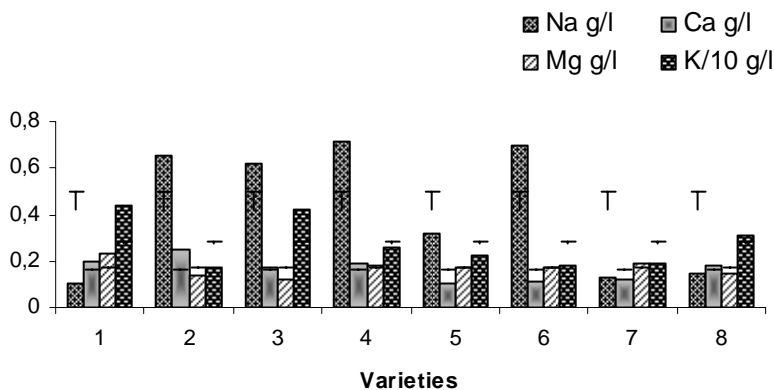
The analysis of sugar by HPLC shows that the grape juice is devoid of saccharose. The variety V1 presented the highest rate of redactor's sugar (230 g/l) and V7 the lowest one (159 g/l) (**Fig. 3**).

**Table 1. Average bay weight (g) and average bunch weight (g) for the different cultivars.**

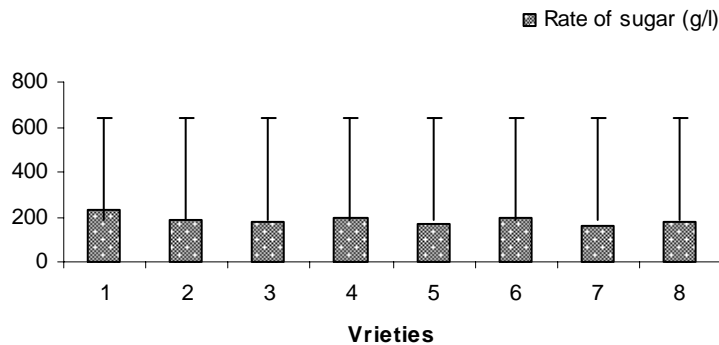
Parameters	Cultivar V1	V2	V3	V4	V5	V6	V7	V8
Average bay weight	3,41 ± 0,63 c	4,66 ± 0,5 b	3,86 ± 0,59 c	4,73 ± 0,47 b	5,1 ± 0,62 b	3,47 ± 0,61 c	3,84 ± 0,12 c	6,37 ± 0,96 a
Average bunch weight	874,35 ± 6,67 b	833,46 ± 1,92 b	850,99 ± 5,69 b	1103,27 ± 9,58 a	801,94 ± 5,67 b	1202,49 ± 8,44 a	903,19 ± 5,99 b	470,04 ± 8,19 c



**Fig. 1. pH of the different cultivars.** Error bars represent standard deviation between three repetitions.



**Fig. 2. Nutrients contents of the different cultivars.** Error bars represent standard deviation between three repetitions.



**Fig. 3. Rate of sugar of the different cultivars.** Error bars represent standard deviation between three repetitions.

#### 4. Discussions

The characters of these autochthones grapevines was comparable and even better than those obtained on varieties cultivated in the north of the county (Souid, 2002). Referring to the classification proposed by Galet (1998), which presents five classes of the smaller ( $w_b < 0.35$  g;  $w_c < 125$  g) at the largest ( $w_b > 6.99$  g;  $w_c > 1000$  g), the cultivars were classified among bays with large size. For bunches, three classes can be identified: average (cultivar V8), large (cultivars V1, V2, V3, V5, V7) and very large (cultivars V4, V6). All cultivars have an acid juice ( $pH < 4.1$ ). This result corroborate with those noted by Souid (2002) who indicates that the pH of the grape juice is closer to 4. The grape juice is rich in potassium compared with other minerals. The rate of redactor's sugar oscillates between 230 g/l and 159 g/l. According to Huglin and Schneider (1998), grapevines having a rate of sugar ranged between 170 and 280 g/l are considered among the best ecotypes. Thus, the majority of the studied varieties can be regarded as grapevines at high sugar rate.

Referring to the parameters studied in this work, outlines of valorization can be advanced. Results analysis makes it possible to differentiate some cultivars. V2, V4 and V8 are distinguished by bays with large size ( $w_b$  varies from 4.66 g to 6.36 g), a relatively low pH (from 3.7 to 3.94) and high sugar content (from 182 g/l to 198 g/l). These values are comparable with those obtained by Souid (2002) and Huglin and Schneider (1998) on the table grapevines Muscat of Italy and Chasselas. These two varieties are characterized by a high sugar rate (178 g/l) and an acid savor ( $pH=3.21$ ), consequently V2, V4 and V8 could be classified among table grape. The cultivars V1 and V6 are characterized by low average fruit weights (3.42 and 3.47 g respectively), pH from 3.7 to 3.88 and the sugar rate varies between 192 and 230 g/l. If we compare these results with those found on the variety Beldi (existing in the Tunisian vineyards during several decades and it is considered among the most appreciated wine grapes), this cultivar has an average bay weight of 3.5 g, a pH of 4.8 and a rate of sugar of 20% (Souid, 2002), V1 and V6 could be lended perfectly for winemaking. These results are consistent with those described by Spring (2004), which affirms that grapes with a sugar content of 190 g/l and 250 g/l offer, respectively, a fresh and fruity wine and a sweet wine. On the other hand, Lozano and Delteil (1995) and Mannini *et al.* (1999) suggest that the small size of bays is among the most important criteria for quality wine.

#### 5. Conclusion

This work is the first to describe the grapevine existed in the coastal oasis in the south east of Tunisia. Eight indigenous varieties were identified by their morphological and physicochemical characterization. Results showed that most of the grapevine cultivated in this area present a sweet quality of fruit. For most of these characters the observed values can be considered comparable, and sometimes superior, to those presented by other well-known cultivars from other countries. The juice of all varieties is acid ( $pH < 4.1$ ), rich in sugar (230-159 g/l) and in potassium. The calcium, magnesium and sodium contents are very weak ( $< 0.25$  g/l). Nevertheless, it should be noted that this interesting source of genetic diversity needs to be better studied and preserved from the risk of extinction for future breeding programs.

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