Uluslararası İleri Doğa Bilimleri ve Mühendislik Araştırmaları Dergisi
Sayı 7, S. 566-568, 11, 2023

Araştırma Makalesi

IJANSER
https://alls-academy.com/index.php/ijanser
ISSN: 2980-0811

International Journal of Advanced Natural Sciences and Engineering Researches
Volume 7, pp. 566-568, 11, 2023

Research Article

Fatty acid and phenolic profiles of olive (*Olea europaea* L.) oils harvested from the Gemlik olive tree and the ground

Pinar GUMUS[1*], Hakan CETİNKAYA[2]

[1] *Department of Nutrition and Dietetics, Kilis 7 Aralik University, Turkey*
[2]*Department of Horticulture, Kilis 7 Aralik University, Turkey*

[*]*(dr.pinargumus@gmail.com)*

(Received: 19 December 2023, Accepted: 27 December 2023)

(3rd International Conference on Scientific and Academic Research ICSAR 2023, December 25-26, 2023)

ATIF/REFERENCE: Gumus, P. & Çetinkaya, H. (2023). Fatty acid and phenolic profiles of olive (*Olea europaea* L.) oils harvested from the Gemlik olive tree and the ground. *International Journal of Advanced Natural Sciences and Engineering Researches*, 7(11), 566-568.

Abstract – In this study, the olive fruits of the selected olive trees were collected directly from the tree and from the ground. The fatty acid composition and phenolic compounds of olive oils harvested from the Gemlik olive tree and the ground were examined. It was observed that oleic acid, palmitic acid and linoleic acid were identified as the main fatty acids in two type of olive oils. In the samples of olive oil, oleic acid content was determined as 64.37% and 64.55% in A type and B type olive oils, respectively. Phenolic compounds in olive oils obtained from Gemlik olive varieties picked up from tree and ground were evaluated by HPLC (High Performance Liquid Chromatography). A total of 12 phenolic compounds were identified in these olive oils, which include tyrosol, 4-Hydroxybenzoic acid, vanillic acid, caffeic acid, syringic acid, p-coumaric acid, ferulic acid, taxifolin, oleuropein, cinnamic acid, rutin and luteolin. It was determined that oleuropein content 10.83 mg/kg in A type olive oil and 12.67 mg/kg in B type olive oil. Oleuropein is the dominant phenolic compound in both olive oils. It was observed olives harvesting from the tree and the ground does not change the major components of the fatty acid composition and phenolic profiles of the Gemlik variety olive oils.

Keywords –Olive Fruit, Fatty Acids, Phenolic Compounds, Olive Oil, Olea Europaea L.

I. INTRODUCTION

Olive (*Olea europaea* L.) belongs to the Oleaceae family. In our country, olives are primarily cultivated in the Aegean, Mediterranean and Southeastern Anatolia regions. In olive cultivation, important provinces in the Southeastern Anatolia Region are Gaziantep, Kilis, Şanlıurfa and Kahramanmaraş. Among vegetable oils, olive oil is the cornerstone of the Mediterranean food in terms of nutritional value and sensory characteristics. Due to its content of phenolic compounds, it holds great importance for human health [1-4]. For centuries, olive oil has played a crucial role in human nutrition. Olive oil is obtained through mechanical means from the fruits of the olive tree.

Olive oil is composed of triglycerides, generally containing oleic, palmitic, linoleic and stearic acids in its structure. Phenolic components found in olive oil are tyrosol, hydroxytyrosol, caffeic acid, ferulic acid, vanillic acid, p-coumaric acid, p-hydroxybenzoic acid, cinnamic acid, and oleuropein. Many of these components enhance the stability of olive oil to oxidative degradation. In the literature, it is stated that there is a linear relationship between the oxidative stability of extra virgin olive oil and its phenolic content [5]. The importance of olive oil is attributed to its high content of monounsaturated fatty acids, particularly oleic acid, and its abundance of natural antioxidants, such as polyphenols.

Olive oil quality varies depending on numerous factors such as variety, geographical production area, climate, agricultural practices, harvesting methods and production technology [2,4,6,7]. Oil accumulation in the olive fruit begins at the end of july and early august, continuing until october and december, reaching its maximum by the end of this period [8]. The aim of this study was to detect the fatty acid composition and phenolic compounds of olive oils harvested from the Gemlik olive trees grown in Kilis province and their grounds.

II. MATERIALS AND METHOD

A. Material

Olive fruits of the Gemlik variety was used to be grown in Kilis.

B. Olive Oil Production

The olive fruits of the Gemlik variety were obtained from trees aged around 20 years, cultivated at Kilis 7 Aralik University. The olive fruits of the selected olive trees were collected from the tree and the ground. The olives were extracted two days after harvesting using an oil extraction device with a two-phase decanter system (Olio Mio Mini, Italy). The olives were first crushed in the milling section, and the resulting olive paste was kneaded in a mixer at 30°C for 1 hour before being separated into oil and pomace in the decanter. The obtained oils were stored in dark-colored glass containers in a dark, dry and cool environment until analyses were conducted.

C. Determination of Fatty Acid Composition

Fatty acid composition was measured according to the method by International Olive Oil Council with some modifications. 0.1 g oil sample was weighed in test tube. Heptane (2 mL) was added. Subsequently, 0.2 mL of methanolic potassium hydroxide solution was added, and the cap fitted with PTFE (politetrafloroetilen) joint was closed and shaken for 30 sec. The heptane solution was used for injection into the gas chromatography. The methyl esters of fatty acids (1μL) were measured using a GC (Agilent, GC-5977MSD) [9].

D. Determination of Phenolic Compounds

Phenolic compounds were detected according to the method by International Olive Oil Council with some modifications. Olive oil (2 g) was weighed in a test tube. The internal standard solution (1 mL) was transferred into the weighed sample. It was shaked for 30 s. Then the methanol/water 80/20 (V/V) extraction solution (5 mL) was added and shaken for 1 min. It was extracted in the ultrasonic bath for 15 min and centrifuged at 5000 rev/min for 25 min. Finally, the supernatant was injected into HPLC (Shimadzu, LC20A) system [10].

III. RESULTS AND DISCUSSION

A. Fatty Acid Composition

The fatty acid composition of olive oils was shown in Table 1. According to Table 1, it can be observed that oleic acid, palmitic acid and linoleic acid were identified as the main fatty acids in two type of olive oils. In the samples of olive oil, oleic acid, palmitic acid and linoleic acid contents were determined as 64.37%, 18.60% and 8.46% (A) and 64.55%, 16.99% and 10.89% (B) respectively. Yorulmaz et al. [11] determined the oleic acid content in olive oils obtained from different olive varieties to be in the range of 60.15% to 80.46%.

Table 1. Fatty Acid Composition

Component (%)	A	B
Palmitic acid C16:0	18.60	16.99
Palmitoleic acid C16:1	1.40	1.32
Margaric acid C17:0	0.27	0.23
Stearic acid C18:0	2.60	2.60
Oleic acid C18:1	64.37	64.55
Linoleic acid C18:2	8.46	10.89
Linolenic acid C18:3	1.09	0.92
Arachidic acid C20:0	1.33	0.91
Paullinic acid C20:1	0.65	0.48
Behenic acid C22:0	0.36	0.20
Trikosilic acid C23:0	0.08	0.09
Nervonic acid C24:1	0.29	0.32

A: Olive oils obtained from olives collected from the ground
B: Olive oils obtained from olives collected directly from the tree

B. Phenolic Compounds

The phenolic compounds and their quantities determined by the HPLC method in olive oils were presented in Table 2. In the study, a total of 12 phenolic compounds were identified, which include tyrosol, 4-Hydroxybenzoic acid, vanillic acid, caffeic acid, syringic acid, p-coumaric acid, ferulic acid, taxifolin, oleuropein, cinnamic acid, rutin and luteolin. In the study, it was observed that oleuropein content 10.83 mg/kg in A type olive oil and 12.67 mg/kg in B type olive oil. Oleuropein is

the dominant phenolic compound in both olive oils. Coumaric acid, taxifolin, rutin and cinnamic acid was detected in olive oils coded as B. Dagdelen et al. [12] stated that hydroxytyrosol, oleuropein, rutin, tyrosol, vanilic acid, luteolin, sinapinic acid, p-cumaric acid, gallic acid and apigenin were found as major phenolic compounds in that of Gemlik olive fruits.

Table 2. Phenolic Compounds

Compounds (mg/kg)	A	B
Tyrosol	1.18	1.99
4-Hydroxybenzoic acid	0.01	0.01
Vanilic acid	0.19	0.21
Caffeic acid	0.01	0.01
Syringic acid	0.10	0.16
p-Coumaric acid	-	0.02
t-Ferrulic acid	0.09	0.11
Taxifolin	-	0.01
Oleuropein	10.83	12.67
t-Cinnamic acid	-	0.76
Rutin	-	0.17
Luteolin	0.16	0.65

A: Olive oils obtained from olives collected from the ground
B: Olive oils obtained from olives collected directly from the tree

IV. CONCLUSION

In this study, the fatty acid composition and phenolic compounds of olive oils harvested from the Gemlik olive tree and the ground were investigated. Based on this study, oleic acid, palmitic acid and linoleic acid were identified as the main fatty acids in two type of olive oils. Oleuropein is the dominant phenolic compound in both olive oils. Considering the data obtained from this study, it was determined that olives harvesting from the tree and the ground does not change the major components of the fatty acid composition and phenolic profiles of the Gemlik variety olive oils.

ACKNOWLEDGMENT

Both authors thank Advanced Technology Application and Research Center, Kilis 7 Aralık University for providing laboratory facilities for this study.

REFERENCES

[1] T. Öztürk, M. Borcakli "Gemlik ve Uslu Zeytin Çeşitlerinin Besin Öğelerinin Karakterizasyonu," *Zeytin Bilimi*, vol. 3 no.1, pp. 29-34, 2012.

[2] H. Türkoğlu, Z. Kanık, A. Yakut, A. Güneri, M. Akın, "Some propertiesof olive oils sold in Nizip and surroundings," *Journal of the Faculty of Agriculture of Harran University* 2012.

[3] H. Kelebek, S. Kesen, Ç. Sabbağ. S. Selli, "Gemlik zeytin çeşidinden elde edilen natürel zeytinyağında fenol bileşiklerinin ve antioksidan kapasitenin belirlenmesi," *Gıda*, vol. 37 no. 3, pp.133-140, 2012.

[4] M. Nebioglu, "The Effects of Different Malaxation Parameters Used in the Production of Olive Oil from Gemlik and Memecik Varieties on the Amount of Biophenol and Sensory Profile," *Journal of Food and Feed Science-Technology*. 2020.

[5] F. Göğüş, M. T. Özkaya S. Ötleş,, Ed., *Zeytinyağı Kimyası*, ser. Zeytinyağı. Ankara, Türkiye: Eflatun Yayınları, 2009, p. 38.

[6] A. Sözen, M. Çöldür, S. Özen, E. T. Özer, Ş. Güçer, "Zeytin Yağı Karakterizasyonu için Toplam Fenol Düzeylerinin UV/Görünür Spektrometresi ile Belirlenmesi," in *I.Ulusal Zeytin Öğrenci Kongresi,* 2008, p. 136-140.

[7] A. Yorulmaz, H. Erinç, A. Tatlı, A. Tekin, "Effect of Verticillium wilt in Gemlik variety olives cultivated in South East Anatolia on quality parameters and phenolic compounds of virgin olive oils," *Journal of Food*, vol. 42 no. 2, pp. 197-203, 2017.

[8] E. Kutlu, F. Şen, "The effect of different harvest time on fruit and olive oil quality of olive (Olea europea L.) cv. Gemlik," *Ege Üniversitesi Ziraat Fakültesi Dergisi*, vol. 48 no. 2, pp. 85-92, 2011.

[9] (2001). "Method of analysis, preparation of the fatty acid methyl esters from olive oil and olive pomace oil," International Olive Council. COI/T. 20/Doc. No. 24. [Online]. Available:http://www.internationaloliveoil.org

[10] (2009). "Determination of biophenols in olive oils by HPLC," International Olive Council. COI/T.20/Doc. No. 29. Available: http://www.internationaloliveoil.org

[11] A, Yorulmaz H, Yavuz A. Tekin ''Characterization of turkish olive oils by triacylglycerol structures and sterol profiles,'' *J Am Oil Chem Soc*. 91: pp. 2077–2090, 2014.

[12] A, Dağdelen, G,Tümen, M. M Özcan, E, Dündar, "Phenolics profiles of olive fruits (Olea europaea L.) and oils from Ayvalık, Domat and Gemlik varieties at different ripening stages," *Food chemistry*, vol.136 no. 1, pp. 41-45. 2013.