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The Quality Attributes of Processed Beef Burgers with Different Levels of Camel Meat

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Abstract

This study aim to determine the effect of added different levels of camel meat on the quality attributes of beef burger. Physico-chemical analysis, colour values and sensory evaluation of three types of [(100% camel meat), (50%camel meat) and 50% beef meat and (100%beef burgers)] camel meat were obtained from different cuts of mature camel (5-6 years old) and beef from (3-4 years old) of top side of camel. Burger types were ready for analysis after processing. The obtained data of was analysed using analysis of variance ANOVA followed by least significant different test. Physico-chemical analyses excluding fat content were significantly affected ($P<0.01$) with various camel meat levels. Although increasing of camel meat level had no effect on colour values and sensory tests ($p>0.05$), but 100% camel meat burger record the highest values in redness (a^*) and all sensory evaluation values. It could be conclude that camel meat levels affecting some physico-chemical parameters, sensory attributes were the highest in 100% camel meat burger.

Keywords: camel meat, moisture content, cooking loss, redness, organoleptic scores

Introduction

Sudan comes at the second rank in the world with 4.75 million head, according to the FAO, (2018). Out of the other livestock species, the camel has a special capability to live and survive with under harsh environmental conditions make it unique and optional animal in arid and semi-arid area of the world, hence it is a good meat source in such areas where climate influence other animal species (Kadim et al., 2006). In Sudan camel participates by 82 thousand tons of meat for local consumption and 62 thousand tons for export (MAR, 2018).

In Sudan camel meat comes generally from older males, whereas females are mainly reserved for milk production, racing, and transportation but not for meat production. (Adam and Abugroun, 2015). Comparing to beef camel meat characterized with lower fat content, cholesterol and high in protein (Williams, 2002), high water holding capacity (Elgasim and Alkanhal, 1992), while it has a similar taste and texture (Kurtu, 2004). Camel meat recommended as a healthy food with good processing characteristics (Babiker and Yousif, 1990).

In study of quality traits of burger manufacturing with different levels of camel meat Ibrahim and Nour, (2010) reported a significant increase in moisture

content, associating with decrease in fat contents also water holding capacity, pH was increased while colour assessment, including lightness (L*), redness (a*) and yellowness (b*), protein and ash contents were in significantly indifferent. In the last decade in Sudan sausage, burger and other type of ready to cook food were widely distributed in supermarkets, street shops, restaurants and homes due to increasing in meat processing factories and minor change in consumer culture, therefore many researches and studies work and focus on investigating and assess the quality properties of these products.

Materials and methods:

Preparation of the products

Camel meat (*Camelus dromedaries-single hump)* from different cuts of 5-6 years old camel and beef from top side of 3-4 years old bull were purchased from west Omdurman (Alnaga market) and Kuku market. It were transported under healthy conditions to the meat lab in the Department of Meat Science and Technology, College of Animal Production Science and Technology at Hillat Kuku (Khartoum north), Sudan University of Science and Technology, where it were deboned, weighed, reserved in plastic bags and stored at -18℃ until processing. Three types of burger were processed according to camel meat percentage as [(100% camel meat), (50% camel meat and 50% beef meat) and (100% beef meat)]. One kg of each burger type was formulated as presented in table (1).

Chemical assessment:

About 50g from the tree burger types (triple times) were blended in for 25s in lab mincing machine, then moisture, fat, protein and ash content were assessed using standard methods of (AOAC, 2002). Also The pH of the burger samples determined using Hanna pH meter, Japan, 10 g of each sample were blended with 100ml distilled water in a blender jar at high speed for 1 min. before measuring pH.

Product quality attributes:

Triplicate samples (About 1g) from each were used for water holding capacity WHC determination. Sausage samples were putted on Whatman No. 4 filter paper in a desiccator over soaked on KCl solution), pressed between two plexiglass plates for one minute at 25kg/cm^2 load. Planometer device was used to measure the areas covered with meat and moisture. Then the WHC was calculated as ratio (Grau and Hamm, 1953).

$$\text{WHC} = \frac{\text{Loose water area} - \text{meat film area}}{\text{meat film area}}$$

The cooking loss percentage was conducted as a method described by Honikel (1998), weight of samples was recorded before and after cooking. The fresh samples were subjected to Hunter-Lab Tristimulus colorimeter (Model D25 M.Z, Hunter Associated Lab. Inc., Virginia, USA), to determine the colour evaluation, including lightness (L*), redness (a*) and yellowness (b*).

Sensory evaluation

Sensory attributes were performed by fifteen semi-trained sensory panellists to evaluate colour, tenderness, juiciness, flavour, and overall acceptability of the cooked burger samples using an 8-points hedonic scale card, 8 being extremely desirable and 1 being extremely undesirable as described by Cross et al., (1978).

Statistical analysis:

The obtained data of was analysed using analysis of variance ANOVA and the means were significantly tested with least significant difference (LSD) at 0.05 level of significant.

Table 1. Burger ingredients and proportion (g/kg)

Ingredients	Burger type		
	Camel	Camel/beef	Beef
Camel meat	670	335	-
Beef meat	-	335	670
Bread crumbs	60	60	60
Wheat flour	50	50	50
Water (ml)	110	110	110
Onions	50	50	50
Skim milk	30	30	30
Salt	15	15	15
Coriander	3	3	3
Black pepper	2	2	2
Nutmeg	2	2	2
Kebab china	3	3	3
Garlic	3	3	3
Cinnamon	2	2	2
Total	1000	1000	1000

Results and discussion

The chemical and physical analysis of burger types except fat content were affected by adding different levels of camel meat (Table 1), with the highest values of 100% camel meat burger in protein and ash followed by 50% camel meat burger. In this study moisture content (67.93%) of 100% camel meat burger was lower than ($P<0.01$) 100% beef burger (69.50%) it could be due to the source of meat were from younger bull, but it was higher than those reported by Ibrahim and Nour, (2010); Adam and Abugroun, (2015) and Heba and Hussein (2016) with mean value 64.01, 65.30 and 63.90 respectively this might be attributed that camel meat had higher moisture content. Also fat% were lower in 100% camel meat burger than 100% beef burger makes it a healthier source of red meat compared to other livestock species. Similar results were found by Babiker and Tibin, (1986); Babiker and Yousif, (1990); Ibrahim and Nour, (2010), Adam and Abugroun, (2015) and Heba and Hussein (2016). Protein and ash content was the highest 17.58 and 1.64% ($P<0.01$) in 100% camel meat burger. Agreed results were reported by Kadim, (2008) and Heydari, (2015). Several factors such as pre-slaughter stress, post-mortem handling and physiology of muscle affected the pH value of meat (Marsh, 1977 and Thomason, 2002). Slight increase in pH values of burger with increase of camel meat portions might be due to those factors in camel meat. These results in harmony with those of FAO (1991); Guingnot et al., (1992); Kadim et al.(2008); Ibrahim and Nour, (2010), Heydari, (2015). Water holding capacity and cooking loss are very important issues in meat quality which influencing product yield it depend on pH value (Kadim et al., 2012), it was significantly increased ($P<0.01$) by increasing the percentage of the camel meat in the burger while cooking loss was decreased, similar results were found by Kadim et al., (2006); Ibrahim and Nour, (2010) and Adam and Abugroun, (2015).

Table 2. Effect of added camel meat on chemical and physical analysis of beef burger

Traits	Camel meat percent			P. Value
	100	50	0	
Moisture	67.93±0.31^{b}	68.00±0.40^{b}	69.50±0.17^{a}	0.000
Protein	17.58±0.15^{a}	17.30±0.05^{b}	17.14±0.04^{c}	0.000
Fat	1.17±0.04	1.24±0.18	1.42±0.24	0.164
Ash	1.64±0.02^{a}	1.58±0.04^{a}	1.45±0.11^{b}	0.014
pH	5.98±0.03^{a}	5.91±0.03^{b}	5.83±0.02^{c}	0.000
Water holding capacity	0.99±0.06^{a}	0.60±0.06^{b}	0.53±0.03^{c}	0.000
Cooking loss%	15.24±0.10^{c}	17.38±0.35^{b}	19.44±0.83^{a}	0.000

N =4/burger type - Means bearing different letters in the same row mean significant differences at P<0.05

From figure (1) although the current study showed no significant differences in the colour values for lightness (L^{*}), redness (a^{*}) and yellowness (b^{*}) of the studied burger types, 100% camel meat burger records the highest redness (a^{*}), also it was higher in yellowness (b^{*}) than beef, agreed results was reported by Al-Qadi (2007); Kadim et al., (2008); Ibrahim and Nour, (2010); Adam and Abugroun, (2015); Heydari, (2015).

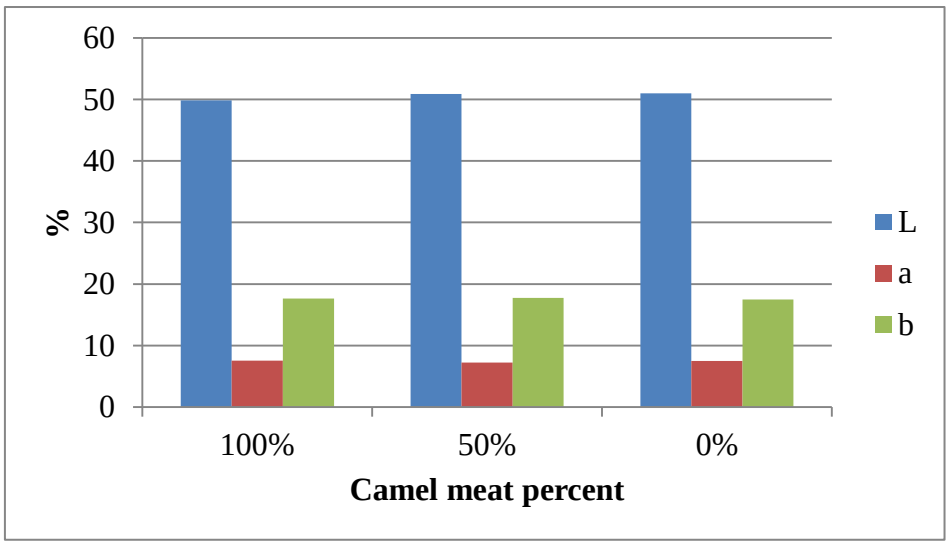

Figure 1. Effect of added camel meat on colour values of beef burger

L-lightness, a-redness, b-yellowness

The current study revealed insignificant differences in sensory evaluation scores among the studied burger types (Figure 2). Supported findings were reported by Babiker and Tibin

(1986) who found similar flavour score of camel and beef sausage prepared with 10 and 15% of fat was accepted by panellists.

Also it is in line with finding reported by Williams (2002) who mentioned that taste and texture were similar in camel and beef meat. Also the results were in harmony with those of Ibrahim and Nour, (2010). Meanwhile, Siham et al., (2015) reported similar results on sensory attributes of sausages from camel, beef and goat meat.

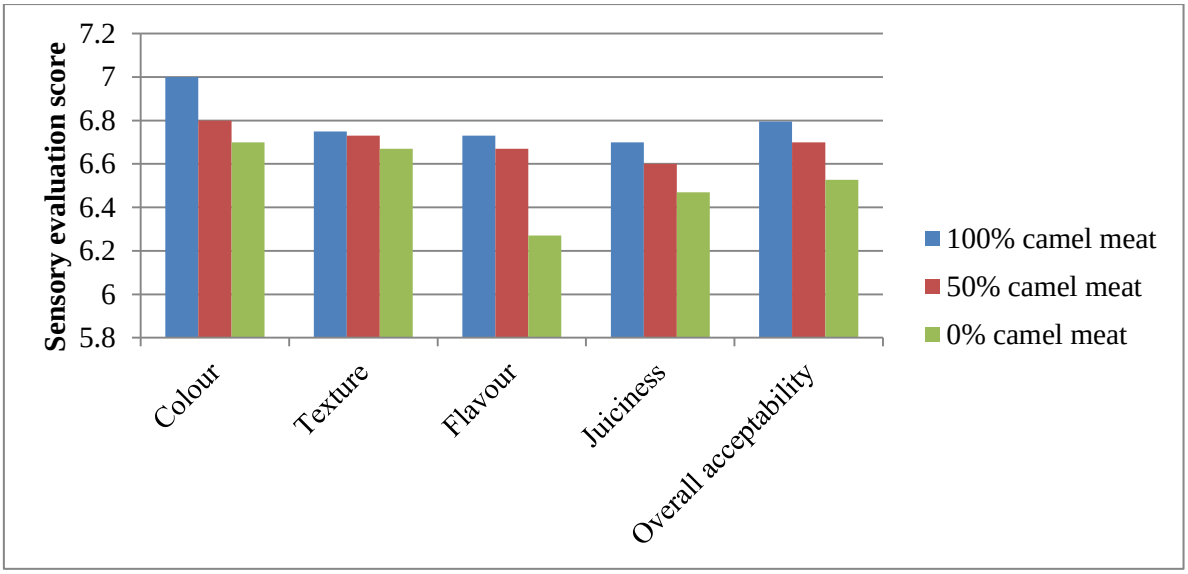

Figure 2. Effect of added camel meat on sensory evaluation of beef burger

Conclusion

It was concluded that protein, ash, pH and water holding capacity of the camel meat burger increased with increasing the level of camel meat, however cooking loss% was decreased with various camel meat level. Also 100% of camel meat sausage ranked the highest sensory evaluation tests.

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خصائص جودة بيرقر البقر المصنع من مستويات مختلفة من لحم الإبل

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المستخلص

هدفت هذه الدراسة لتقييم أثر إضافة مستويات مختلفة من لحم الإبل على خصائص جودة بيرقر لحم البقر. التحليل الفيزيو–كيميائي، قياسات اللون والتقييم الحسي لثلاث أنواع من البيرقر [(100% لحم إبل)، (50% لحم إبل و50% لحم بقر) و (100% لحم بقر)] . تم الحصول على لحم الإبل من حيوانات بالغة (5–6 سنوات) ولحم البقر من قطعية الظهر. تم تجهيز أنواع البيرقر للتحليل بعد تصنيعها. أستخدم تحليل التباين متبوعاً بإختبار أقل فرق معنوي في تحليل البيانات المتحصل عليها. بإستثناء الدهون تأثرت التحليل الفيزيو–كيميائي معنوياً ($P<0.01$) بنسب لحم الإبل المختلفة. على الرغم من عدم وجود فروق معنوية ($P>0.05$) في قيم اللون والإختبارات الحسية (a^*) إلا أن البيرقر 100% لحم إبل سجل أعلى قراءات في درجة الإحمرار وكل نتائج التقييم الحسي. يمكن أن نخلص إلى أن لحم الإبل بمستويات مختلفة أثر على بعض الخصائص الفيزيو–كيميائية لبيرقر البقر، الخصائص الحسية كانت الأعلى في 100% بيرقر لحم الإبل.