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DETERMINATION OF OIL QUALITY AND FATTY ACID COMPOSITIONS OF SOME PEANUT (*Arachis hypogaea* L.) GENOTYPES GROWN IN MEDITERRANEAN REGION

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ABSTRACT

This study was conducted to determine the performance of fifteen peanut lines from India and four peanut varieties (NC-7, Halisbey, Sultan and BATEM-5025) registered in Turkey. The present study was carried out in Osmaniye, which is under Mediterranean climate conditions as main crop season in 2020 and 2021. The experimental design was randomized complete block design (RCBD) with three replications. The highest oil content of peanut was observed in ICGV 10193 (52.16%±0.34), followed by ICGV 10179 (51.58%±0.35) and ICGV 16013 (51.47%±0.35). However, Oleic Acid / Linoleic Acid (O/L) ratio and iodine value are both indicators of peanut shelf life and oil stability. ICGV 15074 and ICGV 16013 came to forefront with high O/L ratio (9.46±1.46, 5.44±0.61) and low iodine value (72.68±0.60, 76.41±0.69), respectively. As a result of the study, it was concluded that some Indian peanut lines, mentioned above, can be proper to include breeding program due to their higher oil and oleic acid contents.

Keywords: ***Arachis hypogea*** **L., fatty acid composition, iodine value, oil content.**

INTRODUCTION

Peanut, also known as groundnut, is a valuable and highly nutritional product all over the world. Its seed contains 43-55% oil and 25-28% protein depending on market types and years along with essential mineral elements such as Na, Cu, Zn, Fe, Ca, Mg and K. In addition, it is a good source of E, K and B group vitamins. Due to these properties, peanut (*Arachis hypogea* L.) is important source of nutrition for both humans and animals (Bakal and Arioglu, 2019; Ergun and Zarifikhosroshahi, 2020; Yasli et al., 2020; Yilmaz et al., 2022).

In 2020, the World produced 53.7 million tonnes peanut with shells in 31.6 million hectares. Asia and Africa contributed to this production by about 90% of total production, and the rest was produced by Americas. The most important producer countries, accounting for more than half of the total production, were China (~18 million tonnes) and India (~10 million tonnes). In the same year, Turkey contributed to the total production by 215 927 tonnes in about 54 775 hectares. Even if Turkey had low contribution on production, Turkey doubled average yield compared to the World (FAO, 2022; TUIK, 2022).

Peanut oil includes seven major fatty acids which are oleic (C18:1), linoleic (C18:2), arachidic (C20:0), palmitic (C16:0), stearic (C18:0), behenic (C22:0) and lignoceric (C24:0) acids. Linoleic and oleic acids, two important acids, explain about 80% of the total fatty acid composition (Onemli, 2012; Yol and Uzun, 2018). The fatty acid composition plays an important role in determining nutrition, shelf life, and flavor of peanut. High oleic acid content, monounsaturated fatty acid, supplies an extended shelf life for peanut-derived products, and reduces cardiovascular disease risk and decreases low-density lipoprotein cholesterol levels. Also, linoleic acid is the most effective polyunsaturated fatty acid for lowering serum cholesterol (Mora-Escobedo et al., 2015; Yol and Uzun, 2018; Bakal and Arioglu, 2019).

The high oleic acid to linoleic acid (O/L) ratio and low iodine value (IV) provide a long shelf life and good stability. The stability of peanut seed oil and the degree of unsaturated fatty acid can be determined by using iodine value. A high O/L ratio (>10:1) in peanut results in an increased shelf life up to ten times and improved flavor compared to a normal O/L ratio (1.5:1) (Yol et al., 2017; Bakal and Arioglu, 2019). Peanut can be a valuable alternative crop for the irrigated areas of the Mediterranean basin which has suitable temperature regimes for both vegetative and reproductive growth of peanut (Caliskan et al., 2008a; Yol and Uzun, 2018).

Cil et al. (2016) carried out a field research on genotypes originated from India (3) and varieties registered in Turkey (9). It was reported that Indian genotypes came forefront by their oil content and yield, and could be used as a breeding material. Yol et al. (2017) conducted a field experiment in Western Mediterranean with 256 peanut genotypes, 186 of them Indian lines, and reported that the mean of oil content was 48.8% and unsaturated fatty acid was 78.7%. Asik et al. (2018), Bakal and Arioglu (2019), and Ergun and Zarifikhosroshahi (2020) reported that oil content and fatty acid compositions of peanut were affected by genotypes, years, seed maturity and environmental conditions such as temperature, precipitation, etc. It was found the oil content of peanut varied between 49.01-53.78%, 43.91-49.48% and 56.62-50.30%, respectively. Besides, it was indicated that unsaturated fatty acid composition was composed of about 80% of total fatty acid compositions.

The aims of the present study, the first research to use these Indian lines, were to; *i*. determine the performance of Indian lines in comparison with the varieties registered in Turkey, and *ii*. select the proper Indian lines for the breeding program.

MATERIALS AND METHODS

Materials

Fifteen lines (ICGV 10176, 10178, 10179, 10193, 10207, 10208, 10209, 10220, 15074, 16013, 16017, 06040 and 06099) originated from India and four varieties (NC-7, Halisbey, Sultan and BATEM-5025) registered in Turkey were used as plant materials in the study. Indian lines were provided from ICRASAT (International Crops Research Institute For The Semi-Arid Tropics) and other varieties, used as control, from Osmaniye Oil Seed Research. Experiments were carried out in the experimental fields of Osmaniye Oil Seed Research (37°03′41”N, 36°06′79”E; 50 m) in Eastern Mediterranean of Turkey during the main growing seasons of 2020 and 2021.

The pH of the clay soil used in the study was slightly alkaline (pH ~8). Lime content (~3%) and organic matter (~2%) of the soil were optimum. Total precipitation and average temperature during 2020 and 2021 growing period and long year were shown in Figure 1. The total precipitation was 237.3 mm in 2020 and 88.0 mm in 2021. Although long year (266.5 mm) was similar with 2020, it was different from 2021. This difference resulted from April and May, 2021. The average temperatures in the studied years and long year had no significant differences. The average temperatures were 24.8°C, 25.0°C and 24.3°C in 2018, 2019 and long year, respectively.

Methods

Experiments were conducted in a Randomized Complete Block Design (RCBD) with three replications. Each plot had 5 m long four rows with 70 × 15 cm spacing. Di-ammonium phosphate (18% N, 46% P_2O_5) fertilizer was used at the rates of 25 kg da^{-1} before sowing. Sowing was performed on April 12, 2020 in the first year and on April 29, 2021 in the second year. Hand weeding was performed with the emergence of the plants. The first irrigation was made when the plants flowered adequately and the drought was seen. The drip irrigation was done six times and for ten hours during the period from the beginning of the gynophore to the formation of pod in the studied years. Manuel harvests were performed on September 17, 2020 in the first year and on September 27, 2021 in the second year. Harvests were performed from two inner rows by taking into consideration side effects.

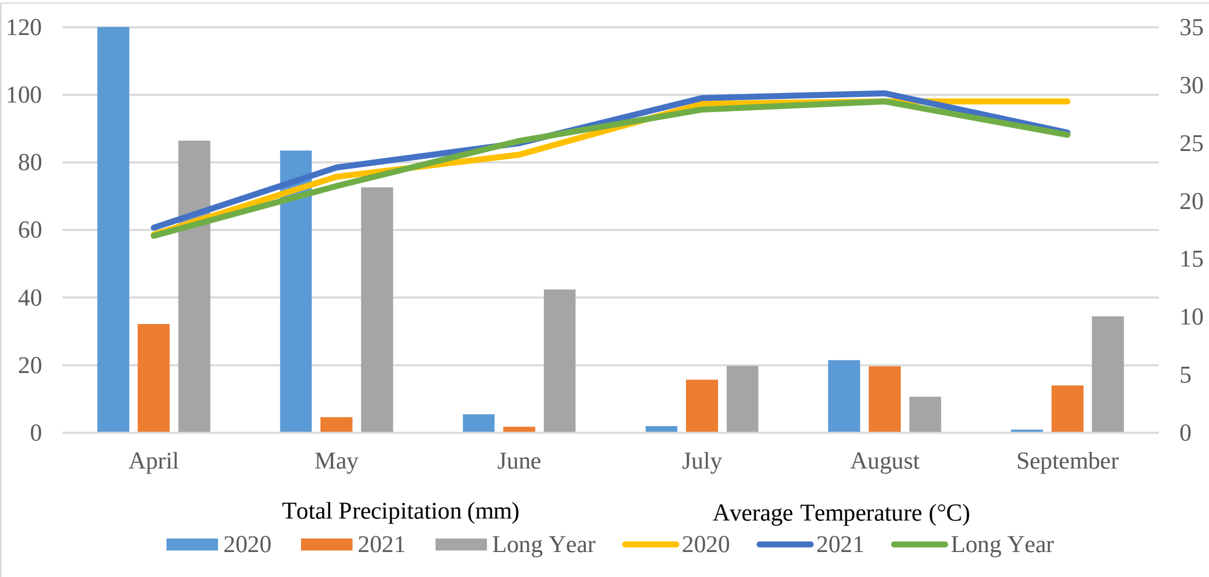

Figure 1. Climate parameters of the research field (2020, 2021 and long-year average)

Conventional soxhlet apparatus which consisted of a distillation flask, sample holder (thimble), siphon and condenser was used for extracting the seed oil, and solvent material was diethyl ether. The percent of peanut oil content was determined using the formula below:

$$\text{Oil content (\%)} = \frac{\text{Weight of oil extracted (g)}}{\text{Weight of the seed sample (g)}} \times 100$$

Fatty acid compositions of peanut seeds were analyzed by Thermo Scientific ISQ Single Quadrupole TR-Fame Gas Chromatography–Mass Spectrometry (GC-MS) system. Column had these properties; 5% Phenyl Polysilphenylene-silohexane, 0.25 mm inner diameter x 60 m length, 0.25 µm film thickness. Helium (99.9%) was used as a carrier gas which had 1 mL min^{-1} flow rate. The ionization energy was set at 70 eV and the mass range m / z 1.2-1200 amu. Scan Mode was used for data collection. The structure of each compound was identified with the Xcalibur software using mass spectra (Wiley 9).

Temperature program involved the following steps. The temperature of machine was warmed up to 120°C and waited for 1 min, increased by 10°C per minute until 175°C and waited for 10 min, increased by 5°C per minute until 210°C and waited for 5 min, and increased by 5°C per minute until 230°C and waited for 6 min. Split flow rate was 20 mL min^{-1}.

Iodine values (Chowdhury et al., 2015) and Oleic acid/Linoleic acid ratio were calculated with the help of the following formula:

$$\text{Iodine Values (IV)} = [(\text{oleic acid} \times 0.8601) + (\text{\% linoleic acid} \times 1.7321)]$$

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

Statistical Analysis

Experimental data were subjected to analysis of variance in accordance with Randomized Complete Block Design (RCBD) joined years with the aid of MSTAT-C and SPSS v22. Means were compared with the aid of Duncan's multiple range test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Oil Content and Unsaturated Fatty Acid Compositions

Peanut oil is one of the most valuable protein and oil sources with its high oil and unsaturated fatty acid contents. The high oil content is an important quality parameter even if not by itself. The oil content was affected significantly ($p < 0.01$) by genotypes according to ANOVA. However, year and genotype × year interaction was no significant ($p > 0.05$) for oil content (Table 1). The oil contents obtained from genotypes in current study varied between 41.26-52.16% (Table 2). The highest oil contents were obtained from ICGV 10193, ICGV 10179 and ICGV 16013 with the value of 52.16%, 51.58% and 51.47%, respectively. This trio, was in same statistical group, had higher oil content compared to control varieties (NC-7, Halisbey, Sultan, BATEM-5025). There were no significant differences between years, and the oil contents of years were 46.97% in 2020 and 46.78% in 2021. Cil et al. (2016) conducted a field experiment with 9 varieties registered in Turkey and 3 Indian lines (ICGV 88365, ICGV 99085 and ICGV 00391), and observed variation in oil content in different genotypes of peanut, which was mainly driven by environmental conditions. It was reported that oil contents of Indian lines were about 50.6%. Yol et al. (2017) used 186 Indian lines as plant material to identify the oil and fatty acid profile of peanut and reported the average oil content as 48.8%. Ergun and Zarifikhosroshahi (2020) found an increase in oil content with change in genotype and growing conditions such as climatic conditions, environment and growing season. These findings were supported by most of researchers like Caliskan et al. (2008b), Cil et al. (2016), Onat et al. (2017), Yol et al. (2017), Asik et al. (2018) and Ergun and Zarifikhosroshahi (2020), who conducted their study in similar regions.

Table 1. Results of the analysis of variance for characteristics studied in the study.

Source of Variation	df	Oil Content	Oleic Acid	Linoleic Acid	Palmitic Acid	Stearic Acid	Behenic Acid	Arachidic Acid	Lignoceric Acid	O/L Ratio	Iodine Value
Year	1	ns	**	**	**	**	**	**	**	**	**
Block	4	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Genotypes	18	**	**	**	**	**	**	**	**	**	**
Y x G	18	ns	**	**	**	**	**	**	**	**	**
CV (%)		2.65	4.01	6.54	5.35	3.97	4.29	6.55	19.06	9.86	3.35

df: Degree of freedom; ns: Non-significant; CV: Coefficient of variation; ** $p < 0.01$

The peanut seed is rich in monounsaturated (oleic acid) and polyunsaturated (linoleic acid) fatty acids which were affected significantly ($p < 0.01$) by genotype, year and their interaction (Table 1). Oleic acid (C18:1) varied between 33.57-68.30% with an average of 46.89% whereas linoleic acid (C18:2) ranged from 8.05 to 45.46% with a mean of 30.82%. Oleic and linoleic acid ratios were found as 47.48% and 31.66% in 2020, and 46.31% and 29.97% in 2021, respectively. It was found that the unsaturated fatty acid ratios decreased due to the insufficient precipitation in 2021 compared to that in the first year of the study (2020). Hassan et al. (2005) stated that fatty acid compositions were affected by environmental conditions such as temperature, moisture, etc. The highest and lowest oleic acid content was observed in ICGV 15074 and ICGV 10178, respectively. The genotypes, ICGV 16013 and ICGV 16017, from India had >50% oleic acid while ICGV 10217, ICGV 10218, ICGV 10220 and ICGV 10208 had >40% oleic acid. The maximum and minimum linoleic acid contents were detected in the lines ICGV 06040 (45.46%) and ICGV 15074 (8.05%), respectively. Considering all the genotypes together, the total averages of major unsaturated fatty acid compositions of peanut were about 77.71%. As can be seen in Figure 2, the genotype with the highest oleic acid content also had the lowest linoleic acid content. There was a negative correlation between oleic and linoleic acids. These findings were similar with those of Mora-Escobedo et al. (2015), Yol et al. (2017), Asik et al. (2018), Yol and Uzun (2018), Bakal and Arioglu (2019), Uckun et al. (2019) and Ergun and Zarifikhosroshahi (2020).

Table 2. Mean values of oil content, unsaturated fatty acids and oil quality parameters.

	Oil Content (%)	Oleic Acid (C18:1) (%)	Linoleic Acid (C18:2) (%)	O/L Ratio	IV
Varieties					
ICGV 10176	49.40±0.47 bc	34.80±0.85 jk	41.30±0.71 b	0.85±0.03 lm	101.47±0.74 bc
ICGV 10178	46.49±0.67 e	33.57±0.52 k	42.83±0.98 b	0.79±0.02 m	103.07±1.92 b
ICGV 10179	51.58±0.35 a	35.98±1.14 j	40.57±1.24 bc	0.90±0.05 km	101.23±1.67 bc
ICGV 10193	52.16±0.34 a	38.81±1.12 i	36.56±1.82 de	1.08±0.09 jl	96.71±2.36 d
ICGV 10207	43.26±0.64 f	39.47±1.55 i	36.16±2.83 e	1.15±0.13 ik	96.59±3.64 d
ICGV 10208	43.06±0.44 f	42.33±0.56 h	34.92±1.62 ef	1.23±0.07 hj	96.90±2.46 d
ICGV 10209	42.71±0.45 fg	39.50±1.31 i	35.72±1.05 ef	1.11±0.06 il	95.84±1.85 d
ICGV 10217	43.33±0.43 f	48.34±1.12 f	31.51±0.72 gh	1.54±0.07 fg	96.16±0.70 d
ICGV 10218	41.26±0.41 g	45.56±0.97 g	33.46±0.81 fg	1.37±0.05 gi	97.14±1.13 d
ICGV 10220	43.78±0.38 f	45.52±0.96 g	31.79±1.56 gh	1.45±0.06 gh	94.21±3.29 de
ICGV 15074	46.68±0.45 e	68.30±1.57 a	8.05±1.07 m	9.46±1.46 a	72.68±0.60 j
ICGV 16013	51.47±0.35 a	63.94±1.83 b	12.36±1.10 l	5.44±0.61 b	76.41±0.69 i
ICGV 16017	41.51±0.37 g	59.32±1.20 c	18.75±0.85 k	3.19±0.13 c	83.49±2.21 h
ICGV 06040	47.58±0.62 de	34.59±0.73 jk	45.46±0.62 a	0.76±0.02 m	108.48±0.94 a
ICGV 06099	48.96±1.09 cd	35.66±0.73 jk	38.74±1.97 cd	0.94±0.06 km	97.78±3.28 cd
NC-7	49.37±0.39 bc	59.84±1.19 c	21.60±0.67 j	2.79±0.14 d	88.89±1.04 fg
Halisbey	47.73±0.61 de	51.12±1.01 e	29.89±1.06 h	1.73±0.08 f	95.73±1.56 d
Sultan	49.55±0.47 bc	53.93±0.79 d	25.90±0.53 i	2.09±0.04 e	91.24±1.28 ef
BATEM-5025	50.75±0.24 ab	60.40±0.58 c	19.92±0.32 jk	3.04±0.05 c	86.44±0.82 gh
Years					
2020	46.97±0.47	47.48±1.59 A	31.66±1.52 A	2.35±0.37 A	95.67±1.33 A
2021	46.78±0.53	46.31±1.38 B	29.97±1.29 B	1.95±0.19 B	91.74±1.20 B
Mean	46.87±0.35	46.89±1.05	30.82±0.99	2.15±0.21	93.71±0.91

SEM: Standard Error of the Mean. Letters show different groups in each column.

Oil Quality Parameters

The ANOVA results of the genotypes showed a significant ($p < 0.01$) effect on oleic acid to linoleic acid (O/L) ratio and Iodine Value (IV) for all independent variables (Table 1). The low IV and high O/L ratio provide a long shelf life and good stability for peanut. Besides, high oleic acid content of peanut oil is valuable nutrient for augmented thermos-oxidative stability and human health (Ergun and Zarifikhosroshahi, 2020). The varieties of peanut have long shelf life when O/L ratio is equal or above 10, whereas most of varieties have normal O/L ratio as 1.5. The O/L ratios varied between 0.76-9.46 with the average of 2.15. As can be seen in Table 2, the maximum and minimum O/L ratios were observed in ICGV 15074 and ICGV 06040, respectively. Two lines among all genotypes, ICGV 16013 and ICGV 16017, had higher O/L values than 3 which were 5.44 and 3.19, respectively. Similarly, IV was affected significantly ($p < 0.01$) by genotypes, years and genotype × year interaction. IV of peanut genotypes ranged from 72.68 to 108.48 with an average of 93.71. The highest and lowest IV was detected in ICGV 06040 and ICGV 15074, respectively. Most of Indian lines' iodine values varied between 90-100. The desirable Iodine Values was observed in genotypes ICGV 15074 (72.68), ICGV 16013 (76.41) and ICGV 16017 (83.49). These three peanut lines came to forefront with their O/L ratio and IV. It has been reported that O/L ratio of peanut genotypes depends on the genetic structure of genotype and environmental factors (Chowdhury et al., 2015; Mora-Escobedo et al., 2015; Gulluoglu et al., 2016; Yol et al., 2017; Ergun and Zarifikhosroshahi, 2020; Yilmaz, 2022). These findings were similar with the results of these researchers.

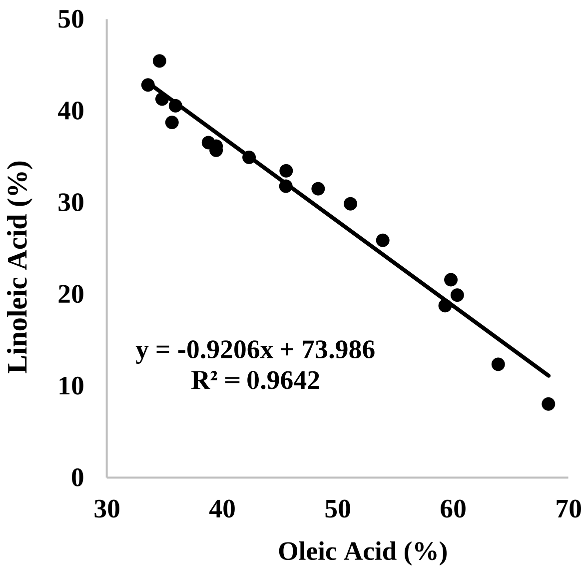

Figure 2. Relationship between linoleic and oleic acid.

Saturated Fatty Acid Compositions

Saturated fatty acids were affected significantly ($p < 0.01$) by genotype, year and their interaction (Table 1). Peanut oil is comprised of five major saturated fatty acids which are palmitic (C16:0), stearic (C18:0), behenic

(C22:0), arachidic (C20:0) and lignoceric (C24:0) acids (Table 3). Palmitic acid is more important among saturated acids due to its amount. The highest and lowest palmitic acid ranged from 9.73 to 12.59% with the mean of 11.22%. Only two within all the studied genotypes were below 10% and they were BATEM-5025 (9.73%) and NC-7 (9.98%), respectively. The lowest palmitic acid content was observed in ICGV 15074 (10.16%) among Indian lines. Stearic acid contents of peanut oil varied between 1.45-2.58% with an average of 2.02%. The maximum and minimum values were detected in ICGV 10208 and ICGV 06040, respectively. As regards to behenic acid, the values ranged from 1.60 to 4.05% and the mean was 2.84%. The lowest behenic acid was observed in control variety Sultan whereas ICGV 06040 had the minimum value of behenic acid (1.96%) among Indian lines. The highest and lowest arachidic acids were observed in ICGV 10207 with 2.30% and Halisbey with 1.24%, respectively. The average of arachidic value was 1.82%. Similar with results of stearic and behenic acids, ICGV 06040 had the lowest arachidic acid content with 1.30% within Indian lines. ICGV 10193 and NC-7 had the maximum and minimum lignoceric acid contents with 2.05 and 0.57%, respectively. The mean of the lignoceric acid was 1.09%. The lowest content was observed in ICGV 10217 with 0.61% among Indian lines. It was observed that saturated fatty acid ratios in 2021 were higher than those in the first year of the study (2020) due to the lower precipitation (Hassan et al., 2005). Saturated fatty acids are used in production of soaps, agricultural chemical and fatty alcohols. However, peanut oil is not adequate for commercial application compared to palm oil (Yol et al., 2017). These findings were in agreement with the results of Hassan et al. (2005), Hassan and Ahmad (2012), Mora-Escobedo et al. (2015), Yol and Uzun (2018), Uckun et al. (2019) and Ergun and Zarifikhosroshahi (2020). Isleib et al. (2008) and Onemli (2012) reported that fatty acid compositions are related to the plant growth habit. In the present study, fatty acid compositions of peanut genotypes were oleic acid (~47%), linoleic acid (~31%), palmitic acid (~11%), behenic acid (~3%), stearic acid (~2%), arachidic acid (~2%), and lignoceric acid (~1%) according to the mean of 2-year results (Figure 3).

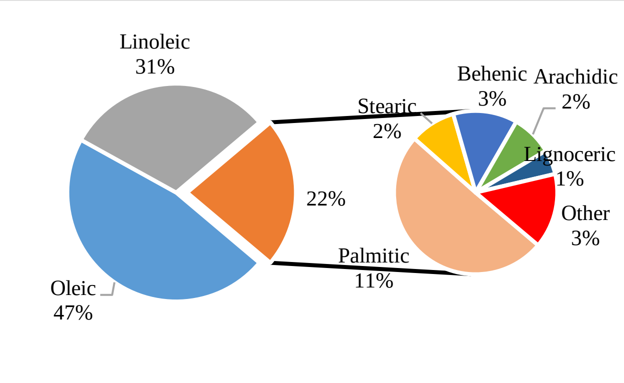

Figure 3. Fatty acid composition of peanut seed oil according to 2-year obtained data.

Table 3. Means of saturated fatty acid composition of varieties.

	Palmitic Acid (C16:0) (%)	Stearic Acid (C18:0) (%)	Behenic Acid (C22:0) (%)	Arachidic Acid (C20:0) (%)	Lignoceric Acid (C24:0) (%)
Varieties					
ICGV 10176	12.01±0.44 ab	1.55±0.04 h	3.03±0.09 f	1.92±0.09 bd	1.07±0.05 eg
ICGV 10178	12.10±0.40 ab	1.50±0.04 h	2.92±0.05 fg	1.87±0.14 cd	1.37±0.01 cd
ICGV 10179	11.91±0.44 ac	1.78±0.16 g	3.72±0.04 bc	1.88±0.11 cd	1.58±0.12 bc
ICGV 10193	11.65±0.49 bd	2.07±0.30 e	3.63±0.23 cd	1.77±0.12 df	2.05±0.42 a
ICGV 10207	12.29±0.71 ab	2.26±0.14 d	3.56±0.20 d	2.30±0.20 a	0.98±0.10 fg
ICGV 10208	12.22±0.22 ab	2.58±0.24 a	2.55±0.43 j	1.83±0.25 cde	1.27±0.36 de
ICGV 10209	11.20±0.43 ce	2.29±0.21 cd	3.79±0.24 b	2.25±0.15 a	1.58±0.28 bc
ICGV 10217	10.97±0.22 df	1.80±0.03 fg	2.18±0.37 k	1.32±0.19 g	0.61±0.14 h
ICGV 10218	10.91±0.13 dg	1.85±0.04 fg	2.85±0.23 gh	1.72±0.11 ef	1.22±0.24 ef
ICGV 10220	10.37±0.64 fi	1.89±0.06 f	3.19±0.21 e	1.97±0.12 bc	1.09±0.09 ef
ICGV 15074	10.16±0.40 gi	1.75±0.07 g	4.05±0.22 a	2.30±0.13 a	1.66±0.10 b
ICGV 16013	10.50±0.94 ei	2.37±0.06 c	3.53±0.08 d	2.21±0.03 a	1.02±0.05 eg
ICGV 16017	10.68±0.60 eh	2.37±0.27 c	2.74±0.51 hi	1.65±0.25 f	1.01±0.19 eg
ICGV 06040	12.36±0.98 ab	1.45±0.04 h	1.96±0.38 l	1.30±0.24 g	0.66±0.11 h
ICGV 06099	12.59±0.43 a	2.46±0.23 b	2.69±0.16 i	1.96±0.11 bc	0.80±0.07 gh
NC-7	9.98±0.42 hi	2.08±0.08 e	2.01±0.16 l	1.64±0.11 f	0.57±0.05 h
Halisbey	10.48±0.17 ei	1.81±0.02 fg	1.70±0.16 m	1.24±0.14 g	0.71±0.03 h
Sultan	11.19±0.21 ce	2.04±0.04 e	1.60±0.04 m	1.39±0.04 g	0.69±0.09 h
BATEM-5025	9.73±0.13 i	2.45±0.02 ab	2.20±0.07 k	2.04±0.04 b	0.98±0.05 fg
Years					
2020	10.49±0.16 B	1.80±0.4 B	2.63±0.09 B	1.66±0.04 B	0.91±0.04 B
2021	11.96±0.17 A	2.23±0.07 A	3.05±0.14 A	1.97±0.08 A	1.29±0.09 A
Mean	11.22±0.13	2.02±0.04	2.84±0.09	1.82±0.04	1.10±0.05

SEM: Standard Error of the Mean. Letters show different groups in each column.

Correlation

The Pearson correlation matrix is provided in Table 4. A significant negative correlation (r = -0.951) was observed between oleic and linoleic acids, as expected. This relationship was also reported by Yol et al. (2017) and Bakal and Arioglu (2019). Behenic acid had a strong positive correlation with arachidic acid (r = 0.835) and lignoceric acid (r = 0.737) whereas oleic acid and palmitic acid had a negative correlation (r = -0.558). There was a significant and positive correlation between lignoceric and arachidic acid (r = 0.547) even not as strong as the other relationships. Yol et al. (2017) also observed that palmitic acid had positive correlation with low values with all saturated fatty acids.

Table 4. Correlation coefficients among the fatty acid compositions based on average of two years.

	Oleic Acid	Linoleic Acid	Palmitic Acid	Stearic Acid	Behenic Acid	Arachidic Acid
Oleic Acid	1					
Linoleic Acid	**-.951**	1				
Palmitic Acid	**-.558**	**.421**	1			
Stearic Acid	**.217**	**-.360**	**.191**	1		
Behenic Acid	-.109	-.101	.173	**.330**	1	
Arachidic Acid	.028	**-.225**	.156	**.531**	**.835**	1
Lignoceric Acid	-.136	-.030	**.191**	**.349**	**.737**	**.547**

$p < 0.05$ in bold.

CONCLUSION

O/L ratio and IV are both indicators of peanut shelf life and oil stability. High O/L ratio and low IV provide extensive shelf life, better stability and high quality of oil. ICGV 15074 and ICGV 16013 came to forefront with high O/L ratio (9.46±1.46, 5.44±0.61) and low IV (72.68±0.60, 76.41±0.69), respectively. Besides, ICGV 10193 had higher oil content (52.16%±0.34) compared to ICGV 15074 (46.68%±0.45). In addition to these peanut lines, ICGV 10179 (51.58%±0.35) and ICGV 16013 (51.47%±0.35) may be recommended for peanut breeding program due to their high oil content.

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