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Effect of Adding Camel Hump Fat on Quality Attributes of Beef Burger

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Abstract

The study was conducted to determine the sensory properties of beef burgers manufactured with different levels of camel hump fat. The hump fat, which has low cholesterol, is successfully used in many regional countries.is almost neglected as a binder in processed meat production in Sudan. The samples were weighed and burger patties were formulated in 5 treatments T1: 0% T2: 10%, T3: 15%, T4: 20% and T5: 25% hump fat, respectively. The treatments were subjected to 4 replications. The sensory evaluations included tenderness, juiciness, colour, flavour and overall acceptability. The data were statistically analyzed using variance analysis for a completely randomised design using the SPSS version 8.0 computer program. LSD did mean separation, and the values were expressed as means and standard error. The difference between mean values was significant at $P < 0.05$. The flavour (T1: 5.54 , T5: 5.11).juiciness (T1: 5.64 T5: 5.45) and total acceptability (T1: 6.11, T5: 5.57) decreased by increase of camel hump fat. The study concluded that camel hump fat can be added to the beef burger formulation. However, the negative effect of flavour can be solved by increasing the level of spices.

Introduction

Sudan has a huge livestock population, estimated to be more than one hundred and seven million heads. Camels are important livestock species uniquely adapted to hot and arid environments. One-third of the total camel population is found in Somalia, and 60% is found within the borders of Somalia, Sudan, Kenya, and Ethiopia. Australians have lately started to look at camel as a source of meat (Fathi, 2005). Meat and meat products are essential components in human diets; their consumption is affected by various factors. The most important are product consumer and environment-related characteristics (Colmenero et al., 2001). A burger is a minced meat product. The minced meat is mixed with condiments and spices, shaped, and cooked by frying or baking (Gurjral et al., 2002). The types of seasoning used vary depending on the taste requirement, from mild to hot and spicy. Humans' use of animal fats may well predate civilisation. As the depot fats in animals are readily visible during the butchering of a slaughtered animal, are easily harvested, and are available without the need for plant domestication or the adoption of established agriculture, animal fats were probably the first lipids consumed by humans. Lipids support multiple biological functions in the body. They serve as the structural building materials of all cell and organelle membranes. Lipids are the most efficient fuel for living organisms, containing more than twice the energy content of carbohydrates and proteins on a weight basis (Sbihi et al., 2013).

Fat in meat products plays an important role in stabilising meat emulsions, reducing cooking loss, improving water holding capacity, providing juiciness and tenderness and has considerable effects on the binding, rheological and structural properties of the meat products (Yoo et al.2007). Fat is important in meat products since it affects technological properties and sensory aspects, mainly hardness and juiciness (Ozvural et al., 2008). The level and type of fat in emulsion-type sausages affect the percentage of cooking losses. In this regard, Serdaroglu et al. (2004) found a possible relationship between increasing cooking yield and higher fat retention in beef patties. In addition to the serious health concerns associated with animal fat, lipid and protein oxidation poses a significant threat to meat quality. Oxidative reactions occurring in muscle foods during handling, processing, and storage can lead to undesirable sensory changes and a decline in nutritional value. Therefore, reducing fat content is widely recognized as a key strategy for improving the nutritional profile of foods and producing healthier products. This is particularly important in the meat industry, where certain meat products contain high levels of fat (Huda et al., 2014). From a chemical perspective, camel meat contains more moisture than beef. Studies have shown that camels have a slightly higher moisture-to-protein ratio compared to beef or lamb (Babiker & Tibin, 1989). Babiker and Tibin (1989) found that, compared to beef, camel meat has significantly higher protein content and lower intramuscular fat. Additionally, camel meat contains notably lower levels of sarcoplasmic protein than beef. Given these characteristics, camel meat presents a viable alternative for addressing animal protein shortages.

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Camel meat is the least studied and is wrongly believed to be of lower nutritive value and quality than other red meat, despite their ability to produce good quality meat at comparatively low cost under highly harsh environments (Skidmore, 2005). Camel is suitable for exploiting arid areas, which constitute an important resource for some countries such as Sudan, Somalia, and Mauritania. Its meat represents about 8% of the meat production in the Arab countries (Kadim et al., 2008). Therefore in The objectives of this study were To determine the sensory properties of burgers manufactured with different levels of camel hump fat.

Materıals And Methods

Materials: Seven and half Kilo grams of beef meat and 100 gm of beef fat were purchased from the University of Khartoum project for animal production. One kilogram of sample camel hump fat was purchased from Tambull Meat Market (East Gazira State) and stored in ice in a thermal container before travelling to Shambat (Khartoum North), University of Khartoum and stored in a deep freezer at -18c till use. Mixes of spices were purchased from Khartoum North Market, Khartoum State, Sudan and were cleaned and grind by an electric grinder separately (cardamom, cinnamon, coriander, and fennel).

The meat samples were thawed overnight in a refrigerator at 4°c. Each of the samples was thoroughly ground. Random samples were taken from each batch to determine the fat content. The person square method was adopted to formulate treatments with different fat percentages. The remaining samples were thoroughly wrapped and frozen at -18°C until later used.

Treatments formulation: Five treatments were formulated (T1: Control 0%, T2: 10%, T3: 15%, T4: 20% and T5: 25% hump fat) with four replications as listed in table (1). It contained Meat, Beef fat, hump fat, salt, ice water, powdered milk, bread, sugar, and spices (Cardamom, Cinnamon, Coriander and Fennel).

Table 1: Treatments formulation of burger meat

Treatments	Composition of burger (%)							
	Meat	Hump fat	Bread crumps	Salt	Sugar	Ice water	Spices	Milk powder
1	71.5%	0	13	1.5	1	8	2	3
2	61.5%	10	13	1.5	1	8	2	3
3	56.5%	15	13	1.5	1	8	2	3
4	51.5%	20	13	1.5	1	8	2	3
5	46.5%	25	13	1.5	1	8	2	3

All spices (cardamom, cinnamon, coriander and fennel) and salt were added equally to each treatment.

Burger formulations: Meat and fat for each treatment group were ground separately through an electrical meat grinder, the meat through an 8 mm plate and the fat through a 6 mm plate. Samples were taken from the meat for proximate analysis, as AOAC (1990) described. Then, the rest of the ingredients were thoroughly mixed by hand, and the mixture was reground through a 5 mm plate. Finally, burgers were formed weighing 100 gm with 9 cm diameter and 5 – 10 mm thick. After formulation, the burger was packed into suitable plastic bags, labelled, and immediately transported to a freezer at -18°C until it was analysed.

Sensory evaluations: Sensory panel evaluation was conducted in sensory evaluation facilities of Meat Production Department, Faculty of Animal Production, University of Khartoum. Samples were thawed overnight in the refrigerator at 4°C and cooked by peanut oil frying for 2-5 minutes on each side. The samples were turned every few minutes until cooked. Each patty was cut into small pieces and served warm to the panellist. Twelve semi-trained panellists evaluated the warm meat samples. Panellists evaluated each meat sample for tenderness, colour, flavour, juiciness and overall acceptability using an 8-point scale score (hedonic scale) card described by Cross et al. (1978). The highest score of 8 is extremely colourful, tender, flavorful, juicy and acceptable, and the lowest score of 1 is inferior in colour, tenderness, flavour, juiciness and overall acceptability (appendix). Tap water was available for use between testing samples.

Statistical analysis: The statistical analysis for recorded data was done using variance analysis for a completely randomized design (CRD) using a general linear model (statistical program, version 8.0). LSD did mean separation, and the values were expressed as means and standard error.

Results

Colour: The effect of the addition of different levels of hump fat to beef burger colours is illustrated in Table (2). The results showed that T4(20% hump fat) and T3 (15% hump fat) had the highest colour, followed by T2, T1 and T5, respectively, with no significant difference (P ≤0.05) between the treatments.
Tenderness: The effect of adding different levels of hump fat to beef burger tenderness is presented in Table (2). The results showed that T4 (20 % hump fat) showed the highest tenderness, followed by T1, T2, T3 and T5, with no significant difference (P ≤ 0.05) between these four treatments.
Flavour: The effect of the addition of different levels of hump fat to the beef burger is presented in Table (2). The results showed that T1 (0% hump fat) showed the highest flavour, followed by T2, T3, T4 and T5, respectively, with no significant difference (P ≤ 0.05) between the treatments.
Juiciness: The effect of adding different levels of hump fat to beef burgers on juiciness is illustrated in Table (2). The results showed that T4 (20 % hump fat) showed the highest juiciness content, followed by T3, T1, T5 and T2 lowest, respectively, with no significant difference (P ≤ 0.05) between the treatments.
Overall acceptability: The effect of the addition of different levels of hump fat on beef burger acceptability is presented in Table (2). The results showed that T1 (0% hump fat) showed the highest acceptability score with no significant difference (P > 0.05) with the other treatments, followed by T3, T4, T2 and T5 respectively.

Table (3): The effect of adding different levels of hump fat to beef burger panel test

Parameter / Treatments	Color	Tenderness	Flavor	Juiciness	Overall acceptability
T1 0%	5.68	6.04	5.54	5.64	6.11
T2 10%	5.79	5.71	5.32	5.29	5.68
T3 15%	5.82	6.25	5.21	5.68	5.96
T4 20%	5.82	6.14	5.18	5.89	5.82
T5 25%	5.50	5.39	5.11	5.43	5.57
Mean	5.72	5.91	5.27	5.59	5.83
SE	0.131	0.126	0.127	0.124	0.115
LS	N.S	N.S	N.S	N.S	N.S

* The same letter mean on the row indicates no significance (P<0.05).
* SE: Standard Errors

The effect of the addition of different levels of hump fat to beef burgers is presented in Table (2). The results showed that T2 (10% hump fat) showed the highest acceptability score with no significant difference (P ≤ 0.05) with the other treatments, followed by T3, T4, T2, and T1, respectively. These three characteristics of meat (tenderness, juiciness, and flavour) are greatly influenced by various factors, such as the animal (breed, sex, age), meat production activities (feeding, transporting, and slaughtering conditions), and processing (storing time/temperature condition) (Liu et al., 2003).
Treatment A (control) received the highest scores in flavour and overall acceptability, while treatment C received the highest scores In colour and tenderness while in juiciness T.D. Treatment E received the lowest scores of all the treatments, which were generally acceptable by the panel. There were no significant differences (P<0.05) between all the primeless treatments. Raw meat has little aroma, but meat flavour is developed because of many compounds produced in post-mortem muscle (Toldrá, 2002). Park et al. (1989) reported that a reduction in fat content in frankfurters results in decreased juiciness. Beef flavour can vary significantly due to a number of factors ranging from breed type to cattle diets or even meat processing/ageing techniques (Montgomery & Leheska, 2008). Overall acceptability, as evaluated by consumers, is a mixture of flavour and tenderness scores and other sensations that consumers perceive when they taste meat lamb samples. Overall acceptability was highly correlated with flavour and tenderness. These attributes are affected by fatty acid composition. This parameter differs among production systems (Sanudo et al., 2000) and by the cultural background and culinary habits since the kind of meat that consumers are used to eating is generally evaluated with higher scores.

Conclusion

Sensory evaluation showed that tenderness increased with the increase in the level of camel hump fat, while colour was not affected significantly by adding camel hump fat. On the other hand, flavour, juiciness and total acceptability decreased by an increase in the level of camel hump fat. Camel hump fat can successfully be added to beef burgers. Studies on the effects of hump fat on the sensory evaluation of other types of processed meat products are needed.

References

AOAC, (2000). Association of official Analytic Chemists. Official method of analysis. Gaithersburg, MD, USA: AOAC International.

Babiker, S. A., & Tibin, I. M. (1989). A note on desert camel meat production and characteristics. In Proc. Int. Symposium on the development of animal resources in the Sudan. pp (pp. 116-120).

Cross, H. A; Moen, R. and Stanfield, M. S. (1978). Training and testing of judges for sensory analysis of meat quality. Fod Technol. 32:48.

Fathi (2005). Effect of fat type and packaging method on camel frankfurter. M.Sc thesis, university of Khartoum, Khartoum.

Gujral HS, Kaur A, Singh N, Sodhi NS. (2002). Effect of liquid whole egg, fat and textured soya protein on the textural and cooking properties of raw and baked Gujral HS, Kaur A, Singh N, Sodhi NS. Effect of liquid whole egg, fat and textured soya protein on the textural and cooking properties of raw and baked patties from goat meat. J Food Eng 200; 53: 377 – 385.

Huda, A. B., Parveen, S., Rather, S. A., Akhter, R. & Hassan, M. (2014). Effect of incorporation of apple pomace on the physico-chemical, sensory and textural properties of mutton nuggets. International Journal of Advanced Research, 2(4), 974-983.

Jiménez-Colmenero, F., Carballo, J., & Cofrades, S. (2001). Healthier meat and meat products: their role as functional foods. Meat science, 59(1), 5-13.

Kadim, I. T.; Mahgoub, O. and Purchas, R. W. (2008). A review of the growth, and of the carcass and meat quality characteristics of the one-humped camel (camelus dromedaries). Meat Sci. 80: 555-569.

Liu Y., Lyon B. G., Windham W.R., Realini C. E., Pringle T.D.D. and Duckett S., (2003). Prediction of colour, texture, and sensory characteristics of beefsteaks by visible and near infrared reflectance spectroscopy. A feasibility study. Meat Science, 65, pp.1107–1115.

Montgomery, T. and Leheska, J., (2008). Effects of various management practices on beef-eating

Özvural, E. B., & Vural, H. (2008). Utilization of interesterified oil blends in the production of frankfurters. Meat Science, 78(3), 211-216.

Park, J., Rhee, K. S., Keeton, J. T., & Rhee, K. C. (1989). Properties of low‐fat frankfurters containing monounsaturated and omega‐3 polyunsaturated oils. Journal of Food Science, 54(3), 500-504.

Sanudo, C., Alfonso, M., Sánchez, A., Delfa, R. and Teixeira, A., (2000). Carcass and meat quality in light lambs from different fat classes in the EU carcass classification system. Meat science, 56(1), pp.89-94.

Sbihi, H.M., Nehdi, I.A. and Al-Resayes, S.I., (2013). Characterization of Hachi (Camelusdromedarius) fat extracted from the hump. Food chemistry, 139(1-4), pp.649-654.

Serdaroglu, M. and Degırmencioglu, O. (2004). Effects of fat level (5%, 10%, 20%) and corn flour (0%, 2%, 4%) on some properties of Turkish type meatballs (koefte), Meat Science, 68: 291–296.

Skidmore, J. A. (2005). Reproduction in dromedary camels: an update. Anim. Repr. 2:161-171.

Toldrá F., Flores M. Processed Pork Meat Flavors. In: Hui Y.H., editor. Handbook of Food Products Manufacturing. Volume 2. John Wiley & Sons, Inc.; Hoboken, NJ, USA: 2007. pp. 281–301.

Toldra, F. (2002). Dry – cured meat products, Food and Nutrition Press, INC,Trumbull, CT, pp: 63 – 88.

Yoo, S. S., S. H. Kook, S. Y. Park, J. H. Shim and K. B. Clin, (2007). "Physicochemical Characteristics, Textural Proper-ties and Volatile Compounds in Comminuted Sausage as Affected by Various Fat Levels and Fat Replacers." International Journal of Food Science and Technology, 42, (9): 1114 - 1122.