RESEARCH ARTICLE **(Open Access)**

Characterisation of virgin olive oils of cultivar from Adriatic and Ionian Coast grown in The Germoplasm Bank Collection

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Abstract

This work presents the olive oil characterization of eleven olive varieties from Adriatic and Ionian coast, grown on the Olive Germplasm Bank of Cordoba. The cultivar selected were: 'Frantoio, 'Pendolino' and 'Razzola (Italy), 'Amigalolia Nana' and 'Kerkiras' (Greece), 'Kalinjot', 'Kotruvsi', Mixani' and 'Ulliri I Kuq (Albania) and 'Lastovka' and 'Levantinka' (Croatia).

The extraction of olive oil was performed using "Abencor" system. In the olive oil have been determined: fatty acid composition, minor compounds (total poliphenols, orthodiphenols, tocopherols and pigments), oxidative stability and sterol composition.

The olive oils showed an oleic acid content included in the range from 62 % to 73 %. 'Levantinka' oils present the highest values in oleic acid while 'Kerkiras' oils variety showed highest value on palmitic acid content.

Most of the varieties have shown high polyphenols content around of (480-745 ppm). 'Pendolino', 'Amigdalolia Nana', 'Mixani' and 'Lastovka, cultivars have shown lower values in the range of 357- 230 ppm. Olive oils from 'Kerkiras' and 'Kalinjot' cultivars showed the highest values of tocopherols content (449 mg/kg – 594 mg/kg).

The oxidative stability of oil depends on phenols compounds and oleic acid content. The cultivars that have shown the highest value in this compounds have shown high stability. 'Levantinka', 'Ulliri I Kuq' and 'Frantoio' oils showed the higher oxidative stability.

The levels of the sterol obtained from different olive oils lie within the established Regulation limits (CEE Regulation 2568, 1991). 'Frantoio', 'Kerkiras, and 'Kotruvsi' olive oils have shown the highest level of total sterol fraction than the rest of the variety in this study.

Keywords: Olive oil; composition; olive cultivars; Adriatic and Ionian coast.

1. Introduction

Olive growing and olive oil production are activities closely linked with the history and culture of the Mediterranean countries. The heritage left by the Phoenician civilization, which has populated the Mediterranean area, makes the olive oil the characteristic of the Mediterranean diet, linked to cultural and gastronomic traditions of each country and even within each region. Adriatic and Ionian coast have a long tradition of olive growing and olive oil production.

Virgin olive oil is unique among other vegetable oils due to its high levels of monounsaturated fatty acid and the presence of minor components, such as phenolic compounds among others. The content of phenolic compounds is an important factor to be considered when evaluating the quality of virgin olive oil (Servili and Montedoro, 2002), since these compounds have potent antioxidant activity (Tura et al., 2007) and contribute significantly to the stability on virgin olive oils against oxidation (Tura et al., 2007). Although polyphenols are also responsible for the olive oil tastes (Gutierrez et al., 1989). These compounds have shown chemoprotective properties such as anticancer, antioxidant and anti-inflammatory in human health (Bendini et al., 2007, Cicerale, Conlan, Sinclair and Keast, 2009).

"The phenolic fraction of virgin olive oil is heterogeneous, with at least 36 structurally distinct phenolic compounds identified. Variation in the phenolic concentration exists between differing virgin olive oils due to numerous factors including: variety of the olive fruit (Romero et al., 2002; Gomez-Rico et al., 2007) region in which the olive fruit

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(Accepted for publication 03.09.2021)
***ISSN**: 2218-2020,* *© Agricultural University of Tirana*

is grown (Vinha et al., 2005), maturity of the olive fruit at harvest (Aparicio et al., 2006), and olive oil extraction, processing, storage methods and time since harvest (Aparicio et al., 2006.)

The tocopherols in virgin olive oil are important for their nutritional value and for their antioxidant properties, in that, they protect the fat components from autoxidation. They constitute the lipophilic antioxidant group and are noted for their effective inhibition of lipid oxidation in all vegetable oils. α-Tocopherol, the most important antioxidant, accounts for about 95% of the total tocopherols in virgin olive oil (Aguilera et al., 2005, Beltrán et al., 2010).

The list of minor essential compounds present in these oils includes phytosterols which are the main constituents of the nonsaponificable fraction of lipids in olive oil. They can be present as free or esterified structures with sugar or fatty acid, etc (Breinhölder et al., 2002). In the last years, several studies demonstrated that phytosterols exhibit anti-inflammatory, anti-pyretic, antibacterial, antifungal, antineoplastic activities (Perez-Jiménez et al., 2007, Jones et al., 1997).

The present work has studied the oil composition of eleven olive varieties selected from the Adriatic and Ionian coast, cultivated on the germplasm bank IFAPA Centre "Alameda de Obispo" of Cordoba. The countries selected in this work are: Italy ('Frantoio' 'Pendolino' and 'Razzola'), Greece ('Amigdalolia Nana' and 'Kerkiras', Albania ('Kalinjot', 'Mixani' 'Kotruvsi' and 'Ulliri I Kuq') and Croatia ('Levantinka, and 'Lastovka').

2. Material and Methods

The study was carried out on 11 olive varieties from Germplasm Bank IFAPA Centre "Alameda de Obispo" of Cordoba (Table 1). From each cultivar were selected two trees with a crop load index is 3 or 4. The olive tree was spaced 7 x 7 m and grown using the traditional practices.

Table1. Country of 11 olive cultivars.

Cultivar	Origin
'Amigdalolia Nana'	Greece
'Frantoio'	Italy
'Kalinjot'	Albania
'Kerkiras'	Greece
'Kotruvsi'	Albania
'Lastovka'	Croatia
'Levantinka'	Croatia
'Mixani'	Albania
'Pendolino'	Italy
'Razzola'	Italy
'Ulliri i Kuq'	Albania

2.1. Olive sample.

For each cultivar, two samples (3 kg) per trees was harvested when the most abundant ripening stage in the tree was 3, according to fruit classification based on skin and fresh colour described in the ripening index method Uceda et al., 1975

2.2. Oil extraction

Oil extraction was performed using an Abencor laboratory oil mill (Abengoa, Seville), kneading the olive paste at 28 ºC for 30 min. The oil was filtered and stored at -24 ºC prior to analysis

2.3. Oil analysis

Fatty acid methyl ester (FAME's) composition was determined according the EU Regulation 2568/91 (European Union Commission, 1991). The chromatographic separation was performed in a Perkin–Elmer Autosystem gas chromatograph with a split/splittless injector and a FID detector, equipped with a BPX 70 capillary column of 50 m of length, 0.22 mm and 0.25 μm film thicknesses (SGE, Australia). The oven temperature was held at 198 ºC and helium was used as carrier gas. The results were expressed as peak area (relative) percent.
Polyphenols content was analysed as described by Vázquez et al., (1973) using the Folin–Ciocalteau reagent and absorbance measurement at 726 nm, the results were expressed as mg/kg of caffeic acid.
Tocopherol composition was analysed by HPLC, applying the IUPAC method 2432 (1992). Detection and quantification were carried out in a Perkin–Elmer HPLC equipped with a isocratic pump Lc 200 and a UV–Vis detector, Lc295, set at 295 nm, the tocopherol concentration was expressed as milligram's per kilogram of oil.
Bitterness index (K225) was determined by solid phase extraction and absorbance measurement at 225 nm (Gutierrez al., 1992).
Oxidative stability was measured as the induction time in the Rancimat equipment (Metrohm, Basel, Switzerland) at 98 ºC and air flow of 10–12 L/h (Gutierrez, 1989), the measurements were determined in duplicate for each sample and the results given as induction time (h).
The qualitative and quantitative sterol contents were determined according to the European Official Method Analysis described in Annexes V and VI of Regulation EEC/2568/91 of the European Union Commission. The oil sample was saponified with ethanolic potassium hydroxide solution. The unsaponifiable fraction was removed with ethyl ether. The unsaponifiable sterol fraction was separated by Silicagel plate chromatography. Separation and quantification of the silanised sterol fraction was carried out by capillary column gas chromatography, on a Hewlett Packard 6890 chromatograph equipped with a 30 m TRB-5 column of 0.32 mm internal diameter and 0.25 μm film thicknesses. The working conditions were: injector temperature 280 ºC, isothermal column temperature 265 ºC, and detector temperature 290 ºC. The injected quantity was 0.5 μL at a flow rate 1.1 mL/min, using helium as carrier gas. Sterols peak identification was carried out according to the reference method. Quantification was achieved by addition of an internal standard (o-cholestanol).

3. Results and Discussion

Table 1 shows the fatty acid profile of olive oils from all the cultivars. The monounsaturated fatty acids have great importance because of their nutritional implication and affect on oxidative stability of oils. Oleic acid (C18:1) is the main monounsaturated fatty acid. The mean of oleic acid is about 69.4 %, with an exception for 'Levantinka' variety that had present the high level of oleic acid than the rest of the variety in this study, this results are similar with those described from Zanetic et al., 2007, (74.11 %). The level of palmitic acid (C16:0), the main saturated fatty acid in olive oil, was 14.1 %, it ranged between 9, 6% ('Kalinjot') and 18.35% ('Kerkiras'). The results of palmitic acid from 'Kalinjot' oils are different than ones described for Tedeschini et al., 2001.

Table 1. Fatty acid composition of virgin olive from 11 cultivar of the Germplasm bank IFAPA Centre "Alameda de Obispo" of Cordoba.

Cultivar	C16:0[a]	C16:1	C17:0	C17:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1	C22:0	MUFA/PUFA
Kalinjot	9.6 ± 0.2[b]	0.4 ± 0.1	0.04 ± 0.0	2.5 ± 0.06	0.06 ± 0.0	71.8 ± 1.0	13.6 ± 0.4	0.9 ± 0.1	0.44 ± 0.04	0.37 ± 0.04	0.11 ± 0.01	5.0
Mixani	14.3 ± 0.1	0.7 ± 0.0	0.14 ± 0.0	2.8 ± 0.08	0.2 ± 0.0	66.7 ± 0.4	13.5 ± 0.4	0.6 ± 0.0	0.52 ± 0.01	0.32 ± 0.01	0.16 ± 0.0	4.8
Ulliri I Kuq	16.3 ± 0.2	1.3 ± 0.1	0.5 ± 0.01	2.5 ± 0.0	0.2 ± 0.02	66.1 ± 0.6	12.0 ± 0.4	0.6 ± 0.03	0.5 ± 0.01	0.24 ± 0.01	0.12 ± 0.0	5.4
Kotruvsi	13.9 ± 0.3	1 ± 0.04	0.03 ± 0.0	2.1 ± 0.06	0.05 ± 0.01	69.7 ± 0.8	11.6 ± 0.4	0.6 ± 0.03	0.5 ± 0.01	0.35 ± 0.01	0.16 ± 0.01	5.8
Amigdalolia Nana	13.8 ± 0.1	1.2 ± 0.0	0.2 ± 0.03	3.2 ± 0.4	0.3 ± 0.03	69.8 ± 0.5	9.8 ± 0.8	0.6 ± 0.03	0.6 ± 0.02	0.22 ± 0.0	0.15 ± 0.01	6.8
Kerkiras	18.4 ± 0.3	3 ± 0.07	0.02 ± 0.0	1.7 ± 0.03	0.06 ± 0.0	69.7 ± 0.8	13.1 ± 0.4	0.9 ± 0.07	0.42 ± 0.03	0.23 ± 0.01	0.13 ± 0.01	5.2
Lastovka	13.8 ± 0.1	0.6 ± 0.0	0.1 ± 0.01	2.4 ± 0.1	0.2 ± 0.01	65.5 ± 0.1	15.4 ± 0.2	0.6 ± 0.04	0.6 ± 0.01	0.3 ± 0.01	0.15 ± 0.0	4.2
Levantinka	13.5 ±1.3	1.0 ± 0.4	0.04 ± 0.0	2.6 ± 0.3	0.06 ± 0.01	73.0 ± 3.4	8.3 ± 1.4	0.7 ± 0.06	0.52 ± 0.01	0.31 ± 0.01	0.15 ± 0.01	8.3
Frantoio	14.1 ± 0.3	1.3 ± 0.1	0.03 ± 0.0	2.2 ± 0.04	0.08 ± 0.0	71.1 ± 0.9	9.7 ± 0.6	0.6 ± 0.02	0.4 ± 0.01	0.27 ± 0.0	0.11 ± 0.01	7.1
Pendolino	15.3 ± 0.1	1 ± 0.02	0.02 ± 0.0	1.3 ± 0.0	0.06 ± 0.0	69.3 ± 0.6	11.2 ± 0.5	1.0 ± 0.0	0.3 ± 0.01	0.32 ± 0.01	0.09 ± 0.0	5.8
Razzola	12.2 ± 2.9	1.0 ± 0.4	0.04 ± 0.0	2.5 ± 0.7	0.07 ± 0.01	71.0 ± 0.02	11.9 ± 2.4	0.6 ± 0.05	0.43 ± 0.05	0.33 ± 0.08	0.1 ± 0.01	5.8

a- Fatty acid of olive oil, b- Mean ±SD

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(Accepted for publication 03.09.2021)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

With respected to the content of linoleic acid (C18:2), that is more susceptible to oxidation than monounsaturated fatty acid, the highest percentage was observed in 'Lastovka' oils (15.37%), value higher than those described for Zanetic et al., 2007.

The olive oils studied correspond to two different olive cultivars categories: medium- high palmitic and linoleic acid content and medium of oleic acid, and cultivars with high palmitic acid content and high – higher of linoleic acid.

Regarding with the rest of fatty acids, the tested olive oils no showed significant differences between their composition, presenting values of the fatty acid very closed to the EEC established limits (EEC, 2003).

The ratio of MUFA and PUFA is around 5.8 % for all the olive oils analysed, being Levantinka the variety that presented the higher value than the rest.

The natural antioxidants of olive oils of cultivars study are shown in the Table 3. Polyphenols compound are natural antioxidants present in olive oil, they are responsible to flavour and stability of olive oil. In this study, all varieties showed high polyphenol. Attention should be paid on 'Ulliri I Kuq' oils phenol content 745 ppm since it showed the highest phenolic concentration. Other cultivars as 'Frantoio', 'Levantinka', 'Kerkiras' and 'Razzola, showed very high phenol content as established by Uceda et al., (2005). 'Kalinjot' and 'Kotruvsi' had high phenol content whereas the rest of cultivars present medium phenol concentration.

The level of total phenols from Frantoio variety are higher than those described for Uceda, 2004 y Uceda et al., 2005 and similar from those described from Ranalli et al 1997.

The tocopherols are components with great interest because of its high antioxidant activity. In olive oils there are present three different tocopherols, α, β and γ-Tocopherol. In the present work the 'Kerkiras' and 'Kalinjot' cultivars are those that showed the higher average values of this compound, the other cultivar presents an averages from a 255 – 316 ppm, while 'Mixani' and 'Amigdalolia Nana' variety present the lower value than the rest of other cultivars.

Table 3. Minor components (total phenols, tocopherols) bitterness index and oxidative stability of 11 cultivars from Germplasm Bank IFAPA Centre

Cultivar	Tocopherols (mg/kg)	Total phenols (mg/kg)	Bitterness K_{225}	Oxidative stability (h)
Kalinjot	449 ± 103.2[a]	482 ± 36.1	0.37 ± 0.01	50.5 ± 5.6
Mixani	138 ± 29.6	253 ± 56.5	0.19 ± 0.04	45.3 ± 2.2
Ulliri I Kuq	305 ± 122.3	749 ± 20.5	0.43 ± 0.01	74.4 ± 0.7
Kotruvsi	301 ± 13.4	493 ± 38.2	0.42 ± 0.04	49.1 ± 0.4
Amigdalolia Nana	185 ± 19.1	290 ± 0.7	0.23 ± 0.01	59.1 ± 0.1
Kerkiras	594 ± 29.0	592 ± 76.3	0.42 ± 0.04	53.3 ± 4.6
Lastovka	316 ± 25.5	230 ± 8.5	0.14 ± 0.01	36.3 ± 3.9
Levantinka	258 ± 77.1	649 ± 177.5	0.41 ± 0.07	74.9 ± 2.6
Frantoio	301 ± 13.4	670 ± 96.8	0.45 ± 0.05	74.3 ± 1.06
Pendolino	305 ± 17.0	357 ± 175.4	0.19 ± 0.09	50.1 ± 13.3
Razzola	303 ± 11.3	566 ± 108.2	0.36 ± 0.06	57.8 ± 15.6

Mean ± SD

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(Accepted for publication 03.09.2021)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

The bitterness index is related with sensorial valuation (Gutiérrez, et al., 1992) and the polyphenols content. Table 2 shows the value of the bitterness of the oil from the cultivars in this study, 'Frantoio', 'Ulliri I Kuq' and 'Levantinka' oil present higher bitterness than the rest of oils.

The oxidative stability of oil expressed in Rancimat hour depends from phenols compounds and oleic acid. The cultivars that have shown high value in those compounds have shown high stability of olive oil. Cultivars as 'Levantinka', 'Ulliri I Kuq' and 'Frantoio' presented oils with high stability.

The composition of the sterol fraction of olive oil has great importance by health benefits. As shown in the Table 4 the levels of the sterol obtained from different olive oils lay within the established Regulation limits (CEE Regulation 2568, 1991).

The major sterols present in olive oils are β-sitosterol, Δ5- Avenasterol, campesterol and estigmasterol. β-sitosterol, represent more than 84 % of total sterols.

All the olive oils studied contained more than 1000 mg/kg of total sterols, the minimum value established by EU Regulation (EEC, 2003). 'Frantoio' (2089 mg/kg), 'Kerkiras' (1857 mg/kg) and 'Kotruvsi' (1828 mg/kg) cultivars present higher level of total sterol respect to lower one in 'Lastovka' oils (1156 mg/kg). However, this is definitely a good characteristic of olive oils, due to the great benefits of these compounds for the health.

The highest mean value of β-sitosterol was observed on 'Kerkiras' cultivar (89.3 %), whereas 'Mixani' oils had the lowest one (78 %).

Regarding Δ5- Avenasterol content, Levantinka oils present the highest value (11.1 %), whereas Kalinjot, Amigdalolia Nana and Kerkiras oils showed the lowest one (2.7 %).

The content of campesterol from the olive oils variety showed a range about (3.4 %). Pendolino oils present the lowest value (1.5 %) than the rest of olive oils.

Table 4. Sterols composition of the 11 cultivars of 11 cultivars from Germplasm Bank IFAPA Centre "Alameda de Obispo" of Cordoba

Sterols	Amigdalolia Nana	Frantoio	Kalinjot	Kerkiras	Kotruvsi	Lastovka	Levantinka	Mixani	Pendolino	Razzola	Ulliri i Kuq
Cholesterols (%)	0.45 ± 0.06[a]	0.07 ± 0.05	0.0 ± 0.0	0.27 ± 0.1	0.14 ± 0.09	0.19 ± 0.01	0.15 ± 0.1	0.04 ± 0.7	0.1 ± 0.8	0.25 ± 0.09	0.0 ± 0.0
Brasticasterol (%)	0.0 ± 0.0	0.0 ± 0.0	0.01 ± 0.01	0.0 ± 0.0	0.03 ± 0.04	0.0 ± 0.0	0.0 ± 0.0	0.02 ± 0.03	0.04 ± 0.05	0.02 ± 0.02	0.0 ± 0.0
24- Methylenecholesterol (%)	0.0 ± 0.0	0.0 ± 0.0	0.02 ± 0.02	0.0 ± 0.0	0.02 ± 0.02	0.0 ± 0.0	0.03 ± 0.03	0.09 ± 0.09	0.02 ± 0.02	0.09 ± 0.01	0.0 ± 0.0
Campesterol (%)	4.4 ± 1.6	3.0 ± 0.1	4.3 ± 0.0	3.6 ± 0.0	3.4 ± 0.3	3.6 ±0.2	3.2 ± 0.1	3.2 ± 0.1	1.6 ± 1.5	4.3 ± 0.0	3.5 ± 0.3
Campestanol (%)	0.1 ± 0.1	0.5 ± 0.6	0.3 ± 0.4	0.2 ± 0.1	0.1 ± 0.1	0.3 ± 0.0	0.3 ± 0.01	0.3 ± 0.1	0.2 ± 0.2	0.2 ± 0.2	0.2 ± 0.0
Stigmasterol (%)	1.4 ± 0.4	0.5 ± 0.1	2.0 ± 1.8	0.4 ± 0.1	1.1 ± 0.1	1.9 ± 0.4	0.8 ± 0.02	1.5 ± 0.4	0.7 ± 0.2	0.7 ± 0.1	0.6 ± 0.0
Δ-7 Campesterol (%)	2.1 ± 0.5	0.0 ± 0.0	4.1 ± 1.9	1.7 ± 0.4	1.3 ± 0.3	0.7 ± 0.6	0.6 ± 0.3	3.2 ± 1.0	3.7 ± 3.6	2.1 ± 0.6	0.0 ± 0.0
Clerosterol (%)	1.8 ± 0.5	0.9 ± 0.0	1.0 ± 0.2	0.5 ± 0.6	0.8 ± 0.3	1.1 ± 0.1	0.9 ± 1.1	1.6 ± 0.1	1.1 ± 0.1	1.3 ± 0.2	0.9 ± 0.0
β- sitosterol (%)	86.9 ± 2.7	86.9 ± 0.4	83.9 ± 0.1	85.4 ± 0.6	81.0 ± 3.7	82.4 ± 4.1	78.0 ± 0.8	83.6 ± 3.1	81.9 ± 1.8	88.5 ± 0.4	84.3 ± 3.7
β- sitosterol (%)	0.04 ± 0.05	0.06 ± 0.04	0.02 ± 0.03	0.1 ± 0.1	0.0 ± 0.0	0.01 ± 0.01	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Δ-5 Avenasterol (%)	2.8 ± 0.4	6.5 ± 0.4	2.6 ± 0.0	2.8 ± 0.1	6.4 ± 1.2	5.9 ± 0.7	11.2 ± 2.5	10.0 ± 1.0	7.4 ± 0.8	7.6 ± 0.7	5.2 ± 2.8
Δ-5,24 Stigmastadienol (%)	0.2 ± 0.3	1.0 ± 0.1	0.6 ± 0.4	0.5 ± 0.3	1.0 ± 0.1	0.8 ± 0.2	0.3 ± 0.02	0.5 ± 0.5	0.7 ± 0.3	1.1 ± 0.0	0.3 ± 0.3
Δ-7 Stigmastenol (%)	0.1 ± 0.1	0.3 ± 0.1	0.3 ± 0.1	0.4 ± 0.3	0.2 ± 0.0	0.4 ± 0.4	0.2 ± 0.0	0.5 ± 0.5	0.2 ± 0.1	0.2 ± 0.1	0.5 ± 0.5
Δ-7 Avenasterol (%)	0.2 ± 0.0	0.5 ± 0.1	0.3 ± 0.0	0.3 ± 0.0	0.3 ± 0.0	0.3 ± 0.1	0.2 ± 0.1	0.4 ± 0.1	0.3 ± 0.1	0.5 ± 0.1	0.4 ± 0.1
Totals (mg/kg)	1346 ± 474	2089 ± 486	1662 ± 58	1857 ± 299	1828 ± 64	1156 ± 128	1355 ± 298	1655 ± 106	1272 ± 106	1444 ± 298	1698 ± 26
Uvaol (%)	0.0 ± 0.0	0.0 ± 0.0	0.05 ± 0.07	0.5 ± 0.3	0.2 ± 0.0	0.1 ± 0.1	0.05 ± 0.07	0.05 ± 0.07	0.05 ± 0.07	0.3 ± 0.07	0.0 ± 0.0
Erythrodiol (%)	0.65 ± 0.7	0.4 ± 0.3	0.6 ± 0.6	0.7 ± 0.1	2.2 ± 0.3	1.0 ± 0.4	0.2 ± 0.2	1.1 ± 0.3	0.2 ± 0.0	0.4 ± 0.1	0.7 ± 0.0
% Uvaol + erythoridiol	0.7 ± 0.1	0.4 ± 0.3	1.0 ± 0.0	1.2 ± 0.2	2.4 ± 0.2	1.1 ± 0.5	0.4 ± 0.0	1.2 ± 0.1	0.3 ± 0.1	0.7 ± 0.2	0.7 ± 0.0

Mean ± SD

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(Accepted for publication 03.09.2021)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

Erythrodiol and uvaol (Triterpenic dioalcohols) are part of sapunification fraction and usually analysed together with the sterol fraction. Table 4 showed the level of erythrodiol and uvaol of the 11 olive oils, the level of erythrodiol for the Kotruvsi oil (2.2 %) were higher than the rest. The continent of uvaol for the Amigdalolia Nana, Frantoio and Ulliri I Kuq oil are absent, the Kerkiras one presents the highest value around 0.5 %.
The level of erythrodiol + uvaol is used to detect the pormace olive oils (Reina et al., 1997). The level (Table 4) of this parameter was under the limits established from CEE Regulation 2568, 1991.

4. Conclusions

The virgin olive oils from the cultivars analyses showed a fatty acid composition characterised by an oleic acid content medium or medium-high that a provides besides to the phenol content a high oxidative stability.
Natural antioxidant content was in general medium high that provides nutritional properties and strong sensory.
The presence of phytosterols at high content provides very interesting health benefits that may be considered.
These preliminary results may be used as a basis for studies in situ to consider the autochthonous varieties in new orchards in the area

5. Acknowledgements

This work is supported by a C.I.H.E.A.M grant and the Project FEDER-INIA: RTA 2010-00013- C02-01. Our gratitude to the personnel of laboratory and the Center IFAPA "Venta del Llano" by support..

6. References

1. Aguilera, M.P., Beltrán, G., Ortega, D., Fernández, A., Jiménez, A., Uceda, M. (2005) **Characterisation of virgin olive oil of Italian olive cultivars. 'Frantoio' and 'Leccino', grown in Andalucia**. Food Chemistry 89, 387.
2. Aparicio, R., Luna, G (2006) **Characterisation of monovarietal virgin olie oils**. Eur. J. Lipid Sci. Technol. 104, 614.
3. Beltrán, G., Jiménez, A., Del Río, C., Sánchez, A., Martínez, L., Uceda, M., Aguilera, M.P. (2010) **Variability of vitamon E in virgin olive oil by agronomical and genetic factors**. Journal of Food Composition and Análisis 23, 633
4. Bendini, A., Cerretani, L., Carrasco-Pancorbo, A., Gómez-Caravaca, A. M., Segura-Carretero, A., Fernández-Gutiérrez, A (2007). **Phenolic molecules in virgin olive oils: A survey of their sensory properties, health effects, antioxidant activity and analytical methods. An overview of the last decade**. Molecules 12, 1679
5. Breinhölder, P., Moska, L., Lindner, W. (2002). **Concept of sequential analysis of free and conjugated phytosterols in different plant matrices.** J. Chromatography B 777, 67
6. CEE Regulation 2568 (1991). On olive oils characteristic and their analytical methods. CEE Official Report L 248, 1-48.
7. Cicerale, S., Conlan, X.A., Sinclair, A.J. and Keast, R.S.J (2009). **Chemistry and health of olive oil phenolic.** Critical Reviews in Food Science and Nutrition, 49, 218.
8. Conte, L.S.; Caboni, M.F.; Larcker, G. (1993) "**Gli oli di oliva della Romagna Nota II: gli oli del riminese"** Riv. Ital. Sost. Grasse 70, 249
9. EEC (2003). **Characteristics of olive and olive pomace oils and their analytical methods.** EEC Regulation 1989/2003. Official Journal of the European Communities, 295, 57–66.
10. Gutiérrez, F.; González, R. (1989) "**Parámetros de calidad en el aceite de oliva. En su utilización en crudo"** III Simposium Nacional del Aceite de Oliva. Expoliva'89. Jaén.
11. Gutiérrez, F.; Perdiguero, S. (1992) **"Estudio de la efectividad de las columnas de extracción C18 en la valoración del amargor (K225) de aceite de oliva virgen. Error y esquema analítico del método de valoración"** Grasas y Aceites 43, 93

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(Accepted for publication 03.09.2021)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

12. Gutierrez, R., Albi, M.A., Parma, R., Rios, J.J., Olias, J.M. (1989) **Bitter taste of virgin olive oil: Correlation of sensory evaluation and instrumental HPLC analysis.** J. Food Sci. 54, 68
13. Gomez- Rico, A., Salvador, M.D., Moriana, A., Perez, D., Olmedilla, N., Ribas, F., Fregapene, G. (2007) **Influence of different irrigation strategies in a traditional Coricabra cv. Olive orchard on virgin olive oil composition and quality.** Food Chemistry 100, 5687
14. IUPAC. (1992). **Determination of tocopherols and tocotrienols in vegetable fats by HPLC**. Method No. 2432. Standard methods of analyses of oils, fats and derivatives Oxford: Blackwell.
15. Jones, P.J.H., Mac Dougall, D.E., Ntanios, F. and Vanstone, C. A (1997) **Dietary phytosterols as cholesterol- lowerenig agents in humans.** Canadian J. of Physiology and Pharmacology 75, 217
16. Lazzez, A., Perri, E Caravita, Mª A., Khlif, M and Cossentini, M (2008) "**Influence of olive maturity stage and geographical origin on some minor components in virgin olive oil of the Chemlali variety"** J. Agric. Food Chem. 2008, 56, 982–988
17. Pérez- Jiménez, F., Ruano, J., Pérez-Martines, P., Lopez-Segura, F., Lopez-Miranda, J. (2007) **The influence of olive oil on human health: not a question of fat alone** Mol. Nutr. Food. Res 51, 1199
18. Poiana, M.; Minicione, A.; Giuffre, M.; Minicione, B. (2001) "**Ricerche sugli oli di oliva monovarietali Nota XIII. Contributo alla caratterizzazione dell`olio estratto dalle olive della cv. Pendolino coltivata in Calabria"** Riv. Ital. Sost. Grasse 78, 403
19. Ranalli, A.; De Mattia, G.; Ferrante, M. L.; Giansante, L. (1997). **"Incidence of olive cultivation area on the analytical characteristics of the oil"**. Note 1. Riv. Ital. Sost. Grasse 74, 501
20. Romero, M.P., Tovar, M.J., Girona, J., Motilva, M.J., (2000) **Changes in the HPLC phenolic profile of virgin olive from young trees (Olea europaea L. cv. Arbequina) grown under different deficit irrigation strategies.** J. Agric. Food Chem 50, 5349
21. Servili, M., and Montedor, G.F. (2002) **Contribution of phenolic compounds to virgin olive oil quality.** Eur. J. Lipid Sci. Technol. 104, 602
22. Tedeschini, J. : Thomaj, F.; Bregasi, M.; Panajoti, Dh.; Ferraj, B.; Bacaj, M.; Pitts, C.; Pfeiffer, D.: Ferguson, L. (2001) **"Effect of Harvest Timing on Olive Fly Infestation and Olive Oil Yields and Quality"** The Eighth Annual Report of the Integrated Pest Management Collaborative Research Support Program The IPM CRSP Funded by USAID
23. Tura, D., Gigliotti, C., Pedo, S., Failla, O., Bassi, D., Serraiocco, A. (2007) **Influence of cultivar and site of cultivation on levels of lipophilic and hydrophilic antioxidants in virgin olive oils (Olea Europea L.) and correlations with oxidative stability.** Scientia Horticulturae 112, 108
24. Uceda, M., and Frías, L. (1985). **Harvest dates. Evolution of the fruit oil content, oil composition and oil quality.** In: Proceedings del Segundo Seminario Oleicola Internacional (pp. 125–128). Córdoba: COI.
25. Uceda, M (2004) **"Variabilidad intraespecífica de los factores que determinan la calidad del aceite de oliva"** Tesis Doctoral Jaén. 2004.
26. Uceda, M.; Hermoso, M.; Aguilera, M.P. (2004) "**La calidad del aceite de oliva"** En: "El cultivo del olivo" Barranco, D.; Fernández- Escobar, R.; Rallo, L. (Eds), Mundi Prensa- Junta de Andalucía.
27. Uceda, M., Beltrán, G.; Jiménez, A. (2005) **"Composición del Aceite"** Variedades de Olivo en España, Grupo Mundi – Prensa, 14, 359
28. Vázquez Roncero, A., Janer del Valle, C., Janer del valle., M.L (1973) **Determinación de los polifenoles totales del aceite de oliva.** Grasas y Aceite 24, 350
29. Vinha, A.F., Ferreres, F., Silva, B.M., Valentão, P., Gonçalves, A., Pereira, J.A., Oliveira, A.B., Seabra, R.M., Andrade, PB. (2005) **Phenolic profiles of Portuguese olive fruits (Olea europaea L.): Influences of cultivar and geographical origin** Food Chemistry 89, 561.
30. Zanetic, M., Cerretani, L., Del Carlo, M (2007) **Preliminary characterisation of monovarietal extra-virgin olive oils obtained from different cultivars in Croatia.** J. Commodity. Sci. Technol. Quality. 46, 1