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A study of Sensory Panel Rating of Camel meat Compared to Cattle Meat

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Abstract | **Original Research Article**

This study was conducted in College of Animal Production Science and Technology, Sudan University of Science and Technology to evaluate the sensory evaluations of camel meat and beef obtained from young male animals. The meat samples purchased from Khartoum local abattoir. The samples were tasted by 20 semi-trained taste panel as described by Cross *et al.* (1978). The present study showed that the treatments not differ significantly (P> 0.05) in the sensory parameters measured (color, tenderness, juiciness, flavor and overall acceptance) and all scores obtained were above moderately desirable. The result showed that the Panelist scores for color were not significant (P>0.05) between the two types of meat. The result indicated that the color was acceptable to panelists. In this Study the Panelist's scores for tenderness were lower for camel meat compared to that in beef. The results showed that the Panelist's scores for juiciness were higher for camel meat compared to that in beef but there was no significant (P>0.05) difference between the two types of meat in juiciness. Also the result of this study showed that camel meat and beef were desirable to the Panelist. This result indicated that camel meat resembled beef in taste, appearance and palatability. General consumers' view is that camel meat is unacceptably tough, but in fact meat from young camels has been reported to be comparable in taste and texture to beef. The result was showed that camel meat was palatable and desirable to panelists. The panelists could not detect any significant difference (p > 0.05) of the camel meat or cattle meat in (appearance, color, flavor, juiciness and overall acceptability).

Keywords: camel meat, beef, panel rating, sensory evaluation.

INTRODUCTION

The Republic of Sudan is a country in northeast Africa, bordered to the east by Ethiopia and Eritrea, to the north by Egypt and Libya, to the west by Chad and the Central African Republic and from the south by the State of Southern Sudan. Sudan is mainly an agricultural country with a large livestock population. 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 [1]. The rising demand for meat in developing countries is mainly consequence of the fast urbanization and technology among the city dweller to spend more on food than rural population. Siham [2] stated that camel meat is palatable and coarser compared to beef, varying in color from raspberry red to brown red and having white fat. Global meat production in the next decade expected to increase from current annual production of 267 million tons in 2006 to nearly 320 million tons in 2016 [1]. Meat is defined as the whole of the carcass of cattle, sheep, goat, camel, buffalo, deer, hare, poultry or rabbit [3]. Meat is the one of the most nutritive foods used for human consumption. Quantatively 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. Meat is especially rich in vitamin B_{12} and iron which are important to prevent anemia in children and pregnant women. The demand for camel meat appears to be increasing due to health reasons, as it contains less fat as well as less cholesterol and relatively high poly-unsaturated fatty acids than other meat animal's [4]. 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 [5]. Juiciness was defined according to the method described by Rocha-Garaz and Zayas [6]. The panel consisted of 5 staff members who were familiar with meat characteristics. An orientation session was conducted before participating in the formal panel. Juiciness in cooked meat has two organoleptic components; the first is impression of wetness during the first chew produced by rapid release

of meat fluids, and the second is sustained juiciness, largely due to stimulatory effect of fat on salivation [7]. Camels (especially dromedary) are one of the most fundamental pillars of the national economy and food security for many countries in the world [8]. The unique anatomical, physiological, and behavioral characteristics enable camels to reproduce and produce meat and milk under difficult circumstances such as drought, poor grazing, and low management. Furthermore, more recently, distinctive physiological characteristics and production capability of camels have described from time to time by several researches Schwartz [6] and HƏlsebusch [9]. General consumers' view is that camel meat is unacceptably tough, but in fact meat from young camels has been reported to be comparable in taste and texture to beef. [10]. Carcass characteristics of camels were equal to those of other red meat animal species [11]. Knoess [12]; Fisher [13], and Khatimi [14] reported that camel meat is comparable in palatability and texture to beef meat. Expressed juice is an important meat quality characteristic because of its influence on nutritional value, appearance and palatability. Kadim *et al.* [15] reported that meat from camels slaughtered at 1–3 years had higher expressed juice values than those slaughtered at 6–8 years of age, probably due to variations in fat content and binding ability of meat. Mc Bee and Wiles [16] reported that, although variability was apparent with in carcass grades, taste panel scores for tenderness, juiciness and flavour increased as carcass grade increased from standard too good to choice to prime, these differences being highly significant. Blumer [17] stated that, there is a great variation in juiciness scores for cooked meats from different species of animals, also for different cuts of meat. Cooking procedure has a great influence on juiciness. Tibin [18] reported that, the sensation of juiciness of cooked meat may be separated into two effects: the first is the impression of wetness during the first chews produced by the rapid release of meat fluids; the second is one of the sustained juiciness apparently because of the slow release of serum and the stimulating effect of fat on salivary flow. Kumar *et al*. [19] showed that the pre-slaughter and post-slaughter factors affecting meat texture include species, breed, age, sex, feed, pre-rigor factors and processing. Yeatman [20] reported that sensory perception of texture depend on the deformation resulting from the application of pressure and for surface properties such as toughness, smoothness or stickiness estimated by the sense of touch, while a consumer develops some idea of texture by handling the meat, it is more effectively indicated by contact sensation in the mouth. The hard palate determines most of the coarseness of food. Herz and Chang [21] extensively reviewed the literature on antimortum factors relating to the flavor acceptability of cooked meat. Older animals produce meat with more flavor than young animals. Patterson [22] indicated that this odor is due to the presence of the steroid isolated from bear fat. Gann [23] mentioned that the water soluble components of meat which include free amino acids and free carbohydrates are important as flavor and odor precursors which develop cooked meat flavor upon heating. Johnson and Peterson [24] stated that salt is widely used to enhance the flavor of meat. The degree of tenderness was related to three categories of protein in muscle, those of the connective tissue, the myofibril and the sarcoplasmic proteins. Age, breed, and diet influence tenderness, juiciness, and flavor. Morgan [25] considers tenderness as the single most important component of meat quality. Kadim *et al*. [15] stated that, younger animals yield more tender meat than older ones. Mukasa [26] stated that the quality of camel meat produced by younger (5 years or less) was comparable to beef in taste and texture. The cholesterol concentration in camel meat was noted to be lower than that of beef as reported by Siham [27]. Kafe [28] stated that camel meat was dry on day one than day seven of storage which was rated juicier. This improvement in juiciness on day seven related to enhancement of water holding capacity. Meat from older animals is more intense in flavor than meat from younger animals. Calkins and Hodgens [29] reported that flavor is a complex attribute of meat palatability and were determined by the chemical senses of taste and smell. Muchenje *et al*. [30] reported that flavor depends on the quantity and composition of fat in meat. Ellard [31] stated that camel meat was recognized as having a similar flavor to beef. Siham [2] reported that flavor of sausage prepared from camel meat and beef with different fat content (10-15%) was accepted by the panelist. Although camel meat is not universally consumed, it might be a potential alternative for beef particularly in arid/semi-arid regions where camels are usually bred [32]. In recent years the potential of the camel as a meat source has received increased recognition but only few investigations on the chemical composition and physical properties of this meat and their products have been published [33].The panelists could not detect any significant difference ($p > 0.05$) of the camel meat or cattle meat in appearance, color, flavor, juiciness and overall acceptability). Also in this study the results showed no significant different between the type of cooking and the cooking method. Consumer standards are continually reassessed through the consumer taste-testing program using research product and a strict independent auditing program. By continually monitoring consumer scoring, grade standards can be adjusted over time in line with any evident change in consumer preference to maintain eating quality satisfaction. Thus, both the toughness and fat content of camel meat increase with age [34, 35]. The aim of this study is to evaluate the taste panel properties of fresh camel meat compared to fresh cattle meat.

MATERIALS AND METHODS

This study was conducted at the laboratory of Meat Science and Technology, College of animal

Production Science and Technology, Sudan University of Science and Technology.

Meat samples

5 kg of fresh deboned meat from each types of meat (camel meat and cattle meat) was obtained. The meat samples purchased from Khartoum local abattoir. (The muscles samples from young male camel at 2- 2.5 years' old and young male cattle from 1-1.5 years old). Each muscle samples (*longismuss dorsi*) were freed from external visible fat and connective tissue. Samples for Sensory Evaluation were stored at 4^{o}C till analysis (24 hrs.).

Panel Rating (Sensory Evaluation for samples cooked by Oven)

The meat samples were evaluated by twenty semi-trained panelists. The panelists consisted of staff members and Technicians in the Dept. of Meat Science & Technology, Sudan University of science and Technology, Riyadh. The Panelists were given an orientation for 30 min about the samples used for sensory evaluation were randomly selected and thawed for 24 hours in 4^{o}C refrigerator prior to cooking. Then camel meat and beef samples about 7-10 cm length and about 1-2 cm height was wrapped in aluminum foil, placed into an oven at 180^{o}C for 1 hrs. and served within 20 minute after cooking. The cooked sample was cut into portions, and placed in marked dishes. The samples were tasted by 20 semi-trained taste panel as described by Cross *et al.* [36]. Parameters measured included flavor, color, texture, juiciness and overall acceptability. The scores used ranged from 1 to 6 (6 being extremely desirable while 1 was extremely undesirable for each parameters). A six point hedonic scale was used, where six was extremely desirable while one was extremely undesirable (Appendix 1). Tap water was available for the panelists use between testing samples.

Sensory Evaluation by boiling the meat samples in deep fat frying in vegetable oil

The samples used for sensory evaluation were randomly selected and thawed for 24 hours in 4^{o}C refrigerator prior to cooking. Meat samples were separately cooked for 6-10 minutes by deep fat frying in vegetable oil. Then were turned every three minutes to prevent excessive browning. Samples were kept warm for evaluation. They were put in coded plates and served warm to the panelists. From each treatment a sample was randomly placed in a dish divided to portions under lamb light. Every panelist has one dish to test in each session. A six point hedonic scale was used, where six was extremely desirable while one was extremely undesirable (Appendix 1). Tap water was available for use between testing samples as described by Siham [37].

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 [38].

RESULTS

Table (1 and 2) and figure (1, 2, 3 and 4) shows the panel rating of cooked camel meat and cattle meat which cooked by two methods of cooking, samples cooked by Oven and samples cooked by deep fat frying in vegetable oil. The present study showed that the treatments not differ significantly (P> 0.05) in the sensory parameters measured (color, tenderness, juiciness, flavor and overall acceptance) and all scores obtained were above moderately desirable. (Appendix 1). The treatments not differ significantly (P > 0.05) in the parameters measured and all scores obtained were above moderately desirable (Appendix 1). Panelists scores for juiciness of camel meat and beef were same and there was no significant (P>0.05) different between them. Also panelist scores for color were not significant (P>0.05) different between them. Panelists scores for tenderness of camel meat were lower than that of beef and there was no significant (P > 0.05) different between treatment in tenderness and flavor. However, the scores for flavor of camel meat were lower than that of beef. Overall acceptance showed not significant (P > 0.05) difference between them. The result in this study showed that the sensory panel rating of juiciness, texture, flavor and overall acceptability increased but color decreased in the samples of camel meat compared to the samples of beef.

Table-1: Mean Values of Sensory Evaluation of camel meat and Cattle meat samples cooked by oven at (160^{o}C) for one hour

Parameters	Camel meat	Cattle meat	Standard Error (SE)	Level of significance (L.S)
Color	4.00	5.00	0.19	N.S
Flavor (Aroma)	4.11	4.12	0.08	N.S
Tenderness (Texture)	4.60	5.00	0.18	N.S
Juiciness	4.50	4.66	0.34	N.S
Overall acceptance	4.89	5.0	0.67	N.S

N.S. = No significant different between the two means

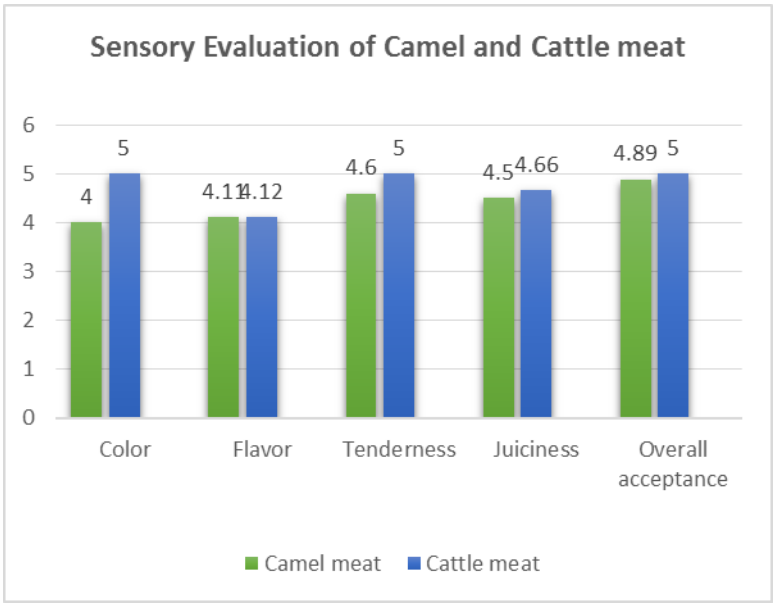

Fig-1: Sensory evaluation of meat samples cooked by Oven

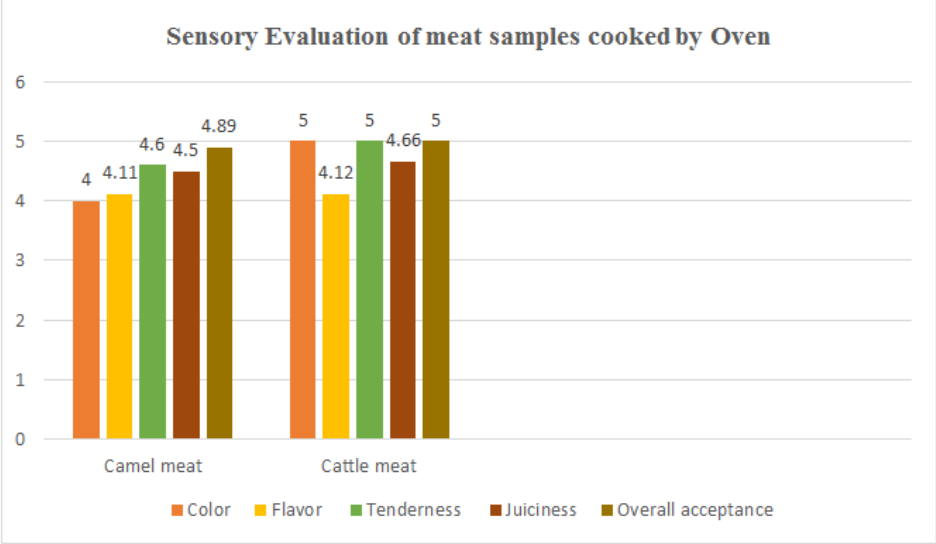

Fig-2: Sensory evaluation of meat samples cooked by Oven

Table-2: Mean values of the Sensory Attributes of Camel meat and Cattle meat Cooked by Deep fat frying in vegetable oil

Meat Types	Color	Tenderness	Flavor	Juiciness
Camel meat	4.50	4.00	5.00	4.5
Cattle meat	5.00	4.50	4.45	4.4
Level of significance (L.S.)	N.S.	N.S.	N.S.	N.S.

NS =No significant different between means

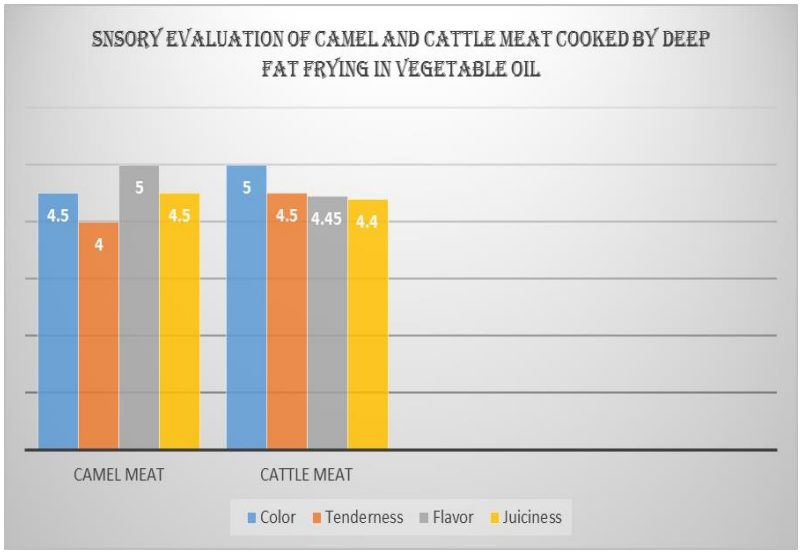

Fig-3: Mean values of the sensory attributes of camel meat and Cattle meat cooked by oil

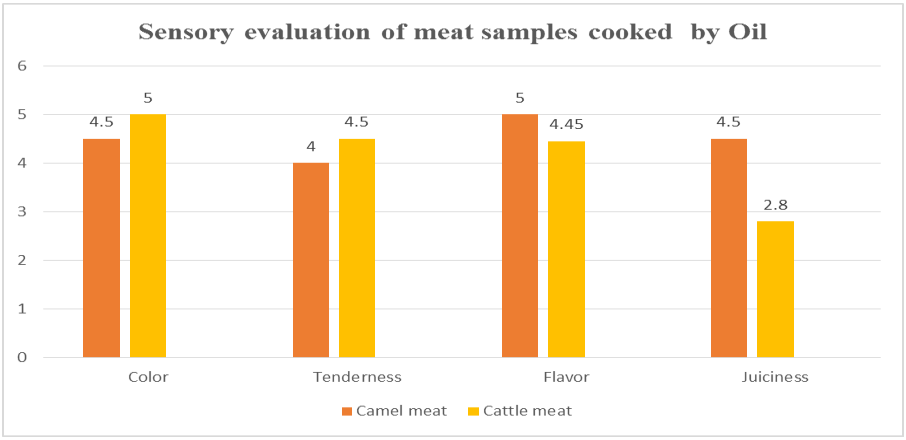

Fig-4: Mean values of the sensory attributes of camel meat and Cattle meat cooked by oil

DISCUSSION

The present study showed that the treatment samples not differ significantly (P>0.05) in the sensory parameters measured (color, tenderness, juiciness, flavor and overall acceptance) and all scores obtained were above moderately desirable. In this result tenderness of camel meat was less than beef, this result disagreed with the result stated by Adim *et al.* [38] who found that the camel meat was similar in taste and texture to beef and Williams [39] who reported that camel meat was similar in taste and texture to beef. Panelist's scores for tenderness of camel meat was lower than that of beef, this result disagreed with the result stated by Adim *et al.* [38] who found that the camel meat was similar in taste and texture to beef and Williams [39] who reported that camel meat was similar in taste and texture to beef. Differences in juiciness related primarily to the ability of muscles to hold water during cooking as reported by Aberle *et al.* [40]. The result in this study showed that the sensory panel rating of juiciness, texture, flavor and overall acceptability increased but color decreased in the samples of camel meat, this result agreed with the finding of Elgasim & Alkanhal [11] who reported that the sensory panel rating of juiciness, texture, flavor and overall acceptability increased but color decreased with increased the level of camel meat. This result in this showed that meat from young camels has been reported to be comparable in taste and texture to beef, this finding in line with the finding of Kurtu [10]. Knoess [12]; Fisher [13], and Khatimi [14] reported that camel meat is comparable in palatability and texture to beef meat. Beef meat had higher on protein, fat and ash contents compared to the camel meat such conclusion is similar to that of Elgasim and Elhag [11]. The result in this study agreed with that reported by Mukasa [26] stated that the quality of camel meat produced by younger (5 years or less) was comparable to beef in taste and texture.

CONCLUSION

The present result was showed that camel meat was palatable and desirable to Sudanese panelists. Camel meat is comparable in palatability and texture to beef meat

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APPENDIX 1

Grading chart for meat Panel Rating (Taste Panel)

Evaluate these samples for color, texture, flavor and juiciness – for each meat sample, use appropriate scale to show your attitude by checking at the point that best describe the feeling about the sample. If you have any question please ask, thanks for your cooperation.

Sample code	Color	Flavor	Tenderness	Juiciness
A				
B				
C				
D				
E				
F				

Key

Color		Flavor		Tenderness			Juiciness
6	Extremely desirable	6	Extremely intense	6	Extremely desirable	6	Extremely juicy
5	Very desirable	5	Very intense	5	Very desirable	5	Very juicy
4	Moderately desirable	4	Moderately intense	4	Moderately desirable	4	Moderately juicy
3	Moderately Undesirable	3	Moderately un intense	3	Moderately un- desirable	3	Moderately un-juicy
2	Very undesirable	2	Very un intense	2	Very undesirable	2	Very dry
1	Extremely undesirable	1	Extremely un intense	1	Extremely bland	1	Extremely dry