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Determination of Fruit Quality and Fatty Acid Composition of Turkish Walnut (*Juglans regia*) Cultivars and Genotypes Grown in Subtropical Climate of Eastern Mediterranean Region

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ABSTRACT

Turkey has considerable walnut populations in its several different ecological regions. Five cultivars ('Şebin', 'Şen 1', 'Tokat 1', 'Kaplan 86' & 'KR 2') and three genotypes ('Malatya 1', '77H1' & '65/4') selected form different regions were investigated for their fruit quality characteristics and fatty acid compositions in the eastern Mediterranean region of Turkey. The results indicated that the fruit weight ranged from 9.21 g ('Tokat 1') to 22.2 g ('Kaplan 86'), kernel weight ranged from 5.39 g ('Şebin') to 9.79 g ('Malatya 1') and kernel percentage ranged from 36.69 ('Kaplan 86') to 62.84% ('Tokat 1'). Fatty acid profile was a significant parameter distinguishing the walnut cultivars and genotypes. Palmitic acid values of these genotypes were ranged from 6.98 to 8.77%, oleic acid ranged from 19.33 to 36.76%, linoleic acid ranged from 41.55 to 59.89%, linolenic acid ranged from 8.44 to 11.0%, steraic acid ranged from 3.22 to 4.99. Oleic acid content of genotype kernels with dark color (C & *h*° values are low) were the lowest but the linolenic acid contents of them were the highest. 65/4', 'KR 2' and 'Şebin' genotypes were found to be very promising for fruit quality traits and fatty acid profiles in the eastern Mediterranean region of Turkey.

Key Words: Walnut; Subtropical conditions; Fruit quality; Fatty acid profiles

INTRODUCTION

Walnut (*Juglans regia* L.) is among the earliest cultivated fruit trees in the world and Turkey is one of the main genetic origins of walnut (Şen, 1986). Turkey's production of 177.298 t is 8% of the world's total production (FAO, 2009). Turkey has considerable walnut populations in its different ecological regions. This production is generally from seedling trees up to last ten years, but cultivation of promising walnut genotypes obtained from breeding researches are increased to fruit quality standard and quantity in walnut production in Turkey (Koyuncu *et al*., 2004).

In recent years, there is gradual increase of the importance of a healthy diet, nutritional composition and fruit quality because of increasingly aware of health-promoting components of foods by consumers (Dogan & Akgul, 2005). Nuts are a main source of unsaturated fatty acids, vitamin E, fiber, magnesium and potassium (Dreher *et al*., 1996). Among the nuts, which contain mostly mono-unsaturated fatty acids, walnuts are considerably rich in omega-6 and omega-3 polyunsaturated fatty acids (Amaral *et al*., 2003). These compounds are also favorable to human health, since they are able to act as protection by different ways such as regular consumption of them may supply some protection against coronary heart disease (Prineas *et al*., 1993; Hu *et al*., 1998), magnesium and potassium may regulate blood pressure (Elin, 1993) and they are believed to possess plasma cholesterol-lowering properties (Sabate *et al.,* 1993). Walnut kernels have mean 60% oil (Prasad, 1994) and this value can range from 52 to 70% depending on the cultivar, cultivation conditions, ecology, and irrigation regime. Nuts are high in mono-unsaturated fat (oleic acid) values whereas walnuts are also rich in two poly-unsaturated fatty acids such as linoleic and linolenic acids (Zwarts *et al*., 1999; Maguire *et al*., 2004).

Walnut is a fruit species well-adapted to the various ecological regions of Turkey. Walnut trees are widely distributed throughout Turkey in the valleys of big rivers and on the hillside. Very rich walnuts populations are found and many promising genotypes have been cultivated in various ecological region of Turkey (Muratoglu *et al*., 2010).

Some walnut genotypes which are very promising for cultivation have not been examined so far in terms of fruit quality and fatty acid composition in the subtropical climate of the Turkish Mediterranean Region. The objective of this study was to determine the fruit quality parameters and fatty acid composition of some important Turkish walnut genotypes.

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MATERIALS AND METHODS

The study was conducted on the walnut orchard in Yayladağı, Hatay, Turkey, during 2007-2009 years. Walnut orchard is located 35°55′N, 36°05′E and 421 m elevation. Hatay province has a typical Mediterranean climate; yearly mean temperatures are ranged between 8.2 and 27.7°C. The summer temperatures between June and September, fruit ripening period, are 29.2 and 31.9°C. Total precipitation is 1144 mm which primarily falls in winter and spring seasons (Table I). Total of eight genotypes, (5 out of 8 were standard cultivars, 'Şebin', 'Şen 1', 'Tokat1', 'Kaplan 86', 'KR2', and the rest were promising genotypes, 'Malatya1', '77H1', '65/4') were included in the study. These genotypes were budded onto seedling rootstocks, and planted at 7 x 7 m in 2000.

Pomological analyses: Fruits were harvested at their fully mature period in three replicates of 10 fruit in per replicate. Fruit weight (g), fruit width (mm), fruit length (mm), shell thickness (mm), kernel weight (g), kernel percentage (%) were measured. Fruit shape index, fruit shape, shell roughness, shell breaking and size were determined according to Turkish Standard Institute (TSE) 1275/T1 (Anonymous, 2010). Also, fruit shell and kernel colors were determined using a Color Meter CR-300. The L* value represents lightness (L* 0 for black, L* 100 for white), while a* scale represents the red/green dimension, with positive values for red and negative ones for green. The color values were measured on three different spots in each of two samples for fruit shell and two different spots each of three samples for kernel. The results were recorded as the mean of these measurements. Chroma $[(a^*2 + b^*2)^{1/2}]$ and hue angle $(\tan)^{-1}$ b*/a*) were also calculated.

Total fat content: Total fat analyses were extracted with Hexane in Soxhlet set. Total fat contents of samples were calculated according to the formula given by Akyuz and Kaya (1992):

Total fat (%) = (fat weight (g)/fruit weight (g) in cartridge) x 100.

Fatty acid analysis: The fatty acids methyl esters (FAMEs) of walnut oil were prepared according to AOCS method Ce 1b-89 using gas chromatography (AOCS, 1993). Approximately 30 mg lipid was added to into a screw tube and 1.5 mL of methanolic (0.5 M) NaOH was added and then boiled at 115°C for 7 min. After cooling, 2 mL of methanolic BF_3 (14%) was added and boiled for 5 min at the same temperature. FAMEs were extracted with 2 mL of iso-octane and kept in an amber vial at -20°C for further analysis. The samples were analyzed with Hewlett Packard 6890 GC-MS instrument equipped with a HP-Innowax PEG capillary column (HP 19091N-133). Injection and detector temperatures were set at 250°C and at 270°C respectively, with a split ratio of 1:50, split flow was maintained at 9.9 mL/min with a total flow of 13.9 mL/min. Helium was used as a carrier gas. Individual FAMEs were identified by Supelco 37 component FAME mix (47885U). Further confirmations of fatty acid methyl esters were also done by using MS data base library (FAMEDBWAX). A relative amount of each fatty acid methyl ester was expressed as a percentage of the total amount of FA in the analyzed sample. All analyses were carried out in three replicates.

Data analysis: The analysis of variance was constructed according to Steel and Torrie (1980) using SAS (2005). The percentage values were transformed (arcsin) to increase normality. The mean separations were analyzed by Tukey test at $p<0.05$.

RESULTS

Pomological analyses: Some fruit quality parameters of walnut genotypes were presented in Table II. Analyses of variance showed that there were statistically significant differences among the genotypes for all traits. 'Kaplan 86' had the highest fruit weight (22.2 g), followed by 'Malatya 1' (17.6 g) and '77H1' (17.0 g). The lowest fruit weight was observed on 'Tokat 1' (9.21 g). The average highest fruit width was 44.5 mm for 'Kaplan 86' and 42.6 mm for 'Malatya 1', while the lowest fruit width was 29.3 mm for 'Tokat 1'. For fruit length, the highest value was observed for 'Kaplan 86' (53.2 mm), while the lowest was for '65/4' (35.8 mm) and 'Tokat 1' (33.5 mm).

'Kaplan 86' (2.04 mm) had the highest shell thickness whereas 'Tokat 1' and 'Malatya 1' (1.61 & 1.60 mm, respectively) had the smallest shell thickness. 'Malatya 1' had the highest kernel weight (9.79 g), followed by 'Tokat 1' (5.78 g) and 'Şebin' (5.39 g). Kernel percentage values ranged from 36.7 ('Kaplan 86') to 62.8% ('Tokat 1').

Fruit shape and fruit shell characteristic: The fruit shape index (fruit length/width) of the genotypes ranged between 1.03-1.28, and the fruit shape was spherical for '77H1' and 'KR 2' and was oval for others (Table III). Shell roughness was smooth for 'Şebin', 'Malatya 1', 'Tokat 1' and 'KR 2', was medium for '77H1' and was rough for 'Kaplan 86', 'Şen 1', and '65/4'. 'Şebin', 'Malatya 1', 'Tokat1' and 'KR 2' were on ease of shell breaking, but '65/4' was difficult. The other genotypes were intermediate.

Fruit shell and kernel color measurements: Fruit skin L* value had the lightness value of 50.1 for 'KR 2' (Table IV). Fruit skin a* values indicating red color, was the highest for 'Kaplan 86' (7.59), while it was the lowest for 'Malatya 1', 'Şen 1', 'Tokat 1' and 'KR 2' (6.43, 6.26, 6.24 & 6.17, respectively). The maximum hue angle value (h^o, the higher values are the clearer) was found from 'Malatya 1' (74.55). Chroma values (C, the lower values are more density) were found highest for '65/4' (21.16), 'Tokat 1' (20.77), 'Şen 1' (20.3), and 'Şebin' (20.21) genotypes. The kernel L* value was the lightest for 'Şebin' (41.6). The kernel a* values indicating red color, had the highest for 'Kaplan 86' (10.97). C and h^o values had the highest for '77H1' (31.0 & 29.0, respectively).

Table I: Meteorological data of Hatay province, in the subtropical climate of the eastern Mediterranean region of Turkey (mean of 1975-2010 years)

Month	Minimum temperature (°C)	Maximum temperature (°C)	Mean temperature (°C)	Total rainfall (mm)
January	4.5	12.3	8.2	182.8
February	5.5	14.5	9.8	164.1
March	8.5	14.8	13.2	141.9
April	12.2	22.7	17.2	102.7
May	16.3	26.5	21.2	92.9
June	20.8	29.2	24.8	20.4
July	23.8	31.2	27.2	24.8
August	24.5	31.9	27.7	5.9
September	21.1	31.1	25.5	42.1
October	15.4	27.6	20.8	77.5
November	9.3	20.1	14.0	115.2
December	5.9	13.9	9.6	173.7

Table II: Pomological traits of some important Turkish walnut genotypes in the subtropical climate of the eastern Mediterranean Region of Turkey in 2009

Genotype	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Shell thick.(mm)	Kernel weight (g)	Kernel percentage (%)
Kaplan 86	22.23±0.93 a	44.50±0.48 a	53.22±0.34 a	2.04±0.06 a	8.16±0.34 ab	36.69±0.45 e
Malatya 1	17.63±0.98 b	42.64±0.32 a	44.10±0.95 bc	1.60±0.07 c	9.79±0.31 a	55.75±1.99 ac
Şebin	10.66±0.89 cd	31.26±0.30 de	36.99±1.43 cd	1.85±0.11ac	5.39±0.12 d	51.13±3.90 cd
Şen 1	14.19±0.62 bc	36.86±0.61 b	38.20 ±0.64 cd	1.71±0.06 bc	7.76±0.72 b	54.55±3.47 ac
Tokat 1	9.21±0.41 d	29.32±0.08 e	33.52±0.44 d	1.61± 0.00 c	5.78±0.23 cd	62.84± 0.53 a
KR2	14.31±0.28 bc	35.28±1.42 bc	44.87±4.02 bc	1.70±0.05 bc	7.40±0.10 bc	51.75±1.09 bd
77H1	17.03±0.96 b	37.11±0.15 b	46.54±0.28 ab	1.94±0.05 ab	7.13±0.39 bc	41.97±1.65 de
65/4	12.84±0.61 cd	33.18±0.31 cd	35.83±1.14 d	1.69±0.00 bc	7.96±0.21 b	62.11±1.36 ab
$HSD_{0.05}$	3.68	3.13	7.98	0.29	1.74	10.59

Table III: Fruit quality traits of some important Turkish walnut genotypes in the subtropical climate of the eastern Mediterranean Region of Turkey in 2009

Genotype	Fruit Shape Index	Fruit Shape	Shell roughness	Shell breaking	Size[1]
Kaplan 86	1.20	Oval	Rough	Intermediate	Extra
Malatya 1	1.03	Oval	Smooth	Ease	Extra
Şebin	1.18	Oval	Smooth	Ease	Extra
Şen 1	1.04	Oval	Rough	Intermediate	Extra
Tokat 1	1.14	Oval	Smooth	Ease	Extra
KR2	1.28	Spherical	Smooth	Ease	Extra
77H1	1.25	Spherical	Medium	Intermediate	Extra
65/4	1.08	Oval	Rough	Difficult	Extra

[1]: Size groups were evaluated according to TSE 1275/ T1

Fatty acid composition: The fatty acid composition of studied walnut genotypes were showed in Table V. According to mean of three years, total fat contents of genotypes ranged between 53.58 and 56.99%. In Turkish walnut genotypes, the main fatty acids were linoleic, oleic, linolenic, palmitic and stearic acids, respectively. The polyunsaturated fatty acid (PUFA) values (linoleic+linolenic acid) of the total fatty acids ranged between 51.64 and 69.87%.

Total fat contents were not significantly different between genotypes and years, whereas fatty acid profiles were significantly different among the genotypes. Palmitic, stearic and linolenic acids were found highest values in 2007. Oleic acid was higher in 2008, while linoleic acid was higher in 2009 (Table V).

Palmitic acid values ranged from 6.98 ('Malatya 1') to 8.77% ('77H1'). Oleic acids of '65/4' (36.76%), 'KR2' (34.03%) and 'Şebin' (34.01%) had the highest, whereas 'Tokat 1' and 'Malatya 1' had the lowest (21.09 & 19.33%, respectively). Linoleic acid changed between 41.55 ('65/4') and 59.89% ('Malatya 1') Linolenic acid values of 'Tokat 1'and '65/4' genotypes had the highest (11.0 & 10.10%, respectively), while 'Şebin' had the lowest linolenic acid (8.44%). 'Kaplan 86' (4.49%) had the highest stearic acid content and followed by '65/4' (4.11%). 'Malatya 1' had the lowest steraic acid content (3.22%). Total fat values were not significant in walnut genotypes.

DISCUSSION

Turkey is one of the most important walnut producing countries in the world. In Turkey, walnut is very common in traditional Turkish foods. There are numerous walnut genotypes in terms of size, shape, kernel percentage, ripening time in different ecological conditions of Turkey. In selection studies on these walnut diversity enables to find potentially promising walnut cultivars ('Şebin', 'Şen 1', 'Tokat1', 'Kaplan 86', 'KR2') and genotypes

Table IV: Fruit shell and kernel color traits of some important Turkish walnut genotypes in the subtropical climate of the eastern Mediterranean Region of Turkey in 2009 year

Genotype	Fruit Shell Color				Fruit Kernel Color			
	L	a	C	*h°*	L	a	C	*h°*
Kaplan 86	51.97±1.17 b	7.59±0.23 a	22.55±0.27 ab	70.31±0.44 d	28.15±1.77 b	10.97±0.39 a	22.71±1.15 ab	60.15±1.76 ac
Malatya 1	55.22±0.87 ab	6.43±0.22 b	24.35±1.12 a	74.55±0.25 a	31.49±2.10 ab	10.33±0.59 ab	26.67±2.59 ab	65.70±2.13ab
Şebin	53.47±0.97 b	6.65±0.28 ab	20.21±0.86 b	70.90±0,34 cd	41.61±2.75 a	9.74±0.88 ab	27.73±1.00 ab	69.09±2.50 a
Şen 1	54.17±0.83 ab	6.26±0.13 b	20.28±0.29 b	71.95±0,53 bd	27.61±4.12 b	9.66±1.20 ab	19.15±3.81 ab	55.02±4.22 bc
Tokat 1	53.89±1.16 ab	6.24±0.12 b	20.77±0.08 b	72.52±0.41 bc	29.46±0.50 b	10.47±0.49 ab	18.03±1.56 b	53.37±1.60 c
KR2	59.10±1.93 a	6.17±0.28 b	21.80±0.58 ab	醋F57±0.41	29.83±0.77 b	8.78±0.54 b	22.66±4.64 ab	61.99±2.01 ac
77H1	55.88±0.32 ab	6.82±0.13 ab	23.18±0.81 ab	72.87±0.26 ab	37.04±1.43 ab	10.77±0.31 a	30.99±0.71 a	69.56±0.75 a
65/4	51.76±0.67 b	6.95±0.10 ab	21.16±0.21 b	70.75±0.46 cd	33.25±2.27 ab	9.74±0.42 ab	20.76±0.64 ab	61.43±2.73 ac
$HSD_{0.05}$	5.30	0.98	3.09	1.95	10.97	1.90	12.10	11.78

Table V: Fatty acid composition of some important Turkish walnut genotypes in the subtropical climate of the eastern Mediterranean Region of Turkey (%)

Variable	Palmitic Acid	Oleic acid	Linoleic Acid	Linolenic Acid	Stearic Acid	Total Fat	PUFA
Year							
2007	8.65±0.14 a	26.38±1.24 b	48.41±1.18 b	11.98±0.29 a	4.42±0.21 a	56.99±1.43	60.39±1.53
2008	7.66±0.23 b	29.16±1.79 a	49.21±1.47 b	9.48±0.36 b	4.15±0.09 a	53.87±1.28	58.69±1.85
2009	5.98±0.16 c	28.15±1.63 ab	54.93±1.64 a	8.04±0.24 c	2.86±0.06 b	53.57±1.62	62.97±1.11
Genotype							
Kaplan 86	7.21±0.33 b	28.01±1.13 b	50.31±1.77 de	9.75±0.54 ab	4.49±0.60 a	56.31±1.00	60.06±2.97
Malatya 1	6.98±0.50 b	19.33±0.74 d	59.89±1.85 a	9.97±0.72 ab	3.22±0.18 c	51.73±3.44	69.87±2.02
Şebin	7.13±0.37 b	34.01±2.36 a	46.55±2.48 ef	8.44±0.64 b	3.82±0.25 abc	56.77±2.20	55.00±2.42
Şen 1	7.24±0.53 b	27.49±1.76 bc	51.52±1.37 cd	9.96±0.80 ab	3.72±0.20 abc	54.67±1.56	61.47±1.50
Tokat 1	7.70±0.55 b	21.09±0.73 d	56.45±1.80 ab	11.00±0.71 a	3.67±0.25 bc	55.22±0.88	67.45±2.51
KR 2	7.28±0.50 b	34.03±2.15 a	45.30±1.88 fg	9.66±0.73 ab	3.73 ±0.19 abc	55.79±2.47	54.97±2.91
77H1	8.77±0.41 a	22.45±1.22 cd	55.23±0.57 bc	9.79±0.77 ab	3.74±0.25 abc	53.00±1.60	65.01±1.448
65/4	7.14±0.40 b	36.76±0.77 a	41.55±0.93 g	10.10±0.90 a	4.11±0.33 ab	54.96±4.23	51.64±2.80
HSD_{year}	0.46	2.39	2.12	0.76	0.38	ns[1]	
$HSD_{genotype}$	0.98	5.13	4.55	1.63	0.81	ns	
$HSD_{yearxgenotype}$	ns	2.61	2.06	1.19	0.52	ns	

[1]: Not significant

('Malatya1', '77H1', '65/4'). Determination of fruit quality traits and fatty acid compositions of these Turkish walnut cultivars and genotypes are very important for commercial culturing and oil industry.

About 17% of total walnut production of Turkey is produced in the Mediterranean region. Turkish Mediterranean region has a typical subtropical climate. In this region, walnut cultivation has been intensified on the plateaus in the mountains near the Mediterranean Sea. Under these ecological conditions, more economic production could be possible comparing to the other parts of Turkey. Especially, late spring frosts in central and eastern Anatolia regions can damage walnut plants. This study showed that, ecological conditions of the Mediterranean region could enhance fruit quality parameters of walnut genotypes According to Turkish walnut standards, walnut genotypes with kernel weight >5 g and kernel percentage >50% are accepted as very good quality. These values were very considerable for all genotypes except for 'Kaplan 86' and '77H1'. Also, data of fruit weight was similar to results on obtained from 40 walnut genotypes by Asadian and Pieber (2005).

'Oval' for fruit shape and 'smooth' for shell is preferred in walnut tradition. In this regard 6 of them were oval. Three out of these 6 genotypes had both smooth and ease of shell breaking. According to Turkish walnut standards a fruit size above 29.10 mm is classified extra. All of the studied genotypes were classified in this group. 'Kaplan 86', '77H1' and 'Malatya 1' genotypes had the shell and kernel with high a* values. The light kernel color is one of the important criteria for walnut quality. Genotypes were usually light kernel color except for 'Tokat 1'. 'Şebin' and 'KR 2' genotypes with high *h°* value had the highest oleic acid. Oleic acid contents of genotype kernels with dark color (C and *h°* values are low) were the lowest but the linolenic acid contents of them were the highest.

In this research, total fat was not significantly different among genotypes and years, whereas fatty acid profiles significantly affected by genotypes and years. Zwarts *et al*. (2003) estimated that fatty acid values of some walnut cultivar did not affect significantly by years and these cultivars may be less affected by ecological conditions. However, McNeil *et al*. (1994) showed that some walnut cultivars have a different taste from year to year. Walnuts are a rich source of PUFA and among these fatty acids, linolenic acid, which has been regarded as beneficial for health (Amaral *et al*., 2003). The PUFA data are parallel to the results of Zwartz *et al*. (1999) and Amaral *et al*. (2003).

In Turkish walnut genotypes, different fatty acids' ranges were: palmitic acid 6.98 to 8.77%, oleic acid 19.33 to 36.76%, linoleic acid 41.55 to 59.89%, linolenic acid 8.44 to 11.0%, and steraic acid 3.22 to 4.99. Our results concerning palmitic acid were similar to the results obtained from walnut cultivars (Zwartz *et al*., 1999) and local genotypes (Çaglarırmak, 2003) but higher than those of Ozcan *et al.* (2010). Oleic acid values were found higher than those of Zwartz *et al*. (1999), Çaglarırmak (2003) and Ozcan *et al*. (2010). Linoleic acid and linolenic acid contents were in agreement to the results of Zwartz *et al*. (1999) but higher than those reported by Çaglarırmak (2003). Steraic acid values were higher than those of Zwartz *et al*. (1999) and Ozcan *et al*. (2010) but lower than those of Çaglarırmak (2003). The results of walnut genotypes showed differences between the fatty acid compositions reported earlier on. These differences can be a result of the genetic structure of genotypes, ecological conditions and cultural practices (Beyhan *et al*., 1995). Therefore, the adaptation studies of walnut genotypes in different regions are an important criterion for identification of fatty acid compositions.

The walnut genotypes with high fatty acid, especially linoleic and linolenic acids, have beneficial effects on human health especially for cardio vascular system (Sabate *et al.,* 1993; Abbey *et al*., 1994). Also, Chisholm *et al.* (1998) determined that fatty acid profile of the major lipid fractions showed changes, which might be expected to reduce risk of cardiovascular disease.

The ratios of oleic, linoleic and linolenic acids to each other are important to the economic and nutritional value of the nut. Oils with lower linoleic and linolenic acid values may have a longer shelf life and monounsaturated fatty acids may be more desirable fatty components because of their potential health benefits (Sabate *et al*., 1993; Abbey *et a*l., 1994). Also, walnut genotypes with high polyunsaturated fatty acid level have higher tendency to preserve snack foods (Gunstone & Norris, 1983). Therefore, 'Malatya 1' and 'Tokat' cultivars which has high linoleic and linolenic acid values may have shorter shelf life.

The variation in fatty acid profiles of the genotypes can be used for the health product. If the walnut kernel were designed for a cholesterol control diet, kernel should contain high amounts of oleic acid (Zwartz *et al*., 1999).

The high summer temperatures over 38ºC that occur during fruit ripening period, between June and September, can be sun damage on walnut fruits. These damages would change the fatty acid compositions in kernels, and would reduce the quality of health care of fruit. According to meteorological data, summer temperatures do not cause the sun damage on walnut fruit in hillsides of mountains and plateaus of the eastern Mediterranean region of Turkey.

In walnut orchard, plants can be planted with pollinators which are similar of fatty acid composition for economical fruit set. These walnut genotypes can be used for the specific culturing (McNeil & Smith, 1993; Zwartz *et al*., 1999). According to our results, '65/4', 'KR 2' and 'Şebin' genotypes with similar fatty acid profiles were promising in the eastern Mediterranean region of Turkey.

The results presented here are the first data on the fruit quality parameters and fatty acid composition of important Turkish walnut genotypes grown in the eastern Mediterranean region. This study indicated that considerable variation exists in fatty acid composition of walnut cultivar and genotypes in eastern Mediterranean region. Variable palmitic acid, oleic acid, linoleic acid, linolenic acid, and steraic acid contents were growing season and genotypes-dependent. Walnut genotypes with light kernel color had the highest oleic acid values. Genotypes with the dark kernel color had the lowest oleic acid whereas it had the highest linolenic acid. As a result, 65/4', 'KR 2' and 'Şebin' genotypes would be choice for fruit quality traits and fatty acid profiles in the eastern Mediterranean region of Turkey.

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