EVALUATION OF TOTAL POLYPHENOLS IN ALBANIAN OLIVE OILS PRODUCED DURING THE HARVESTING PERIOD 2010-2012

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Abstract

The antioxidant properties of phenolic compounds increase the interest of Olive oil health benefits. The total phenols are very important for the quality of extra virgin olive oils; those parameters are related to oxidative stability and the bitter index, both implicated in olive oil taste. Sensory evaluation is another criteria of olive oil quality, which identifies the specifics flavors and the gout, to better understand the bitterness. Very important to observe the phenolic compounds in olive oil is the determinations of ripening phase.

This study aims the evaluation of total polyphenols in extra virgin olive oils of autochthones cultivars, examined during the harvesting period 2010-2011 and 2011-2012. The determination of those natural antioxidants, using a spectrophotometric method of Gouttfinger. The results were expressed as mg of caffeic acid per kg of oil (mg caffeic acid kg $^{-1}$). Each sample of extra virgin olive oil was representative of olive trees from one variety. The extraction was made using continuous extractions system (Olerina 40, capacity 5-10kg), at the Oil Laboratory of the Faculty of Biotechnology and Food, Agricultural University of Tirana.

The role of extraction (sort-time-temperature) and the characteristics of the cultivar are very important in the quality and the components of the extra virgin olive oil, demonstrated with the data of all parameters analyzed.

Keywords: *extra olive oil, antioxidant, phenolic compounds, pigments, autochthone varieties*.

INTRODUCTION:

Phenolic compounds constitute an important group of naturally occurring compounds on plants. Extra Virgin Olive oil (EVOO) contains a complex mixture of these compounds. Among those mostly discussed are phenolic alcohols, that is, hydroxytyrosol (3,4 dihydroxyphenylethanol; 3,4- DHPEA) and tyrosol (p-hydroxyphenylethanol; p-HPEA), simple phenolic acids, flavonoids, lignas (acetoxy pinoresinol and pinoresinol), oleosidic forms of hydroxytyrosol and tyrosol, and oleuropein aglycon (3,4-DHPEA-EA) and ligstroside aglycone (p-HPEA-EA). (Andjelkovic, nr 56,2008).The phenolic compounds content are important parameters 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 (Morello, 2004,nr 54). In addition to olive cultivar, the importance of harvest year has been demonstrated by the relating the content of phenolic compounds and the quality of olive oils (Morello, 2004,nr 54) (Lerma-Garcia, nr 57, 2009) (Brenes, nr 47, 1999) . The natural phenolic antioxidants are supposed to have chemo protective properties in human beings (Lerma- Garcia, nr 57, 2009) and also to contribute to the sensorial properties of virgin olive oil (Frankel, 2011) (Boskou, 1996). The total phenols are very important for the quality of extra virgin olive oil, because of their involvement in its resistance to oxidation, bitterness and pungency of olive oil taste (Kongoli, 2011). This study aims the evaluation of totals phenols in two productive autochthones cultivars of 2011 and 2012 harvested.

MATERIALS AND METHODS

Fruits samples. Fresh olive was carried out during the 2011 and 2012 crop season in tow different olive groves Kalinjot in Mallakastra region and Kushan in Berat region. Representative samples from each one were picked in 10 kg boxes and taken directly to the laboratory were they were produced.

Oil Extraction. The samples were produced using continuous extractions system (Olerina 40, capacity 5-10kg). The unit consists in the pulp centrifuge. Each sample was stored in dark bottles in room temperature, until analysis was performed.

Chemical analysis included the measurement of several parameters.

Table 1 Chemical analysis and quality parameters

IOC TESTS	ANALYSIS	DETERMINATION	INDICATORS	ANALYSES
	Free fatty Acids	Free fatty acids are formed by the hydrolysis of acid triacylglycerols in oils during the extraction.	An elevated level of free fatty acid indicate oxidized and low quality oil.	EEC/2568/91
	Peroxide Value	Peroxides are primary oxidation products that are formed when oils are exposed to oxygen producing undesirables' flavors and odors.	An elevated level of free fatty acid indicate oxidized and low quality oil.	EEC/2568/91
	UV Absorption K232,K270,ΔK	Conjugate double bands are formed from natural no conjugated unsaturation in oils upon oxidation.	Is an indicator of adulteration of oil.	EEC/2568/91

Pigment content Chlorophyll and Carotenoids were determined calorimetrically operating as described by *Minguez-Mosquera et al*. (1991). The maximum absorption at 670 nm is related to the chlorophyll fraction and that at 470 nm is related to carotenoid fraction. The values of the coefficients of specific extinction applied were E0 = 613 for pheophytin as a major component in the chlorophyll fraction and E0 = 2,000 for lutein as a major component in the carotenoids fraction. Thus the pigments content were calculated as follows: Chlorophyll (mg/kg) = (A670 × 106) / (613 × 100 × d) Carotenoid (mg/kg) = (A470 × 106) / (2,000 × 100 × d) Where A is the absorbance and d is the spectrophotometer cell thickness (1 cm).

Total phenols were quantified calorimetrically 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 (Gutfinger*, 1981). The extracts were measured at the absorption 725 nm and the values are given as mg of caffeic acid per kilogram of oil.

RESULTS AND DISCUSSION

The Kalinjot is a traditional variety in Mallakastra region. One of the most outstanding cultivar for the production of olive oil, with good resistance adaptable to different climates and soils. The oil is good with excellent quality with good organoleptic characteristics. The Kushan cultivar is very resistant and his orientation to produce olive oil.

Table 1 shows the data for the indicators of quality. They 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 on oil. The free acidity percentage during the tow years of Kushan variety ranged from 0.2% to 061% and of Kalinjot variety from 0.54% to 0.67%. Respectively the PV values are lower then legal limits for each olive oil produced from the tow cultivars. Changed in oxidative status for Kushan and Kalinjot oil as conjugate dienes (k_{232}), trienes (k_{270}), showed values lower then legal limits for all the samples at time(t) (six months after production).

The chlorophyll and carotenoids contend for both Kushan and Kalinjot samples are shown in **Tabele 2.** The highest levels were of chlorophyll pigment in relation with carotenoids pigment, both of them have an antioxidant role in raport au maturation of olive oil.

Phenolic compounds are natural antioxidants in olive oil. The antioxidant capacity of polyphenols has an important role for olive oil stability since it exist a correlation between the quantity of total polyphenols and the resistance to oxidation over time. The data showed in Table 2 demonstrate that "Kalinjoti" have the higher level of phenolic compounds. During the olive oil maturation the level of total phenols decrease in time.
The phenol compounds are known to have a significant effect on the stability and sensory characteristics of olive oil (Brenes M. G., 1999)

Table 2 Quality indexes of virgin olive oils extracted during 2010-2011 and 2011-2012

Quality indexes	**Kushan 2011**	**Kalinjot Mallakaster 2011**	**Kushan 2012**	**Kalinjot Mallakaster 2012**	**Extra Virgin Standards (limits)**(EC,1991)
Free acidity (% oleic acid)	**0.20**	**0.54**	**0.61**	**0.67**	**≤ 0.8**
Peroxide value (mev. O2/Kg oil)	**16.8**	**20**	**18**	**10.6**	**≤ 20**
K232	**2.0**	**2.4**	**2.2**	**1.8**	**≤ 2.50**
K270	**0.13**	**0.19**	**0.17**	**0.14**	**≤ 0.20**
ΔK	**0.001**	**0.005**	**0.005**	**0.001**	**≤ 0.01**

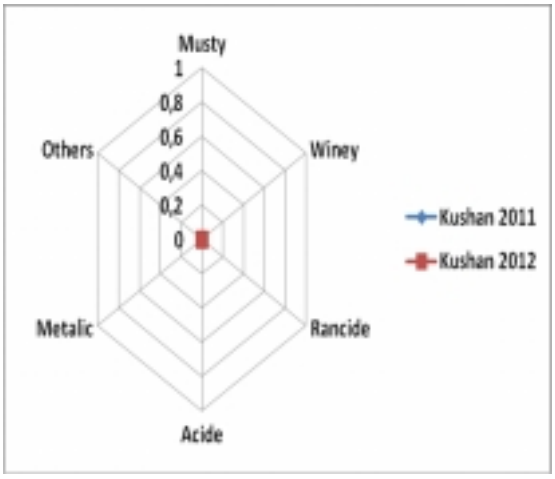
Table 3 Some data of: Chlorophyll, Carotenoids and Phenols

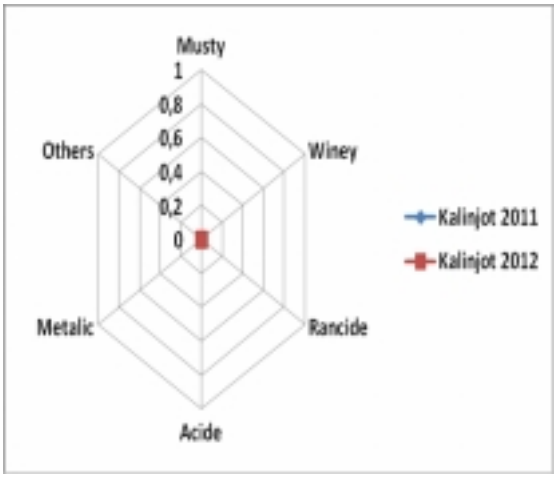
	Kushan	Kalinjot Mallakaster	Kushan	Kalinjot Mallakaster 2012

	2011	2011	2012	
Chlorophyll (mg/Kg)	**1.35**	**5.9**	**1.43**	**3.55**
Carrotenoides (mg/Kg)	**1.2**	**4.5**	**1.04**	**1.8**
Total phenols (mg/l caffeic acid)	**160**	**190**	**150**	**220**

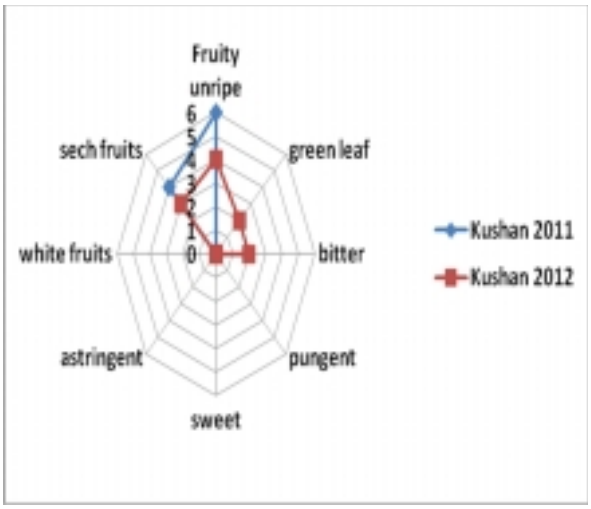
One of the aim of this study was to explore the organoleptic profile. **Sensory evaluation** (Panel must find medium of defect =0 and medium of attribute ›0). The panel test were create from 7 persons in Biotechnology Faculty. In Graf 1 the intensity of the sensory defects detected in oils samples is shown. Oils were stored in open boxed and were produced directly. One reason than we don't identified any defects. In Graf 2were showed the positive attributes. Moreover other attributes were observe in olive oils, artichoke were detected in lower value in Kalinjot.

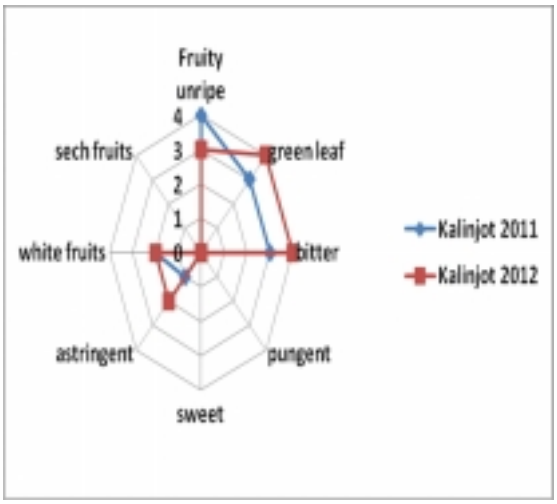
Graf 1. Sensory negative attribute (defects) for each cultivar purchased in tow years.





Graf.2 Sensory positive attribute for each cultivar purchased in tow years





CONCLUSION

Among the olive varieties chosen for the present study, Kalinjot has the highest polar phenolic component in 220 mg/kg (acid caffeic) in 2012. The Kushan olive oil sensorial profile showed intensities of the green almond and in Kalinjot olive oil we identified intensities of white fruits (apple) and the bitter attributes between 3 and 4. The sensorial profile showed more balanced oils. We can conclude that the profile of each variety can changed from one crop to another indicated by the extern factors, but at the end each olive oil save the characteristics of the cultivars.

The phenol profile can be followed from the fruit to the oil production and through storage, and may serve as a good indicator of olive oil quality (Boskou, 1996). Polyphenols perform a protective action not only on oil but also on the cells of the human being since they oppose the negative effect of free radicals and the three cultivars have good value. Another reason for the stability of Extra Virgin Olive Oil (EVOO) its antioxidant content, which depends on genetic, environmental and technological factors.

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