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Some Oil Characteristics of Fruit of LE002 and MT087 Olive Cultivar Candidates

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Summary

LE002 and MT087 cultivar candidates had olive fruits their color is never turn black from green until they fall. So that their olives described as evergreen fruit. In this study olives were harvested at of first day of November normally other olive cultivars have whole black olive but LE002 and MT087 have green olives. Oil and dry matter content of LE002 and MT087 fruits were determined after that oils were produced by cold press and free fatty acid content, peroxide value and absorbency in ultraviolet light of oils were detected. Dry matter and oil content of olives were 41,0% and 19,47% for MT087 and 45,96% and 23,42% for LE002. Oil content of green olives were lower than these detected values for Marmara region of Turkey. All the analyses result of oils was between the limits of olive oil standards and regulations. So that both these cultivar candidates should be more analyzed to be determine their oil characteristics for future cultivar registration and certification steps.

Introduction

During maturation of olive fruits, their color, size and contents were changed. Normally olives had green color at first stage of ripeness after that violet-red, purple, dark purple and black skin color were formed [1,2]. With black skin color formation tissue color of olive change from white to dark purple/black color from skin to the seed. During olive fruit maturation from green to black color oil content were increased but total phenol and antioxidant activity content declined whose content highly determine the sensory characters, shelf life and price of olive oil [3,4]. LE002 and MT087 had ever green olive fruits until they fall from tree. So that they attracted breeding researcher who work on olive breeding project which started in 1990 with cross breeding of Spanish, Italian and Turk olive cultivars [5]. LE002 and MT087 may have both positive characters of green and black olive maturation stages. So that this study aimed to determine some their fruit and oil characteristics.

Materials and Methods

Material

Fruits of LE002 (Lucas X Ednciksu crossing) and MT087 (Manzanilla X Tavşanyüreği crossing) cultivar candidates were used as material. Their trees were planted at 1.5 × 3 m distance in olive genotype observation orchard of Ataturk Central Horticultural Research Institute (Yalova/Turkey). Olives were hand-picked at first day of November of 2014/2015 and 2015/2016.

Fruit Analysis

Maturation index of olives was determined according calculation method of [6] by using the color of olive skin and flesh. Before the oil content analysis, olive seeds were removed and sliced after that dried until constant weight. Oil of the dried olive paste was extracted by soxhlet apparatus, for at least 8 hours, with petroleum ether extraction at 50°C [7].

Olive Oil Production

Olives were washed and unhealthily and washed olives were removed. Olives were crashed to form olive paste by laboratory scale hammer (100 rev/min) and kneader (45 minutes) after which 250 mg batches of olive paste was put into press cloth and pressed (250-300 kg/cm^2). Drained liquid phase from press was separated into water and oil phase by using separatory funnel. The obtained oil was centrifuged (8,000 rev/min) and filtered through a coarse filter (20 µm). Finally, oil was filled into dark glass bottles and analyzed immediately.

Oil Analysis

Free acid content and peroxide value were assessed by titrimetric methods according to the official methodologies of Turkish Food Codex - Communiqué of Analysis Methods of Olive Oil and Pomace Oil [8]. For determination of specific absorbance value, 0.5 g of oil were weighted and dissolved into 50 mL cyclohexane 50 mL. Mixture was put into 1 cm quartz cuvette and its absorbance was measured at 232 and 270 nm with spectrophotometer (Hitachi, Japan).

Statistical Analysis

Randomized experimental design was used and analysis of variance was applied with LSM student's t multiple comparison test of the means ($p<0.05$) to determine the presence of significant differences among the samples. Statistical analysis was performed by using the JMP v. 5.0 statistical package program (SAS Institute, Cary, N.C., U.S.A.). Different letters indicate significant difference in same colon of tables.

Results and Discussion

Oil content was one of the important criteria for table olive because it directly affects sensory characteristics of final product [9]. On the other hand, oil content directly determines the commercial value of olive cultivars for oil production aim. So that oil content was thought as important as oil quality characters of olive cultivars for oil production purpose cultivars. Maturity index and dry matter and oil content of olives were given in Table 1. Dry matter content has less importance for oil production than table olive. Because water soluble dry matter will be discharged with waste water during oil production from olives. But dry matter of raw olives is important for table olive production. When oil content was deleted from dry

matter content gives idea on sugar, protein, mineral and fiber content of olive. Invert sugar and nitrogen content was important for successful fermentation of olives. Oil content were reported 20,52 % and 19,61 % and dry matter content 36,89 % and 37,45 for olive of Ayvalık and Memecik cultivars [10]. These result were similar with oil content of fruit of MT087 but lower than that of LE002. Dry matter contetns of fruit of MT087 and LE002 were higher than resuşts of Yildirım [10].

Parameters	MT087	LE002	p	cv
Maturity index	1,2	1,5	-	-
Dry matter (%)	41±3,12b	45,99±5,94a	<0,05	3,6
Oil (%)	19,47±1,5b	23,42±1,31a	<0,05	2,9

Table 1: Maturity index and dry matter and oil content of olives.

Free fatty acid content was the first quality evaluation criteria for extra virgin olive oils. Lower free fatty acid content indicates possibilities for earlier harvest, healthiness of olives, immediately oil production after harvest without losing time, colder oil production temperature and appropriate oil storage without or reduced light and oxygen and reduced temperature [11,12]. Peroxide value also indicates same history of olive and olive oil, but only free fatty acid content can be seen on label of olive oils because of national and international olive standards and regulations. Specific absorbency at ultraviolet light (232 and 270 nm) of olive oil is reported as another common character used for quality and purity determination of olive oils [13,14]. In this study free fatty acid content, peroxide value and absorbency at 232 and 270 nm of olive oils were given in Table 2. All of these parameters were between the limits of extra virgin olive oils.

Parameters	MT087	LE002	p	cv
Free fatty acid (oleic acid %)	0,50±0,17	0,63±0,65	>0,05	9
Peroxide value (meqO_2/kg)	2,35±0,07b	3,42±0,08a	<0,05	4,9
Absorbency at 232nm	2,63±0,055a	2,40±0,035b	<0,05	3,5
Absorbency at 270nm	0,187±0,01	0,21±0,01	>0,05	5,7

Table 2: Free fatty acid content, peroxide value and absorbency at 232 and 270 nm of olive oils

Last years with parallel to idea of disease prevention by consuming healthy diet phenols, antioxidants and effective nutrients gain importance on developed countries [15]. As a result of this idea, olive oil had remarkable attraction not only its produces are but also worldwide because of its specific components such as phenols, fatty acids and tocopherols etc. [16,17].
Table 3. Total phenol, antioxidant activity and alpha tocopherol content of olive oils

Parameters	MT087	LE002	p	cv
Total phenol (mg gallic acid/kg)	446,67±5,36b	653,33±9,22a	<0,05	2,7
Antioxidant activity (µM trolox /kg)	334,11±3,33b	419,31±7,68a	<0,05	2,3
Alpha tocopherol (mg/kg)	190,667±11,50a	148±3,72b	<0,05	7,3

Table 3: Total phenol, antioxidant activity and alpha tocopherol content of olive oils.

Total phenol content, antioxidant activity and alpha tocopherol content of olive oils were given in Table 3. These values give idea on quality, sensory characters, nutritive value and disease preventive potential of olive oils [18]. Reported total tocopherols content ranging between 84 and 463 mg/kg within thirty olive cultivars. Antioxidant activity of olive oil of four cultivars were reported between 659-1803 µmol Trolox/kg by [19] On the other hand [20] reported that polyphenols content and the antioxidant activity reported from 97,37 to 219,70 mg gallic acid/kg of oil and from 387,2 to 997.5 µmol Trolox/kg in commercial olive oils respectively.

Total phenol content was reported 1041 and 694 mg/kg of for olive oil of Sevillana and Kalamata cultivars [12]. From producer perspective olive and oil yields was important for giving decision to plant new olive cultivars and they used for calculation of total income. But some minor components such as phenols and/or tocopherols directly affect the unit price of olives oils. So that selection for new olive cultivars should be done after evaluation all of parameters of olive and olive oil of cultivars.

Conclusion

Oil content directly affect olive commercial value of olives for both table olive or olive oil production purpose. Fruits of LE002 and MT087 had satisfied oil content for pre-selection as oil production purpose. Their olive oil had remarkable total phenol and antioxidant activity but they had lesser content of tocopherols. LE002 and MT087 had ever green olive fruits until they fall so that they should be thought as high oil content such a black olive maturation with higher phenol content such a green olive maturation.

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