

## RESEARCH ARTICLE

**(Open Access)****Characterization of Extra Virgin Olive Oil from Kalinjot**ELONA HYSI<sup>1</sup>, RENATA KONGOLI<sup>1</sup>

Agricultural University of Tirana, Faculty of Biotechnology and Food, Tirana, Albania

**Abstract**

Our research consists in characterization of organic extra virgin olive oil of “Musai” company. The evaluation of the components of olive oil: fatty acid, phenols, pigments, fragrance and minor components contribute in the composition of the profile of olive oil.

Fatty acid composition was measured by gas chromatography determined as acid methyl esters (FAMES). FAMES were prepared by vigorous shaking of a solution of each olive oil sample in hexane (0.2 g in 3 ml) with 0.4 ml of 2 N methanol potassium hydroxide solution, then 2 µl were injected into the GC (HP5890N, Hewlett Packard, USA) with a FID detector. The monounsaturated fatty acid Oleic acid (C18:1) was representing high concentrations (74.4%-77.5%). Palmitoleic acid (C16:1) the major saturated in olive oil (11.5%-12.1%). The total phenols are very important for the quality of extra virgin olive oils; these parameters are related to oxidative stability and bitterness index, both implicated in olive oil taste. The determination of these natural antioxidants is carried out using a spectrophotometric method of Gouttfinger. The results were expressed as mg of caffeic acid per kg of oil (mg caffeic acid kg<sup>-1</sup>). Sensorial evaluation showed higher level of natural antioxidant.

**Keywords:** Kalinjot, organic extra olive oil, fatty acids, phenol compounds, pigments.

**1. Introduction**

The olive oil is part of the Albanian gastronomy. In the last century, many olive oils companies are being developed. “Musai” is one of the few in Albania, certified both: organic and extra virgin olive oil, 100% cold-pressed to preserve the highest levels of flavor, nutrients and anti-oxidants [7]. Kalinjot is the cultivar, autochthon of Vlora region, taking up the most olive-growing area in all olive trees orchards (around 45 percent)[10]. Olive oil production is of great importance in health benefited. This is mainly due to its fatty acid composition, characterized by a high monounsaturated-to polyunsaturated fatty acid ratio, and to the presence of minor compound. [8] Some of these compounds have a powerful anti-oxidant activity as well as biological and nutritional functions, and endow added value to extra virgin olive oil in terms of vitamin E content and anticancer properties [1] [8]. The phenol compounds content is an important parameter in the evaluation of virgin olive oils quality because they contribute to oil flavor and protect them from oxidation through their radicals scavenging metal chelating properties. [3] In addition to olive cultivar, the importance of harvest year has been demonstrated by relating the content of phenol

compounds and the quality of olive oils [9]. The natural phenol antioxidants are supposed to have chemo protective properties in human beings [3] and also to contribute to the sensorial properties of virgin olive oil bitterness and pungency of olive oil taste [3][7]. The nutrient content of 100 grams of olive oil: Saturated Fat: 13.8%. Monounsaturated Fat: 73% (most of it the 18 carbon long oleic acid). Omega-6: 9.7% (less than 10% linoleic acid). Omega-3: 0.76% (less than 1% linolenic acid). Vitamin E: 72% of the RDA. Vitamin K: 75% of the RDA. [11]

This study aim the characterization of extra virgin olive oil Kalinjot of “Musai” company.

**2. Materials and methods****2.1. Fruit sample**

Fresh olives (variety Kalinjot) were carried out during the 2014 crop season in olive groves of Vlora region. The olives are extracted in continued lines. The washed fruits were crushed by the hammer mill mixed and homogenized. The paste was pressed and extracted in cold-pressed. At the end was centrifuged in 5000 rpm for 20 minutes. The oil was stored in 4°C.

\*Corresponding author: Elona Hysi; E-mail: hysielona@gmail.com  
(Accepted for publication June 05, 2015 )

### 1.1 Fatty acids analysis

The fatty acid composition of olive oils was determined as acid methyl esters (FAMES). FAMES were prepared by vigorous shaking of a solution of each olive oil sample in hexane (0.2 g in 3 ml) with 0.4 ml of 2 N methanol potassium hydroxide solution, then 2 µl were injected into the GC (HP5890N, Hewlett Packard, USA) with a FID detector. The carrier gas was helium at a flow through the column (50 m length×0.25 µm i.d.×0.25 mm film thickness, HP 5) of 1 ml/min, according to the method of European Regulation Commission 2568/91 [4]. The temperature of the injector and detector were set at 250°C and the oven temperature at 210°C. The results were expressed as relative area percent of the total FAMES. Iodine (IV) were calculated from the percentage of fatty acids (Maesteri D.M., Labuckas, 1998) using the formula:  $IV = (\text{palmitoleic \%} \times 1.001) + (\text{oleic \%} \times 0.899) + (\text{linoleic \%} \times 1.814) + (\text{linoleic \%} \times 2.737)$ .

### 2.3 Total phenols

Total phenols were quantified in the polar fraction from 10 g of oil extracted three times using methanol/water (60:40 v/v), and the determination was based on the *Folin - Ciocalteu method*. [5] The extracts were measured at the absorption 725 nm and the values are given as mg of caffeic acid per kilogram of oil.

### 2.4 Pigment content

Chlorophyll were determined according to the calorimetry operating as described by *Minguez-Mosquera* [5]. The maximum absorption at 670 nm is related to the chlorophyll fraction. The values of the coefficients of specific extinction applied were  $E_0 = 613$  for pheophytin as a major component in the chlorophyll fraction. Thus the pigments content was calculated as follows:  $\text{Chlorophyll (mg/kg)} = (A_{670} \times 106) / (613 \times 100 \times d)$ .

### 2.2. Chemical analysis

Chemical analysis included the measurement of several parameters. **Fatty acids, peroxide value, and UV Spectrophotometric indices (K232, K270)** The quality indices of fatty acids, peroxide value, specific extinction coefficient of K232 and K270 and K were calculated by absorption at 232 and 270 nm, respectively, by a UV spectrophotometer (Techcomp-

7500 UV-Visible spectrophotometer) according to the European Commission Regulation EEC/2565/91[5].

## 3. Results and Discussions

Kalinjot is the variety of “Musai” Company, a traditional variety in Vlora region, one of the most outstanding cultivar for the production of olive oil, with good resistance percentages of oil. The oil is of excellent quality, with good organoleptic characteristics.

### 3.1. Fatty acid

Table I shows the 15 fatty acids that were detected in the organic extra virgin olive oils of Kalinjot. The monounsaturated fatty acids have great importance because of their nutritional implication and effect on oxidative stability of oils [1] [3]. Oleic acid, the major monounsaturated fatty acid, is present in higher concentrations (74.4%-77.5%). Palmitic acid, the major saturated fatty acid in olive oil, showed a value (11.5%-12.1%). The linoleic acid contents (8.9% - 9.4%) are probably related to the cultivar and/or environmental interactions during the development and the maturity of the fruit.

The delay in harvesting tends to increase the content of unsaturated fatty acids, especially linoleic, at the expense of palmitic acid. For the other fatty acids (palmitoleic (C16:1); stearic (C18:0); linolenic (C18:3) and arachidic (C20:0), although their small amounts varied between oil samples. [8].

### 3.2. Phenolic compound and chlorophyll

The data shows that “Kalinjot” has higher level in phenolic compounds and the values of chlorophyll is (8.79 mg/kg). Both of them are natural antioxidants in olive oil. The phenol compounds are known to have a significant effect on the stability and sensory characteristics of olive oil [3].

### 3.3. Free fatty acids, Peroxides values and UV indexes

The indicators of quality estimate the oxidation of oil: measurement of free fatty acids, the indication of primary oxidation and the oxidation that is connected to certain strange oxidized compounds, which are present in oil. All analysis have very low values according IOOC. (Table 2).

**Table 1.** Fatty acids composition of organic extra virgin olive oils from Kalinjot of 2014 harvest

Fatty acid composition (% mm of methyl esters)		Kalinjot variety	IOOC
Myristic acid	(C 14:0)	0.01±0.01	Max 0.05
Palmitic acid	(C 16:0)	11.5±0.6	7.5-20.0
Palmitoleic acid	(C 16:1)	0.5±0.1	0.3-3.5
Heptadecanoic acid	(C 17:0)	0.1±0.01	Max 0.3
Heptadecenoic acid	(C 17:1)	0.2±0.1	Max 0.3
Stearic acid	( C 18:0)	2.5±0.2	0.5-5.0
Oleic acid	(C 18:1)	74.4±3.1	55.0-83.0
Linoleic acid	(C 18:2)	8.9±0.5	3.5-21.0
Linolenic acid	(C 18:3)	0.5±0.1	Max 0.9
Arachidic acid	(C 20:0)	0.8±0.1	Max 0.6
Gadoleic acid	(C 20:1)	0.4±0.1	Max 0.4
Behenic acid	(C 22:0)	0.1±0.1	Max 0.2
Lignoceric	(C 24:0)	0.1±0.1	Max 0.2
Saturated fatty acids		14±1.2	
Monounsaturated fatty acids		74.2±2.6	
Polyunsaturated fatty acids		8.9±2.1	

Reg CEE 796/2002 06/05/2002 GU CEE L128 15/05/2002 All XB + Reg CEE 2568/1991 11/07/1991 GU CEE L248 05/09/1991 ALL XA. Reg CEE 1429/1992 26/05/1992 GU CEE ;L150 02/06/1992 Reg CE 702/2007 21/07/2007 GU CE L 161 22/06/200 Mean ± SD (n=3):

**Table 2.** Quality indexes of organic extra virgin olive oil “Kalinjot” extracted during 2014

Quality indices of organic extra virgin olive oils	Variety “Kalinjot”	EVO EEC, 2003
Free acidity (% oleic acid)	0.17±0.01	0.8
Peroxide value (mev.O2/kg oil)	10.7±0.6	20
K 232	1.94±0.02	2.5
K 270	0.138±0.002	0.22
K	0.002	0.1
Sensory evaluation	6.0	

Reg CEE 2568/1991 11/07/1991 GU CEE L248 05/09/1991 All II Reg CE 702/2007 21/06/2007 GU CE L161 22/06/2007 Reg CEE 2568/1991; 11/07/1991 GU CEE L248 05/09/1991 All III Mean ± SD (n=3):

**Table 3 .** Data about Chlorophyll and Phenols content

“Kalinjot”	Chlorophyll (mg/kg)	Totals phenols (mg/l caffeic acid)
	8.9	280

Minguez-Mosquera et al. (1991) and Folin - Ciocalteu method (Gutfinger, 1981)

### 3.4 Sensory evaluation

The panel test is composed by 7 persons in Biotechnology Faculty (Panel must find medium of defect = 0 and medium of attribute > 0). In Figure 1 the positive and negative attributes were shown. We

didn't identify any defect. Other attributes were observed in olive oils, white fruits was detected in lower value.

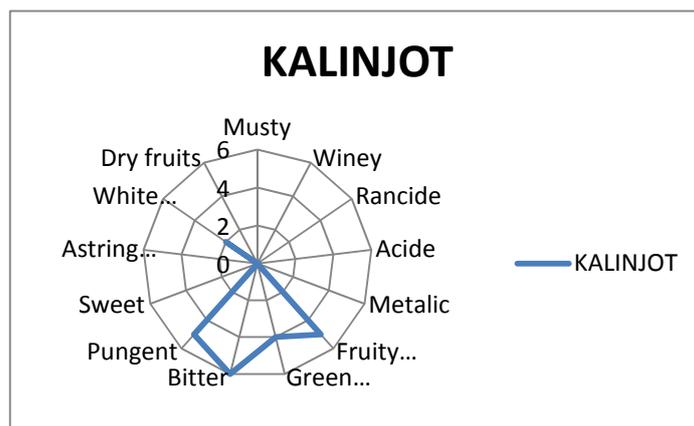


Figure 1. The positive and negative attributes of organic extra virgin olive oil Kalinjoti Musai

#### 4. Conclusions

We can conclude that: (1) The data of the indicators of quality in accordance with IOOC classified the oil like an extra virgin olive oil. (2) The fatty acid composition showed the authenticity of the oil, highest levels of monounsaturated acids and lower value of saturated and polyunsaturated fatty acids. (3) Rich in polyphenols, in natural antioxidants. These high levels are according to the growing location and olive cultivar. (4) The bitterness and pungency of olive oil taste demonstrate an oil rich in polyphenols.

Quantity and quality of substances existing in olive oil such as fatty acids, phenols, chlorophyll and carotenoids are affected by various factors: olive cultivar, the region, the climatic conditions, ripening stage and the extraction methods.

#### 5. Acknowledgement

This work was supported from “Musai” olive oil factory.

#### 6. References

1. Aguilera M.P, Beltran G, Ortega D, Fernandez A, Jimenez A, Uceda M : **Characterisation of virgin olive oil of Italian olive cultivars: ‘Frantoio’ and ‘Leccino’, grown in Andalusia**, Elsevier, *Food Chemistry* 2005, 89: 387–391
2. Angerosa F, D'Alessandro N, Konstantinou P, Di Giacinto L: **GC-MS Evaluation of Phenolic Compounds in Virgin Olive Oil**, *Journal of Agricultural and Chemistry* 1995, 43: 1802-1807
3. Boskou D: **Olive Oil: Chemistry and Technology**; 1996: 1-134
4. Codex standards for olive oil: **Virgin and refined and for refined olive – Pomace oil**; Codex standard
5. 33-1981 (rev. 1-1989) Codex Alimentarius;
6. Commission Regulation (EC): **The characteristics of olive oil and olive-residue-oil and relevant methods of analysis**: Commission Regulation (EC) 1248: 1-83; 1991
7. Del Carlo M, Ritelli E, Procida G, Murmura F, Cichelli A : **Characterization of extra virgin olive oils obtained from different cultivars**, *Pomologia Croatica* 2006, 12(1): 29-41
8. Kongoli R: **Influence of Albanian Olive Varieties on the Quality of Organic Extra Virgin Olive Oil**: International congress of food technologists, biotechnologists and nutritionists: 284-289; 2011
9. Meftah H, Latrache H, Hamadi F, Gharby S, Eloualli M: **Lipid Components Of Olive Oil From Tadla Azilal Area Of Morocco: Characterization and authenticity**, *Chemical and Process Engineering Research* 2013, 15: 11-17
10. Ranalli A, De Mattia G, Patumi M, Proietti P: **Quality of virgin olive oil as influenced by origin area**, *Grasas y Aceites* 1999, 50(4): 249-259
11. Thomaj, F; **Shtimi dhe mirëmbajtja e ullishtave**: 2009, ISBN 978-99956
12. <http://authoritynutrition.com/extra-virgin-olive-oil/>