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Evaluation of Camel Meat in Processing Burger Products under Sudanese Conditions

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Abstract: *The study was carried out to evaluate the burger products processed from camel meat. Burger products were processed from various amount of meat (camel and beef) as mixing and divided into four groups. A (100% camel meat). B (75% camel meat, 25% beef). C (50% camel meat 50% beef).and D (100% beef meat) as a control group. Samples were prepared for analysis after processing. Chemically crud protein content (%) were not significantly different (p>0.05) among burger treatments, ash, fat and moisture content (%) also were not significantly differences. Determined the pH value for burger treatments, cooking loss and were not significantly differences among burger products. There were no differences in microbial growth assessed by total microbial count between camel and beef meat were used in processing burger. The sensory attributes conducted, flavor, color, juiciness, tenderness and overall acceptability were not differences.*
Keyword: *camel meat, Beef, Burger, processing, Quality attributes.*

I. Introduction

The world population of camels is estimated to be 17 million (Elgasim & Alkanhal, 1992). Compared to other livestock, the camel is unique in having an exceptional ability to survive and thrive under adverse climatic conditions such as high ambient temperatures, low rainfall, and feed scarcity. Therefore, it offers an ideal option for animal production in arid and semi-arid regions of the world. Camel is a unique animal having the ability to survive and produce with low cost of feeding under harsh conditions compared to other livestock. It is a good source of meat in areas where the climate adversely affects other animal's production efficiency (Kadim et al., 2006). Traditionally, camel meat comes mostly from old males and females that are primarily kept for milk, racing, and transportation rather than for meat production. 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 (Kurtu, 2004). Carcass characteristics of camels were equal to those of other red meat animal species (Elgasim & Alkanhal, 1992). Chemically camel muscles had been found to have low fat content, high water holding capacity recommending camel meat as a healthy food with good processing properties (Babiker & Yousif, 1990). However, there is evidence of a great demand for fresh camel meat and for camel meat in blended meat products even in societies not herding camels (Morton, 1984; Pérez et al., 2000).

II. Materials & Mathods

2.1 processing products: Camel meat from around cuts and Beef top side cuts were purchased from west Omdurman and divided to four groups for used in processing burger products which consists from various amount of lean meat as mixing according to percentage of camel meat A (100%camel meat) B (75%camel meat 25% Beef meat) C (50%camel meat 50% Beef) and control D (100% Beef meat). Burger samples were processed using the formulation in table (1).

Table (1):- burger ingredients per g/kg

INGREDIENTS (gm)				
	A	B	C	D
Meat (camel)	700	525	350	_
Meat (beef)	_	125	350	700
Fat (cattle)	100	100	100	100
Water	100	100	100	100
Skim milk	30	30	30	30
Wheat starch	35	35	35	35
Bread crumbs	35	35	35	35
Cinnamon	2	2	2	2
Black pepper	2	2	2	2
Sugar	2	2	2	2
Salt	15	15	15	15
Nutmeg	2	2	2	2

Chemical evaluation: Approximately 150 g of products from each treatment were blended for 15s in laboratory blender and were used in all chemical analysis. Each products samples was homogenized and analyzed in triplicate, to determine moisture (drying for 6 h at 105◦c), fat (as extractable component in Soxhlet apparatus) protein (Kjeldahl nitrogen) using standard methods (AOAC, 1980). The ultimate pH of products samples determined by sing pH meter. The pH meter was calibrated with buffers 4 and 7.

Meat quality attributes: burger products were prepared for colour sensing and covered by polythene sheets. The colour was determined using a Hunter-Lab Tristimulus colorimeter (Model D25 M.Z, Hunter Associated Lab. Inc., Virginia, USA). Hunter (L) lightness, (a) redness and (b) yellowness were recorded before and after storage. Duplicate samples, each of approximately 0.5 gm of two products, were placed on a humidified filter paper (Whatman No. 4 in adesiccator over saturated KCl solution) and pressed between two plexiglass for 1 min at 25 Kg/cm2. Meat and moisture areas were measured using a compensating planometer. The result was expressed as ratio (Grau and Hamm, 1953). Water Holding Capacity (WHC) =[Loose water area-meat film area] ÷ meat film area. Cooking loss determined as Babiker (1981) by using thermostatically controlled water bath 90◦c for 90 min, samples were weighed before and after cooking
The storage loss % was determined by taking the initial weight of the products (sausage or burger) after processing immediately and then after the storage period (five weeks). The frozen samples were left overnight in a refrigerator at 4oC for thawing and then weighed.

Microbial analysis: One gram of products burger was homogenized in nine ml of sterile distilled water for 1-5 min. ten fold dilutions of homogenate were prepared in normal saline.

Enumeration of total aerobic mesophilic bacteria: Plating was performed into plate count agar (PCA, OXOID CM 325) from the prepared dilutions by spread plate method. Colonies formed after 48 h incubation at 30◦c under aerobic conditions were counted (Swanson et al., 1992).

Sensory attributes: The sensory evaluation was conducted in the sensory evaluation facilities of the Meat laboratory, Samples were separately cooked from each group of treatment, 11 semi trained panelists were used to evaluate the burger samples. The evaluation included, colour, tenderness, flavour and juiciness using an 8-point scale score (hedonic scale) card as described by Cross and Overby (1988).

Statistical analysis: The data obtained were analyzed statistically and the means were tested for significance using Duncan Multiple range test as described by SPSS. v.16 (2008).

III. Results And Discussion

Items	A	B	C	D
Protein	17.2 ± 0.03^{a}	17.3 ± 0.05^{a}	17.3 ± 0.02^{a}	17.9 ± 0.5^{a}
Moisture	$65.3^{b}\pm0.6$	$63^{b}\pm0.5$	$64^{b}\pm1.2$	$63^{b}\pm0.5$
Fat	5.03c±0.2	4.7c±0.1	5.03c±0.1	5.3c±0.3
Ash	0.9±0.03	0.8±0.03	0.9±0.03	0.9±0.03

Table (2): Means and standard error of chemical composition of burger treatment.

Burger were processed from camel meat and others the mixed with beef were not significantly different in protein content % among all groups present in table (2) with a higher mean value for group D which processed from beef and that refer for beef meat protein content %, agreement with the overall average 17.2 % for camel meat protein content in different season by Abdelhadi et al., (2012) Babiker and Yousif (1990) . Burger processing additives as a constant percentage for all groups from water and other ingredients, chemically there were no different ($p>0.05$) in moisture, fat, and ash %, among burger products with means value 65.3-63%, 5.3-4.7%, and 0.9-0.8% respectively. Observe that the higher one in moisture content for camel meat and a lower one for beef. In general, camel meat is high in moisture content, moderate in protein and ash, but low in fat, which clearly confirms the fact that camel meat is healthier due to its low intramuscular fat content compared to other species (for review, see Hocquette et al., 2010) like cattle (Delgado et al., 2005; Sasaki, Mitsumoto, & Kawabata, 2001), sheep (Farid, 1991; Sen, Santra, & Kadim, 2004) and goats (Mahgoub, Kadim, Al-Saqry, & Al-Busaidi, 2004; Sen et al., 2004).

Item	A	B	C	D
PH	5.8±0.1	5.4±0.2	5.5±0.2	5.3±0.2
Cooking loss	29.1±4	20.6±0.6	16.9±5	31.1±4
Color	18.03±0.9	18.3±0.4	17.7±0.4	17.6±0.2
Redness(a*) Yellowness(b*)	8.8±0.06	8.6±0.14	8.9±0.03	8.8±0.23
Lightness(L*)	32.03±0.5	32.4±0.7	31.5±0.9	32.3±0.8
W.H.C	2.2±0.02	2.3±0.12	2.06±0.07	1.9±0.06

Table (3): Means and standard error of ultimate pH and coking loss and color and W.H.C of burger treatments.

Meat quality attributes of burger treatments were determined by pH value, cooking loss, W.H.C, and colour measurement, present in table (3). The ultimate pH of burger were processed from camel meat had a higher value with average 5.8 and a lower for beef burger (5.3). The mean value pHu was 5.8 which falls within the pHu range value of 5.4–6.0 reported by Abdelhadi et al., 2012, Kadim and Mahgoub (2006), Shariatmadari and Kadivar (2006), Kadim et al. (2006, 2008) and Kadim, Mahgoub, et al. (2009). However, the pHu were decreased in this study for burger products which mixed camel and beef meat clearly in group B and C and that refer for beef.

Water holding capacity and cooking loss is important issue in meat quality and it depend on pH value were its clear shown in table (3) and there were no significantly different (p>0.05) with increase in cooking loss% for beef burger and less in group C which consist 50% from camel and beef meat and improved quality of burger (Parang Nikmaram et al. 2011) reported the Cooking loss of camel and veal were obtained 42.46 and 41.20% for microwave cooking. Adam and Abugroun (2010) mentioned, the results of ultimate pH for processed meat sausage and burger groups were not significantly different in water holding capacity (p>0.05). Water holding capacity is affected by several factors such as pH, species, age and muscle type and function. Price and Schweigert (1987) reported that the water holding capacity of meat could be increased by addition of table salt. Addition of these salts to meat during curing or manufacture of emulsion thus increases the water holding capacity. Water-holding capacity is especially critical in meat ingredients of meat products that are subjected to combinations of heating, grinding and other processes. Weight losses during fabrication processes are largely the results of water evaporation.

Items	A	B	C	D
T.count	6.03±0.08	5.8±0.04	6.3±0.5	6.8±0.24
Storage loss%	0.56±0.08	0.53±0.2	0.40±0.05	0.80±0.05

Table (4): Means and standard error of total viable bacterial count cfu/gm and storage loss of burger treatments.

The burger sample were stored at -18◦c as general attitude in market or customers, and they were not significantly different (p>0.05) in storage loss. During freezing storage meat loses water by evaporation, sublimation, and exudation, respectively, moisture is also lost during cooking. Moisture losses by evaporation during freezing of non-packed carcasses or joints normally amount to between 0.5 and 1.2% of the total weight (Genot 2000). The same author mentioned monthly losses of 0.15% to 0.7% were found in traditional stockinet-wrapped meat at-30◦c and-10°c, respectively. In other work, it has been reported that drip losses from fast-frozen and stored meat increase with storage time, reaching the same level as the drip losses observed from meat frozen at slow rate not stored for any length of time (Ngapo et al, 1999b).

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