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Mineral and Proximate Composition of the Meat of the One-Humped Camel (*Camelus dromedarius*)

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ABSTRACT

*The information available on the nutritional value of the meat of the one-humped camel (*Camelus dromedarius*) is very limited. The mineral elements and proximate composition of muscle tissues taken from the shoulders, thighs, ribs, necks and humps of seven young (1–3 years) male camels have been determined. The amounts of mineral elements, protein and ash in the various muscle tissues of the camel are generally similar to the amounts reported for these constituents in the corresponding tissues of beef. However, the meat of the camel contains significantly less lipids (1·2–1·8% versus 4·0–8·0%) and higher water content (5–8% more) than beef. The hump consists mainly of lipids (86·9%).*

INTRODUCTION

Owing to its amazing ability to withstand water deprivation for long periods of time, the one-humped camel (*Camelus dromedarius*) has been the subject of extensive biochemical investigations. However, these investigations have focussed mainly on the blood characteristics of the camel (Grudel, 1988). Although some work has recently been carried out on the milk of the camel (Abu-Lehia, 1989; Abdulrahim, 1987) very limited information is available on the chemical composition of the meat (Awad & Berschneider, 1979; Yousif & Babiker, 1989; Babiker & Yousif, 1990). This is rather surprising in view of the importance of the meat for the diet of a large portion of the

inhabitants of the vast geographic area of the Indian subcontinent, the Middle East and North Africa (Kojeneve, 1982). The lack of knowledge on the nutritional value of the meat of the one-humped camel has prompted the present study in order to determine the mineral constituents and proximate composition of this meat.

MATERIALS AND METHODS

Samples of the meat were obtained from young (1–3 years old) male camels slaughtered in a commercial slaughterhouse (Dammam, Saudi Arabia) under the supervision of an official veterinarian. Samples were obtained from seven camels during the months of March, April and May 1990, and were analysed within one half-hour of slaughter.

Any visible fat was removed from the muscle tissues before they were minced and subsequently analysed. The proximate analyses were performed in duplicate in accordance with AOAC (1984) procedures. Moisture was determined in an oven at 105°C overnight. For the hump, the moisture levels were confirmed by both freeze-drying and Dean–Stark methods. Total nitrogen was determined by the Macro–Kjeldahl method and protein values were obtained by multiplying by a factor of 6·25. Ash was determined by combustion in a muffle furnace at 550°C overnight. Lipids were determined by a modified procedure of Bligh and Dyer (Christie, 1982). Metals were analysed by inductively coupled plasma atomic emission spectrometry on an Applied Research Laboratories ICP-3580 vacuum version, equipped with a monochromator and a simultaneous polychromator for 48 elements. Operation was carried out under the following conditions: 1200 W incident power, 5 W reflected power, 12·8 litre/min coolant argon gas flow, 0·8 litre/min plasma argon flow, 15 mm above a 3-turn local coil observation height, 0·8 litre/min aerosol carrier flow and 2 ml/min sample uptake rate. Calibration standards were prepared from a NIST (formerly NBS) spectrometric standard solution. The samples of camel muscle tissues were digested as follows: approximately 5·00 g of the homogenized tissue were weighed in a tared 250 ml Vycor beaker and 10 ml of conc. (68%) nitric acid were added to the beaker. The contents were mixed thoroughly with a glass rod to wet the tissue sample and the glass rod rinsed with a minimum amount of distilled deionized water. The beaker was covered with a watch glass and left at room temperature for 1 h followed by heating at 90°C for 2–3 h until a viscous residue was obtained. An additional 10 ml of conc. nitric acid were added to the cool beaker and the contents heated again at 90°C. The beaker was transferred to a muffle furnace at room temperature. The temperature of the furnace was set at 100°C for the first hour, then

increased to 150°C for 3 h, followed by 100°C increments every hour to a temperature of 450°C. The sample was ashed in the muffle furnace, at 450°C for 12 h until a white residue was finally obtained. Hydrochloric acid (10 ml of 25%) were added to the cool residue, followed by warming on a hot plate until dissolution. The contents of the beaker were finally transferred into a 50 ml class A volumetric flask and diluted to the mark with distilled deionized water.

RESULTS AND DISCUSSION

The proximate compositions of lean raw meat taken from the shoulder, leg, neck, ribs and hump of seven male camels are given in Table 1. Data on some mineral constituents of these muscles are listed in Table 2. With the exception of the hump, which is essentially a fat depot, the meat samples analysed were all free of visible fat.

For the proximate composition presented in Table 1, the sum of the percentages of water, protein, lipids and ash does not necessarily equal 100% because the amounts of each of these constituents were independently determined. The amounts of protein and ash of the lean raw meat of the shoulder, leg, back and ribs of the camel are similar to the amounts of protein and ash reported for lean raw meat taken from the corresponding muscles in beef (USDA, 1986). However, this is not the case for the lipid and water contents of the two meats which show considerable differences. Hence the various muscle tissues of the meat of the camel, with the exception of hump, are generally 5–8% higher in water content than the corresponding tissues in lean raw beef (USDA, 1986). On the other hand the lipid content of the various muscles of camel vary within a relatively narrow range of 1·24–1·85%, and this is significantly lower than the levels of lipid reported

TABLE 1
Mean (g/100 g) Proximate Composition (± Standard Error of the Mean) of the Meat of the One-Humped Camel (*Camelus dromedarius*)[a,b]

Cut	*Protein*	*Fat*	*Moisture*	*Ash*
Shoulder	19·52 ± 0·29	1·24 ± 0·22	78·25 ± 0·87	1·09 ± 0·05
Thigh	18·88 ± 0·76	1·40 ± 0·40	78·40 ± 0·92	1·13 ± 0·10
Ribs	18·71 ± 0·30	1·85 ± 0·43	78·85 ± 0·76	1·04 ± 0·03
Neck	19·23 ± 0·78	1·60 ± 0·22	78·52 ± 0·90	1·08 ± 0·05
Hump	1·88 ± 0·35	86·85 ± 2·50	11·50 ± 1·63	0·15 ± 0·10

[a] Visible fat was removed from all samples analysed (except for the hump).
[b] A total of seven individual camel samples were analysed in each case.

TABLE 2
Mean (mg/100 g) Mineral Elements (± Standard Error of the Mean) of the Meat of the One-Humped Camel (*Camelus dromedarius*)[a,b]

Metal	*Shoulder*	*Thigh*	*Ribs*	*Neck*	*Hump*
Ca	5·05 ± 1·34	5·41 ± 1·92	4·71 ± 0·88	5·61 ± 1·24	1·78 ± 0·25
Fe	1·24 ± 0·34	1·35 ± 0·62	1·16 ± 0·39	1·35 ± 0·35	0·31 ± 0·01
Mg	20·56 ± 2·12	21·03 ± 2·02	18·46 ± 2·10	18·45 ± 1·74	1·05 ± 0·28
P	195·7 ± 23·2	199·0 ± 22·2	181·1 ± 25·0	180·7 ± 20·8	14·77 ± 4·20
K	357·4 ± 29·1	360·5 ± 40·2	324·0 ± 34·8	338·1 ± 29·0	17·94 ± 5·82
Na	69·08 ± 19·61	70·42 ± 26·22	84·1 ± 20·3	87·3 ± 22·6	36·11 ± 11·02
Zn	3·52 ± 0·74	3·07 ± 0·41	3·85 ± 1·15	4·80 ± 1·24	0·00 ± 0·00
Cu	0·073 ± 0·034	0·085 ± 0·040	0·069 ± 0·033	0·094 ± 0·066	0·033 ± 0·03
Mn	0·004 ± 0·006	0·009 ± 0·008	0·007 ± 0·006	0·006 ± 0·005	0·00 ± 0·00
S	56·09 ± 17·07	54·99 ± 8·30	57·97 ± 11·96	64·38 ± 11·40	5·86 ± 2·04
Sr	0·02 ± 0·007	0·03 ± 0·01	0·02 ± 0·01	0·03 ± 0·01	0·01 ± 0·01
Cr	0·005 ± 0·013	0·008 ± 0·021	0·01 ± 0·02	0·03 ± 0·02	0·00 ± 0·00
Al	0·51 ± 0·50	0·15 ± 0·15	0·12 ± 0·10	0·58 ± 0·73	0·10 ± 0·10

[a] Visible fat was removed from all samples analysed (except for the hump).
[b] A total of seven individual camel samples were analysed in each case.

for lean beef, which generally fall within a range of 4·0–8·0% (USDA, 1986). The lipid contents of lean meat taken from the legs of horse, kangaroo and buffalo have been reported to be 1·02, 1·06 and 1·08%, respectively (Sinclair *et al.*, 1982), and these values are comparable to the percentages of lipid in the thigh of the camel. The hump is essentially a fat depot with lipid content of *c.* 87%.

The first nine 'nutrient' elements reported in Table 2 (calcium to manganese) for the various muscle tissues, with the exception of the hump, exhibit similar trends as far as the amounts are concerned in both camel and beef (USDA, 1986). Hence potassium is the most abundant element in both meats, followed by phosphorus, sodium and magnesium, respectively, with smaller percentages of the remaining nutrient elements. Sulphur is present in appreciable amounts in all four muscle tissues investigated, whereas strontium, chromium and aluminium are present in trace amounts indicating that these elements might be contaminants in the meat. No cadmium has been detected in any of the meat samples.

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