

A Study of The Effect of Adding Bean as Sausage Filler on Sensory Evaluation of Camel and Beef Sausages

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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 effect of adding Bean as sausage filler on sensory evaluation of camel meat sausages and beef sausages. Whereas the Sensory evaluation of sausages and the line scale was used to estimate the intensity of sensory properties according to (Poste, et. al. 1991). the results showed that camel sausage and beef sausage were not significantly different ($P > 0.05$) in color of the cooked sausages. However, camel sausages with bread crumbs filler received higher scores compared to other sausage types in this study. Also sausages of camel meat containing bread crumbs had higher tenderness scores compared to beef sausages with bread crumbs. Also the camel sausages with bread crumbs had received the highest scores in flavor. In this study the results showed that the camel sausages were resembled beef sausages in taste, appearance and palatability. Sausages processed by adding bread crumbs and bean fillers were acceptable. The present results showed no significant differences between camel sausages and beef sausages, but camel sausage recorded higher scores in sensory evaluation compared to beef sausages.

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

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. The global increase in meat product supply has strengthened the demand for manufacturing of safe, nutritious, and innovative ones (Yousefi & Moosavi-Nasab 2014). Furthermore, the preference of the consumers is directed toward the development of meat products like sausages using alternative sources of protein (Cardoso, Mendes, & Nunes, 2008). According to Camel Newsletter, (1999), the camel meat industry is developing widely throughout Australia and it certain that camel is destined to play a significant role in the meat industry, both in Australia and Overseas. There has been an increased demand for convenience meat and meat products requiring minimal home preparation (Stubbs et al., 2002). 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 (Zidan et al., 2000). Pearson and Tauber (1984) mentioned that, the term sausage is derived from the Latin word "salsas" meaning salt or literally translated refers to chopped or minced meat preserved by salting Yeatman (1972) 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. Kumar et al. (1974) showed that the pre-slaughter and post-slaughter factors affecting meat texture include species, breed, age, sex, feed, pre-rigor factors and processing. Angelo et al. (1987) reported that the acceptance of meat, products depends to a large extent on the desirability of their flavor. Some of the factors that influence the flavor of these products include animal feed, processing methods, storage condition and sanitation. Camel meat is popular source of red meat in arid and Semi-arid areas that can compensate beef shortage to a large extent. increasing consumer demand for quality meat products results in the development of meat products by incorporating health enhancing ingredients. The long standing positive consumer perception that meat and meat products are the best sources of minerals, vitamins and complete proteins (complete proteins are those proteins contains all of the amino acids that our body needs to function properly) (Verbeke et al., 2010). Selection of meat for sausage production is important in achieving good quality products. All the formulas of sausage production are based on meat and also all additives used in sausage production must be based on weight rather than percentage. Consumer demand healthier meat products that are low in fat, salt, cholesterol, nitrates and calories in general and contain in addition health-promoting bioactive components such as carotenoids, unsaturated fatty acids, sterols and fibers on the other hand; furthermore, consumer accept these level meat products with altered formulations to taste, look and smell the same way as they are traditionally formulated and processed counterparts. At the same time

competition is forcing the meat processing industry to use the increasingly expensive raw material. Buffalo meat is one of the best sources for quality meat sausages and ready to eat meat products (Kandeepan et al., 2013; Abdolghafour and Saghir, 2014). Buffalo meat has been used for processing of products like sausages (Sachindra et al., 2005), loaves (Suresh et al., 2004), burgers (Modi et al., 2003), patties (Suman and Sharma, 2003) and nuggets (Thomas et al., 2006). Chin et al. (1999) reported soy protein isolate resulted in a softer texture of low fat bologna and did not affect other chemical parameter. Feng et al. (2002) described heat and enzyme hydrolyzed soy proteins effected texture properties differently, the 1st improving hardness and 2nd reducing hardness, cohesiveness and breaking strength. Muguerza et al. (2003) described the addition of soy oil did not modify the percentage of water or protein and the pH in fermented sausages, but with the addition of pre-emulsified soy oil cholesterol hardly decreased and oxidation was not modified. The legume seeds are of prime importance in human and animal nutrition due to their high protein content (20– 50%). Their protein content is twice the level found in cereal grains and significantly more than the level in conventional root crops Legumes include peas, beans, lentils, peanuts, and other podded plants that are used as food. Legumes have been cultivated for thousands of years, although many of the varieties of beans and peas that are commonplace today were unknown until relatively recent times. Legumes have played an important role in the traditional diets of many regions throughout the world (Ustimenko, et. al. 1983 and Makri, et. al. 2005). Vegetable proteins are less used. Among these are those from lupins (*Lupinus albus* L.), peas (*Pisum sativum* L.) and broad beans (*Vicia faba* L.), that are extensively grown in different parts of the world (Ustimenko, et. al. 1983 and Miquel, 1991). In the meat processing industry the substitution of meat with non-meat ingredients is considered an important strategy for reducing overall production costs. Proteins from legume seeds have been widely studied as regards functional and bioactive properties and one of the sources of plant proteins can be make an attractive alternative to wheat flour as a meat binder for replacement of a portion of the proteins in low-fat meat production (Pereira, et. al. 2009 and Shand, et. al. 2011). Sensory evaluation involves the interpretation of the responses by the sensory professional (Yin, et. al. 2009 and Ghasemi, et. al. 2012). Sensory properties are some of the most important factors on consumer liking and preference; thus it is very important to determine factors affecting the product attributes, acceptance and preference; thus it is very important to determine factors affecting the product attributes, acceptance and preference especially for foods as reported by (Dos, et. al. 2005 and de Melo, et. al. 2009).

The Objectives of this study are:

1. To evaluate the sensory evaluation of camel Sausages.
2. To evaluate the addition of Bean as a filler in sausage processing as alternative for Bread crumbs.

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.

Meat samples: Meat samples: 5 kg of fresh deboned from each types of meat (camel and cattle meat) was obtained from the Sudanese local market. The muscles samples from male camel at 2-3 years old and male cattle at 1.5-2 years old. Each muscle samples (*longissimus dorsi*) were freed from external visible fat and connective tissue. Samples for sausages processing were stored at 4oC till processing (24 hrs.).

Sausage Fillers: Bean: It was soaked overnight in fresh water then ground. Bread Crumbs: It was used dried after ground.

Sausages preparation: There are two types of sausages were manufactured according to the type of fillers. All ingredients (shown in Table 1) were added equally to all treatments. The Sausage consist of minced meat to which salt (NaCl), garlic, coriander, black pepper, nutmeg, fat, cold water, were added. The whole mixture was mixed well in a chopper to the dough. The mixture was stuffed in casings using piston stuffer, then linked, labeled and frozen at -18oC to wait the following tests.

Table (1): Ingredients of the sausages recipe:

<i>Ingredient</i>	<i>Percentage (%)</i>
Meat	60
Filler	25
Ice water	10
Fat	5
Salt	3
Black pepper	0.5
Coriander	0.5
Nutmeg	0.3
Garlic	0.5

Sensory evaluation of sausages: All ingredients are percentage from the formulated products. The samples to be used for sensory evaluation were randomly selected and thawed for 24 hours in 4°C refrigerator prior to cooking. Ten (10) semi-trained panelists were asked to evaluate the treatment effects on, cooked color, texture, flavor and juiciness of the sausage samples. Sausages were separately cooked 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 about 6 fingers was randomly placed in a dish divided to six portions under natural 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).

After preparation cooked sausages samples were sensory evaluated. The sensory evaluation was carried out using the nine point hedonic scale (1 – dislike extremely and 9 – like extremely). The main sensory properties (hardness, aroma, taste, aftertaste, and color of cooked sausages) were evaluated by the line scale. The nine point hedonic scale was used in order to determine the degree of preference of products (Serdaroğlu, *et al.* 2005). Whereas the line scale was used to estimate the intensity of sensory properties (Poste, *et al.* 1991 and ISO 2003). Prepared samples were evaluated by trained 30 panelists. The panelists received equally prepared cooked samples and questionnaires, instructions for the evaluation procedure

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, 2008 version ,17).

RESULTS

Sensory results of sausages with different types of filler and Meat were shown in Table (2), all the scores given were ranging between 4.5 and 5 and the treatments did not differ significantly ($P > 0.05$) in any of the parameters measured. Flavor: As shown in table (2), there was no significant different among treatments in flavor. Also it was observed that camel sausages received the highest scores in flavor. Also it was found that camel sausages with bread crumbs filler had received higher scores in flavor. Also, it was observed that there was a decrease in flavor score in the treatment sausages (camel sausages or

beef sausages) with bean filler. As shown in table (2), the juiciness was not significantly ($P > 0.05$) different among treatments. Sausages of camel meat with bread crumbs and bean fillers and beef sausages with bread crumbs and bean fillers were received the same score. Also the adding of bean filler comparing with bread crumbs filler was reduced juiciness. There was no significant different ($P > 0.05$) among treatments in texture. Sausages of camel meat containing bread crumbs filler had higher texture scores followed by beef sausages with bread crumbs filler. These results indicated that the bean filler not improved the tenderness compared to bread crumbs filler. Camel and beef sausages were not significantly different ($P > 0.05$) in color of the cooked sausages. However, beef sausages with bread crumbs filler received higher scores than the other sausages. Generally it was observed that most of the scores of color, texture, flavor and juiciness were above moderately desirable (Appendix 1). Results showed that meat flavor was not pronounced in all samples. However it is necessary to note, that more intensive meat flavor was detected in cooked sausage sample of camel sausage with bread crumbs filler), also the sample more intensive meat color compared to the other samples (comparing with control sample). The obtained results suggested that more intensive legumes taste, comparing to control sample (with bread crumbs) was established in sample (cooked sausage with beans additive), at the same time it was sample with lower intensity of meat aroma.

Results obtained from this study shown that sausages made from either types of meat beef or camel meat is acceptable to the Sudanese palate. This indicates that meat from beef or camel meat can replace each other in sausage manufacture, 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. The results also show that sausage manufactured by using bean filler and bread crumbs filler were acceptable. Abubaker, *et al.*, (1986) reported that tenderness and color scored highest in sausages containing bean and chick pea.

Table (2): Mean values of the effect of the types of meat and type of fillers on sensory attributes of camel sausages and beef sausages cooked by oil:

Samples		Color	Tenderness	Flavor	Juiciness	Overall acceptance
Camel sausages	a) With bread crumbs filler	5.50	5.00	5.50	4.5	5
	b) with Bean filler	4.50	4.5	4.5	4.5	4.60
Beef sausages	a) With bread crumbs filler	5.00	5	5	4.5	5
	b) With bean filler	4.50	4.5	4.5	4.5	4.5
Level of significance (L.S.)		N.S.	N.S.	N.S.	N.S.	N.S.

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

[2] Means (6-7 panelists, 3 replicates)

N.S. = No significant different between means

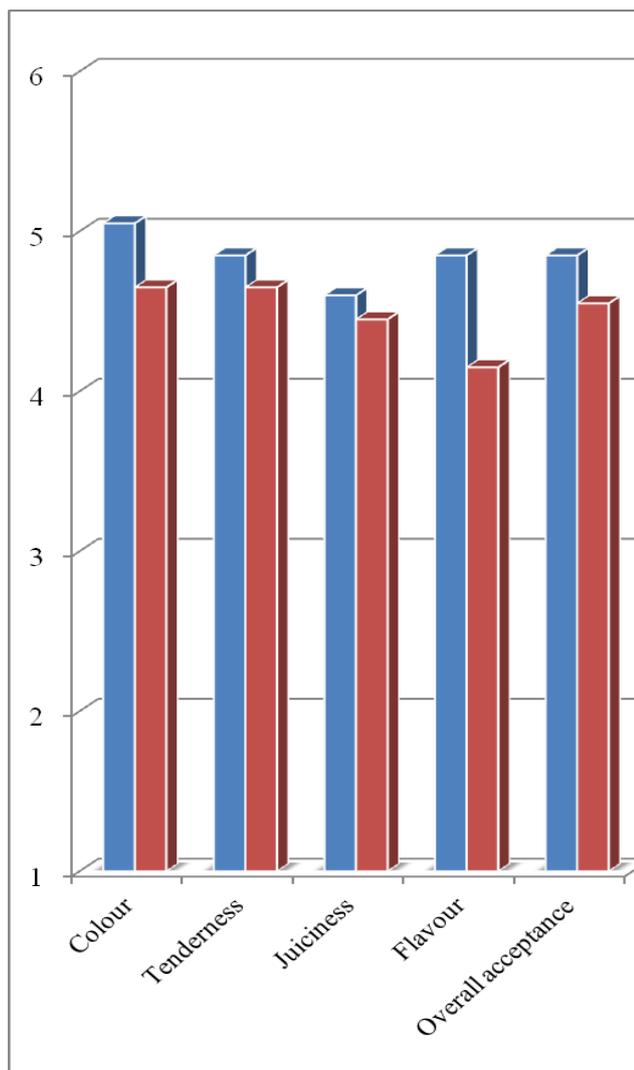


Figure 1. Sensory evaluation of different types of sausages

The present results showed no significant differences between camel and beef sausages, but camel sausage recorded higher scores in sensory evaluation than beef sausage. This finding was in line with that of Siham, 2008 and James and Berry, (1997) who mentioned that the trained sensory panelist found similar juiciness, flavor, and tenderness in patties of goat and beef. Results of sensory evaluation of sausages manufactured with camel, beef meat, showed that panel scores for color, flavor, juiciness and overall acceptability were significantly different ($P < 0.05$) among treatments. The obtained results suggested that more intensive legumes taste, comparing to control sample (with bread crumbs) was established in sample (cooked sausage with beans additive), at the same time it was sample with lower intensity of meat aroma.

CONCLUSION

The sausages were acceptable to Sudanese panelists which processed from camel meat or beef. Also beef sausages and camel sausages were not significantly ($P > 0.05$) different in juiciness, texture, flavor and color. The non-meat ingredients are generally added in meat products to

improve the quality attributes and functional properties. It was concluded based on literature that non-meat ingredients reduced the cost, improved the quality attributes and consumer acceptability of meat products

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Appendix (1)

Grading chart for meat and sausage

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.

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