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Pomological Characterization and Mineral Study of Fruit of Some Local and Introduced Varieties of Olive-tree (*Olea europaea* L.) Cultivated in South of Tunisia

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Abstract: The olive trees plantations are spread in Tunisia. The identification and the characterization of olive-trees, the research of other genotypes, will help to develop "new cultivars" able to improve the qualitative standard of oils. This study, which represents a first stage of a research aiming the improvement of the genetic resources of the olive-tree, is based on a pomological characterization and a study of the mineral composition of the fruit of 14 local and introduced varieties of olive-trees from (Algeria, Italy, Jordan and Lebanon) cultivated under oasis condition on the south of Tunisia. The studied varieties are: Zalmati Zarzis, Zarrazi Matmata, Chemlali Sfax, Chemchali, Chemlali Jerba, Neb' jmel, Chemlal of Kabylie, Frantoio, Leccino, Merhavia, Morello, Nabali, Soury and C112. The pomological parameters showed an important polymorphism between the cultivars. In addition, olive's fruit of the studied varieties are rich on sodium.

Keywords: Characterization, Fruit, Mineral, *Olea europaea*, Pomological

1. Introduction

Tunisia is classified as the fourth world wild considering its olive's tree number (60 million trees), and in the second rank considering the area which is about 1.6 million hectares (about the third of the arable lands of the country) (DGPA/ONH, 1996). However, there is a genetic erosion of this specie caused by the evolution of the socio-economic processes. This situation requires a conservation of this genetic inheritance, knowing some aspects of the specie's genome necessary to a possible characterization of the cultivars (Hannachi *et al.*, 2006). Since, various work of varietals identification was elaborated in Spain, in Italy and Algeria starting from the combination of the morphological, agronomic, technological, biochemical and phenologic characters (Priego, 1931; Ciferri *et al*., 1942; Hauville, 1953; Morettini and Amellini, 1953; Baldini and Scaramuzzi, 1963; Ortega, 1963; Rallo and Cidraes, 1975; Cimato *et al*., 1997; Cantini *et al*., 1999). The olive-tree has a variability of some of its parameters which characterize the genetic polymorphism of this specie. Among these criteria we quote fruit's dimensions (Ruby, 1916; Boulouha *et al*., 1992), core's characters (Hauville, 1953), and the shape and dimensions of the sheets (Bellini, 1993). The variation of the mineral composition of the fruit is under the influence various factors (Nergiz and Engez, 2000).

To safeguarding our olive-growing inheritance, we were interested to characterize 14 varieties of olive-trees cultivated in the south of Tunisia. Our analysis is based on a pomological and biometric study and on the mineral composition of the fruit.

2. Materials and Methods

2.1. Equipment plant

Research affected on a sample of 14 varieties of olive-tree: 8 introduced varieties and 6 local ones cultivated in the oasis of Gabes (South of Tunisia).

2.2. Experimental methods

2.2.1. Pomological analysis of the fruits

The analyzed parameters were: the average weight of fruit (AWF) and core (AWC), the percentage of moisture of olive and the ratio (pulps/core). We had also determined the shape and the symmetry of the fruit (SF, Sy.F) and those of the core (SC, Sy.C), as well as the dimensions of the sheet: the length and the

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average width (LS and WS).

2.2.2. Determination of the mineral composition

The sodium, potassium and phosphorus contents were determined by the conventional methods of analysis based on photometry and spectrophotometry.

2.2.3. Statistical analysis of data

The analysis of the diversity of various varieties of the olive-tree was the statistical processing object using Ascending Hierarchical Classification (SPSS 12).

3. Results and Discussion

3.1. Pomological characteristics

3.1.1. Average fruit weight, average core weight and ratio pulps/core

The average fruit weight (AFW) varies from 0.98 g in the variety Zalmati Zarzis to 5.76 g in the introduced variety Nabali. The average weight of core (AWC) is of the order of 0.22 g in the variety Chemlali Sfax and reached a maximum value of about 0.75 g in the Morello variety. The analysis of AFW of the various studied varieties showed the existence of two groups; The first one is composed by the varieties of Zalmati Zarzis, Chemlali Sfax, Chemlali Jerba, Chemlal de Kabylie, Leccino, Merhavia and C112, having a weight of olives (fruit) not exceeding 2 g and classified very low according to Grati Kamoun *et al*. (2001). The second group is composed by the varieties in which the weight of their fruits was between 2 and 6 g: the varieties Nabali, Morello (4.90 g) and Soury (4.12 g). These ones had been classified as average fruits.

According to our results, some varieties such as Chemlali Jerba, Zalmati Zarzis, Zarrazi Matmata, are characterized by a small fruit, whereas, according to the results of Grati Kamoun *et al*. (2001), they were classified as having average size. This dissimilarity can be explained by the influence of the geographical site and the hydrous conditions. Indeed, these varieties, in our case, were irrigated while those studied by the announced authors above are grown in drought conditions. Chemlali Sfax remains, however, producing fruits of average size (Touzani *et al*., 2000; Grati Kamoun *et al*., 2001).

Considering, the ratio pulps/core, two groups indicated its fluctuation according to the variety: the first with a high ratio (P/C) quoting the variety Nabali (7.52), the variety Chemchali (5.70) and the variety Zarrazi Matmata (5.36). The second group gathers the varieties having a ratio between 2.32 and 4.90. The varieties of table olives are known by the variety Meski, a variety of table with a fruit weight of 6.5 g (Trigui *et al*., 2002). The Nabali variety was relatively heavy (6.5 g) which classified it as a dual purpose variety; which means that it is simultaneously oil and table variety.

The results related to the water content showed that it was variable and oscillated between 9.04 and 50.26%. The varieties Zarrazi Matmata, Leccino, C112, Frantoio and Morello had low water contents. However, the remainders of the varieties had indicated very marked rates such as the Merhavia variety where the moisture was about 50.26%. Sanchez *et al*. (1999), showed that the oil contents of the fruit are very influenced by the moisture of pulp at the time of the harvest of the fruit.

3.1.2. Form and symmetry of the fruit and core

Considering the fruit, the majority of the varieties have an ovoid form. The lengthened form was only observed in the variety Chemlali Jerba. The whole of the fruits are slightly asymmetrical. Concerning the core, the elliptic form was dominant in the local varieties. The ovoid form appeared in the introduced varieties (Leccino, Morello and C112). The majority of cores were symmetrical.

3.1.3. Foliar description

The foliar characteristics indicated a variability of dimensions which oscillated between 3.92 and 6.47 cm for the average length and between 0.81 and 1.17 cm for the average values of the width. The primary characterization, COI (1997), of the sheet enabled us to classify the varieties in two groups: the first gather most of the introduced varieties and five local ones which are characterized by the lanceolate and elliptic shape of the sheets. The second group was characterized by the lanceolate shape of the sheets and contained the two varieties Neb' jmel and Merhavia.

3.1.4. Statistical analyze studied parameters

The analysis of the dendrogram (**Fig. 1**) allows the identification of two groups:

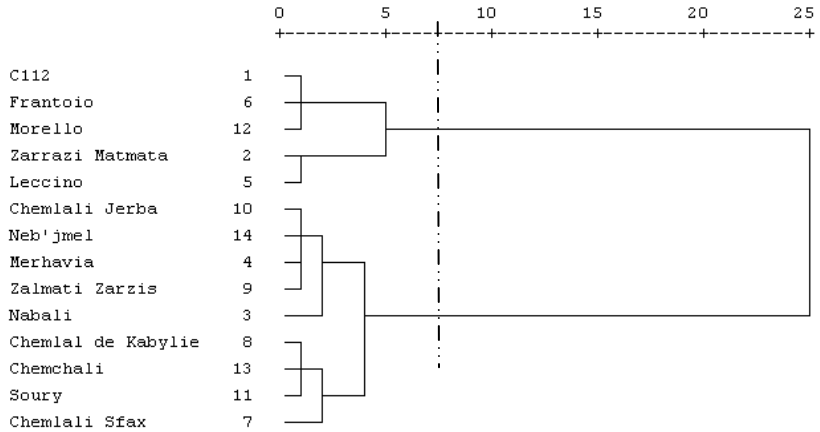

Fig. 1. Dendrogram of the classification of the olive varieties by the combination of the pomological parameters studied

Group 1 (G1) gathers the varieties with average AWC and P/C ratio. These varieties were the introduced varieties: C112, Frantoio, Morello, Leccino excluded Zarrazi Matmata and were characterized by an AWF average. Morello variety had the highest value of AWC (0.751g) but remains still lower than 1, an average ratio P/C and low water content. The variety Zarrazi Matmata had the lowest rate (9.04%).

Group 2 (G2) gathers the varieties with an important AWF and an important water contents. In this same group, we see the variety Zalmati Zarzis having the weakest AWF and the variety Nabali with the highest AWF and a low AWC. Chemlali Sfax represents the lowest value which is equal to 0.221g and a weak ratio P/C. The highest water content is showed by variety of Merhavia (50.26%). It should be noted that the Nabali variety is the top of this group since it presents important values concerning the AWF, the P/C and the content on water.

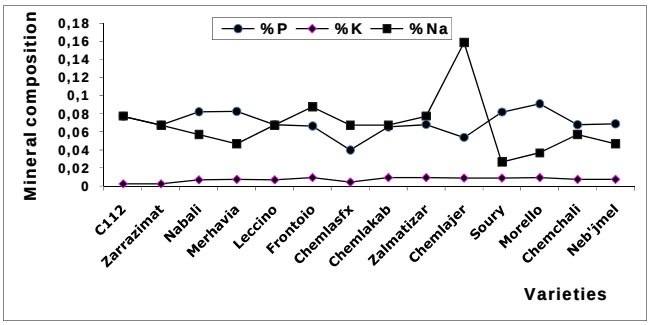

Fig. 2. Contents in (%) of three studied minerals.

3.2. Mineral composition

By analyzing the curves of **Figure 2**, we note that the content in sodium (Na) on the fruits of olive-tree was higher than their content on phosphorus (P). The last one is also higher than their content on potassium (K). The potassium contents vary from 0.0025 to 0.0095%, those of phosphorus lie between 0.04 and 0.09%, whereas those of sodium oscillate between 0.03 and 0.16%.

In this study, the composition of olive fruits in K, Na and P shows a significant variability between the varieties. According to Akrout (1997), the variability of the mineral composition in the plants can be allotted to the nature of the ground, to the climatic conditions, to the age of the plant and to the period of the collection. Keller (2005) said that any deficiency or excess of water have an impact on the production of the crop and it's content on biogenic salts.

4. Conclusions

The description of olive fruits shows differences between the different varieties which testify their variability. In fact, the Nabali variety has the highest content on AWF, P/C and water whereas the Morello variety has the highest content on AWC. Moreover, it proved that the fruits and cores of the introduced varieties are larger than those of the local varieties and that the qualitative parameters are most polymorphic between the studied varieties. The mineral composition of the olive-tree fruits is characterized by a sodium content higher than the phosphorus content which is higher than the potassium content: Na > P > K. This study constitutes a first approach of the characterization of the olive-trees diversity in the oasis of Gabes. That is why it would be desirable to characterize these varieties by biochemical methods and by the molecular markers (microsatellites, AFLP, RFLP, and RAPD) to exploit the results in genetic improvement programs.

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