Nutritional and Bioactive Composition of Apricot Kernel: Fatty Acids, Tocopherols, and Phenolics

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Abstract: The present study investigated the proximate composition, mineral profile, sugar and organic acid contents, phenolic compounds, and lipid fraction of apricot kernels. The kernels contained 3.00% moisture, 2.71% ash, 20.26% crude protein, 20.95% dietary fiber, and 51.60% crude oil, indicating their potential as a rich source of nutrients. Mineral analysis revealed high levels of potassium, phosphorus, and magnesium, alongside trace elements, while toxic heavy metals were below detection limits. The sugar profile was dominated by sucrose (41.02 mg/g), with glucose, fructose, and sorbitol also present. Malic (15.09 mg/g) and citric acids (8.97 mg/g) were the main organic acids, while significant amounts of vitamin C, and B-complex vitamins, were detected. HPLC analysis identified phenolic acids including protocatechuic, caffeic, p-coumaric, and ferulic acids. The lipid fraction was rich in unsaturated fatty acids, primarily oleic (61.43%) and linoleic acids (34.77%), with low saturated fatty acids. Tocopherol analysis showed γ-tocopherol as predominant (432.17 mg/kg), supporting the antioxidant value of the oil. Overall, apricot kernels represent a valuable source of lipids, proteins, micronutrients, and bioactive compounds with nutritional and functional potential.

Keywords: Functional food, fatty acid, tocopherols, phenolic compounds, organic acid.

Kayısı Çekirdeğinin Besinsel ve Biyoaktif Bileşimi: Yağ Asitleri, Tokoferoller, Fenolikler

Özet: Bu çalışmada kayısı çekirdeklerinin temel bileşimi, mineral profili, şeker ve organik asit içerikleri, fenolik bileşenler ve lipid fraksiyonu incelenmiştir. Çekirdekler %3,00 nem, %2,71 kül, %20,26 ham protein, %20,95 diyet lifi ve %51,60 ham yağ içermekte olup, besin açısından zengin bir kaynak olma potansiyelini göstermektedir. Mineral analizinde potasyum, fosfor ve magnezyum yüksek düzeyde bulunmuş, eser elementler tespit edilmiş, toksik ağır metaller ise ölçüm sınırının altında kalmıştır. Şeker profilinde sukroz (41,02 mg/g) baskın olup, glikoz, fruktoz ve sorbitol de belirlenmiştir. Malik asit (15,09 mg/g) ve sitrik asit (8,97 mg/g) başlıca organik asitler olarak öne çıkmıştır; ayrıca kayısı çekirdeklerinde kayda değer miktarda C vitamini ve B grubu vitaminler de tespit edilmiştir. HPLC analizi, protokateşik, kafeik, p-kumarik ve ferulik asitler gibi fenolik asitlerin varlığını ortaya koymuştur. Lipid fraksiyonu, özellikle oleik (%61,43) ve linoleik asitler (%34,77) açısından zengin, doymuş yağ asitleri ise düşük seviyededir. Tokoferol analizleri, γ-tokoferolün baskın olduğunu (432,17 mg/kg) göstermiş ve yağın antioksidan değerini desteklemektedir. Genel olarak, kayısı çekirdekleri lipidler, proteinler, mikro besinler ve biyoaktif bileşenler açısından değerli bir kaynak olup, beslenme ve fonksiyonel gıda uygulamaları için yüksek potansiyele sahiptir.

Anahtar Kelimeler: Fonksiyonel gıda, yağ asidi, tokoferoller, fenolik bileşikler, organik asit

Research Article

1.Introduction

Apricot (*Prunus armeniaca* L.) is an important stone fruit widely cultivated worldwide. It is consumed both fresh and dried, and is also used in various food and industrial products. In 2023, global apricot production reached about 3.8 million tons, of which approximately 750,000 tons (around 20%) were produced in Türkiye, highlighting the country's leading role in apricot cultivation (FAOSTAT, 2025). While the edible flesh of apricots has been extensively studied (Al-Soufi et al., 2022), the apricot kernel, a by-product of processing, has received comparatively less attention despite its high nutritional potential.

Apricot kernels are rich in proteins, lipids, dietary fiber, and contain significant amounts of minerals, sugars, and organic acids (Akin et al., 2008; Muradoğlu et al., 2011). Their oil content ranges from 40.23% to 53.19% and is notable for its high proportion of unsaturated fatty acids, mainly oleic (58.3–73.4%) and linoleic acids (18.8–31.7%). The oil also contains tocopherols and phytosterols, which are associated with beneficial effects on blood pressure and cholesterol regulation, underlining its nutritional and health value (Turan et al., 2007).

The rich and diverse phenolic content of apricot kernels contributes significantly to their nutritional and potential health-promoting properties (Al-Juhaimi et al., 2021; Hrichi et al., 2020; Ortuño-Hernández et al., 2025). In addition, apricot kernels are a rich source of plant proteins, ranging from 17.23% to 31.40% depending on the variety and origin (Alajil et al., 2022; Muradoğlu et al., 2011). Their amino acid profile is well-balanced, including all essential amino acids, though methionine is present at very low levels, and exhibits relatively high protein quality indices (Zhu et al., 2025).

Apricot kernels have been studied for their potential health-promoting effects, which are largely attributed to their unique composition of proteins, lipids, and phenolic compounds. These bioactive constituents not only provide nutritional value but also demonstrate antioxidant, anti-inflammatory (El-Hajjaji et al., 2024) and anti-cancer (Aamazadeh et al., 2022) activities, positioning apricot kernels as a promising source of functional food ingredients.

The present study aimed to comprehensively investigate the nutritional and bioactive composition of apricot kernels, including moisture, ash, protein, oil, dietary fiber, phenolics, minerals, sugars, vitamins (B and C), and the fatty acids and tocopherols in the oil fraction. This work provides detailed insight into their chemical profile and potential functional properties.

2. Materials and Methods

2.1 Material

Apricot samples (Kabaaşı variety) used in this study were obtained from local orchards in the Malatya region of Turkey. Standards for fatty acid analysis, including a 37-component fatty acid methyl ester (FAME) mix (10 mg/mL in methylene chloride, catalog no. 47885-U), were purchased from Supelco (Bellefonte, PA, USA). Phenolic standards, including protocatechuic acid (03930590), caffeic acid (C0625), p-coumaric acid (C9008), and ferulic acid (46278), glucose (G7528), sucrose (S7903), fructose (F3510), and sorbitol (S7547), citric acid (C-0706) and malic acid (M-0875), were obtained from Sigma-Aldrich (St. Louis, MO, USA). All other reagents were of analytical grade and purchased from Merck (Darmstadt, Germany). Milli-Q water was used in all experiments and analyses.

2.2 Determination of the composition of apricot kernels

Moisture (945.39A), ash (923.03), crude protein (960.52), crude oil (920.39C) and dietary fiber (991.43) contents of apricot kernels were determined according to AOCS (1998). Moisture content was measured by drying 5 g of ground sample at 105 ± 2 °C until constant weight, and the weight loss during drying was expressed as percentage moisture. Total dry matter was calculated accordingly. Ash content was determined by incinerating 2–3 g of sample in porcelain crucibles at 550–600 °C for 6 h, and the remaining residue was expressed as percentage ash on a dry weight basis.

Crude protein was analyzed using the Kjeldahl method, where 1 g of sample was digested with concentrated sulfuric acid in the presence of a catalyst mixture, followed by neutralization, distillation, and titration with 0.1 N HCl. The nitrogen content obtained was converted to crude protein using the factor N × 6.25.

Crude oil content was determined by Soxhlet extraction with petroleum ether. Kernels (5 g) from each variety were ground and extracted in a Soxhlet apparatus for 8 h under reflux conditions. The solvent was removed using a rotary evaporator at 40 °C, and the residue was weighed. Oil content was calculated as the percentage of the initial sample weight. The extracted oil was subsequently used for the analysis of fatty acid and tocopherol composition as described in Section 2.6.

Dietary fiber was determined using the enzymatic–gravimetric procedure with the Total Dietary Fiber Assay Kit (Megazyme International Ireland Ltd., Ireland). Ash and protein remaining in the fiber residues were quantified and subtracted for correction, and total dietary fiber (TDF) was calculated as the sum of insoluble dietary fiber (IDF) and soluble dietary fiber (SDF).

2.3 Phenolic Content

Phenolic extracts were prepared based on the method of Amarowicz et al. (2005) with slight modifications. Briefly, 100 mg of defatted, ground sample was suspended in 10 mL of water and 10 mL of 2 N NaOH. The mixture was incubated in a water bath at 40 °C for 4 hours. After hydrolysis, the solution was acidified to pH 2 with 6 N HCl. Free phenolic acids and those released from esters were extracted five times with 15 mL portions of diethyl ether using a separatory funnel. The combined ether extracts were evaporated to dryness using a rotary evaporator (Heidolph, Germany). The residue was dissolved in 2 mL of methanol and filtered through a 0.45 µm nylon filter prior to injection into the HPLC system for analysis.

Phenolic compounds were determined by HPLC according to Onsekizoglu, Bahceci, and Acar (2010), using an Inertsil C18 column (250 × 4.6 mm, 5 µm; GL Sciences, Tokyo, Japan) on a ThermoFinnigan SpectraSystem equipped with a P4000 gradient pump, AS3000 autosampler, and UV6000 PDA detector. The chromatographic conditions and gradient program were applied as reported in the Onsekizoglu, Bahceci, and Acar (2010).

2.4 Mineral Content

Mineral content was determined according to Ozyiğit et al. (2018). Approximately 0.4 g of ground sample was weighed into Teflon vessels and digested with concentrated nitric acid using a Mars Microwave Digestion System (CEM, USA). After cooling, the digest was diluted to 50 mL with deionized water, and mineral concentrations were measured using a PerkinElmer Optima 7000DV ICP-OES system (PerkinElmer, USA).

2.5 Organic Acids and Sugar Content

Chromatographic analyses for organic acids, vitamin C, sugars, and sorbitol contents were performed using a ThermoFinnigan HPLC system (San Jose, CA, USA) equipped with an autosampler, quaternary gradient pump, UV detector (Spectra System UV6000LP, deuterium lamp), refractive index detector (SpectraSystem RI-150), and ChromQuest 4.0 software according to Akin et al. (2008). Organic acids, vitamin C, sugars, and sorbitol contents were determined following the methodology of Akın Bayram (2006), with sample preparation and HPLC analysis carried out according to the procedures and instrument conditions.

The determination of B vitamins (thiamine, riboflavin, and pyridoxine) was performed by HPLC following the method of Kadakal et al. (2007). Separation was carried out on a Luna C18 column (250 × 4.6 mm, Phenomenex) maintained at 35 °C. The mobile phase consisted of A (50 mM KH_2PO_4, pH 7) and B (100% methanol), with a flow rate of 0.8 mL/min. Gradient elution was achieved as follows: 1% B for 5 min, 1-30% B during 15 min, 30% B for 5 min. Detection wavelengths were set at 246 nm for thiamine, 268 nm for riboflavin, and 290 nm for pyridoxine. For sample preparation, according to Erbaş et al. (2005) 2.5 g of ground sample was mixed with 4 mL of hexane and 16 mL of HPLC-grade deionized water, homogenized at 12,000 rpm for 5 min, and centrifuged at 3250 g for 30 min. The aqueous phase was collected, filtered through a 0.45 µm membrane filter, and transferred to HPLC vials.

Prior to injection, all extracts were filtered through 0.45 µm membrane filters and transferred into HPLC vials. Quantification of analytes was carried out based on retention times and peak areas using authentic standards (thiamine, riboflavin, pyridoxine, cholecalciferol, citric acid, malic acid, sucrose, glucose, fructose, sorbitol, and vitamin C), and results were expressed as mg/kg.

2.6 Fatty Acid and Tocopherol Content

Fatty acid composition of apricot kernels was determined by preparing fatty acid methyl esters (FAMEs) using 2 N potassium hydroxide in dry methanol and extracting them with n-hexane, following AOCS Official Method Ce 2-66 (1998) and Turan et al. (2007). One µL of the prepared FAMEs was injected into an GC (HP 5890 Series II) equipped with a flame ionization detector (FID) and an HP 7673A automatic injector. Separation was achieved on a fused silica DB23 capillary column (60 m × 0.25 mm i.d., 0.25 µm film thickness). The oven temperature was programmed from 170 °C (3 min) to 220 °C at 3 °C/min and held at 220 °C for 15 min. Nitrogen was used as the carrier gas at 1 mL/min with a split ratio of 1:65. Fatty acids were identified by comparing retention times with those of standard FAME mixtures, and results were expressed as relative peak area percentages. Analyses were performed in duplicate, and mean values were reported.

Tocopherol composition of apricot kernel oil was determined using normal phase HPLC (ThermoFinnigan, San Jose, California, USA). Samples (20 µL) were injected and analyzed at 292 nm with the column maintained at 30°C and the sample temperature at 15°C. Separation was achieved on a Phenomenex silica column (250 × 4.6 mm) using an isocratic mobile phase of n-hexane: isopropanol (99:1) at a flow rate of 1 mL/min. Compounds were identified and quantified using authentic α-, β-, γ-, and δ-tocopherol standards, and their concentrations (mg/kg) were calculated from peak areas using calibration curves.

2.7 Statistical Analyses

The statistical analyses were performed with the SPSS package software, version 18.0 (SPSS Inc., Chicago, IL). Results were presented as means ± standard deviation of the three replicates of each experiment. Analysis of variance was performed. Significant differences among the means ($p < 0.05$) were determined by Duncan's multiple range test.

3. Results and Discussion

3.1. The Nutritional and Biochemical Composition of Apricot Kernels

The proximate composition of apricot kernels was determined, revealing a moisture content of 3.00 %, ash content of 2.71 %, crude protein content of 20.26%, and dietary fiber content of 20.95 %. Moreover, the kernels exhibited a high crude oil content of 51.60 %, indicating their potential as a rich source of lipids and proteins (Table 1). These findings are generally in line with previously reported values for apricot kernels, which include moisture 4.2 %, protein 21.8 %, ash 2.71 %, fat 40.2 %, and total dietary fiber 35.8 % (Seker et al., 2010).

Table 1. The composition of apricot kernel.
Tablo 1. Kayısı çekirdeğinin bileşimi.

	Apricot Kernel
Moisture (%)	3.00±0.00
Ash (%)	2.71±0.02
Crude Protein (%)	20.26±0.34
Dietary Fiber (%)	20.95±0.51
Crude oil (%)	51.60±1.69

Akin, Karabulut, and Topcu (2008) reported that different fresh Malatya apricot varieties had 11.83–25.81 % moisture and 0.50–0.89 % ash. This low moisture level in the kernels reflects their suitability for storage and oil extraction, whereas the higher moisture content of the fruits influences their perishability and suitability for fresh consumption or drying. The relatively high ash content in the kernels indicates a higher mineral concentration compared to the fruit pulp.

The mineral composition of apricot kernels was further analyzed, revealing that potassium (K, 95.92 µg/kg), phosphorus (P, 64.06 µg/kg), and magnesium (Mg, 31.38 µg/kg) were the dominant minerals. Calcium (Ca, 16.12 µg/kg) was present at intermediate level, while manganese (Mn, 0.11 µg/kg), copper (Cu, 0.14 µg/kg), and zinc (Zn, 0.47 µg/kg) were detected in lower concentrations (Table 2). These results indicate that apricot kernels are particularly rich in K, P, and Mg, which are essential for human nutrition, while additionally containing trace amounts of other micronutrients that may contribute to their overall nutritional value. The mineral composition differed among varieties as reported by Muradoğlu et al. (2011), with potassium (467.6–674.5 mg/100 g), phosphorus (126.86–164.53 mg/100 g), calcium (30.46–40.63 mg/100 g), magnesium (576.3–643.8 mg/100 g), and trace elements such as iron, zinc, manganese, and copper showing cultivar-dependent variations, highlighting a consistent trend in mineral composition across apricot kernels. In contrast, Akin, Karabulut, and Topcu (2008) examined that fresh apricot fruits contained considerably higher levels of major minerals such as potassium, magnesium, phosphorus, and calcium, as well as greater amounts of trace elements including iron, zinc, and manganese, compared to the kernels. These comparisons indicate that while kernels provide a concentrated source of selected minerals, especially K, P, and Mg, the fresh fruits contain a broader spectrum of macro- and micro-minerals in higher absolute amounts on a dry matter basis, highlighting the complementary nutritional roles of the kernel and the fruit.

Furthermore, the mineral analysis included the determination of toxic heavy metals such as arsenic (As), cadmium (Cd), lead (Pb), mercury (Hg), chromium (Cr), nickel (Ni), cobalt (Co), antimony (Sb), and thallium (Tl). The concentrations of these elements were found to be below the detection limits (<0.01 µg/kg) of the analytical method.

Table 2. Mineral, Vitamin, Sugar, Sorbitol, and Organic Acid Profiles of apricot kernel.
Tablo 2. Kayısı Çekirdeği Kayısı çekirdeğinin Mineral, Vitamin, Şeker, Sorbitol ve Organik Asit Profilleri.

Mineral Contents (μg/kg)		Sugar and Sorbitol Contents (mg/g)	
		Sucrose	41.02±4.57
Mg	31.38±1.75	Glucose	18.62±0.94
P	64.06±4.11	Fructose	15.70±0.48
K	95.92±6.84	Sorbitol	7.42±0.99
Ca	16.12±0.54	**Vitamin Contents (mg/kg)**	
Mn	0.11±0.01	Vitamin C	42.08±0.25
Cu	0.14±0.03	Thiamine (B$_1$)	4.07±0.15
Zn	0.47±0.07	Riboflavin (B$_2$)	13.24±1.16
		Pyridoxine (B$_6$)	0.53±0.02
Organic Acid Contents (mg/g)			
Citric Acid	8.97±0.27	Malic Acid	15.09±1.01

Apricot kernels exhibited a substantial dietary fiber content of 20.95 %, alongside a diverse sugar profile. The sugar profile of apricot kernels was characterized by the presence of sucrose, glucose, fructose, and sorbitol. Sucrose was the predominant sugar, measured at 41.02 mg/g, followed by glucose (18.62 mg/g) and fructose (15.70 mg/g). Sorbitol, a sugar alcohol known for its low glycemic impact and potential prebiotic effects, was present at 7.42 mg/g, resulting in a total sugar content of 82.76 mg/g. Fresh apricot fruits also contain sucrose as the main sugar, with glucose and fructose present in similar proportions and appreciable amounts of sorbitol (Akin et al., 2008). Sucrose was the predominant sugar in apricot kernels, accompanied by glucose and fructose, indicating the presence of readily metabolizable sugars that could contribute to energy intake (Matthewman & Costa-Pinto, 2023).

The crude protein content of the apricot kernels analyzed in this study was 20.26 %, indicating a substantial contribution to the overall nutritional value of the kernels. This result is consistent with previous reports on apricot kernels from various genotypes. Muradoğlu et al. (2011) determined that protein content varied among the apricot varieties, ranging from 19.50 % in Teberze to 31.40 % in Beyaz, with an average value of 26.06 %, indicating notable differences in nutritional quality between cultivars. Rampáčková et al. (2021) reported an average total protein content of 22 %, with values varying among cultivars but showing no significant effect of country of origin. Similarly, Alajil et al. (2022) found that protein content ranged from 17.23 to 24.10 g/100 g dry matter, with aspartic acid and tyrosine being the most abundant amino acids, while some genotypes exhibited elevated levels of threonine, lysine, or methionine. Overall, apricot kernels represent a valuable source of high-quality protein, suitable for producing protein isolates for nutritional applications (Akbarbaglu et al., 2024; Sarabandi et al., 2023).

Organic acid analysis revealed that malic acid (15.09 mg/g) and citric acid (8.97 mg/g) were the major acids, contributing to the characteristic tartness and potential antioxidant activity of the kernels. In terms of vitamins, apricot kernels were found to contain significant amounts of vitamin C (42.08 mg/kg), riboflavin (B$_2$, 13.24 mg/kg), and thiamine (B$_1$, 4.07 mg/kg), along with smaller amounts of pyridoxine (B$_6$, 0.53 mg/kg), highlighting their potential contribution to dietary micronutrient intake.

3.2 Phenolic Content

The HPLC analysis of apricot kernel extracts was performed at 280 nm and 320 nm to detect phenolic compounds. Hydroxybenzoic acids and flavonols typically exhibit a prominent absorption peak near 280 nm, whereas hydroxycinnamic acids absorb more strongly around 320 nm (Luis Aleixandre-Tudo & du Toit, 2018). The chromatogram (Figure 1) revealed four main peaks corresponding to protocatechuic acid (peak 1), caffeic acid (peak 2), p-coumaric acid (peak 3), and ferulic acid (peak 4). At 280 nm, higher peak intensities were observed, particularly between peaks 1 and 2 and between peaks 2 and 3, reflecting the strong absorbance of hydroxybenzoic acids at this wavelength. In contrast, these peak areas decreased at 320 nm, while signals corresponding to hydroxycinnamic acid derivatives (*p*-coumaric and ferulic acids) were more pronounced, consistent with their characteristic absorbance at higher wavelengths. These results indicate that apricot kernels contain both hydroxybenzoic and hydroxycinnamic acids, with their UV absorbance profiles reflecting their distinct structural classes.

According to previous studies, apricot kernels are known to contain a diverse range of phenolic and related compounds. Hrichi et al. (2020) reported the presence of phenolic acids (chlorogenic, neochlorogenic, ferulic acids), flavanols (catechin, epicatechin), coumarin, isoflavones (acetylgenistin), cyanogenic glucosides (amygdalin), and dimethoxyflavones, with ethanol extracts showing the highest phenolic content. Similarly, Al-Juhaimi et al. (2021) identified additional compounds in unroasted kernels, including gallic acid, 3,4-dihydroxybenzoic acid, (+)-catechin, kaempferol, isorhamnetin, syringic acid, rutin-trihydrate, apigenin-7-glucoside, resveratrol, and quercetin. Ortuño-Hernández et al. (2025) using UPLC-QToF MS/MS, detected numerous metabolites, among which caffeic acid, p-coumaric acid, ferulic acid, catechin, myricitrin, quercetin, rutin, and several glycosylated derivatives were tentatively identified. Therefore, it is likely that the additional unresolved peaks in our HPLC chromatogram correspond to these minor phenolic compounds and related derivatives, reflecting the complex phenolic profile of apricot kernels.

3.3 Fatty Acid and Tocopherol Content

The lipid fraction of apricot kernels was predominantly composed of unsaturated fatty acids, with oleic acid (C18:1) being the major component (61.43 %), followed by linoleic acid (C18:2, 34.77 %). Saturated fatty acids, namely palmitic acid (C16:0, 2.67 %) and stearic acid (C18:0, 2.03 %), were present in much lower amounts, confirming the nutritional quality of the oil as a source of monounsaturated and polyunsaturated fatty acids. The fatty acid composition of apricot kernel oil closely resembles that of other nutritionally valued plant oils (USDA, 2025). Its high oleic acid content (61.43%) is comparable to that of olive oil and almond oil, both of which are recognized for their cardioprotective properties. The moderate proportion of linoleic acid (34.77%) places it closer to sunflower and canola oils, which are major dietary sources of polyunsaturated fatty acids. In contrast, the low levels of saturated fatty acids in apricot kernel oil (palmitic and stearic acids totaling less than 5%) highlight its favorable lipid profile, since this proportion is considerably lower than that found in many common edible oils. Taken together, the fatty acid profile suggests that apricot kernel oil represents a healthy alternative to traditional vegetable oils, combining the high monounsaturated fraction of olive oil with the polyunsaturated contribution characteristic of sunflower and canola oils (Table 3).
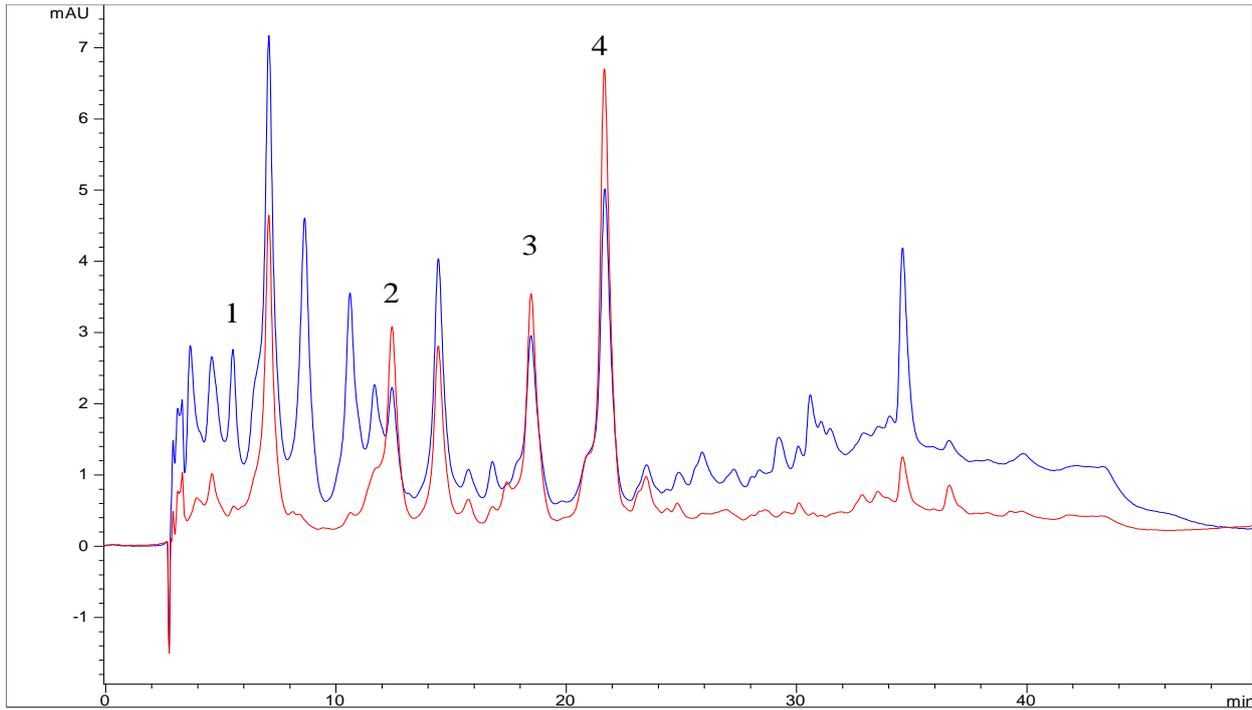
Figure 1. HPLC Chramatogram (------ 280 nm, ------ 320 nm) (1-protocatechuic acid; 2-caffeic acid; 3-*p*-coumaric acid: 4-ferulic acid).
Şekil 1. HPLC Kramatogramı (------ 280 nm, ------ 320 nm) (1-protokateşik asit; 2-kafeik asit; 3-p-kumarik asit: 4-ferulik asit).

Table 3. Fatty Acid Composition and Tocopherol Profile of Apricot Kernel Oil.
Tablo 3. Kayısı Çekirdeği Yağı Kayısı Çekirdeği Yağının Yağ Asidi Kompozisyonu ve Tokoferol Profili.

FATTY ACIDS (%)			
C16:0	C18:0	C18:1	C18:2
2.67±0.81	2.03±0.05	61.43±0.17	34.77±2.31
TOCOPHEROLS (mg/kg oil)			
α-tocopherol	β-tocopherol	γ-tocopherol	δ-tocopherol
19.52±0.62	nd	432.17±5.23	11.50±0.21

The fatty acid composition of apricot kernel oil reported in the present study is consistent with previous findings, which uniformly demonstrate that oleic and linoleic acids are the predominant components. Our data (oleic acid 61.43%, linoleic acid 34.77%, palmitic acid 2.67%, stearic acid 2.03%) confirm the oil as rich in oleic–linoleic fatty acids with a low proportion of saturated fatty acids, a profile that closely aligns with earlier reports (Turan et al., 2007; Uluata, 2016; Zhou et al., 2016). Across different studies, oleic acid generally ranges between 60–75%, while linoleic acid varies from 17–36%, both of which are recognized for their nutritional and cardiovascular benefits. The dominance of unsaturated fatty acids and the limited presence of saturated fatty acids (5–7%) highlight apricot kernel oil as a health friendly oil (Azcan & Demirel, 2012; Zhou et al., 2016).

Additional studies confirm minor variations in fatty acid composition depending on variety, genotype, and harvest year. For instance, Makrygiannis et al. (2023) reported small annual differences in oleic acid linked to fruit maturation, while Alajil et al. (2022) highlighted genotype-driven variation in total oil content (15.7–51.6 g/100 g dry matter) and an inverse relationship between oleic and linoleic acids. Moreover, Al-Juhaimi et al. (2021) observed similar ranges (oleic 66–72%, linoleic 26–27%, palmitic 4–5%, stearic ~1%) in unroasted kernels, consistent with our findings. Taken together, these studies demonstrate that while minor differences exist, the overall lipid profile of apricot kernel oil remains dominated by oleic acid, followed by linoleic acid, with saturated fatty acids consistently present at low levels.

In addition to its favorable fatty acid profile, the oil exhibited a high content of tocopherols, particularly γ-tocopherol (432.17 mg/kg oil), which is recognized for its potent antioxidant activity. Lower levels of α-tocopherol (19.52 mg/kg) and δ-tocopherol (11.50 mg/kg) were observed, while β-tocopherol was absent. This composition suggests that apricot kernel oil represents a valuable source of both health-promoting fatty acids and natural antioxidants. These findings are in line with Turan et al. (2007) , who reported total tocopherol contents of 373–601 mg/kg, with γ-tocopherol being predominant across different varieties. The abundance of γ-tocopherol, a potent antioxidant, enhances the nutritional value of apricot kernel oil, complementing its health-promoting fatty acid profile.

Overall, both our results and the existing literature converge to establish apricot kernel oil as a nutritionally valuable source of unsaturated fatty acids and tocopherols, combining the cardioprotective benefits of a high oleic content with the antioxidant potential provided by its tocopherol fraction. Recent studies highlight its potential in innovative food applications: for instance, apricot kernel oil oleogel and press cake have been successfully used to develop plant-based cheese alternatives with significantly reduced saturated fat content while maintaining desirable textural and sensory properties (Fidan et al., 2025). Similarly, apricot kernel cream has been formulated as a plant-based, cream-like product with enhanced antioxidant activity and favorable rheological behavior compared to cow's milk cream (Sahingil & Hayaloglu, 2021). These applications underscore not only the functional food and nutraceutical potential of apricot kernel oil but also its sustainability as an alternative lipid source, offering high unsaturated fatty acid content and bioactive properties suitable for health-promoting formulations.

4. Conclusion

This study demonstrated that apricot kernels are a nutrient-dense raw material with considerable potential for both nutritional and functional applications. The kernels contained high levels of crude oil and protein, alongside substantial dietary fiber and essential minerals. These features position them as a valuable plant-based source of macronutrients and micronutrients. The lipid fraction was dominated by oleic and linoleic acids, with a consistently low proportion of saturated fatty acids, thereby offering a favorable fatty acid profile comparable to olive, almond, and sunflower oils. Moreover, the kernels exhibited a rich tocopherol content, particularly γ-tocopherol, which enhances their antioxidant capacity. The presence of diverse phenolic acids, vitamins, and sugars further contributes to their health-promoting properties. Taken together, apricot kernels can be considered a multifunctional food ingredient, combining cardioprotective and antioxidant benefits. They also hold promise prospects for incorporation into functional foods, nutraceuticals, and sustainable oil alternatives.

5. Conflict of interest

The authors report there are no competing interests to declare.

6. References

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