

A Study of Sensory Evaluations of Different Types of Sausages in the Sudanese Palate

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ABSTRACT

This study was aimed to evaluate the Sensory evaluations of camel, beef and goat sausages. Camel, beef and goat sausages were not significantly different ($P > 0.05$) in color of the cooked sausages. However, camel and beef sausages with sweet potato received higher scores compared to goat sausages. Most noticeably, sausages of camel meat containing sweet potato had higher tenderness scores followed by beef sausages and goat sausages. Also it was noticed that sausages became juicier with the addition of sweet potato compared to bread crumbs. The camel and goat sausages with sweet potato had received the highest scores in flavor, whereas the flavor scores of different sausages (camel, beef or goat sausages) with bread crumbs showed decreased values. The results showed that the camel and goat sausage resembled beef sausage in taste, appearance and palatability. Sausages made of camel and goat meat were also acceptable to the panelists. Camel sausage recorded higher scores in sensory evaluation compared to beef and goat sausage. Sausages processed by adding sweet potato and bread crumbs were acceptable. However, addition of sweet potato slightly improved the texture and juiciness of the sausage.

Keywords: color, tenderness, juiciness, flavor, overall acceptance and sausage fillers

INTRODUCTION

Sudan is situated in northeast of Africa, lying between latitudes 4° and 22° North and longitudes 22° and 38° East. The country is traversed by the River Nile and its tributaries which have varying influences on irrigated agriculture and livestock production systems. In recent years, there has been an increased demand for convenience meat and meat products requiring minimal home preparation (Stubbs *et al.*, 2002). Gadiyaram and Kannan (2004) stated that goat meat is an ideal source of red meat for the preparation of heart-healthy products because of its lower fat content. Processing is a mean for extending the product, improving shelf-life and producing an upgraded value added product (Kalaloui *et al.*, 2004; Kalaloui *et al.*, 2010). Mansour and Ahmed (2000) had used advanced technology to process sausage from camel meat and the products showed similar chemical composition to beef products; however the camel meat products were higher in moisture (73.6%) and ash (4.13%). FAO (1991) reported that, sausage is meat product in form of especially prepared, ground or chopped meat in which fresh comminuted meat are modified by various processing methods. Dytte *et al.* (1981) and Essien, (2003) defined sausages as a comminuted processed meat made of red meat, poultry or a combination of these with water, binders and seasonings. Juiciness is important to meat texture and palatability. It has two major components; the first is the impression of wetness produced by the release of fluid from the meat during chewing, the second is the more sustained juiciness that apparently results from the stimulating effect of fat on the production of the saliva (Lawrie, 1991; Moloney, 1999). Siham (2008) stated that sausages became juicier with the addition of potato. Siham (2008) reported that the panelist's scores for juiciness of camel meat were lower than that of beef but there was no significant difference between them. Babiker and Tibin (1986) and Siham (2008) reported that flavor of sausage prepared from camel meat and beef with different fat content (10-15%) was accepted by the panelists.

The objectives of this study were to evaluate sensory and hygienic properties of fresh and frozen camel, beef and goat meat as well as to evaluate the addition of sweet potato as a filler in sausage processing as alternative for bread crumbs filler.

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MATERIALS AND METHODS

This study was conducted in the laboratory of meat, College of Animal Production Science and Technology, Sudan University of Science and Technology (SUST) and in meat laboratory in Khartoum University.

Meat samples: 21 kg of fresh deboned camel, beef and goat meat were obtained. Camel meat was purchased from "Soug Elnaga" which is a local camel market located at the west of Omdurman. The beef was obtained from Kuku Research Centre, and goat meat from local market. The meat was trimmed to small pieces and ground through 0.5 cm plate using meat grinder.

Fillers: The preparation methods of fillers: The following fillers were used:

1. Bread Crumbs: was used after being ground through a plate of 0.5 cm diameter.
2. Sweet Potato: was cooked under pressure for 10 minutes and ground through a plate of 0.5 cm diameter.

Sausage preparation: Three types of sausages were prepared using two types of fillers (bread crumbs and sweet potato). The ingredients were added equally to the treatments as shown in (Table 1). The Sausage consist of minced meat to which salt (NaCl), garlic, coriander, cinnamon, black pepper, nutmeg, fat, cold water, skim milk and filler 15% were added. The whole mixture was mixed well in a chopper after adding skimmed milk powder to the dough. The mixture was stuffed in sheep casings using piston stuffer, then linked, placed in polythene bags, labeled and frozen at -20°C to wait the following tests.

Sensory evaluations of sausages: Samples for sensory evaluation were conducted in the sensory evaluation facilities of meat laboratory, College of Animal Production Science and Technology Sudan University of Science and Technology (SUST). Ten semi-trained panelists were asked to evaluate the treatment effects on color, texture, flavor and juiciness of the sausage samples. The samples used for sensory evaluation were randomly selected and thawed for 24 hours in 4°C refrigerator prior to cooking. Sausages were separately cooked for 6-10 minutes by deep fat frying in vegetable oil. Sausages 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 of 6 fingers was randomly placed in a dish divided to six 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.

Table1. *Ingredients of the sausage recipe:*

Ingredient	(%)
Fillers (bread crumbs or sweet potato)	15
Ice water	20
Salt	2
Black pepper	0.5
Coriander	0.5
Sugar	0.5
Garlic	0.3
Skimmed milk powder	0.3
Cinnamon	0.1

(All ingredients are percentage from the formulated products)

Statistical analysis: The data collected were subjected to statistical analysis using complete randomized design and subjected to ANOVA followed by Least Significant Difference test (LSD) using the SPSS analysis program (Version 17.0, 2008).

RESULTS

The sensory results and the acceptability of sausages of different types of meat and fillers were shown in Table 2 and Figures 1, 2 and 3. All the scores obtained were ranged between (3.0 - 6.0) and there was no significant ($P>0.05$) difference between the treatments in any of the parameters measured. Sensory results of sausages with different types of fillers were shown in Table 2. All the scores

obtained ranged between (4.0-6.0). The statistical analysis showed high significant ($P < 0.01$) difference among the parameters measured.

Color: Camel, beef and goat sausages were not significantly different ($P > 0.05$) in color of the cooked sausages. However, camel and beef sausages with sweet potato received higher scores compared to goat sausages.

Tenderness: There was no significant difference ($P > 0.05$) among treatments in tenderness. Most noticeably sausages of camel meat containing sweet potato had higher tenderness scores followed by beef sausages and goat sausages.

Juiciness: As shown in Table 2, the juiciness of different sausages showed no significant ($P > 0.05$) difference among treatments. Sausages of camel meat with sweet potato received the highest score (5.5 ± 0.53). Also it was noticed that sausages became juicier with the addition of sweet potato compared to bread crumbs.

Flavor: As shown in Table 2. There was no significant ($P > 0.05$) difference among treatments in flavor. The camel and goat sausages with sweet potato had received the highest scores in flavor, where as the flavor scores of different sausages (camel, beef or goat sausages) with bread crumbs showed decreased values.

Overall acceptance: As shown in Table 2. There was no significant ($P > 0.05$) difference among treatments in overall acceptance, while the camel sausages with sweet potato received higher scores followed by beef and goat sausages. Generally, it was observed that most of the scores of color, tenderness, juiciness, flavor and overall acceptance were above moderately desirable (Appendix 1). These results indicated that the sweet potato improved the characteristics of sausages and had marked influence on the overall acceptance scores. The overall acceptability results indicated that sausages made with camel, beef and goat meat with different types of fillers were differed in the overall acceptability scores but all were accepted. Results also indicated that camel, beef and goat sausages made with sweet potato were preferred by the panelists group and received the highest acceptability scores compared with others, while sausages made with bread crumbs received the least acceptability scores. The results showed that textural attributes of goat sausages are comparable to those of other types of sausages, since several important attributes were not influenced by sausage type.

Table 2. Mean values (\pm SD) of sensory attributes of sausages made of different types of meat and fillers cooked by deep fat frying.

Factors		Parameters				
Sausage Type	Filler type	Color	Juiciness	Tenderne ss	Flavor	Overall acceptance
Camel sausage	Bread crumbs	4.70 \pm 0.95	3.70 \pm 1.06	4.40 \pm 0.97	4.40 \pm 0.70	4.30 \pm 0.67
	Sweet potato	5.40 \pm 0.70	5.50 \pm 0.53	5.30 \pm 0.95	5.30 \pm 0.82	5.40 \pm 0.70
Beef Sausage	Bread crumbs	4 \pm 0.94	4.10 \pm 1.45	4.60 \pm 1.17	3.80 \pm 1.32	4.20 \pm 1.14
	Sweet potato	5.30 \pm 0.67	4.80 \pm 0.92	4.70 \pm 1.06	4.50 \pm 0.85	4.90 \pm 0.74
Goat sausage	Bread crumbs	5 \pm 1.05	4.40 \pm 1.07	4.60 \pm 0.97	3.90 \pm 1.10	4.70 \pm 0.95
	Sweet potato	4.90 \pm 0.57	4.60 \pm 0.52	4.50 \pm 0.85	5.10 \pm 0.57	4.90 \pm 0.32
Main effect						
Sausage type	Camel sausage	5.05	4.60	4.85	4.85	4.85
	Beef sausage	4.65	4.45	4.65	4.15	4.55
	Goat sausage	4.95	4.50	4.55	4.50	4.80
Standard Error		0.19	0.22	0.22	0.21	0.18
Significanc level		NS	NS	NS	NS	NS
Filler type	Bread crumbs	4.57	4.07	4.53	4.03	4.40
	Sweet potato	5.20	4.97	4.83	4.97	5.07
Standard Error		0.15	0.18	0.18	0.17	0.15
Significance level		**	**	NS	**	**
Sausage type \times Filler type						
Significance level			*	*	NS	NS

Notes = [1] Based on a scale of 1-6 with six the highest score

[2] Means (10 panelists).

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* = ($P < 0.05$)

** = ($P < 0.01$)

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

Factors		Parameters				
Sausage Type	Filler type	Color	Juiciness	Tenderness	Flavor	Overall acceptance
Camel sausage	Bread crumbs	4.70±0.95	3.70±1.06	4.40±0.97	4.40±0.70	4.30±0.67
	Sweet potato	5.40±0.70	5.50±0.53	5.30±0.95	5.30±0.82	5.40±0.70

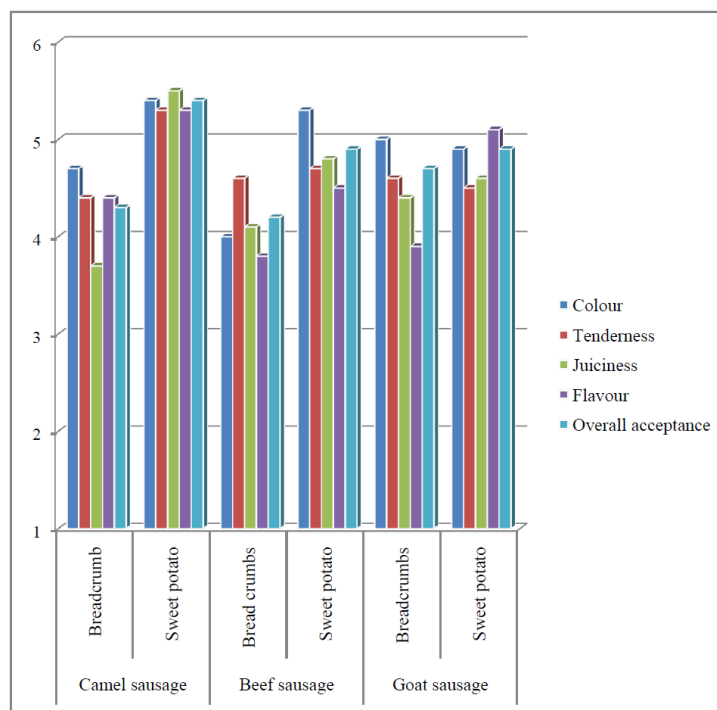


Figure1. Sensory evaluation of different types of meat and fillers

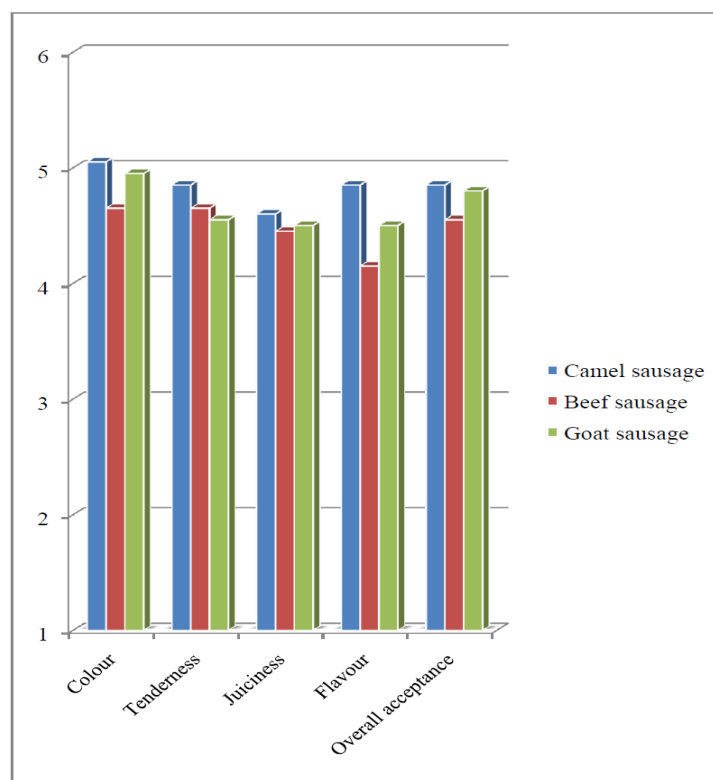


Figure2. Sensory evaluation of different types of meat sausages

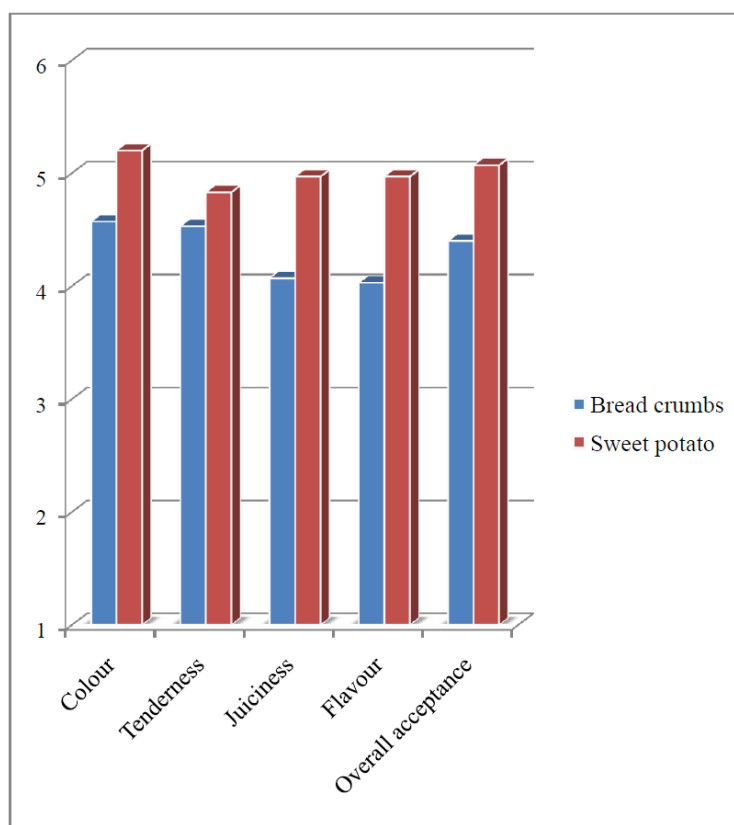


Figure 3. Sensory evaluation of different types of fillers.

DISCUSSION

Sensory results and acceptability of sausages of different types of meat and fillers showed all the scores obtained were ranged between 3.0 and 6.0 and there was no significant ($P>0.05$) difference between the treatments in any of the parameters measured. The present results showed no significant differences between camel, beef and goat sausages, but camel sausage recorded higher scores in sensory evaluation than beef and goat sausages. This finding was in line with that of James and Berry (1997) who mentioned that the trained sensory panelists found similar juiciness, flavor, and tenderness in patties of goat and beef. Textural attributes of goat sausages are comparable to those of beef sausages Gadiyaram and Kannan (2004). Results of sensory evaluation of sausages manufactured with camel, beef and goat meat, showed that panel scores for color, flavor, juiciness and overall acceptability were significantly different ($P<0.05$) among treatments. Results obtained from this study showed that sausages made from either camel meat or goat meat was acceptable to the Sudanese palate. This indicates that beef, camel meat or goat meat can replace each other in sausage manufacturing, These results being in agreement with Kulaeva (1964) who reported that camel meat resembled beef in taste; and Khatami (1970) who noted that camel meat closely resembled beef in appearance, color, texture and palatability. Moreover, this finding was in line with that of James and Berry (1997) who mentioned that the trained sensory panelist found similar juiciness, flavor, and tenderness in patties of goat meat and beef. The present results also showed that sausage manufactured by using sweet potato and bread was acceptable. The camel meat with its superior processing properties and low fat content furnishes a good raw material for comminuted meat and healthy food commodities. The result in this study were in line with the findings of Ellard (2000) who reported that the camel meat had similar flavor to beef. Camel, beef and goat sausages were not significantly different ($P> 0.05$) in color of the cooked sausages. However, camel and beef sausages with sweet potato received higher color measurement scores compared to goat sausages. These results indicated that using sweet potato with meat to manufacture sausages resulted in improved characteristics of camel and beef sausages and made them acceptable to panelists compared with bread. The overall acceptability results indicated that sausages made with camel, beef and goat meat with different types of fillers were differed in the overall acceptability scores but all were accepted. These findings are supported by the results of Babiker and Tibin (1986) who evaluated overall organoleptic properties of sausages made from either beef or camel meat and they observed that all

sausages were acceptable to the panelist group. The results also indicated that camel, beef and goat sausages made with sweet potato were preferred by the panelists group and received the highest acceptability, while sausages made with bread crumbs received the least acceptability scores.

CONCLUSION

Camel, beef and goat sausages were not significantly ($P > 0.05$) different in juiciness, tenderness, flavor and color. Camel and goat sausages were organoleptically acceptable to Sudanese panelists and did not differ significantly ($P > 0.005$) when compared to beef sausages.

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APPENDIX 1

Grading chart for meat and sausage

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

Evaluate these samples for color, texture, flavor and juiciness – for each 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.

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 undesirable	3	Moderately unjuicy
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