

## Nutritive Value of The Dromedary Camel Meat

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### Abstract

The current study was conducted to spotlight on the nutritive value of the dromedary camel meat from different ages in Egypt. A total of 50 samples were randomly collected over a period of 10 months from the hindquarter (*glutobiceps*) muscle of male camel carcasses slaughtered at Assiut and Sharkia Governorates. The samples were divided into two groups according to the age: Group "A" for young age (1≤5 years) and Group "B" for old ages (5-8 years). All samples were subjected to a proximate analysis (moisture, protein, fat, ash, and carbohydrate). Only 16 samples from each age were analyzed for some minerals content (Ca, Fe, K, P, Na, and Mg) and for cholesterol, caloric value and conjugated linoleic acid (CLA) contents. The statistical analysis of the results declared the presence of a significant increase ( $p<0.01$ ) in fat, ash, carbohydrate, energy, calcium, phosphorus, magnesium, iron, cholesterol and conjugated linoleic acid contents of the camel meat samples with an increasing age. Camel meat from different ages has high nutritive value and it contains considerable amount of protein, which is nearly similar or sometimes higher than other red meat. Pointing to cholesterol and conjugated linoleic acid (CLA) content of camel meat, the obtained mean values in young and old ages were 31.11, 3.19 and 50.63, 5.99 mg/100gm fat, respectively. In conclusion, meat from young camels could be healthier due to its lower fat and cholesterol content.

**Keywords:** Camel meat, Cholesterol, Linoleic acid, Nutritive value.

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## Introduction

The camel is likely to produce animal protein at comparatively low cost in the arid zones based on feeds and fodder that are generally not utilized by other domestic species (Tandon et al., 1988). Economic analysis shows that, camel meat has low wholesale and retail prices (Kadim et al., 2014). A considerable number of camels are managed and bred for slaughtering in the near East and Northern Africa as well as for export to Somalia, Saudi Arabia, Egypt, and the Gulf states (FAO, 2011). The protein content of the camel meat is significantly greater and intramuscular fat is significantly lower than veal (Kadim et al., 2008). The amount of mineral elements in ash and protein content in camel meat are reported to be similar to beef. However, the Najdi-camel meat contains significantly less fat and higher moisture than beef (Dawood and Alkanhal 1995). From healthy and nutritive value view, camel meat is good of choice that it contains high quality protein and they produce carcasses with less fat with fewer calories as well as having less levels of cholesterol in fat than other animal meats (Al-Ani, 2004). Therefore, it is wrongly believed that camel meat to be low in nutritive value and quality than other types of meats (Babiker and Yousif, 1987). Cholesterol is the main sterol present in animal tissues (mainly adipose tissues and fat in meat tissue) which is considered as essential components of cell membrane and can be stored as cholesterol esters in lipid droplets (Dessi and Batetta, 2003). Cholesterol has an essential role in lipid metabolism and other vital processes inside the body while high amount of cholesterol leads to adverse effect on consumer health. Conjugated linoleic acid (CLA) and its isomers are considered as a good not bad trans fatty acids which has many health benefits. CLA are biologically

highly active compounds that have several healthy beneficial properties including antitumor, anti-obese, anti-atherogenic and anti-diabetic activities. The molecules have been shown to prevent the onset of hypertension. Age is considered a main factor, which affects the composition and quality of camel meat especially from young ones, which contains low fat with low cholesterol as well as being a good source of high-quality protein and minerals. The favorable and suitable age for slaughtering ranges from 1 - 4 years (Abuheif et al., 1990). In Egypt, camel meat is still one of the few meats that have not been chemically studied in detail as well data on the nutritional value of camel meat are very limited particularly in Upper Egypt. Therefore, the present study was planned to determine the approximate chemical composition of camel meat slaughtered at different ages. In addition, caloric value was calculated.

## Materials and Methods

### *I. Sampling:*

Fifty meat samples were collected from hindquarter (*gluteobiceps* muscle) of male camel carcasses (one humped Arabian camel) slaughtered at different ages. The samples were collected randomly over a period of 10 months from both Banny Addey village, Assiut Governorate and from Bilbeis city, Sharkia Governorate. About 250 – 500 gm of the fresh meat was taken from each carcass (purchased from meat markets) within 3hrs post slaughter. The samples were divided into two groups according to the age: group A (25 samples) with age ranged from 1 to  $\leq 5$  years old and group B (25 samples) with age ranged from 5 to 8 years old.

The samples after purchase were placed in plastic bags, kept in ice tank and

quickly transported to a laboratory of meat hygiene section, Department of Food Hygiene, Faculty of Veterinary Medicine, Assiut University for further preparation and analysis.

#### *I.1. Preparation of samples:*

Sample preparation was carried out according to (Kadim et al., 2009). The collected samples were kept in chilling (4°C) for 24 - 48 hours before further preparation. Then-after most of visible fat, tendon and connective tissue were removed. The samples were well minced through mincing machine, well homogenized using stomacher machine, and kept frozen (-10°C at least). Chemical analysis was not delayed, to avoid any chemical and enzymatic changes.

#### *II. Proximate chemical analysis:*

The prepared meat samples were analyzed for moisture, crude protein, fat, ash, and carbohydrates contents. The samples were analyzed in duplicates. The methods adopted according to AOAC (2000).

#### *III. Calculation of energy value (Merrill and Watt, 1973):*

The energy value of camel meat was calculated according to the following equation:

$$\text{Energy value (kcal/100g)} = (\text{Protein \%} \times 4) + (\text{Fat \%} \times 9) + (\text{Carbohydrate \%} \times 4).$$

#### *IV. Estimation of some macro and micro essential minerals:*

The iron, magnesium and potassium as well as sodium, calcium and phosphorus contents of the samples were estimated. Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES 6200, Italy) was used for Ca, magnesium, and iron, while Flame Photometer (Jenway PFP-7, UK) was used for Na and K and

Spectrophotometer (Unico 2100 UV, USA) for phosphorus.

#### *V. Determination of cholesterol in camel meat tissues (Pasin et al., 1998):*

Enzymatic determination using procedures of diagnostic cholesterol reagent (CHOD-PAP, Spectrum, S.A.E.) was applied.

#### *VI. Determination of conjugated linoleic acid (CLA) Cis9-trans11 isomer by Thermo Fourier Transforms Infrared Spectrometer (FT-IR) (AOCS, 2009):*

FT-IR IS10 instrument (Nicolet Thermo Scientific Company U.S.A), Department of Chemistry (section B), Faculty of Science, Assiut University, was used for determination of Cis9-Trans11 CLA isomer in the samples.

#### *VII. Statistical Analysis:*

Data statistical analysis was performed by SPSS 16.0 statistical software, (2001). Differences among means were determined using T-test.

#### **Results**

The data presented in Table 1 declared significant differences ( $P < 0.001$ ) in all parameters of proximate analysis. The moisture and crude protein content of camel meat were significantly decreased ( $P < 0.01$ ) by increasing camel age however the fat and ash content were significantly increased ( $P < 0.01$ ) by increasing camel age. From results presented in (Table 2) it is obvious that there was a significant increase in gross energy, total cholesterol and CLA contents in examined camel meat by increasing the age of camels. The most interesting finding was the significant increase ( $P < 0.01$ ) in Ca, Mg, Fe and P contents of camel meat by increasing the age of camels (Table 3). However, no significant difference ( $P > 0.05$ ) was observed between the mean values of potassium and sodium contents in young and old ages camel meat.

**Table 1:** Mean values of the proximate chemical analysis of the examined camel meat (% on fresh basis).

Group	Age	Proximate analysis*				
		Moisture	Protein	Fat	Ash	Carbohydrate
A	1≤5	76.83±0.08 <sup>a</sup>	21.13±0.04 <sup>a</sup>	1.19±0.07 <sup>b</sup>	0.80±0.04 <sup>b</sup>	0.05±0.01 <sup>b</sup>
B	5-8	74.90±0.15 <sup>b</sup>	20.46±0.09 <sup>b</sup>	2.76±0.08 <sup>a</sup>	1.48±0.04 <sup>a</sup>	0.4±0.03 <sup>a</sup>

Means in the same column with different superscript are significantly different (P<0.01).

**Table 2:** Descriptive statistics of energy, cholesterol and CLA contents of the examined camel meat:

	Group	Samples number	Age (year)	Min	Max	Mean	SE	P. value
Gross energy, Kcal/100gm	A	25	1≤5	90.84	99.87	<b>95.44<sup>b</sup></b>	0.55	0.001*
	B	25	5-8	102.41	118.92	<b>108.41<sup>a</sup></b>	0.88	
Total cholesterol, mg/100gm	A	16 <sup>#</sup>	1≤5	14.54	50.13	<b>31.11<sup>b</sup></b>	2.88	0.001*
	B	16 <sup>#</sup>	5-8	36.59	60.14	<b>50.63<sup>a</sup></b>	1.74	
Conjugated linoleic acid (CLA) mg/100g	A	16 <sup>#</sup>	1≤5	2.09	4.49	<b>3.19<sup>b</sup></b>	0.26	0.001*
	B	16 <sup>#</sup>	5-8	4.92	7.58	<b>5.99<sup>a</sup></b>	0.28	

Means in the same column for each variable with different superscript are significantly different (P<0.001).

<sup>#</sup>Sixteen representative random samples out of 25 total samples were used in these two analyses of total cholesterol (mg/100gm), and CLA (mg/100g) because of financial reason.

**Table 3:** Mean values of some macro and micro elements (mg/100g) of the examined camel meat samples (Mean ± SE).

Group	Age	Elements*					
		Ca	Mg	Fe	K	P	Na
A	1≤5	14.24±0.75 <sup>b</sup>	15.78±0.47 <sup>b</sup>	2.16±0.13 <sup>b</sup>	279.34±15.24 <sup>a</sup>	114.61±6.03 <sup>b</sup>	94.72±7.06 <sup>a</sup>
B	5-8	24.39±1.45 <sup>a</sup>	19.31±0.79 <sup>a</sup>	5.50±0.41 <sup>a</sup>	298.32±11.25 <sup>a</sup>	155.61±6.03 <sup>a</sup>	107.5±9.31 <sup>a</sup>

Means in the same column with different superscript are significantly different (P < 0.001).

## Discussion

Dromedary camel meat has both nutritional and healthy values as most researchers reported that camel meat

contains high amount of protein with high biological value, high minerals content, high polyunsaturated fatty acids, with low intra-muscular fat content than other red

meats and low cholesterol content and low caloric value (Kadim et al., 2006, 2008; Alamin et al., 2014). Proximate analysis revealed that both moisture and protein content decreased by increasing camel age, while fat, ash and carbohydrate contents increased. The decrease in protein content by increasing camel age was consistent with the finding of earlier studies (Al-Shabib and Abu-Tarboush, 2004; Kadim et al., 2006, Saleh (2010), Raiymbck et al., 2013; Kadim et al., 2013). In contrast, Dawood and Al-Kanhal (1995), Mahmud et al. (2011), and Muhammed and Abubaker (2011) reported that protein content of camel meat was lower in old age camels in comparison with young camels (18.88vs 20.07, 20.1 vs 20.27, 18.57 vs 19.25%, respectively). On the contrary, to that result EL-Mossalami et al. (1995) recorded higher values of protein % in his study (22.02 % and 24.93%, respectively). Lower protein values (18.8, 19.52, and 18.5%, respectively) were observed for old age camels. Calculated energy content of the examined samples significantly increased with ages. This result was not agreeing with those obtained by Soltanizadeh et al. (2010) who reported higher caloric value 120.2 kcal/100gm in young age camel. For old age camels the current results were closely similar to those found by Bieklen et al. (2007) 108.03kcal/100gm but lower than those reported by Shahin (2006) 144 kcal/100 gm. The increase in cholesterol content by increasing g the age of camels consistent with those Farah and Fisher (2004) and Kadim et al. (2008) for old age camels. Cholesterol and conjugated linoleic acid (CLA) contents in camel meat significantly increased with age. Although cholesterol increases with age, however its amount is still lower than other red meats. Abu-Tarbush and Dawood (1993) did the early investigation of cholesterol content in camel meat and Kadim et al. (2013 and

2014) who noted that cholesterol content in camel meat increases with an increasing of animal age, and this agree with the obtained results. The detected camel meat content of conjugated linoleic acid (CLA) particularly cis9-tran11 was nearly similar to another ruminants' meat. The values for calories, cholesterol and CLA of camel meat. CLA of young age camel was nearly similar to that reported by Shibani et al. (2011). For old age camel, Beilken et al. (2007) reported close similar value. Effect of animal age on CLA content in camel meat was previously observed by Fritsche and Fritsche (1998), Raes et al. (2004), Dhiman et al. (2005), De la torre et al. (2006) and Barton et al. (2011), also they noted that diet, breed and seasonal variation could affect CLA content in ruminant's meat.

The higher calcium, magnesium, iron and phosphorus contents of camel meat in old camel meat than in young one was in agreement with the finding of Kadim et al. (2008 and 2009) who observed that camel meat has high Na, Fe and Ca content recorded similar results. It has been established that potassium content in camel meat is the highest among other mineral elements followed by in descending order, phosphorus, sodium, magnesium and calcium (Kadim et al., 2006).

In conclusion, camel meat from different ages had different nutritive value. It contains considerable amount of protein, which is nearly similar or sometimes higher than other red meat. Meat from young camels could be considered as a healthy option because it contains lower fat and cholesterol content.

#### **Conflict of interest statement**

The authors declare that they have no conflict of interest.

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