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Original article

Evaluation of Some Nutritional Properties of Camel Meat Originating from Libya

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Abstract
The current study aims to focus on the nutritional value of camel meat. Camel meat has the same nutritional value as the main sources of red or white meat. The camel is a desert creature, its meat is just as nutritious as other red meat animals such as beef, lamb, and goat. This study indicated that the results of the approximate analysis of the components of camel meat are 18.30% protein, 2.24% fat, 1.28% ash, and 0.38% carbohydrates. The results also indicated that camel meat contains essential and non-essential amino acids. Provides requirements of children and adults. In addition, the results indicated that the fatty acid composition of camel fat includes palmitic, oleic, and linoleic acids It is a good source of the unsaturated fatty acid linoleic acid to meet nutritional needs. The percentage of unsaturated fatty acids in camel fat is 1.04%, according to available data. The results also indicated that the levels of calcium, sodium, potassium, as well as iron and copper were 6.12, 68.50, 270, 2.5, and 0.067 mg/100 gram.
Keywords: Camel Meat, Amino Acids, Fatty Acids, Mineral.

Introduction

Throughout history, camels have been important animals. They are part of the Artiodactyla order, the *Camelidae family*, and the *Camelus genus*, which consists of three species: Dromedary, Bactrianus, and wild camel. Single-humped camels (*Camelus dromedarius*), double-humped camels (*Camelus bactrianus*), and camels (*Camelus ferus*) are found across Africa, the Middle East, Central Asia, China, and isolated regions of Mongolia and Northwestern China [1-3].

Camel meat is a valuable source of top-notch protein in numerous nations, particularly in regions where the climate impacts the efficiency and abilities of other animals, the therapeutic value of its meat is high due to lower fat and cholesterol content in its carcasses compared to other farm animals [1]. The meat of this animal has excellent therapeutic qualities, as its bodies have lower levels of fat and cholesterol compared to other livestock. Beef has a lower amount of polyunsaturated fatty acids in its meat compared to camel. Consuming camel milk can lower the likelihood of contracting conditions like high blood pressure, lung infections, sensitivities, and breathing issues in people [4]. In contrast, they possess distinct physical traits, such as being able to withstand high temperatures, solar radiation, and survive in regions lacking food and water [1]. Producing meat and milk in both urban and rural areas offers a cost-effective and rapid response to the existing nutritional problem. They have shown themselves to be a critical component of economic expansion and food stability in the Middle East, Africa, Australia, and certain Asian nations. Global improvements in agriculture have not been achieved [5]. The purpose of this study was to investigate and evaluate some nutritional properties in the camel meat of Libya originated whose very few studies have been made. Analyzing camel meat is a standard practice to ensure quality of meat.

Methods

Raw materials

Camel meat: Hawar (1–1.5 years old) was brought from the Tobruk region to the city of Al-Bayda, placed on a pre-prepared farm, and left for 3 days to rest before slaughter. The slaughter was done in one of the slaughter houses in the city of Al-Bayda, and the carcass was transferred to a refrigerator with a temperature of 2–3 °C and a relative humidity of 85%. It was left for 24 hours to finish the rigor mortis. After that the meat was taken for study by curing the thigh and removing the bone from it. The meat was transferred to the laboratory for the necessary analysis.

All chemicals for determining the main components were used as analytical reagent grade and purchased from Sigma-Aldrich (Sigma-Aldrich GmbH, Sternheim, Germany).

Proximate Chemical composition

Including moisture, crude protein, and total ash were determined according to the AOAC [6].

Lipids

Total lipids in the meat samples were determined [7].

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Total carbohydrates
The percentage of total carbohydrates was calculated by subtracting the sum of the percentages of moisture, protein, lipids, and ash from 100. Carbohydrate percentage *(%) = 100 - (%Moisture + % Protein+%Total lipids+%Total ash)*

Determination of Minerals
Potassium, calcium, and sodium were determined in meat samples by using a JENWAY PFP7C Flame Photometer, while copper and iron were estimated using an Agilent Technologies GTA 120 graphite tube atomizer AOAC [6]. with three replicates for each sample

Fatty Acid Composition
The content of fatty acids in the lipids of camel meat was determined using gas liquid chromatography (GLC), were prepared following Radwan's procedure [8]. The fatty acid methyl esters were separated using Shimodzu gas chromatograph (GC-4 CM-PFE) with 1% sulphuric acid in absolute methanol. Separation conditions included a column of 10% DEGS on 801100 chromosor Q III, a detector temperature of 270˚C, N2 flow, and a chart speed of 5 min. standard methyl esters of fatty acids were utilized for identification purposes. The percentage of each fatty acid was determined by measuring the area under each peak using the triangulation method relative to the total area.

Amino Acid Composition
Amino acid content was estimated as described by AOAC [6]. Amino acids were determined using High Performance Amino Acid Analyzer. Chemical score was calculated according to FAO/WHO [9].

Results and discussion
Table-1 displays the proximate chemical analysis of camel meat including moisture, ash, fat, and protein. The findings in the current research showed a small decrease compared to the results documented by [10]. the camel meat, ash, fat, and protein levels, may are influenced by factors such as animal age, diet [11].

Table 1. Proximate chemical analysis of the examined camel meat

Camel meat	Component %
Crud protein	18.30
Lipid	2.24
ash	1.28
moisture	70.1

** Values are average of three replicates*

Amino acids contents
The result revealed that camel meat has a higher content of glutamic acid, aspartic and essential amino acids such as leucine and lysine than other meat sources while the cysteine, methionine concentration was low in camel meat compared with other meat sources lysine and leucine are the most abundant essential amino acids in camel meat. This suggests camel meat is a source of high and superior quality protein than red meat these results were consistent with [1]. Additionally, the content of essential amino acids was compared with the values suggested by the FAO/WHO [9]. due to the nutritional significance of these acids and the daily needs for both adults and children. The table makes it evident that all of the essential amino acids in camel meat meet the suggested requirements of both adults and preschoolers, and these findings are in line with those found by [12.13].

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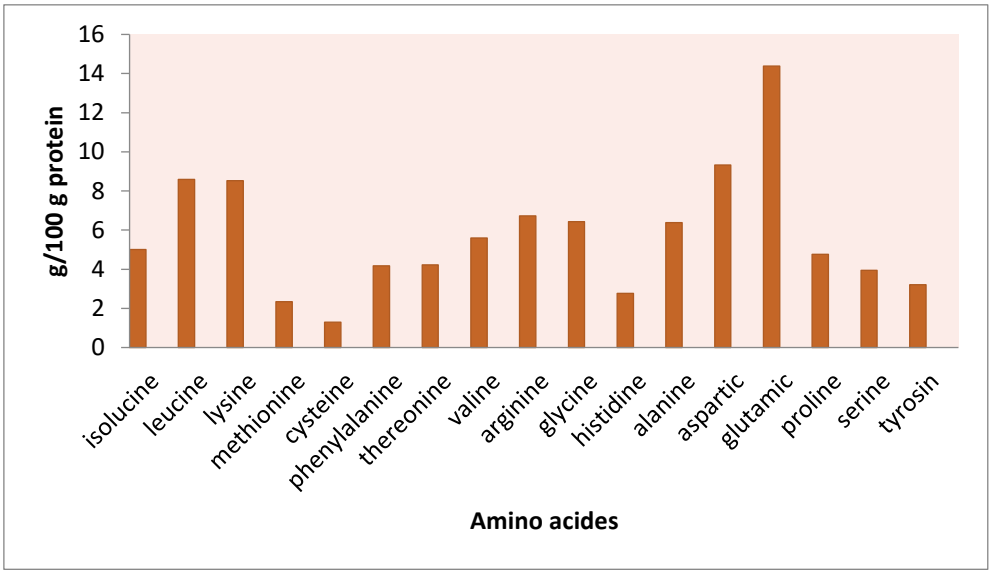

Figure 1. Amino acid content of camel meat (g/100g protein)

Table 2. Content of basic components of camel meat compared to values of FAO/WHO/UNU

Essential amino acids g/100g protein	**Camel meat**	**FAO / WHO**	
		Children pre school	**Adults**
Isoleucine	5.01	2.8	1.3
Lucine	8.60	6.6	1.9
Lycine	8.52	5.8	1.6
Mithonine -cystine	5.24	2.5	1.7
Phenylalanin- tyrosin	7.39	6.3	1.9
Threonine	4.22	3.4	0.9
Valin	5.51	3.5	1.3
Histidine	2.77	1.9	1.6

FAO/WHO/UNU 1991

Fatty acid content

Gas liquid chromatography was used to estimate the content of fatty acids in the total lipids of camel meat fat, and the results obtained, shown in Table (3), indicate that the most abundant fatty acids are palmitic, oleic, linoleic, and stearic, and the percentage in camel meat it was 24.69, 31.19, 4.97, and 11.34 mg/100 g, respectively.

It is also clear from the percentages obtained that camel meat fat is high in the essential fatty acid oleic C18:1, and linoleic C18:2, which is important for human nutrition. It should be noted that the percentages of total saturated and unsaturated fatty acids percentages in camel fat were 47.58 and 49.16, respectively. The results of this study are consistent with [14], especially myristic, palmitic, and stearic acids

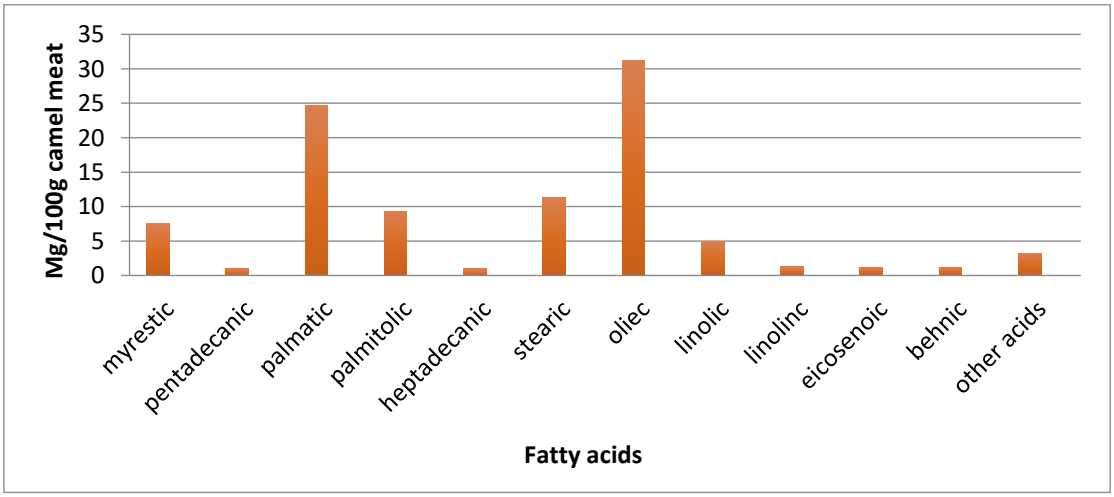

Figure 2. Fatty acid content of camel meat (mg/100 g).

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Mineral content

Table (3) shows the average content of the major elements represented by calcium, sodium, potassium, and the minor elements iron and copper.

Table 3. Mineral content of camel meat

Elements	Concentration mg/100g
potassium	270 .91
sodium	68.50
calcium	6.12
iron	2.50
copper	0.067

Compared to the results of the present study, the increased potassium (K) level in camel meat (270 mg/100g) was lower than the 411.0 mg/100g finding presented by [15]. According to the study's findings, camel meat contains 6.12 milligrams of calcium per 100 grams. The findings of this study are consistent with those of previous study who reported that the calcium content of camel meat ranged from 5.59 to 8.27 mg/100gm [14]. The current study's results were lower than those of earlier study who found that the calcium content of camel meat was 27 mg/100 g [16]. Additionally, lower than calcium content of camel meat ranges from 9.2 to 46.6 mg/100gm [17]. However, the results of this study were consistent with another previous study who discovered that camel meat had a calcium content of 5 mg/100 g [18]. While the sodium results of this study were less than those of previous study who reported that the sodium concentration in camel meat was 252 mg/100g [17], and higher than those of [18], who found that the sodium concentration in camel meat was 64 mg/100g. The current study found that the sodium content in camel meat was 68.5 mg/100g. In relation to ferrous (Fe), the current investigation revealed 2.50mg/100g, which is consistent with the findings of [20]. who found that camel meat had a significantly higher iron content, while this study's result is lower than that of [15-19], they reported the ferrous concentration in camel meat was 4.3 mg/100gm, while in the range of 1.16 to 3.39 mg/100gm [21], and more than [22] reported a ferrous concentration of 0.03 mg/100gm. However, the results of the present study regarding the concentration of copper (Cu) in camel meat (0.067 mg/100 g) are consistent with the findings of [22]. who found the copper content in the longissimus muscle of camel to be 0.001 mg/100 g.

CONCLUSION

Camel meat is rich in a variety of macro- and micronutrients and is therefore nutritionally as good as traditional meat sources. In addition to being rich in many essential amino acids and mineral, camel meat also contains saturated and unsaturated fatty acids. The amino acid and mineral content of camel meat tends to be higher than other red meat animals. Due to the nutritional value of camel meat, it can be successfully marketed along with other livestock. Camel meat is low in fat and cholesterol. Future research is needed to realize the potential of camel as a meat source through multidisciplinary research into efficient production systems, improved meat technology, and marketing.

Conflicts of Interest

The authors declare no conflicts of interest

REFERNCES

1. Kadim IT, Mahgoub O, Purchas RW. A review of the growth, and of the carcass and meat quality characteristics of the one-humped camel (Camelus dromedaries). Meat Science. 2008 Nov 1;80(3):555-69.
2. Kadim IT, Mahgoub O, Mbaga M. Potential of camel meat as a non-traditional high quality source of protein for human consumption. Animal frontiers. 2014 Oct 1;4(4):13-7.
3. Burger PA, Ciani E, Faye B. Old World camels in a modern world–a balancing act between conservation and genetic improvement. Animal Genetics. 2019 Dec;50(6):598-612.
4. Kurtu MY. An Assessment of the Productivity for Meat and the Carcase Yield of Camels (Camelus dromedarius) and of the Consumption of Camel Meat in the Eastern Region of Ethiopia. Tropical Animal Health and Production. 2004 Jan;36:65-76.
5. Faye B. (International Committee for Animal Recording). Session on camelids. 28 mai-3 juin 2004, Sousse (Tunisie)6. AOAC. 1997. Official Method of Analysis. 16th ed. Association of Official Analytical Chemists, DC., USA. 2004. Proc. of the 34th meeting FAO/ICAR
6. Folch J, Lees M, Stanley GS. A simple method for the isolation and purification of total lipides from animal tissues. Journal of biological chemistry. 1957 May 1;226(1):497-509.
7. Consultation JF. Protein quality evaluation. Food and Agriculture Organization of the United Nations: Rome, Italy. 1991;51:1-66.
8. Radwan S. Coupling of two-dimensional thin-layer chromatography with gas chromatography for the quantitative analysis of lipid classes and their constituent fatty acids." Journal of Chromatographic Science. 1978;16(11):538-542.

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9. Elgasim EA, Alkanhal MA. Proximate composition, amino acids and inorganic mineral content of Arabian camel meat: comparative study. Food chemistry. 1992 Jan 1;45(1):1-4.
10. Kadim IT, Mahgoub O, Al-Maqbaly RS, Annamalai K, Al-Ajmi DS. Effects of age on fatty acid composition of the hump and abdomen depot fats of the Arabian camel (Camelus dromedarius). Meat Science. 2002 Oct 1;62(2):245-51.
11. Sales J, Hayes JP. Proximate, amino acid and mineral composition of ostrich meat. Food Chemistry. 1996 Jun 1;56(2):167-70.
12. Kadim IT, Mahgoub O, Al-Marzooqi W, Al-Zadjali S, Annamalai K, Mansour MH. Effects of age on composition and quality of muscle Longissimus thoracis of the Omani Arabian camel (Camelus dromedaries). Meat Science. 2006 Aug 1;73(4):619-25.
13. Kadim IT, Al-Amri IS, Alkindi AY, Haq QM. Nutritional values and health benefits of dromedary camel meat. Animal Frontiers. 2022 Aug 1;12(4):61-70.
14. Mohammad BF, Abubakar FM. Chemical Composition of Raw and Cooked Camel (Camelus dromedarius) Meat Cuts. Savannah Journal of Agriculture. 2011;6(2):32-6.
15. Gashe M. Assessment of Abattoir Facilities, Slaughtering Practices and Evaluation of Bacterial Load on Carcass and In-Contacts In Abattoirs of North West Amhara, Ethiopia (Doctoral dissertation).
16. Ali S, Rehman R, Abbas A, Mahmud T, Anwar J, Salman M. Minerals and nutritional composition of camel (Camelus dromedarius) meat in Pakistan. Journal of the Chemical Society of Pakistan. 2011 Dec 11;33(6):835.
17. Raiymbek G, Faye B, Serikbayeva A, Konuspayeva G, Kadim IT. Chemical composition of Infraspinatus, Triceps brachii, Longissimus thoraces, Biceps femoris, Semitendinosus, and Semimembranosus of Bactrian (Camelus bactrianus) camel muscles.
18. Zahari, Mwan, and S. Abdul wahid. "Mineral Concentration In blood plasma and various tissues of local crossbreed goates" (1985): 333-340.
19. Soltanizadeh N, Kadivar M, Keramat J, Bahrami H, Poorreza F. Camel cocktail sausage and its physicochemical and sensory quality. International Journal of Food Sciences and Nutrition. 2010;61(2):226-243.
20. El-Faer MZ, Rawdah TN, Attar KM, Dawson MV. Mineral and proximate composition of the meat of the one-humped camel (Camelus dromedarius). Food Chemistry. 1991 Jan 1;42(2):139-43.
21. Knoess KH. The camel as a meat and milk animal. 1977:39-44.

المستخلص

تهدف الدراسة الحالية إلى التركيز على القيمة الغذائية للحوم الإبل. حيث يتمتع لحم الإبل بنفس القيمة الغذائية التي تتمتع بها المصادر الأساسية للحوم الحمراء أو البيضاء. الجمل وهو مخلوق صحراوي، لحومه مغذيه تمامًا مثل الحيوانات ذات اللحوم الحمراء الأخرى كلحم البقر والضأن والماعز. ولقد أشارت هذه الدراسه ان نتائج التحليل التقريبي لمكونات لحم الإبل هي 18.30% بروتين، 2.24% دهون، 1.28% رماد، و 0.38% كربوهيدرات. كما أشارت النتائج إلى أن لحم الإبل يحتوي على أحماض أمينية أساسية وغير أساسية. يلبي احتياجات الأطفال والكبار. بالإضافة إلى ذلك، أشارت النتائج إلى أن تركيبة الأحماض الدهنية في دهن الإبل تشمل أحماض البالمتيك، والأوليك، واللينوليك . وهو مصدر جيد للحمض الدهني اللينوليك الأساسي لتلبية الاحتياجات الغذائية . وتبلغ نسبة الأحماض الدهنية غير المشبعة في دهن الإبل 1.04% حسب النتائج. كما أشارت الدراسه إلى أن مستويات الكالسيوم والصوديوم والبوتاسيوم وكذلك الحديد والنحاس كانت 6.12 و50.68 و270 و2.5 و0.067 ملغم/100 غرام.

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