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Comparative Study of Some Chemical Attributes of Camel and Goat meat

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ABSTRACT

This study was conducted in College of Animal Production Science and Technology, Sudan University of Science and Technology to evaluate the chemical composition and cholesterol level of fresh camel and goat meat (*longissimus muscle* from different carcass of young animals). The chemical composition determined according to Association of Official Analytical Chemists methods (AOAC) and cholesterol content by (HPLC method) the samples were analyzed in three different brands of these raw cuts in duplicate. The results showed that chemical composition of camel and goat meat were significantly different (P<0.05). Camel meat had higher moisture content (78.72%) compared to goat meat (74.85). Whereas goat meat had higher protein content (21.54%) compared to camel meat (18.96%). Camel meat had the lower fat content (1.17 %) compared to goat meat (1.66%). However, camel meat had the higher ash content (0.88%) compared to goat meat (0.53%). The present result showed that the camel meat had lower cholesterol content (58.74 mg/100gm) compared to goat meat as (72.42mg/100gm). The myofibrillar proteins, sarcoplasmic proteins and non-protein-nitrogen were not significantly different (P> 0.05) between the two types of meat, although concentration of myofibrillar protein in the camel meat was slightly lower (11.02%) than goat meat (11.3%). The sarcoplasmic protein value was slightly higher for camel meat (5.49%) compared to goat meat (5.36%). The non-protein-nitrogen value was slightly higher in camel meat (1.55%) than goat meat (1.35%). Chemically camel meat had low fat and cholesterol concentration which makes it an ideal healthy meat. Goat meat has been evaluated as a lean meat with favorable nutritional quality.

Keywords: camel meat, goat meat, chemical composition, cholesterol level.

INTRODUCTION

Meat consumption in developing countries has been continuously increasing from annual per capita consumption of 10 kg in 1960s to 26 kg in 2000 and expected to reach 37 kg in 2030 according to FAO projections (FAO, 2007). Meat is defined as the whole of the carcass of cattle, sheep, goat, camel, buffalo, deer, hare, poultry or rabbit (Williams, 2007). Quantative and qualitatively meat and other animal food are better sources for high quality protein than plant food, for its richness in essential amino acids and organic acids that cannot be synthesized in human are available in well balanced proportions and concentration. The demand for camel

meat appears to be increasing due to health reasons, because it contains less fat as well as less cholesterol and relatively high poly-unsaturated fatty acids than other meat animal's (Zidan *et al*., 2000). Recently, more attention has been paid to the nutritional value of camel meat, with the aim of creating additional value for various camel meat products (Ulmer *et al*., 2004). On the other hand, goat meat obtained from old goats specially males is less preferred because it's lower in tenderness and distasteful flavor compared to mutton and beef (Webb *et al.* 2005). Goat meat has been evaluated as a lean meat with favorable nutritional quality, it is considered as an ideal choice of the health-conscious consumer (Correa, 2010). Furthermore goat meat is preferred in most African and Asian countries for its taste, higher lean ground and high price of beef and mutton, coupled with consumer's low incomes. Multiple factors affect the cholesterol content such as gender, animal maturity, degree of marbling, subcutaneous fat thickness, animal breed, dietary energy level, different feeding treatments (restricted diet or *ad libitum*), and muscle location (Fenton 1992). In recent years, among all quantitative techniques for cholesterol in foods, especially muscle food products, chromatography, primarily GC and HPLC with various detection methods, has been studied and used extensively (Fenton 1992).

The Objective of this study was to compare the chemical properties of camel and goat meat.

MATERIALS AND METHODS

The study was conducted at the laboratory of Meat Science and Technology, College of animal Production Science and Technology, Sudan University of Science and Technology and the laboratory of chemistry of Faculty of Science Khartoum University and the laboratory of Sudanese central petroleum labs.

***Meat samples*:5** kg of fresh deboned from each types of meat (camel and goat meat) was obtained from the Sudanese local market(The muscles samples from male camel at 2-3 years old and male goat from 9-11 month old).

Each muscle samples (*longismuss dorsi*) were freed from external visible fat and connective tissue. Samples for chemical analysis were stored at 4ºC till analysis(24 hrs).

Chemical composition (Proximate Analysis): Determination of total moisture, ash, total protein and fat (ether extract) were performed according to Association of Official Analytical Chemists methods (AOAC, 2002).

***Moisture Determination*:** Moisture content was determined as weight loss of 5 gm of each sample. The fresh samples were put in an oven at 100c^{o} for 24 hrs. Consequently the samples were cooled in desiccators and their weights were determined.

$$\text{Moisture\%} = \frac{\text{Fresh sample weight-dried sample wt.}}{\text{Fresh sample weight}} \times 100$$

Crude protein:

Kjeldahl method was used to determine nitrogen content protein was determined by multiplying the amount of nitrogen times 6.25. The formula used for calculation of Nitrogen content was:

$$\text{Nitrogen content \%} = \frac{\text{TvxNx14X100}}{\text{Weight of sample X 1000}}$$

Where**:**

Tv = Actual volume of HCL used for titration.

N = Normality of HCL.
14= each ml is equivalent to 14 mg nitrogen.
1000 = to convert from mg to gm.
6.25= constant factor.
Protein content%=Nitrogen content%×6.25.

Fat Determination: Fat was determined by ether extract. Five gram from each Sample was taken to soxhlet apparatus. The samples were subjected to continuous extraction with ether for 5 hrs. The samples were then removed from the extractor and allowed to dry for 2 hr at 100C^{o} in drying oven till no traces of ether remained. The calculation was as described as follows:

$$\text{Fat \%} = \frac{\text{Fat weight}}{\text{Sample weight}} \times 100$$

Ash Determination: Five gram of the meat samples after fat extracting (fat free samples) were placed into dried crucible of known weight. The crucible was placed inside a muffle furnace at 150C^{o}. The temperature was increased gradually till it reached 600C^{o} for 3 hrs. Then the crucible was taken out, cooled into desiccators and weighed. The ash **%** was calculated by the following formula:

$$\text{Ash\%} = \frac{\text{Weight of crucible before ashing-weight of crucible after ashing}}{\text{Sample weight}} \times 100$$

Cholesterol Determination: Total cholesterol concentration in the different types of meat (Camel and goat meat) was quantified using high performance liquid chromatography (HPLC) (Fenton 1992). The compounds were detected with an ultra violet (UV) detector at (202nm) for cholesterol. The column was made of ultra-clean silica micro particles. The mobile phase was 99% hexane and 1% iso-propanol. Most HPLC methods use the polar stationary phase column made of highly pure silica micro particles (Ponte, *et. al*., 2008 and Costa, *et. al*., 2006).

Protein Fractionation: Samples for protein fractionation were prepared by trimming off excessive subcutaneous fat and connective tissues then minced. Five gm from the sample was weighed and fractionated into sarcoplasmic and myofibrillar proteins according to the procedure described by Babiker and Lawrie (1983).

Statistical analysis:The data collected were subjected to statistical analysis by using complete randomized design used to analyze the results obtained from this study and subjected to ANOVA followed by Least significant difference test (LSD) using the (SPSS, version ,17).

RESULTS

The table (1) and figure (1) shows the mean values (±SD) of chemical composition and cholesterol content of camel and goat meat.

The moisture content showed significant difference ($P< 0.05$) between the meats samples used. Camel meat had higher moisture content than goat meat.

Protein content was highly significant difference ($P<0.01$) between the two types of meat. Goat meat had higher protein content compared to camel meat.

Fat content was not significantly different ($P>0.05$) between the meat samples used. However, the fat content of goat meat was higher compared to camel meat.

Ash content was highly significant difference ($P< 0.01$) between the two types of meat. Camel meat had higher amount of ash compared to goat meat.

The cholesterol concentration of the two types of meat showed high significant difference ($P< 0.01$) between them. Camel meat had

significantly lower cholesterol concentration than goat meat.
Myofibrillar proteins, sarcoplasmic proteins and non-protein-nitrogen were not significantly different (P> 0.05) between the two treatments.

Table 1: Mean values (+SD) of some chemical co;position of camel and goat meat :

Parameters \ Meat type	Camel meat	Goat meat	Significant level
Moisture %	78.72 ± 0.50[a]	74.85 ± 0.60[b]	*
CP %	18.96 ± 0.77[a]	21.54 ± 0.71[b]	**
Fat %	1.17 ± 0.26	1.66±0.17	NS
Ash %	0.88 ± 0.47[a]	0.53±0.02[b]	**
Cholesterol(mg/100gm)	58.74 ± 4.66[b]	72.42±5.81[a]	**
Myofibriller protein%	11.02 ± 0.27	11.3±0.25	NS
Sarcoplasmic protein%	5.49 ± 0.35	5.36±0.32	NS
NPN % (non-protein-nitrogen)	1.55±0.26	1.35±0.11	NS

NS = No significant difference between the two means.
* = (P< 0.05)
** = (P< 0.01)
a, b and c = Means within the same row with different superscripts differ (P < 0.05).

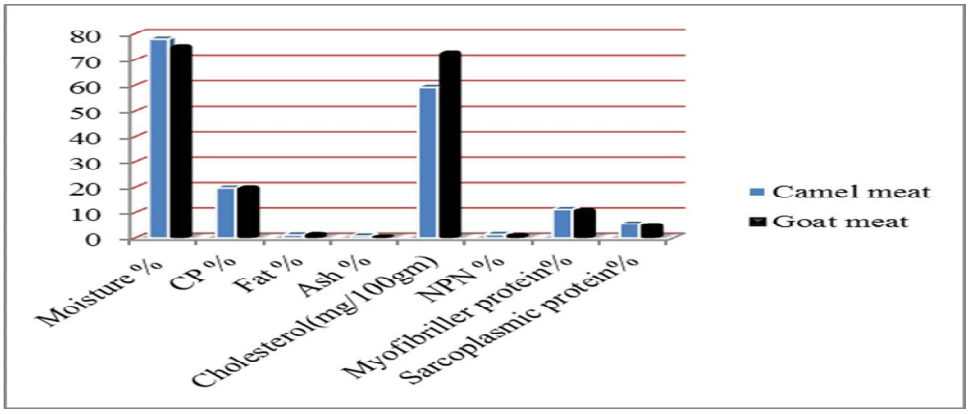

Figure 1: Physiochemical analysis of camel and goat meat

DISCUSSION

The moisture content was significantly different (P< 0.05) between the two different types of meat. Camel meat had higher moisture content compared to goat meat so the camel meat less fat content.
The moisture content of camel meat was 78.72% and this agrees with the results of Dawood and Alkanhal, (1995), Al-Sheddy *et al*., (1999), Al-Owaimer, (2000); Kadim *etal.*, (2006), and Siham (2008 and 2015) who reported a value ranging between 70 and 79%. The moisture content of goat meat was 74.85%. This result was higher than the findings of Schonfeldt, (1989) 64.6 to 65.4 %. Also higher than the result of Shija *et al.,* (2013) who reported moisture in goat meat as 70.65% and lower than the findings of Arguello *et al.*, (2004) who reported the moisture content in goat meat 76.63%.
The protein content showed high significant difference (P< 0.01) between the two types of meat. Goat

meat had higher protein content compared to camel meat 21.54 % and 18.96% respectively. The protein content in camel meat was 18.96%. This result was almost in line with the findings of Mohammad and Abu-Bakr, (2011) as (19.25%) and Adim *et al*., (2008) 19% . The protein content was 21.54% in goat meat, this result was in line with the findings of Arguello *et al.*, (2004) 20.1%and USDA, (2007) 20.6%.

The fat content in this study showed no significant difference (P>0.05) between camel and goat meat. Fat content was 1.17% in camel meat which was in line with the findings of Zamil El-Faer *et al*., (1991) 1.2 to 1.8%, and Kadim *et al*., (2006) 1.1 to 1.5%. The fat content of goat meat in the present study was 1.66%, which was in line with the findings of Arguello *et al*., (2004) 1.5 % and Mohammad *et al.*, (2010) 1.8%. Also in line with the findings of Siham (2015).

The ash content in this study revealed high significant difference (P<0.01) among the two types of meat. Camel meat had the higher ash content 0.79% compared to goat meat 0.43%. The ash content of fresh camel meat was 0.88% which was in line with the result found by Gulzhan *et al.,* (2013) 0.9% . Also this result was in line with the result reported by Siham, (2015). The ash content in goat meat was 0.53%, which agreed with the result of Wattanachant *et al*., (2008) 0.45% and Siham, (2015) 0.43%.

The cholesterol content in this study was highly significant difference (P<0.01) between the two types of meat. The camel meat had lower cholesterol content 58.74mg/ 100 gm compared to goat meat 72.42mg /100 gm . These results were similar to that reported by Elgasim and Elhag, (1982); Fallah *et al*., (2008); Kadim *et al*., (2009) who found that the camel meat was leaner than beef and goat meat. The present result showed cholesterol content in goat meat was 72.42mg/100gm which was more than that finding of Park *et al.,* (1991) 57.8 to 70mg/100gm. The result in this study was in line with Siham, (2015) who stated that the cholesterol concentration in camel meat was lower than that of goat meat.

The myofibrillar proteins, sarcoplasmic proteins and non-protein nitrogen were not significantly different (P>0.05) between the two types of meat. The result in this study was in line with the findings of Siham (2015) who reported that there was no significant difference between myofibrillar proteins in Camel meat and goat meat.

CONCLUSION

Chemically camel meat had low fat and cholesterol content which makes it an ideal healthy meat. Goat meat has been evaluated as a lean meat with favorable nutritional quality.

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