Physical and chemical properties of camel meat burgers

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Abstract

The quality attributes of burgers manufactured with different levels of camel meat were studied. Chemical composition, cooking loss, water holding capacity, color, pH, oxidative rancidity and sensory evaluation were determined. The meat was obtained from 5 mature camels and beef (3-4 years old). Five levels of camel meat treatments (0%, 25%, 50%, 75%, and 100%) were used. Increasing the level of camel meat resulted in significant ($P<0.05$) increase in moisture and decrease in fat contents with no differences ($P>0.05$) in protein, and ash contents. . Water-holding capacity and pH increased significantly ($P<0.05$) with an increase in the level of camel meat. However, cooking loss and shrinkage percentages were not different between levels 0 and 100%. Color co-ordinates a*-(redness, b*-(yellowness) and L*(lightness) were also similar across the different levels. However there was a trend toward lower values for a* and b* at 0% level of camel meat compared with that at 100%. Oxidative rancidity (TBA-value) decreased significantly with an increase in the level of camel meat but this decreased was not significant between levels 50, 75 and 100% and also between levels 0% and 25%. The 0% level showed the highest (TBA)-value, while levels 75% and 100% showed the lowest values. Sensory evaluation, panel scores for tenderness, flavor, juiciness and color increased significantly ($P<0.05$) with an increase in the level of camel meat.

Key Words: Camel Burger, Chemical, Physical, Sensory, Properties.

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1. Introduction

Camels are an important livestock species uniquely adapted to hot and arid environment. They feed on range of grasses, shrubs and trees which enable them to survive under harsh environmental conditions. The camel population in Sudan has increased by approximately 38% during the years 1988-2008 (FAO, 1986). The export of camel meat is now creating interest for the international meat market. Comparative technical information shows that the fat content of camel meat is considerably less than beef, low in cholesterol and high in protein. Camel meat is similar in taste and texture to beef (Williams, 2002). Increasing population with high income led meat consumption grew at the range of 3.4-6% (Sarma and Young, (1985). Meat consumption between countries varies from 4 kg per person per annum to 35 kg in high income groups (Bender, 1992). Due to the effects of desertification, many of agropastorlist in Northern Kordofan and Darfur started to raise camels in place of cattle due to their ability to with stand hard condition, thus there will be market which may lead to increased consumption.

2. Materials and methods

2.1. Experimental meat

The meat was obtained from 5 mature camels and beef (3-4 year old). The loin cut from both animals were purchased from Abuzaid meat market to obtain twenty five kg of meat (12.5 kg camel meat and12.5 kg beef) and 2.5 kg kidney fat (beef) were also purchased. These samples were transported hygienically to the meat laboratories in the Department of Meat Production, Faculty of Animal Production at Shambat (Khartoum

North), University of Khartoum, where it was boned, weighed, labeled properly and kept in a plastic bag and frozen at -18 ̊C until used. Five levels of camel meat treatments 0% (beef only), 25%, 50%, 75%, 100% were used

2.2. Burger formulations

Meat and fat for each treatment group were run separately through an electrical meat grinder, the meat through 8mm plate and the fat through 6mm plate. Samples from the meat were used for the proximate analysis as described by AOAC (1990). Then the rest of the meat and the other ingredients were thoroughly mixed by hand and the mixture was regrinded through a 5mm plate and finally burgers were formed, 100 g in weight, 4 inches diameter and 5mm thick. After freezing, the burgers were packed into suitable plastic bags, and immediately stored at -18̊C until analysis.

2.3. Chemical and physical analyses

Determination of moisture, ash, protein and fat (ether extract) were performed according to AOAC (1990) methods. The difference in weight of samples before and after cooking was recorded as the total cooking loss and expressed as a percentage of weight before cooking (Bouton et al., 1978). The same samples were used for shrinkage determination. The meat film area was traced with a ball pen before and after frying. The filter paper was allowed to dry and areas were measured. Shrinkage was expressed as a percentage of weight before cooking. The oxidative rancidity of the samples was determined using 2- thiobarbituric acid (TBA) method as described by Hoyland and Taylor (1989). Ten gram of each sample were blended with 20 ml distilled water in a blender for 30 second and pH value of the homogenate was measured by a digital pH-meter (HM-5 S; TOA Electric Industrial Co. Ltd., Tokyo, Japan) standardized at pH 7. Water holding capacity was determined according to the procedure described by Grauard and Hamm (1953). Hunter color components lightness (*L**) redness (*a**) and yellowness (*b**) were recorded using Hunter Lab Tristimulus colorimeter model D25 m-2. Sensory evaluation was presented to an eight-member panel on an8-point scale, 8-being extremely desirable and 1 being extremely undesirable as described by Parrish *et al.* (1973).

2.4. Statistical analyses

Data were analyzed using SPSS version 10.05-computer program.

3. Results

3.1. Chemical composition

Increasing the level of camel meat resulted in a significant ($P<0.05$) increase in moisture percentage, while protein and ash percentage slightly non-significantly decreased but the fat % decrease significantly ($P <0.05$) between 0% and 75 and 100% levels (Table 1). The 0% level had significantly ($P<0.05$) lower pH value than 100% level (Table 2). Cooking loss, shrinkage and oxidative rancidity decreased, the decrease in cooking loss and shrinkage was not significant ($P>0.05$) between level 0 and 4. TBA-value decreased significantly ($P<0.05$) but this decreased was not significant between level 2, 3 and4 also between levels 2 and 1. Water-holding capacity significantly increased ($P<0.05$) with an increase the level of camel meat (Table 2). Lightness (*L**), redness (*a**) and yellowness (*b**) values were not affected by adding different levels of camel meat (Figure 1). The current study showed that the panel scores for the tenderness, flavor, juiciness and color were not affected by the added level of camel meat (Table 3).

Table 1. Effect of adding different levels of camel meat on beef burgers chemical composition

Parameter	Levels of Camel Meat					SE
	0%	25%	50%	75%	100%	
Moisture	61.88^{c}	63.01^{b}	63.38^{b}	63.41^{b}	64.01^{a}	0.28
Protein	22.26^{a}	21.82^{b}	21.79^{b}	20.81^{d}	21.09^{c}	0.04
Fat	8.45^{a}	7.04^{b}	6.87^{c}	6.05^{d}	5.99^{d}	0.05
Ash	2.14^{ab}	2.09^{d}	2.10^{cd}	2.12^{bc}	2.15^{a}	0.01

$^{abc\ d}$ Means within the same row different superscripts were significantly different (P<0.05)

Table 2. Effect of different levels of camel meat on burgers physical properties.

Parameters	Levels of Camel Meat					SE
	0%	25%	50%	75%	100%	
PH	4.78^{c}	4.82^{bc}	4.94^{ab}	4.93^{ab}	5.07^{a}	0.07
WHC	1.11^{b}	0.96^{c}	0.95^{c}	1.15^{ab}	1.28^{a}	0.06
Cooking loss	31.34^{a}	31.16^{a}	30.92^{ab}	29.45^{bc}	28.97^{c}	0.83
Shrinkage	19.61^{a}	18.38^{a}	17.68^{ab}	17.54^{b}	17.42^{b}	0.84
Rancidity	0.11^{a}	0. 10^{ab}	0.09^{bc}	0.08^{c}	0.08^{c}	0.1

^{abc} Means within the same row different superscripts were significantly different (P<0.05)

Table 3. Effect of different levels of camel meat on burger sensory characteristics.

Parameter	Levels of Camel Meat					SE
	0%	25%	50%	75%	100%	
Tenderness	5.77^{d}	5.99^{cd}	6.25^{c}	7.16^{b}	7.92^{a}	0.23
Flavor	6.10^{ab}	5.79^{b}	6.16^{ab}	6.30^{ab}	6.52^{a}	0.27
Juiciness	6.17^{b}	6.07^{b}	6.09^{b}	6.40^{b}	7.27^{a}	0.23
Color	5.80^{c}	5.91^{bc}	6.09^{bc}	6.30^{b}	6.76^{a}	0.23

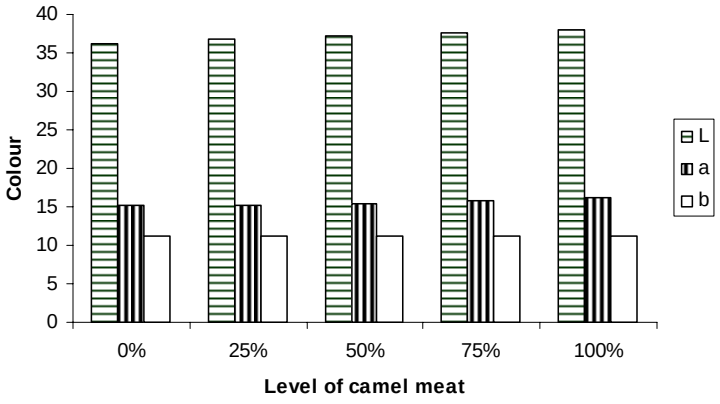

Figure 1. Effect of level of camel meat % on beef burger color value.
L-lightness, a-redness, b-yellowness.

4. Discussion

Increasing the level of camel in burger recipes resulted in an increase in moisture % and a decrease in fat %. This could be attributed to the fact that camel meat had high moisture and low fat content (Babiker and Tibin, 1986; Babiker and Yousif, 1990). The slight increase in pH values of the burger with an increase the level of camel meat may be due to pre-slaughter stress of camel. These results agreed with those reported by FAO (1991) and Guingnot et al, (1992). The improvement in the water-holding capacity could be due to the fact that camel meat had superior water content compared with beef which had been reflected on the reduction of cooking loss and shrinkage (Saliha, 2000). TBA-value decreased with increasing the level of camel meat. These findings agreed with Fathi Elrhman (2005) who reported that Frankfurter made from camel with different camel fat had lower TAB- value compared with that of corn oil. The increase in color values could be attributed to the difference in color between beef and camel meat. This result was indicated by Al-Qadi (2007) who pointed that camel meat sustains its redness for up to five days of storage. Sensory evaluation and overall acceptability were not significantly different for all treatment which is supported by Babiker and Tibin (1986) who reported that, flavor of sausage prepared of camel meat and beef with two fat levels (10 and 15%) were accepted by panelists. It is also supported by the finding of Williams (2002) who reported that camel meat is similar in taste and texture to beef.

5. Conclusion

Result of this study concluded that camel meat can be added up to 75% in the burger, which it can be acceptable by consumers.

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