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Improving the Functionality of Olive Oil by Cross Breeding

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Abstract

This research is aimed to generate olive oils with increased functional properties and nutrient content. In this research, oils of 5 cultivar candidates were used as material. Maturation index of their fruits and alpha tocopherol and total phenol content and total antioxidant activities of their oils were evaluated. Results of this study showed that it is possible to develop and register new olive varieties which have olive oils with improved functional properties by cross breeding. LT001 and LT011 could be advised to enrich diet and for the preparation of functional food.

Keywords: Functional olive oil; Olive crossing; Olive genotype; Tocopherol

Introduction

Genetic variation was reported as an important factor on substances which related with functional characters of olive oil [1]. So that researchers focused on develop new olive genotype which had olive oil with high yield, quality and functional characters [2,3]. In this context one national cross breeding program initiated in 1990 at Ataturk Central Horticultural Research Institute Yalova/Turkey to develop new cultivar which had higher table olive and olive oil quality than that's of standard cultivars. 393 olive genotype were obtained by different crossing combinations of Turkish and foreign olive cultivars. The aim of the current research was to determine some functional characteristics of olive oil of 5 cultivar candidates obtained by crossing Lucques (Spanish cultivar) with Edinciksu, Tavşanyüreği and Uslu (Turkish cultivar) in this national breeding project.

Materials and Methods

This study evaluated olive oils of 5 olive cultivar candidates and Gemlik cultivar (to compare) from Ataturk Central Horticultural Research Institute. These genotypes were chosen on the basis of their high productivity and agronomic characteristics among 393 olive genotypes. Olives were hand-picked at 3-3, 2 maturation index in harvest season of 2011/2012, 2012/2013 and 2014/2015. Oils obtained by using laboratory scale hammer (100 rev/min) and kneader (45 minutes) and press (250-300 kg/cm^2). Obtained oil was centrifuged (8000 rev/min) and filtered through a coarse filter (20 µm). Finally oil was filled into dark glass bottles without any air space and stored at 4°C until analyzed. Total phenol content of these samples was determined by Folin-Ciocalteu method according to Gutfinger [4] and antioxidant activity was detected by DPPH method according to Usenik et al. [5]. Alpha-tocopherol content was determined by high pressure liquid chromatography according to official method of FAO [6]. Research plan was established according to completely randomized design and trial was performed in 3 replications. The data obtained throughout 3 years were determined whether there is a significant difference among the characteristics of samples with analysis of variance. Analyses were performed using the GLM procedure of SAS statistical software package program.

Olive oil	Parents	Total phenolic content (mg gallic acid kg^{-1})	Antioxidant activity (µmol trolox kg^{-1})	Alpha tocopherol (mg kg^{-1})
LE001	Lucques x Edinciksu	47.16 ± 11.72 c	488.05 ± 42.38 b	53.95 ± 10.66 c
LT001	Lucques x Tavşanyüreği	71.13 ± 16.51 a	553.46 ± 49.77 a	89.54 ± 17.49 a
LT011	Lucques x Tavşanyüreği	68.65 ± 10.83 a	506.52 ± 41.42 b	75.48 ± 13.28 ab
LU060	Lucques x Uslu	57.51 ± 8.15 b	483.71 ± 43.52 bc	65.91 ± 10.08 b
LU065	Lucques x Uslu	66.43 ± 13.72 ab	451.04 ± 22.94 c	84.33 ± 12.56 a
Gemlik	-	57.60 ± 10.44 ab	492.65 ± 35.08 b	63.95 ± 9.31 b
Different letters in the same column refers to the statistical difference (p<0.05)				

Table 1: Total phenolic content, antioxidant activity and alpha tocopherol content of olive oil.

Results and Conclusion

The beneficial health effects of olive oil are due to its high content of phenolic compounds, which have recently attracted research interest [1]. Parents of olive cultivar candidates and antioxidant activity, total phenolic content and alpha-tocopherol content of oil samples are given in Table 1. Genotype greatly varied total phenols, antioxidant activity and alpha tocopherol. With regard to the LT011 and LT001 had higher total phenolic content than Gemlik which is widely cultivated in Turkey. Total phenols result of this study was lower than El Riachy et al. [3] but similar with Garcia [2]. Detected alpha tocopherol content was higher than result of Aparicio and Harwood and antioxidant

activity was similar with Aparicio and Harwood [7] and Loizzo [1]. Result of this showed that olive oil of LT001 and LT011 had higher total phenol, alpha tocopherol and antioxidant activity than other oils so that LT001 and LT011 could be consumed to enrich diet and used for the preparation of functional food whereas LE001 LU060 and LU065 had lower or similar characters with Gemlik.

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