CONTRIBUTIONS TO THE KNOWLEDGE OF THE QUALITY OF SOME OLIVE OIL ASSORTMENTS SOLD ON IAŞI CITY MARKET

CONTRIBUȚII LA CUNOAŞTEREA CALITĂȚII UNOR SORTIMENTE DE ULEI DE MĂSLINE COMERCIALIZAT PE PIAȚA MUNICIPIULUI IAŞI

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Abstract. *Olive oil is a food rarely consumed by Romanian peoples, even it if has a varied range of utilisations, and consumed in moderate quantities is beneficial to human organism. The aim of the current paper to establish the main quality characteristics of some olive oil assortments sold on Iaşi City market and their comparison in according with the values of actual standards. Olive oil samples gathered from two different producers (A and B) were achieved from Iaşi City market. The determined physical-chemical properties were: humidity, density, acidity value, saponification value, iodine value, and peroxide value.*
Key words: extra virgin olive oil, pomace olive oil, assortments, quality

Rezumat. *Uleiul de măsline este un aliment rar consumat de români, chiar dacă prezintă o gamă variată de metode de utilizare, şi consumat în cantități moderate este benefic organismului. Scopul prezentei lucrări este de a evidenția principale caracteristici de calitate ale unor sortimente de ulei de măsline comercializate pe piața municipiului Iaşi şi compararea rezultatelor cu valorile standardelor în vigoare. Probele de ulei de măsline de la doi producători diferiți (A şi B) au fost achiziționate de pe piața municipiului Iaşi. Proprietățile fizico-chimice analizate au fost reprezentate de următoarele determinări: umiditate, densitatea relativă, indicele de aciditate, indicele de saponificare, indicele de iod şi indicele de peroxid.*
Cuvinte cheie: ulei de măsline extra virgin, ulei din turte de măsline, sortimente, caracteristici de calitate

INTRODUCTION

Olive oil is used for culinary purposes as filler for canned fish (tuna) and not least, in the cosmetic industry. A better understanding of the benefits of this product, once referred by Homer "liquid gold", is gradually increasing sales across the globe.

The benefits of using olive oil in human nutrition are justified by its high content in monounsaturated fatty acids, thus helping to reduce the risk of cardiovascular disease (HTA, thrombosis) and regulating insulin levels, by

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improving its sensitivity. Also, the antioxidants in its content perform the neutralization of cellular oxidation (Banu *et al.,* 2007, 2013; Nistor and Hoha, 2017).

UC Davis (University of California, Davis) conducted in 2010 a study on the quality of extra virgin olive oil marketed on the California market, using the I.O.C. standards as a scientific benchmark.

Analyzes performed on the 56 oil samples, belonging to a number of fourteen brands imported into the U.S, they highlighted the non-compliance of a percentage of 73% of them (Frakel *et al.,* 2011).

There are many olive oil standards that have been approved and published by various associations and countries defining grades of olive oils and specifying chemical composition and quality parameters (Amirante *et al.*, 2002; Azizian *et al.,* 2015).

MATERIAL AND METHOD

The aim of this paper was to highlight the features related to the quality of olive oil, a controversial product, but which is the subject of an intensive distribution system, including in Iasi County.

To complete the current study were achieved 20 bottles with olive oil (10 extra virgin olive oil and 10 pomace olive oil) from different batches, 5 for each studied assortment, bought from different stores localised in Iaşi City. Samples provided from two different producers were gathered in original package and transferred to the analysis laboratory.

Sensory evaluation of olive oil samples was conducted by a team of twelve assessors. The criteria used for sensory evaluation were overall appearance and colour, taste, and smell. Respecting the method proposed by Banu et al. (2007) each of the board members received four coded samples, corresponding for each type of olive oil. Sensory appreciation of the samples was performed using the analytical method of assessing the quality by scoring, using a 5-point system scale for olive oil, and the obtained results were interpreted based on the scoring scale for quality evaluation (Banu *et al.*, 2007).

Determination of humidity, iodine value and density by pycnometer method was realised in according with *CODEX STAN 33-1981,* which establish the determination methods for humidity, iodine value and density for olive oil and pomace olive oil.

The method is based on neutralizing the free acidity of a known quantity of oil with an alcoholic solution of KOH (potassium hydroxide) 0.1 N, in the presence of phenolphthalein.

For determination of saponification value, a certain amount of oil is subjected to saponification by boiling with an excess amount of potassium hydroxide (KOH 0.5 N). Subsequently, by acid titration, the amount of KOH left un-reacted is determined.

Determination of iodine index. The oil is treated with iodine (excess), leaving it in contact with it for a certain amount of time, after which the titration is carried out to determine the amount of iodine remaining uncombined. The difference between the amount of iodine introduced into the work and the unmixed one is made and the amount of iodine on which the fat is fixed is determined.

Determination of peroxide value was realised in according with standard *STAS 145-67.* Product is titre in an acetic acid and chloroform environment, with solution of potassium iodide

RESULTS AND DISCUSSIONS

Regarding the extra virgin oil A assortment, in case of appearance, it was clear, free of impurities. The color, presented the characteristics of an oil rich in chlorophyll, being dark green. The smell was the most appreciated characteristic of this oil. The olfactory sensation created was described as fruity or rich, without the presence of foreign odors. The taste has been characterized as slightly pasty. Establishing a global score of 17.083 points ranks the extra virgin olive oil A in first quality class (fig. 1 and 2).

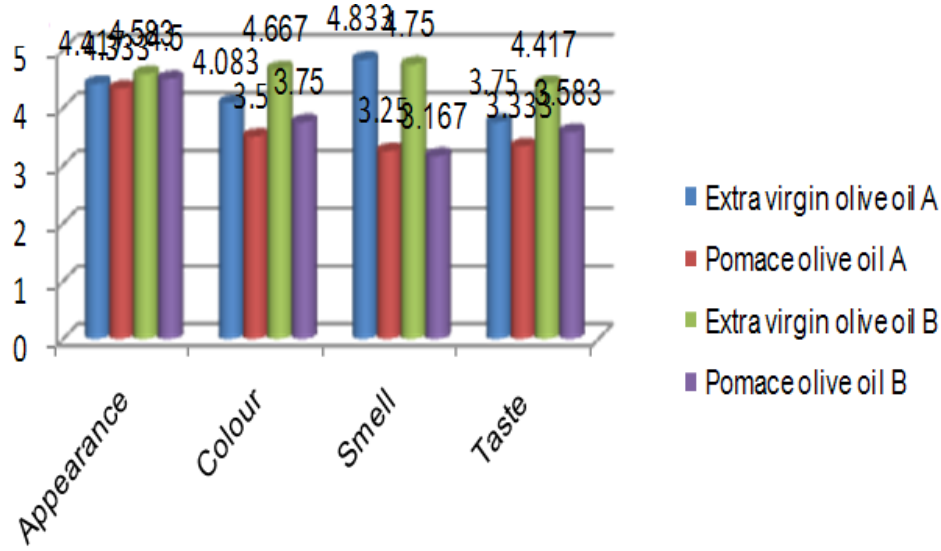

Fig. 1 Graphical representation of the average scores obtained by the analyzed olive oils

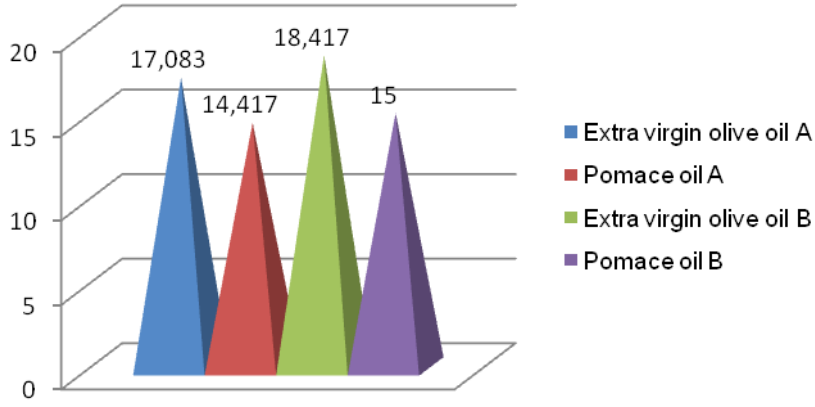

Fig. 2 Graphical representation of the total average scores obtained by the analyzed olive oils

Concerning the extra virgin oil B assortment, the appearance met the requirements of a conforming product, the oil being clear, without impurities. The color, presented the characteristics of an oil rich in chlorophyll, green to dark green. The smell was characterized as very fruity. Taste has been characterized as slightly bitter, pronounced by fruit, characteristic and free of foreign tastes. The results obtained when establishing the global score (18.417 points) receive the mark "***Very good***" and was classified in the "superior" quality class.

Regarding the assortment of pomace olive oil A, the appearance was according to the specific requirements, free of impurities and clear. The color was characterized by the participants as having a very low opalescence. The smell was characterized as being noticeable, almost non-existent, with no foreign odor. Taste, has been identified as oil, without creating taste sensations foreign to the specific one. The results obtained when establishing the global score (14.417 points) receive the mark "***Satisfactory***" and its classification in the second class of quality.

Regarding the assortment of pomace olive oil B, the appearance, met the requirements, being a conforming product, clear and free of impurities, the yellow-green hue, was characterized as having medium opalescence, characteristic of the refined oil. The smell was characterized as lacking intensity, no foreign smell. Taste was characterized by the participants as perceptible environment. The results obtained when establishing the global (15.00 points) receive the mark "***Satisfactory***" and its classification in the second class of quality.

Analyzes carried out on extra virgin olive oil reported a difference of humidity of 0.105% between brand A and B. The results are presented in table 1. In the case of pomace olive oil assortments taken in study a difference of humidity of 0.018% was reported, this not being significant. Both brands have resulted in being in compliance with specific quality standards.

Table 1

The results of moisture content present in the olive oils

Product	Average	Standard value
Extra virgin olive oil A	**0.208%**	<0.2%
Extra virgin olive oil B	**0.103%**	
Pomace olive oil A	**0.074%**	<0.15%
Pomace olive oil B	**0.092%**	

From the analyzes carried out, there was an overcome of the standard value proposed by the European Union legislation in the case of extra virgin olive oil A. This fact can be correlated with the humidity value obtained in the previous analysis. In the case of brand B, the value of the relative density was within the range required by the European Union legislation.

In the case of pomace olive oil, the resulting values revealed negligible differences in the case of oil A, while in the case of oil B we determined a value that falls within the limits imposed by EU regulations (tab. 2).

Table 2

The results of relative density of olive oils

Product	Average	Standard value
Extra virgin olive oil A	**0.9205 g/cm^3**	0.910-0.916 g/cm^3
Extra virgin olive oil B	**0.9145 g/cm^3**	
Pomace olive oil A	**0.909 g/cm^3**	
Pomace olive oil B	**0.912 g/cm^3**	

The acidity of the olive oil is the most important characteristic of its quality, its values being used in establishing the quality classes under which the product is marketed.

The results of analyzes carried out (tab. 3) showed possible non-conformities of the extra virgin olive oil of the brand A, the value resulting being twice higher than the limit presented in the standard.

Table 3

Acidity value of olive oils

Product	Average	Standard value
Extra virgin olive oil A	**1.7% oleic acid**	<0.8% oleic acid
Extra virgin olive oil B	**0.57% oleic acid**	
Pomace olive oil A	**1.17% oleic acid**	<1.00% oleic acid
Pomace olive oil B	**0.63% oleic acid**	

The differences recorded cannot be neglected, indicating an acidity of extra virgin olive oil A, with 1.13% higher than its competitor, B and 0.9% higher than that described in the literature and European Union legislation. The high values of the acidity of the oil, in general, reflect its stability and susceptibility to rancidity.

Regarding the pomace olive oil, the obtained values showed a similarity with those of extra virgin olive oil.

The saponification index provides information on the nature of the fatty acids that enter the composition of the oil, its value being inversely proportional to the length of the constituent fatty acid chain (Frega *et al.,* 1993).

Analyzes carried out revealed negative aspects of all the samples taken. Thus, none of the assortments evaluated were within the specific standards. By comparing the two manufacturing brands, the samples from A assortment have an average value relatively close to the requirements of EU legislation, while the samples from B assortment recorded a difference of 64.75 from its competitor and 86.25 from the minimum value allowed by standard (tab. 4).

Table 4

Saponification value

Product	Average	Standard value
Extra virgin olive oil A	**162.5 mg KOH/1 g**	184-196 mg KOH/1 g
Extra virgin olive oil B	**97.75 mg KOH/1 g**	
Pomace olive oil A	**162.8 mg KOH/1 g**	182-193 mg KOH/1 g
Pomace olive oil B	**96.12 mg KOH/1 g**	

Similar to the values resulting from the analysis performed on extra virgin olive oil, samples from pomace olive A recorded values close to the reference standard. The major differences appear in the case of pomace olive oil B, where the value of the saponification index is 85.88 lower than the minimum expressed by EU legislation. Such values often indicate the presence of non-conformities during storage or an extension of its duration.

The iodine index is an analytical constant of great importance, which is used for the characterization of natural lipids. Analyzes carried out generally revealed small values of the iodine index. The exception is extra virgin olive oil A, with values of the iodine index close to those specified by the standards. The low values of the samples taken can indicate an adulteration with other oils of vegetable origin (tab. 5).

Table 5

Iodine values of olive oil samples

Product	Average	Standard value
Extra virgin olive oil A	**96.55 meq/100**	75-95 meq/100
Extra virgin olive oil B	**50.39 meq/100**	
Pomace olive oil A	**70.73 meq/100**	
Pomace olive oil B	**51.65 meq/100**	

Comparing the extra virgin olive oils analyzed, there was a difference of 46.16 meq/100 g between assortments and in the case of the pomace olive oils, a difference of 19.08 meq/100 g between the two assortments was obtained.

The peroxide index provides essential information on the age and stability of olive oil. Analyzes revealed nonconformities for three assortments of the four analyzed, the extra virgin olive oil A falling within the specific standards. The peroxide index provides information regarding the degree of oxidation of the fats in the composition of the analyzed product. Considering this fact, it is deduced that most of the samples showed signs of oxidation, the differences between the obtained values and the standardized ones exceeding 2 meq/100 g of product.

Comparing the results obtained after carrying out analyzes for extra virgin olive oil, there is a difference of 3.66 meq/100 g between the assortments, presented in table 6.

Table 6

Peroxide value of analyzed olive oils

Product	Average	Standard value
Extra virgin olive oil A	**1.03 meq/100 g**	≤2 meq/100 g
Extra virgin olive oil B	**4.69 meq/100 g**	
Pomace olive oil A	**4.38 meq/100 g**	≤1.5 meq/100 g
Pomace olive oil B	**3.67 meq/100 g**	

In the case of pomace olive oil, the problem of the refining process arises, which is responsible for eliminating the oxidation products. This makes the analysis of their peroxidic index irrelevant. However, the percentage of virgin olive oil added for the purpose of obtaining marketable pomace olive oil must be taken into account. In this regard, the legislation of the European Union, together with the standards of the International Olive Council and the Codex Alimentarius, establish a limit of 1.5 meq/100 g of product.

As a result of this analysis, it was found, that there are some depreciations of the oil samples taken, the results indicating the oxidation of the constituent fatty acids.

CONCLUSIONS

1. The analysis carried out for the purpose of determining the acidity index revealed the possibility of problems encountered by the brand A regarding the storage mode, these values exceeding the limit allowed by the legislation and the specific standards.

2. The analysis performed for the purpose of determining the peroxide index presented values that exceed the maximum limits allowed by standards and specific laws for three of the four analyzed assortments. Thus, the oil sold by brand B showed signs of oxidation in both analyzed assortments.

3. The values of iodine index again bring up the possibility that the oil sold by brand B may show signs of oxidation. The results revealed a small number of fatty acids with double bonds, which could not add the excess iodine. The causes are multiple, but all indicate an inconsistent storage of the product.

4. Olive oil cannot be marketed under Romanian producers. The impossibility of renouncing the import is due to the climatic and pedological conditions in our country. This fact has influence on the finished product that goes through a long enough distribution chain. Also, the low consumption in our country makes the finished product, once it has reached the shelf, to last for a long period until the total consumption. All these factors influence the physical-chemical and sensory quality of the olive oil.

5. It is mentioned that the whole set of physical-chemical analyzes was performed three weeks after the opening of the product bottles. Between the two sets of analyzes, the olive oil was kept in the dark, without contact with the air. The results obtained from the analyzes carried out thus offer two possibilities: the oxidation reactions started before the opening of the bottles, which shows an incorrect handling of the packages, or the oxidation reactions had a very fast development, this last aspect bringing a question mark on the product authenticity.

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***** STAS 145-67 -** Oil and vegetable fats.

***** CODEX STAN 33-1981 -** *Standard for olive oils and pomace olive oils.*