

NOTE**Analysis of Oil Composition of Native Almonds from Turkey**

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Native almond genotypes contained 43.5-62.4 % oil, 5.61-16.48 % palmitic acid, 0.32-0.69 % palmitoleic acid, 1.23-3.89 % stearic acid, 68.99-81.71 % oleic acid, 7.70-21.65 % linoleic acid, 0.08-0.21 % linolenic acid and 0.22-0.91 % myristic acid. In addition, they had 78.74-92.97 % unsaturated fatty acid content, 7.03-21.28 % saturated fatty acid content and 3.7-13.2 unsaturated fatty acid/saturated fatty acid ratio.

Key Words: Native almond, Oil, Fatty acids.

Today almond is one of the most valuable nut crops due to nutritional value. Almond production in the world increases in response to consumer awareness about their health¹. Almond kernels contain ω -3 polyunsaturated fatty acids that reduce heart disease, rheumatoid arthritis, autoimmune disease and cancer² and plays a major role for human nutrition, diet and health³⁻⁶. Therefore, research findings related to fatty acid composition (FAC) in almonds increasingly gain value. The objective of this paper is to identify kernel FAC of native almonds from Turkey.

The material of this research constituted kernels of 13 almond [*Prunus dulcis* (Miller) D.A. Webb.] genotypes from Tunceli (eastern Turkey). After fruits of almond were harvested, they were removed from their shells and dried in a vacuum oven at 60 °C for three days. Fat contents (ether-extractable) of samples were determined according to standard AOAC⁷ procedure. For the preparation of the fatty acid methyl esters (FAME) 0.4 g oil were dissolved in 4 mL of isooctane and methylated in 0.2 mL 2 M methanolic KOH. Analysis of FAME was performed on an Agilent 6890 series gas-chromatography equipped with flame-ionization detector and a 60 m capillary column (ID = 0.25 mm) coated with 0.25 μ m of 50 %-cyanopropyl-methylpoly-siloxane (J&W Scientific, Folsom, CA, USA). Helium was used as a carrier gas at a flow rate of 1.5 mL/min and a split ratio of 1:10. Injector temperature was 250 °C, detector temperature was 260 °C and the oven temperature was programmed at 120 °C for a hold of 5 min and increased to 240 °C at a rate of 15 °C/min and hold at the

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final temperature for 20 min⁸. Fatty acid methyl esters were identified by comparison of their retention time and equivalent chain length with respect to standard FAMES (Supelco. 47885-U). Fatty acid methyl esters in samples were quantified according to their percentage area⁷. All the samples were analyzed in triplicate.

Kernel moisture was between 0.60 and 3.80 %. Ranging from 43.5 to 62.4 %, oil content was 53.41 %. Kernels of almond genotypes contained 78.74-92.97 % unsaturated fatty acids (oleic acid, linoleic acid, linolenic acid and palmitoleic acid) and 7.03-21.28 % saturated fatty acids (palmitic acid, stearic acid and myristic acid). The ratio of unsaturated fatty acids/saturated fatty acids was recorded between 3.7 and 13.2. In addition, the mean values of unsaturated fatty acids and saturated fatty acids were 90.60 and 9.38 %, respectively. The mean value of ratio of unsaturated fatty acids/saturated fatty acids was computed as 9.6 (Table-1).

TABLE-1
VALUES OF KERNEL MOISTURE, FAT CONTENT, SATURATED AND
UNSATURATED FATTY ACIDS OF NATIVE ALMOND GENOTYPES FROM TURKEY

Almond genotypes	Kernel moisture (% dry after)	Oil content (% dry matter)	Unsaturated fatty acids (%)	Saturated fatty acids (%)	Unsaturated/Saturated
AL1	0.60	62.40	91.64	8.35	10.9
AL2	1.00	50.50	91.18	8.83	10.3
AL3	1.40	51.50	91.13	8.69	10.4
AL4	1.20	50.80	91.49	8.49	10.7
AL5	1.60	42.70	91.44	8.56	10.6
AL6	1.60	53.60	92.25	7.75	11.9
AL7	3.80	54.70	92.97	7.03	13.2
AL8	1.40	59.90	91.83	8.17	11.2
AL9	1.20	58.40	91.56	8.44	10.8
AL10	0.80	56.50	91.08	8.80	10.3
AL11	1.60	54.00	91.33	8.67	10.5
AL12	1.40	43.50	78.74	21.28	3.7
AL13	1.60	55.80	91.11	8.89	10.2
Mean	1.48	53.41	90.60	9.38	9.6

On the other hand, almond kernels contained 5.61-16.48 % palmitic acid, 0.32-0.69 % palmitoleic acid, 1.23-3.89 % stearic acid, 68.99-81.71 % oleic acid, 7.70-21.65 % linoleic acid, 0.08-0.21 % linolenic acid and 0.22-0.91 % myristic acid. The mean values of palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, linolenic acid and myristic acid were 7.24, 0.55, 1.93, 72.60, 17.39, 0.11 and 0.47 %, respectively (Table-2).

Oil contents were reported as 52-57 % by Agar *et al.*⁹, 52-56 % by Barbera *et al.*¹⁰ and 30.1-51.0 % by Martins *et al.*¹¹. Although oil contents were similar to the related references, some genotypes contained higher oil than those of Agar *et al.*⁹, Barbera *et al.*¹⁰ and Martins *et al.*¹¹.

TABLE-2
FATTY ACID CONTENTS OF NATIVE ALMOND GENOTYPES FROM TURKEY

Almond genotypes	Palmitic acid (%)	Palmitoleic acid (%)	Stearic acid (%)	Oleic acid (%)	Linoleic acid (%)	Linolenic acid (%)	Myristic acid (%)
	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	C14:0
AL1	5.98	0.48	1.94	73.44	17.64	0.08	0.43
AL2	7.33	0.51	1.50	71.63	18.97	0.07	–
AL3	5.91	0.32	2.78	73.32	17.49	–	–
AL4	6.12	0.61	1.76	70.27	20.61	–	0.61
AL5	6.49	0.69	1.69	71.23	19.44	0.08	0.38
AL6	6.17	0.63	1.58	75.66	15.81	0.15	–
AL7	5.61	0.53	1.42	81.71	10.73	–	–
AL8	5.96	0.45	2.21	74.27	17.02	0.09	–
AL9	6.70	0.56	1.74	70.23	20.77	–	–
AL10	7.08	0.44	1.72	68.99	21.65	–	–
AL11	6.88	0.55	1.57	72.38	18.40	–	0.22
AL12	16.48	0.67	3.89	70.16	7.70	0.21	0.91
AL13	7.39	0.69	1.23	70.54	19.80	0.08	0.27
Mean	7.24	0.55	1.93	72.60	17.39	0.11	0.47

It is reported that 8 almond cultivars from 12 different California counties contained 5.07-6.78 % palmitic acid, 57.54-73.94 % oleic acid, 19.32-35.18 % linoleic acid and 0.04-0.10 % linolenic acid, Sahte *et al.*¹² indicated that fatty acid composition was significantly influenced by cultivar and county statistically. Gradziel *et al.*¹³ reported 5.0-6.4 % palmitic acid, 64.7-76.0 % oleic acid and 16.3-26.9 % linoleic acid contents for almond varieties. Martins *et al.*¹¹ determined 2.15-3.13 % stearic acid, 5.94-7.31 % palmitic acid, 17.52-29.89 % linoleic acid and 58.96-69.68 % oleic acid contents for 12 almond varieties.

In this study, some genotypes had higher oleic acid content, on the contrary lower linoleic acid content than some other almond varieties or genotypes.

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