jotaf
Journal of Tekirdag Agricultural Faculty
Tekirdağ Ziraat Fakültesi Dergisi

Aralık/December 2023, 20(4)
Başvuru/Received: 15/06/22
Kabul/Accepted: 04/02/23
DOI: 10.33462/jotaf.1129845

http://dergipark.gov.tr/jotaf
http://jotaf.nku.edu.tr/

ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Determination of Oil Quality Factors and Fatty Acid Compositions of Some Peanut Varieties

Bazı Yerfıstığı Çeşitlerinin Yağ Kalitesi Özellikleri ve Yağ Asidi Bileşimlerinin Belirlenmesi

Mustafa YILMAZ[1*], Cenk Burak SAHIN[2], Resat YILDIZ[3], Necmi ISLER[4]

Abstract

The aim of this study was to determine the oil properties and fatty acid compositions of peanut cultivars (*Arachis hypogaea* L.) grown as the main crop in the Eastern Mediterranean transition zone of Turkey. The field experiment was conducted at the Oil Seed Research Institute experiment area in the main crop seasons of 2018 and 2019. The experiment was designed according to the randomized complete block design (RCBD) with three replications. Oil ratio, saturated fatty acids (palmitic acid, stearic acid), unsaturated fatty acids (oleic acid, linoleic acid), iodine value, and oleic/linoleic acid ratios were investigated in the experiment. Runner (Georgia Green), Spanish (Florispan), and Virginia market types (Sultan, Brantley, BATEM-Cihangir, BATEM-5025, Arioglu-2003, Halisbey, NC-7, Flower-22, Wilson, NC-V-11, Com, Osmaniye-2005, Gazipasa) varieties were used as plant materials. As a result of this study, NC-V-11 (52.23%) cultivar with the highest oil content was determined, followed by Florispan (52.16%), Brantley (52.10%), and Gerogia Green (51.54%). The lowest oil content was obtained from BATEM-Cihangir (44.57%) variety. Brantley variety was found to have the least palmitic acid ratio with 8.04%, while Florispan variety was found the highest with 12.24%. In terms of stearic acid ratios, the lowest value (1.38%) was determined in Com variety, while the highest value (2.91%) was found in Brantley variety. Brantley variety was found to have the highest oleic acid content (71.83%), which is one of the unsaturated fatty acids. Florispan variety had the lowest oleic acid content (43.70%). While Brantley variety had the lowest linoleic acid ratio (9.78%), it was determined that Com variety had the highest linoleic acid ratio (35.77%). The iodine value varied between 78.71-100.71, the lowest value was in Brantley and the highest value was in Com. The oleic acid/linoleic acid ratio was determined to vary between 1.22 and 7.35, the lowest value was in Florispan and the highest value was in Brantley. As a result of the research, it was determined that the variety with the highest oleic acid ratio in the Eastern Mediterranean Transition Zone was Brantley. Peanuts with high oleic acid content are preferred by producers and consumers because they have good quality and extend the shelf life of products producing with them.

Keywords: *Arachis hypogaea* L., Fatty acid compositions, Iodine value, Oil content, Oleic/Linoleic acid ratio

[1]***Sorumlu Yazar/Corresponding Author:** Mustafa Yilmaz, Oil Seed Research Institute. Merkez, Osmaniye. E-mail: mustafayilmaz80@hotmail.com OrcID: 0000-0002-1816-0729

[2]Cenk Burak Sahin, Hatay Mustafa Kemal University, Antakya, Hatay. E-mail: cbsahin@mku.edu.tr OrcID: 0000-0001-6270-8184

[3]Resat Yildiz, Oil Seed Research Institute. Merkez, Osmaniye. E-mail: resat.yildiz@tarimorman.gov.tr OrcID: 0000-0002-4990-7311

[4]Necmi Isler, Hatay Mustafa Kemal University. Antakya, Hatay. E-mail: nisler@mku.edu.tr OrcID: 0000-0001-5877-7830

Atıf/Citation: Yilmaz, M., Sahin, C. B., Yildiz, R., Isler, N. (2023). Determination of oil quality factors and fatty acid compositions of some peanut varieties. *Journal of Tekirdag Agricultural Faculty*, 20(4): 755-764.

Öz

Bu çalışmanın amacı, Türkiye'nin Doğu Akdeniz geçit kuşağında ana ürün olarak yetiştirilen yerfıstığı çeşitlerinin (*Arachis hypogaea* L.) yağ özellikleri ve yağ asidi kompozisyonlarını belirlemek için yapılmıştır. Tarla denemeleri Yağlı Tohumlar Araştırma Enstitüsü deneme lokasyonunda 2018 ve 2019 yıllarının ana ürün sezonlarında yapılmıştır. Deneme tesadüf blokları deneme desenine göre (RCBD) üç tekerrürlü olarak tasarlanmıştır. Denemede yağ oranı, doymuş yağ asitleri (palmitik asit, stearik asit), doymamış yağ asitleri (oleik asit, linoleik asit), iyot değeri ve oleik/linoleik asit oranları incelenmiştir. Runner (Georgia Green), Spanish (Florispan) ve Virginia pazar tipleri (Sultan, Brantley, BATEM-Cihangir, BATEM-5025, Arıoğlu-2003, Halisbey, NC-7, Flower-22, Wilson, NC-V-11, Çom, Osmaniye-2005, Gazipaşa) olmak üzere 15 yerfıstığı çeşidi bitkisel materyal olarak kullanılmıştır. Bu çalışmanın sonucunda, en yüksek yağ içeriği NC-V-11 (%52,23) çeşidi tespit edilmiş olup, bunu sırasıyla Florispan (%52,16), Brantley (%52,10) ve Gerogia Green (%51.54) çeşitleri takip etmiştir. En düşük yağ içeriği ise (%44.57) BATEM-Cihangir çeşidinden elde edilmiştir. En düşük palmitik asit oranı %8.04 ile Brantley çeşidinde bulunurken, en yüksek ise %12.24 ile Florispan çeşidinde bulunmuştur. Stearik asit bakımından en düşük değer (%1.38) Çom çeşidinde bulunurken, en yüksek değer (%2.91) Brantley çeşidinde bulunmuştur. Doymamış yağ asitlerinden olan oleik asit içeriği en yüksek Brantley çeşidinde (%71.83) bulunmuştur. Florispan çeşidi ise en düşük oleik asit içeriğine (%43.70) sahip olmuştur. Linoleik asit oranı en az (%9.78) Brantley çeşidinde bulunurken, en fazla (%35.77) Çom çeşidinde olduğu tespit edilmiştir. İyot değeri 78.71 (Brantley) ile 100.71 (Çom) arasında değişirken; oleik asit/linoleik asit oranı %1.22 (Florispan) ile %7.35 (Brantley) arasında değiştiği belirlenmiştir. Yapılan araştırma sonucunda Doğu Akdeniz Geçit Kuşağında en yüksek oleik asit oranına sahip çeşidin Brantley olduğu tespit edilmiştir. Yüksek oleik asit oranına sahip yerfıstıkları kaliteli olmaları ve kullanıldığı ürünlerde raf ömrünü uzattığı için üretici ve tüketiciler tarafından tercih edilmektedir.

Anahtar Kelimeler: *Arachis hypogaea* L., Yağ asidi, İyot değeri, Yağ içeriği, Oleik/Linoleic asit oranı

1. Introduction

Groundnut (*Arachis hypogaea* L.), named peanut, is an unusual plant for the reason that it flowers above ground and pods containing one to five seeds are produced underground (Fabra et al., 2010). Peanut is a member of the family *Fabaceae*, and genus *Arachis* which has been categorized into the two subspecies *hypogaea* and *fastigiata*. Peanut is an important oil crop and used in both human and animal nutrition because of its protein, minerals (P, Ca, Mg, Mn, K), and carbohydrate contents (Onemli, 2005; Onemli, 2012; Awal and Aktar, 2015; Arioglu et al., 2016).

Peanut seeds contain approximately 45-55% oil and 25-30% protein depending on market types, years, and other conditions (Bakal and Arioglu, 2019). There are four market types of peanut like Virginia, Spanish, Valencia, and Runner. Every market type has its own nutritional composition, pod size, and flavor pod size (Zhao et al., 2017; Karabulut and Tuncturk, 2019). The fatty acid combination of peanut plays a prominent role in defining the shelf life, nutrition, and flavor of peanut. High oleic acid content provides an extended shelf life for peanut-derived products in food applications (Onemli, 2012; Yol and Uzun, 2018; Ozluoymak and Guzel, 2020). Even though eight grand fatty acids are present in peanuts four stearic, palmitic, oleic, and linoleic acids carve out approximately 90% of total peanut triacylglycerols (Hassan and Ahmed, 2012). Peanut oil is composed of 80% unsaturated fatty acids (oleic acid (|C18:1|) and linoleic acid (|C18:2|)). The rest of the fatty acids are saturated fatty acids (palmitic acid (|C16:0|), stearic acid (|C16:0| etc.) (Shin et al., 2010; Yasli et al., 2020; Yilmaz et al, 2022).

The property of high oleic to linoleic acid ratio (O/L) could provide the consumer with a significant health benefit and has the potential to greatly advance the marketability of peanuts. The nutritional quality of the seeds is violently impressed by the place of production, the variety, and the season, in particular, the soil moisture and temperature during plant growth and seed maturation (Hassan and Ahmed, 2012; Arioglu et al., 2016). A loud ratio of oleic acid to linoleic acid (O/L) in peanut (>10:1) results in an extended shelf-life (up to 10 times) and an advanced flavor compared to a normal O/L ratio (1.5:1). Moreover, the iodine value (IV) was used to specify the fatty acid content and stability of peanut oil. A high O/L ratio and a low iodine rate normally remark fine stability and long shelf life (Gali et al., 2021).

The World produced about 48.7 million tonnes of peanut in 29.5 million ha area in 2019. The top producers are China, India, Nigeria, Sudan, and the USA (Anonymous, 2022a). In 2019, the Republic of Turkey produced about 170 thousand tonnes of peanut in 42.2 thousand ha area. Adana and Osmaniye, located in the Mediterranean region, were the top producer provinces at about 90% (Anonymous, 2022b). In 2019, shelled peanut were one the most considerable market products in the Earth which has 3 billion USD in import and 2.8 billion USD in export values. The importers were the Netherlands, Indonesia, the UK, Mexico, and Canada while the top five exporters were India, China, the USA, Argentina, and Netherlands (Anonymous, 2022a).

Onemli (2012) and Bakal and Arioglu (2019) reported that the fatty acid composition and oil content of peanut were influenced by genotypic variation, market type, growing conditions, and maturity. Stearic, palmitic, oleic, and linoleic acids constitute virtually 90% of total peanut fatty acids. Higher temperatures during seed development concluded greater oleic contents while lower temperatures post-anthesis caused higher linoleic acid (Yol et al., 2018). Gali et al. (2021) indicated that higher temperatures over the last four weeks before harvest resulted in higher oil and oleic acid ingredients and according to higher O/L ratios.

The study aimed to state oil content, unsaturated and saturated fatty acids composition, and oil quality (O/L and IV) of some peanut varieties growing main crop season in the Mediterranean region in Turkey.

2. Materials and Methods

2.1. Materials

Georgia Green, Sultan, Brantley, BATEM-Cihangir, BATEM-5025, Arioglu-2003, Halisbey, NC-7, Florispan, Flower-22, Wilson, NC-V-11, Com, Osmaniye-2005, and Gazipasa were used as plant material in the present study (*Table 1*).

Table 1. Some characteristics of peanut varieties*

Varieties	Growing Type	Market Type	Origin
Florispan	Erect	Spanish	USA
BATEM-Cihangir	Semi-erect	Virginia	Turkey
Georgia Green	Spreading	Runner	USA
Sultan	Semi-spreading	Virginia	Turkey
Brantley	Semi-spreading	Virginia	USA
BATEM-5025	Semi-spreading	Virginia	Turkey
Arioglu-2003	Semi-spreading	Virginia	Turkey
Halisbey	Semi-spreading	Virginia	Turkey
NC-7	Semi-spreading	Virginia	USA
Flower-22	Semi-spreading	Virginia	China
Wilson	Semi-spreading	Virginia	USA
NC-V-11	Semi-spreading	Virginia	USA
Com	Semi-spreading	Virginia	Turkey
Osmaniye-2005	Semi-spreading	Virginia	Turkey
Gazipasa	Semi-spreading	Virginia	Turkey

*Asik et al. (2018)

The study was carried out over the experimental fields of Oil Seed Research Institute (37°03′41” N, 36°06′79” E; 50 m) in Turkey during the main growing seasons of 2018 and 2019 (*Figure 1*).

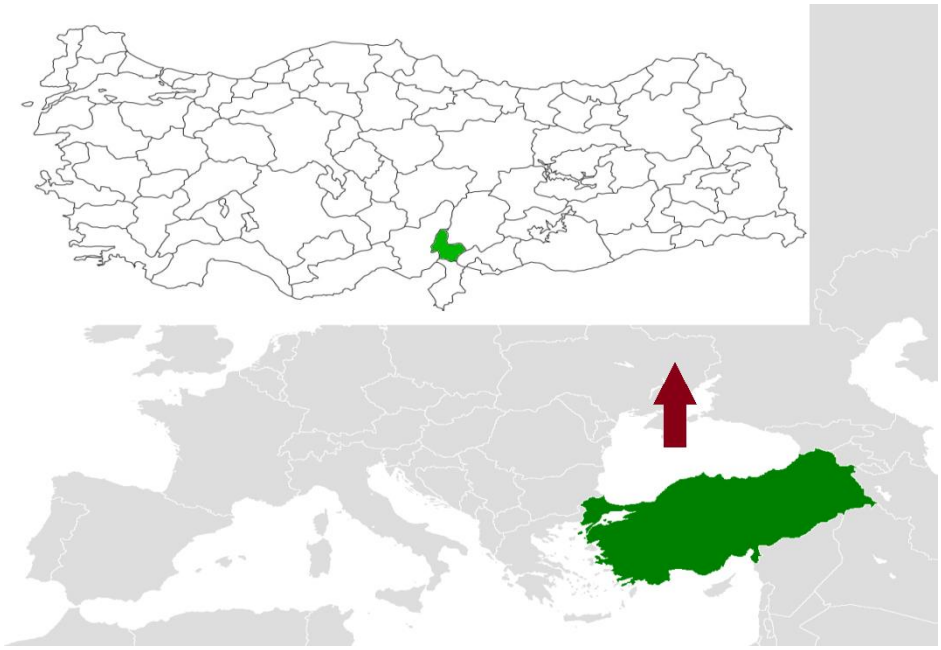

Figure 1. Map of the experimental area (Osmaniye, Turkey)

Table 2. Climate parameters of the research field (2018, 2019, and long-year average)

Months	Precipitation (mm)			Temperature (°C)			Relative Humidity (%)		
	LY	2018	2019	LY	2018	2019	LY	2018	2019
April	79.9	41.2	46.7	17.1	18.9	16.3	63.6	62.6	69.8
May	69.4	65.9	2.4	21.2	23.1	23.3	62.7	65.7	56.6
June	42.2	111.2	73.4	25.2	25.1	26.0	62.0	74.7	71.0
July	17.6	1.8	48.5	27.8	27.8	28.6	65.0	73.3	72.3
August	10.8	0	8.3	28.5	28.6	28.5	64.9	70.9	69.7
September	40.3	0	14.5	25.5	26.9	26.1	61.6	64.8	61.3
Total/Av.	260.2	220.1	193.8	24.2	25.1	24.8	63.3	68.7	66.8

Av.: Average; LY: Long Year.

The pH of the clay-loam soil used in the study was slightly alkaline (pH ~8). The lime substance of the soil was optimum (~10%) while the organic matter of the soil was low (~1.20%). Climate parameters -total precipitation,

relative humidity, and average temperature - during 2018 and 2019 growing period and long year (LY) were shown in *Table 2*. The total precipitation was 220.1 mm in 2018 and 193.8 mm in 2019. Although LY (260.2 mm) was similar to 2018 but a bit difference with 2019. The average temperature and relative humidity in the studied years and LY showed no significant differences. The average temperatures were 25.1°C and 24.8°C in 2018 and 2019, respectively. In addition, the relative humidity values were 68.7% in 2018 and 66.8% in 2019 while the LY was 63.3%.

2.2. Methods

The experiments were conducted in randomized complete block design (RCBD) with three replications. Each plot was composed of 5 m long and four rows with 70 cm row space and 15 cm plant spacing. Di-ammonium phosphate (DAP) fertilizer was used at the rate of 25 kg da^{-1} before sowing. Sowing was performed on April 6, 2018, in the first year and on April 30, 2019, in the second year. Weed control was achieved by hand weeding when it was needed. Irrigations were performed to prevent the plants against drought effects with a drip irrigation system. Harvests were performed on September 11, 2018, in the first year and on September 25, 2019, in the second year, manually. By taking into consideration side effects, two inner rows were harvested from every plot.

The typical conventional Soxhlet apparatus was used for extracting the seed oil. Diethyl ether was used as a solvent for extracting oil from peanut seeds. The fatty acid composition was analyzed as described by Sahin and Isler (2022) (*Figure 2*).

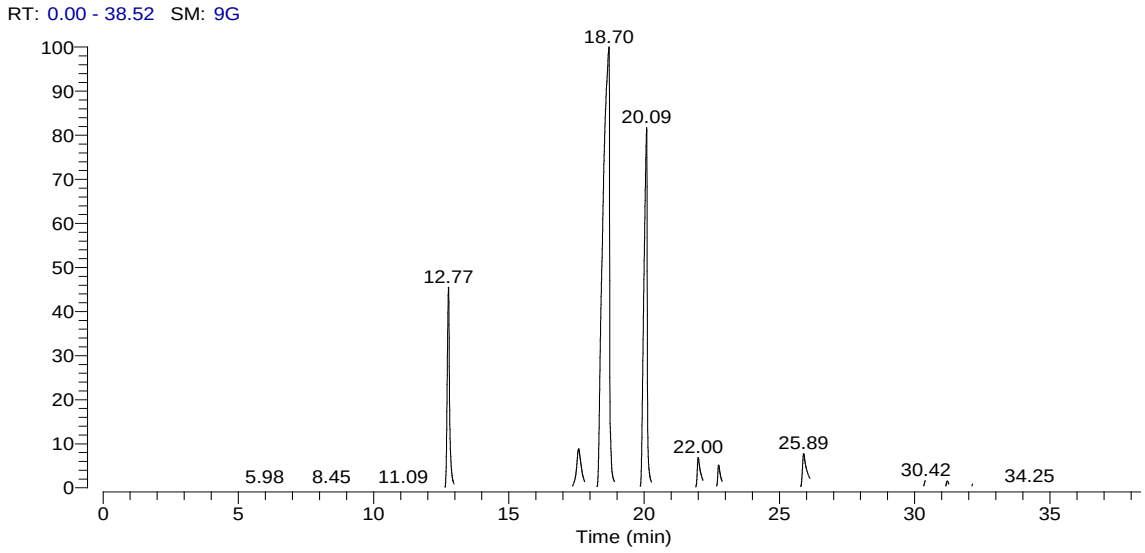

Figure 2. An example chromatogram generated by GC-MS

Oil quality factors (O/L and IV) were calculated using the equation given by Chowdhury et al. (2015) (Eq. 1 and 2).

$$\text{Iodine Values (IV)} = (\%\ \text{oleic acid} \times 0.8601) + (\%\ \text{linoleic acid} \times 1.7321) \quad \text{(Eq. 1)}$$

$$\text{Oleic/Linoleic Acid (O/L) Ratio} = (\%\ \text{oleic acid (18:1)})/(\%\ \text{linoleic acid (18:2)}) \quad \text{(Eq. 2)}$$

2.3. Statistical Analysis

Experimental data were subjected to analysis of variance in accordance with RCBD joined year with the aid of R v4 software. Means were compared to the aid of Duncan's multiple range test.

3. Results and Discussion

3.1. Oil Content

The result for oil content was significant ($p < 0.01$) for varieties but not for year and year x varieties interaction (*Table 3*).

Table 3. Results of the analysis of variance for characteristics studied in the experiment

SV	df	OC	PA	SA	OA	LA	O/L	IV
Block	4	ns	ns	ns	ns	ns	ns	ns
Year	1	ns	ns	ns	ns	ns	ns	ns
Varieties	14	**	**	**	**	**	**	**
Y x V	14	ns	ns	ns	ns	ns	ns	ns
CV (%)		1.79	4.10	7.12	3.68	4.87	5.72	1.85

SV: Source of variation, df: Degree of freedom, CV: Coefficient of variation, ** $p < 0.01$, OC: Oil content; PA: Palmitic acid; SA: Stearic acid; OA: Oleic acid; LA: Linoleic acid; O/L: Oleic/Linoleic Ratio; IV: Iodine Value

The oil content varied between 44.57-52.23% on a two-year average. The ultimate value of oil content was acquired from NC-V-11 at 52.23% and the lowest from BATEM-Cihangir at 44.57% in joint year analysis (*Table 4*). Gulluoglu et al. (2017) and Asik et al. (2018) stated that the oil percentage of peanut kernel varies between 35% and 56% depending on growing conditions and genotype and the oil content of peanut varieties impact by seed maturity, climatic conditions, genotype, geographical location, growing conditions and growing season. The oil content had a positive correlation with the number of pods per plant. Yol and Uzun (2018) detected that the oil percentage of peanut kernel varies between 47.9% and 52.4%. Also, Ozcinar (2022) stated that the oil percentage of peanut kernel varies by %50. The parallel consequences were found by Ozcinar (2022), Arioglu et al. (2016), Asik et al. (2018), and Yol and Uzun (2018). The oil content values of the present study were higher than Karabulut and Tuncturk (2019).

3.2. Saturated Fatty Acid Compositions

The grand saturated fatty acids in peanut oil are stearic (18:0) and palmitic (16:0) acids. The result for palmitic (16:0) acid was significant ($p < 0.01$) for varieties but not for year and year x varieties interaction (*Table 3*). Palmitic acid percentage values varied between 8.04-12.24% on two-year average. The grandest value of palmitic acid content was obtained from Florispan at 12.24% and the lowest from Brantley as 8.04% in joint year analysis (*Table 4*). Yu et al. (2020) palmitic acid ratio 2.92-5.5%; Shibli et al. (2019) found that the palmitic acid ratio varied between 9.32-12.03%; Kamdar et al. (2021) reported palmitic acid values of 8.1-14.2%. Gulluoglu et al. (2017), Yu et al. (2020) and Kamdar et al. (2021) rely on growing conditions and genotype, and the palmitic acid content of peanut varieties was influenced by climatic conditions, genotype, seed maturity, geographical location, growing conditions and growing season. The analog outcomes were found by Shibli et al. (2019) and Kamdar et al. (2021), Onemli (2012), Hassan and Ahmed (2012). The palmitic acid content values of the present study were less than Yol and Uzun (2018), and Yu et al. (2020).

The result for stearic (16:0) acid was significant ($p < 0.01$) for varieties but not for year and year x varieties interaction (*Table 3*). As a consequence, in a two-year average, the stearic acid percentage varied between 1.38-2.91% in two-year average. The highest value of stearic acid content was acquired from Brantley at 2.91% and the lowest from Com at 1.38% in joint year analysis (*Table 4*). Onemli (2012), Gulluoglu et al. (2016), Gulluoglu et al. (2017), Yol and Uzun (2018), and Salamatullah et al. (2021) determined that the stearic acid percentage of peanut kernel varies between 2.38% and 4.9% attaching to growing conditions and genotype, and the palmitic ingredient of peanut varieties efficacy by climatic conditions, genotype, seed maturity, growing season, geographical location, and growing conditions. The similar results were found by Hassan and Ahmed (2012) and Salamatullah et al. (2021). The palmitic ingredient values of the present study were less than Onemli (2012), and Yol and Uzun (2018).

3.3. Unsaturated Fatty Acid Compositions

The great unsaturated fatty acids in peanut oil are oleic (18:1) and linoleic (18:2) acids. The seeds have oleic and linoleic acids accounting for nearly 80% of total fatty acids at seed maturity. The result for oleic (18:1) acid content was significant ($p < 0.01$) for varieties but not for year and year x varieties interaction (*Table 3*). The oleic acid content varied between 43.70-71.83% on two-year average. The highest value of oleic content was obtained from Brantley at 71.83% and the lowest from Florispan at 43.70% in joint year analysis (*Table 5*). Onemli (2012), Hassan and Ahmed (2012), Wang et al. (2013), Yol ve Uzun (2018) and Gali et al. (2021) determined that the oleic acid percentage of peanut kernel varies between 38.85% and 62.04% relying on growing conditions and genotype, and the oleic acid content of peanut varieties impact by seed maturity, genotype, climatic conditions,

growing season and growing conditions. The oleic acid content had a positive correlation with the number of pods per plant. Similar results were found by Onemli (2012), Hassan and Ahmed (2012), Wang et al. (2013), Yol and Uzun (2018) and Gali et al. (2021).

Table 4. Results of the analysis of variance for characteristics studied in the experiment The-2-years average values of oil content and saturated fatty acid compositions (palmitic and stearic acids)

Varieties	Oil Content (%)	Palmitic Acid (%)	Stearic Acid (%)
Florispan	52.16±0.38 a	12.24±0.75 a	1.72±0.06 d
BATEM-Cihangir	44.57±0.34 e	10.65±0.15 de	2.01±0.01 c
Georgia Green	51.54±0.41 a	10.82±0.26 cd	1.57±0.11 de
Sultan	47.96±0.48 d	11.41±0.08 bc	2.05±0.06 c
Brantley	52.10±0.27 a	8.04±0.02 h	2.91±0.14 a
BATEM-5025	51.13±0.25 a	9.82±0.14 fg	2.50±0.14 b
Arioglu-2003	48.49±0.40 d	10.48±0.15 ef	1.72±0.05 d
Halisbey	48.55±0.50 cd	10.18±0.04 ef	1.68±0.11 d
NC-7	49.74±0.45 b	10.31±0.34 ef	2.13±0.08 c
Flower-22	48.50±0.37 d	11.55±0.03 ab	2.22±0.09 c
Wilson	49.65±0.17 bc	9.56±0.08 g	1.99±0.04 c
NC-V-11	52.23±0.34 a	9.75±0.26 fg	2.14±0.08 c
Com	49.01±0.20 cd	10.55±0.05 ef	1.38±0.03 e
Osmaniye-2005	51.21±0.52 a	11.06±0.14 bc	1.56±0.13 de
Gazipasa	49.05±0.17 cd	10.70±0.02 de	1.50±0.13 de
Average	49.73	10.47	1.94

Letters show different groups for varieties in each column. The values are Mean±Standard Error of the Mean.

Table 5. The-2-years average values of unsaturated fatty acid compositions (oleic and linoleic acids) and oil quality factors (O/L and IV)

Varieties	Oleic Acid (%)	Linoleic Acid (%)	Oleic/Linoleic Ratio (O/L)	Iodin Value (IV)
Florispan	43.70±2.51 e	35.68±2.77 a	1.22±0.17 g	99.38±2.64 ab
BATEM-Cihangir	48.63±0.17 d	30.95±0.07 c	1.57±0.01 e	95.43±0.14 cd
Georgia Green	46.97±0.37 de	32.79±0.31 bc	1.43±0.02 fg	97.18±0.47 bc
Sultan	53.45±0.14 c	27.04±0.52 d	1.98±0.04 d	92.80±0.85 d
Brantley	71.83±0.57 a	9.78±0.13 g	7.35±0.14 a	78.71±0.43 h
BATEM-5025	59.58±0.29 b	20.05±0.18 f	2.97±0.04 b	85.98±0.29 g
Arioglu-2003	48.80±0.06 d	30.44±0.08 c	1.60±0.01 e	94.69±0.13 cd
Halisbey	46.24±2.97 de	30.50±0.65 c	1.52±0.12 ef	92.60±2.22 de
NC-7	57.44±1.56 b	22.52±0.03 e	2.55±0.07 c	88.41±1.28 fg
Flower-22	48.72±0.06 d	31.61±0.30 c	1.54±0.01 ef	96.66±0.55 bc
Wilson	58.93±0.36 b	22.56±0.01 e	2.61±0.02 c	89.76±0.31 ef
NC-V-11	53.13±0.44 c	27.95±0.60 d	1.90±0.05 d	94.10±0.92 cd
Com	45.07±0.42 e	35.77±0.28 a	1.26±0.02 g	100.71±0.44 a
Osmaniye-2005	49.61±0.17 d	30.81±0.28 c	1.61±0.02 e	96.03±0.43 c
Gazipasa	46.10±0.26 de	34.48±0.21 ab	1.34±0.01 fg	99.37±0.32 ab
Average	51.88	28.19	2.16	93.45

Letters show different groups for varieties in each column. The values are Mean±Standard Error of the Mean.

The result for linoleic (18:2) acid content was significant ($p < 0.01$) for varieties but not for year and year x varieties interaction (*Table 3*). The linoleic acid content varied between 9.78-35.77% on two-year average. The ultimate value of linoleic content was gotten from Com as 35.77% and the lowest from Brantley as 9.78% in joint year analysis (*Table 5*). Hassan and Ahmed (2012), Bishi et al. (2015), Gulluoglu et al. (2017), Yol ve Uzun (2018), Gali et al. (2021) stated that the linoleic acid percentage of peanut kernel varies between 22.30% and 41.40% relying on growing conditions and genotype, and the oleic acid content of peanut varieties impact by seed maturity,

genotype, climatic conditions, growing season, growing conditions and geographical location. The linoleic acid content had a positive correlation with the number of pods per plant. The counterpart conclusions were found by Onemli (2012), Bishi et al. (2015) and Gali et al. (2021). The linoleic acid content values of the present study were lower than Hassan and Ahmed (2012) and Yol and Uzun (2018).

3.3. Oil Quality Values

The new ingredients in nutrition and exchanging inclinations in peanut marketing project a glossier future for the utilization of peanut cultivars with widely varied nutritional and chemical quality features. All of the constituents of peanut oil quality in this study were extremely impacted by genotype (*Table 5*). The maximum value of oleic/linoleic ratio (O/L) content was obtained from Brantley as 7.35 and the lowest from Florispan as 1.22 in joint year analysis (*Table 5*). Lopez et al. (2001), Yav et al. (2008) and Gali et al. (2021) stated that the ratio of oleic acid to linoleic acid (O/L ratio) and iodine value defines the storability, quality, and shelf life of groundnut oil and its products. The like outcomes results were found by Hashim et al. (1993), Lopez et al. (2001) and Gali et al. (2021).

The iodine value (IV), which ensures a measure of the degree of oil unsaturation, and the ratio of oleic to linoleic acid (O/L) has been mostly used as a means of predicting shelf-life and measuring stability of the oil. Higher (O/L) ratios and lower IV generally suggest better stability and longer shelf-life (Casini et al., 2003; Gulluoglu et al., 2017; Bakal and Arioglu, 2019). The iodine value (IV) content varied between 78.71-100.71 on two-year average. The highest value of iodine value (IV) content was obtained from Com as 100.71 and the lowest from Brantley as 78.71 in joint year analysis (*Table 5*). The similar results were found by Hashim et al. (1993). The iodine value (IV), content values of the present study were lower than Biermann et al. (2000).

4. Conclusions

The oil composition and oil content of peanut varieties may vary depending on environmental conditions and genetic factors. According to the results of this study, besides the significant effects of genotypic differences, years were also found to have a considerable influence on the following fatty acids: palmitic, stearic, linoleic, and behenic. Year effects were significant for the O/L ratios and iodine values as well as the saturated, unsaturated, and long-chain composites. This is in agreement with what has previously been reported regarding the yearly effect on peanut oil quality. Finally, it was recommended that Brantley could be the optimum variety because it had the highest oil content, oleic acid, and O/L ratio according to two-year experiment.

Acknowledgment

The authors would like to thank Dr. Musa Turkmen (Department of Field Crops, Hatay Mustafa Kemal University) for helping with the GC-MS analysis. We are highly thankful to the staff of the Oil Seed Research Institute for their help in the field work. We'll always remember the people who lost their lives an earthquake occurred on February 6 2023 in Turkey.

References

Anonymous (2022a). Food and Agriculture Organization of the United Nations (FAO), http://www.fao.org/site, (Accessed May 18, 2022).

Anonymous (2022b). Crop production statistics, https://biruni.tuik.gov.tr/medas/ (Accessed May 18, 2022).

Arioglu, H. H., Bakal, H., Gulluoglu, L. Kurt, C. and Onat, B. (2016). The determination of some important agronomical and quality properties of peanut varieties in main crop conditions. *Biotech Studies*, 25(2): 24-29.

Asik, F. F., Yildiz R. and Arioglu, H. H. (2018). The determination of new peanut varieties for Osmaniye Region and their important agronomic and quality characteristics. *Journal of Agriculture and Nature*, 21(6): 825-836.

Awal, M. A. and Aktar, L. (2015). Effect of row spacing on the growth and yield of peanut (*Arachis hypogaea* L.) stands. International Journal of Agriculture, *Forestry and Fisheries*, 3(1):7-11.

Bakal, H. and Arioglu, H. (2019). The determination of fatty acids composition and oil quality factors of some peanut varieties having different market types at different harvesting times in main and double crop growing seasons in mediterranean region. *Turkish Journal of Field Crops*, 24(2): 221-229.

Biermann, U., Friedt, W., Lang, S., Lühs, W., Machmüller, G., Metzger, J. O. and Schneider, M. P. (2000). New syntheses with oils and fats as renewable raw materials for the chemical industry. *Angewandte Chemie International Edition*, 39(13): 2206-2224.

Bishi, S. K., Lokesh, K., Mahatma, M. K., Khatediya, N., Chauhan, S. M. and Misra, J. B. (2015). Quality characteristics of Indian peanut varieties and their use as nutritional and functional nutrients. *Food Chem*, 167: 107–114.

Casini, C., Dardanelli, J. L., Martínez, M. J., Balzarini, M., Borgogno, C. S. and Nassetta, M. (2003). Oil quality and sugar content of peanuts (*Arachis hypogaea*) grown in Argentina: Their relationship with climatic variables and seed yield. *Journal of Agricultural and Food Chemistry*, 51(21): 6309-6313.

Chowdhury, F. N., Hossain, D., Hosen, M. and Rahman, S. (2015). Comperative study on chemical composition of five varieties of groundnut (*Arachis hypogaea* L.). *World Journal of Agricultural Sciences*, 11(5): 247-254.

Fabra, A., Castro, S., Taurian, T., Angelini, J., Ibañez, F., Dardanelli, M. and Valetti, L. (2010). Interaction among *Arachis hypogaea* L. (peanut) and beneficial soil microorganisms: how much is it known? *Critical Reviews in Microbiology*, 36(3): 179-194.

Gali, S., Reddy, D. L., Rajesh, A. P., John, K., Sudhakar, P. and Rao, V. S. (2021). Genetic variability studies in large seeded peanut (*Arachis hypogaea* L.). *The Pharma Innovation Journal*, 10(9): 2065-2069.

Gulluoglu L., Bakal, H., Onat, B., Kurt, C. and Arioglu, H. (2017). Comparison of agronomic and quality characteristics of some peanut (*Arachis hypogaea* L.) varieties grown as main and double crop in Mediterranean Region. *Turkish Journal of Field Crops*, 22(2): 166-177.

Gulluoglu, L., Bakal, H., Onat, B., El Sabagh, A. and Arioglu, H. (2016). Characterization of peanut (*Arachis hypogaea* L.) seed oil and fatty acids composition under different growing season under Mediterranean environment. *Journal of Experimental Biology and Agricultural Sciences*, 4(5S): 564-571.

Hashim, I. B., Koehler, P. E., Eitenmiller, R. R. and Kvien, C. K. (1993). Fatty acid composition and tocopherol content of drought stressed Florunner peanuts. *Peanut Science*, 20(1): 21-24.

Hassan, F. and Ahmed, M. (2012). Oil and fatty acid composition of peanut cultivars grown in Pakistan. *Pakistan Journal of Botany*, 44(2): 627-630.

Kamdar, J. H., Jasani, M. D., Ajay, B. C., Rani, K., Manivannan, N., Vasanthi, R. P. and Bera, S. K. (2021). Fatty acid desaturase-2 (ahFAD2) mutant alleles in peanut (*Arachis hypogaea* L.) pre-breeding lines: an insight into the source, features, discourse, and selection of novel pre-breeding lines. *Genetic Resources and Crop Evolution*, 68(2): 529-549.

Karabulut, B. and Tuncturk, R. (2019). Investigation of agricultural and quality characteristics of peanut (*Arachis hypogaea* L.) cultivars growing as main crop in the Diyarbakir-Bismil ecological conditions. *Yuzuncu Yil University Journal of the Institute of Natural and Applied Sciences*, 24(2): 97-104.

Lopez, Y., Smith, O. D., Senseman, S. A. and Rooney, W. L. (2001). Genetic factors influencing high oleic acid content in Spanish market-type peanut cultivars. *Crop Science*, 41(1): 51-56.

Onemli, F. (2005). The correlation analyses of some climate values with flowering and earliness index in peanut (*Arachis hypogaea* L.). *Journal of Tekirdag Agricultural Faculty*, 2(3): 273-281.

Onemli, F. (2012). Impact of climate change on oil fatty acid composition of peanut (*Arachis hypogaea* L.) in three market classes. *Chilean Journal of Agricultural Research*, 72(4): 483-488.

Ozcinar, A. B. (2022). Food grade oil quality of peanut (*Arachis hypogaea* L.). *MAS Journal of Applied Sciences*, 7(1): 81–87.

Ozluoymak, O. B. and Guzel, E. (2020). Determination of colour and kinetic parameter differences between aflatoxin contaminated and uncontaminated pistachio nuts using machine vision. *Journal of Tekirdag Agricultural Faculty*, 18(1): 157-168.

Sahin, C. B. and Isler, N. (2022). The impact of foliar applied zinc and iron on quality of soybean. *Journal of Plant Nutrition*, 46(13): 2977-2989.

Salamatullah, A. M., Alkaltham, M. S., Ozcan, M. M., Uslu, N. and Hayat, K. (2021). Effect of maturing stages on bioactive properties, fatty acid compositions, and phenolic compounds of peanut (*Arachis hypogaea* L.) kernels harvested at different harvest times. *Journal of Oleo Science*, 70(4): 471-478.

Shibli, S., Siddique, F., Raza, S., Ahsan, Z. and Raza, I. (2019). Chemical composition and sensory analysis of peanut butter from indigenous peanut cultivars of Pakistan. *Pakistan Journal of Agricultural Research*, 32(1): 159-169.

Shin, E. C., Pegg, R. B., Phillips, R. D. and Eitenmiller, R. R. (2010). Commercial runner peanut cultivars in the USA: Fatty acid composition. *European Journal of Lipid Science and Technology*, 112: 195–207.

Wang, M. L., Chen, C. Y., Tonnis, B., Barkley, N. A., Pinnow, D. L., Pittman, R. N. and Pederson, G. A. (2013). Oil, fatty acid, flavonoid, and resveratrol content variability and FAD2A functional SNP genotypes in the US peanut mini-core collection. *Journal of Agricultural and Food Chemistry*, 61(11): 2875-2882.

Yasli, S., Isler, N. and Sahin, C. B. (2020). The effect of single and twin planting patterns on yield and important agricultural characteristics of main cropped peanut under Diyarbakir conditions. *Journal of Agriculture and Nature*, 23 (1): 91-98.

Yav, A. S., Richard, A., Osei, A. K., Kofi, A. D. H., Seth, O. D. and Adelaide., A. (2008). Chemical composition of groundnut, (*Arachis hypogaea* L.) Landraces. *African Journal of Biotechnology*, 7(13): 2203-2208.

Yilmaz, M., Sahin, C. B., Yildiz, D., Demir, G., Yildiz, R. and Isler, N. (2022). General situation of peanut (Arachis hypogaea) production in the World and in Turkey, major problems and solution suggestions. *Muş Alparslan University Journal of Agriculture and Nature,* 2(1): 8-17.

Yol, E. and Uzun, B. (2018). Influences of genotype and location interactions on oil, fatty acids and agronomical properties of groundnuts. *Grasas Y Aceites*, 69(4): e276.

Yol, E., Furat, S., Upadhyaya, H. D. and Uzun, B. (2018). Characterization of groundnut (*Arachis hypogaea* L.) collection using quantitative and qualitative traits in the Mediterranean Basin. *Journal of Integrative Agriculture*, 17(1): 63-75.

Yu, H., Liu, H., Wang, Q. and Ruth, S. (2020). Evaluation of portable and benchtop NIR for classification of high oleic acid peanuts and fatty acid quantitation. *LWT*, 128: 109398.

Zhao, C., Shao, C., Yang, Z., Wang, Y., Zhang, X., Wang, M. and McGiffen, M. E. (2017). Effect of planting density on pod development and yield of peanut under the pattern of precision planted peanuts. *Legume Research*, 40(5): 901-905.