Research Journal of Biological Sciences 3 (6): 612-615, 2008
ISSN: 1815-8846

The Effects of Cooking Methods on Cooking Loss and Sensory Evaluation in Camels (*Camelus dromaderius*) and Cattle Meat

Dalia A.M. Abd Alla
Department of Animal Nutrition, Faculty of Animal Production, University of Khartoum, Sudan

Abstract: The main objective of this study, was to determine the effect of cooking method (s) on cooking loss and sensory evaluation in topside muscle from Camel and cattle. The cooking methods used include braising, frying, broiling and roasting. The loss due to different cooking methods is clear, with slight species variations between camel and cattle. From using braising, frying, broiling and roasting, there was an increase in cooking loss, in both camel and cattle, roasting scoring highest lost (58.85 vs. 52.45% for camel and cattle, respectively). As for the sensory evaluation scores, color, flavour, tenderness, juiciness and acceptability camel scored higher figures than the corresponding data for cattle. The lack of training among panelist may account for these variations.

Key words: Camel, cattle, meat, cooking, sensory evaluation, *Camelus dromaderius*

INTRODUCTION

Quality of meat from young camels is comparable to beef, with only a few exceptions; meat is a by-product of the camel, coming mainly from old animals (Wilson, 1978). Traditionally, meat comes mostly from seven years and above males and females that are primarily kept for milk, racing and transportation rather than for meat production (Kurtu, 2004). Camel meat required by consumers because of the nutritional value of these meats, characterized by reduced fat and cholesterol contents (Perez *et al*., 2000; Cristofanelli *et al*., 2004) and also because camel meat is an important source of protein. Camel meat is healthier as they produce carcasses with less fat as well as having less levels of cholesterol in fat than other meat animals (Al-Ani, 2004) and this is an important factor in reducing the risk of cardiovascular disease (Giese, 1992). Camel meat is also relatively high in polyunsaturated fatty acid in comparison to beef (Knoess, 1977).

Alpaca and llama is characterized by reduced fat and cholesterol contents in their meat (Perez *et al*., 2000; Cristofanelli *et al*., 2004). The camel is a good source of meat in areas where the climate adversely affects other animal production efficiency. Camel meat is not universally eaten and in the pastoral communities camel meat is only eaten on specific occasion. Camel meat is palatable and competed favorably with other meat, regarding yield and quality (Shalash, 1979). It also varies in amount, composition and quality with age, sex and feeding. Cooking and organoleptic properties are as important as the quantity of meat expected from animals slaughtered at different ages. Cooking temperature and especially internal end point temperature affect structural changes (Leander *et al*., 1980), tenderness, juiciness (Diamant *et al*., 1976) and flavour (Heymann *et al*., 1990) of cooked meat. However, the higher internal temperature (80°C) was perceived to maximize the palatability characteristics (tenderness and flavour) of cooked meat. The demand for camel meat appears to be increasing especially in arid regions. The potential of the camel as a meat producer has received little attention as compared to true ruminants and this study is designed to assess the impact of the different cocking methods on cooking loss in camel and cattle as well as assessment of sensory evaluation of their meat.

MATERIALS AND METHODS

Sample collection and analysis: The samples of camel's and beef meat used in this study were obtained from the local market, North Omdurman "Saug Elnagga". These samples weight 4 kg from the camel and beef meat each. They were taken from Topside muscle. The meat was trimmed from the fat and four samples were cooked by 4 different methods, namely roasting, frying, broiling and braising to determine cooking loss and sensory evaluation.

Cooking treatments: Four methods of cooking were used in this study, namely roasting, frying, broiling and braising. Briefly, roasting was done by putting the slice of meat into the oven for 1 h at 125-126°C after foiled with

aluminum. Frying was done using a little of oil till boiling and turning brown. Broiling was also done using a slice of meat of thickness 2.5 cm and it was put about 15 cm from the flame for 7 min. As for braising, it was done by water bath at 90°C for one hour and a half.

Cooking loss: This was estimated by the equation: Weight before cooking-weight after cooking/eight before cooking ×100.

Sensory evaluation: For sensory evaluation, the meat of both camel and cattle were cut into small slices and served to 10 panelists to assess the colour, flavour, texture and juiciness, general acceptance and range between 1-5, the best scored and the worst scored number 1. Data were analyzed by the method of least squares using the general linear model procedures of SPSS and results were expressed as least square means. Significant differences between means were indicated when $p<0.05$ or $p<0.01$.

RESULTS AND DISCUSSION

The desert camel (*Camelus dromedarius*) constitutes an important source of meat in arid areas. However, the potential of the camel as a meat producer has received little attention. The aim of this research is to find how cooking methods affecting the percentage of cooking loss and its impact on sensory evaluation done by panelist. As shown in Fig. 1 the loss due to different cooking methods is clear, with slight species variations between camel and cattle. The cooking loss is expected to be low as for the braising due to the use of water. Owing to the fact that the camel had a higher WHC compared to cattle, it not surprisingly to find that the cooking loss is lower in camel than corresponding figures in cattle in all methods of cooking used. Cooking and organoleptic properties are as important as the quantity of meat expected from animals slaughtered at different ages. Cooking temperature and especially internal endpoint temperature affect structural changes (Leander *et al*., 1980), tenderness (Diamant *et al*., 1976) of cooked meat. However, the higher internal temperature (80°C) was perceived to maximize the palatability characteristics (tenderness and flavour) of cooked meat.

Ruyack and Paul (1972) reported that cooking time was greater for meat cooked by dry heat than for meat cooked by moist heat. The extended cooking time in general required to cook camel meat was expected, since camel meat has a lower degree of marbling. Mean cooking loss for leg meat was higher ($p<0.05$) than that for chuck and ribeye. However, braising resulted in more cooking

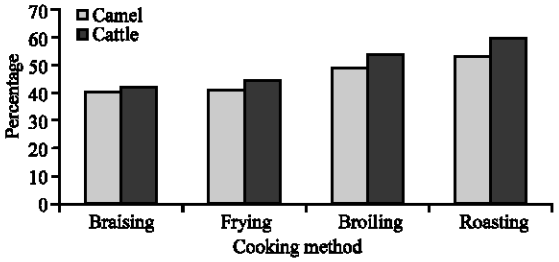

Fig. 1: The effects of cooking method (s) on cooking loss in camel and cattle meat

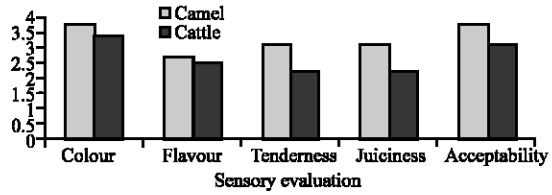

Fig. 2: Sensory evaluation of Camels (*Camelus dromedarius*) and cattle (*Bos indicus*) meat

loss for chuck and ribeye compared to that of leg meat. The differences in cooking loss among cuts could be attributed to the denaturation temperatures of collagen and the differences in mechanical properties of different muscles (Robertson *et al*., 1984).

Asghar and Pearson (1980) believe that characteristic meat flavours are mainly due to the water-soluble fractions. Kregel *et al*. (1986) and Cross *et al*. (1980), who indicated that cooking loss in low-fat ground beef patties was due primarily to moisture loss and that cooking loss in high-fat patties was due primarily to fat loss.

Figure 2 shows some sensory evaluation parameters in both camels and cattle. It is clear that for color, flavour, tenderness, juiciness and acceptability camel scored higher figures than the corresponding data for cattle. These findings may be attributed to the lack of training of the panelist among the students selected to check the camel and cattle meat. The acceptability of camel meat products increases with an increase in the duration of smoking, frying and cooking, indicating that such products should be fully processed to gain acceptability (Zegeye, 1999). The smoked (2.5% salt, 3 h smoking) and the fully fried camel meat products have wide acceptance in Dire Dawa and the fully cooked and the salted (3% salt) ones show promise (Zegeye, 1999).

Within Spanish beef breeds; thawing loss was negatively correlated with juiciness and, likewise cooking loss with juiciness and tenderness (Serra *et al*., 2007). As the meat is usually cooked before being eaten, it is

important to understand the physical changes of meat texture during heating. Temperature and cooking time have a large effect on physical properties of meat and eating quality. The changes in cooking losses tended to be linear with the time and increase with temperature (Garcia-Segovia *et al*., 2007). There was considerable retention of moisture, fat, ash in samples after cooking. Cooking losses were mainly due to water and fat decreases. These losses depend on the mass transfer process during thermal treatment (Vittadini *et al*., 2005), which in turn is influenced by the cooking procedure (i.e. heating rate, final cooking temperature, etc.) and of the meat systems (i.e. moisture, fat and protein composition and size, shape).

The amount of loss is probably related to the composition of muscle, denaturation of proteins by the ionic strength of the extracellular fluid and oxidation of lipids, which decreases solubility of proteins (Dyer and Dingle, 1967). Camel meat is healthy and nutritious as it contains low fat. Age is an important factor in determining meat quality and composition (Kadim *et al*., 2006). Quality of meat from young camels is comparable to beef (Knoess, 1977). However, with only a few exceptions, meat is a by-product of the camel, coming mainly from old animals and form animals that are bred for other purposes (racing, packing, etc) (Wilson, 1978; Kurtu, 2004). Camel meat could be much leaner than meat produced by other species such as sheep, cattle or pig (Al-Ani, 2004) especially if it is slaughtered at a young age. The mean fat of 6.4% fat for camel's longissimus muscle but slightly higher than the ranges listed lower than those (0.50-1.43%) reported by Cristofaneli *et al*. (2004). Slaughtering of camels is recommended to be between 1 and 3 years of age (Al-Ani, 2004) and > 3 years for llamas (Perez *et al*., 2000). Younger camels had significantly ($p<0.05$) higher values than older animals. The decreased binding ability of less mature animal meat, higher moisture content and lower degree of marbling may contribute to the variations. Similarly, Dawood (1995) found that camels at 8 month of age had significantly more cooking loss than camels at 26 month of age. Young camel meat contains low fat (less than 3 years of age) as well as being a good source of minerals.

CONCLUSION

In conclusion, camel is an important animal species to Sudan, however, the research output in improving its meat production is far from being good. More research is recommended to improve meat shelf life and the general acceptance by people.

REFERENCES

Al-Ani, F.K., 2004. Camel Management and Diseases. 1st Edn. Amman, Jordan: Al-Shraq Printing Press and Dar Ammar Book Publishing.

Asghar, A. and A.M. Pearson, 1980. Influence of ante- and post-mortem treatments upon muscle composition and meat quality. Adv. Food Res., 26: 53-213.

Cristofanelli, S., M. Antonini, D. Torres, P. Polidori and C. Renieri, 2004. Meat and carcass quality from peruvian llama (*Lama glama*) and alpaca (*Lama pacos*). Meat Sci., 66: 589-593.

Cross, H.R., R.L. West and T.R. Dutson, 1980. Comparisons of methods for measuring sarcomere length in beef semitendinosus muscle. Meat Sci., 5: 261-266.

Dawood, A.A., 1995. Physical and sensory characteristics of Najdi-Camel Meat. Meat Sci., 39: 59-69.

Diamant, R., B.M. Watts and R.L. Cliplef, 1976. J. Can. Inst. Food Sci. Technol., 9: 151.

Dyer, W.J. and J.R. Dingle, 1967. In Fish as Food. 1st Edn. G. Borgstrom. Academic Press, New York.

Garcýa-Segovia, P., A. Andre´s-Bello, and J. Martý´nez-Monzo, 2007. Effect of cooking method on mechanical properties, color and structure of beef muscle (*M. pectoralis*). J. Food Eng., 80: 813-821.

Giese, J., 1992. Developing low fat meat products. Food Technol., 46: 100-108.

Heymann, H., H.B. Hedrick, M.A. Karrasch, M.K. Eggeman and M.R. Ellersieck, 1990. J. Food Sci., 55: 613.

Kadim, I.T., O. Mahgoub, W. Al-Marzooqi, S. Al-Zadjali, K. Annamalai and M.H. Mansour, 2006. Effects of age on composition and quality of muscle Longissimus thoracis of the Omani Arabian camel (*Camelus dromedarius*). Meat Sci., 73: 619-625.

Knoess, K.H., 1977. The camel as a meat and milk camel. World Anim. Rev., 22: 3-8.

Kregel, K.K., K.J. Prusa and K.V. Hugnes, 1986. J. Food Sci., 51: 1162.

Kurtu, M.Y., 2004. An assessment of the productivity for meat and carcass yield of camel (*Camelus dromedarious*) and the consumption of camel meat in the Eastern region of Ethiopia. Trop. Anim. Health Prod., 36: 65-76.

Leander, R.C., H.B. Hedrick, M.F. Brown and J.A. White, 1980. J. Food Sci., 45: 1.

Perez, P., M. Maino, R. Guzma`n, A. Vaquero, C. Ko¨rich, and J. Pokniak, 2000. Carcass characteristics of llamas (*Lama glama*) reared in Central Chile. Small Rumin. Res., 37: 93-97.

Robertson, J., D. Ratcliff, P.E. Bouton, P.V. Harris and W.R. Shorthose, 1984. J.

Ruyack, D.F. and P.C. Paul, 1972. Home Econ. Res. J., 1: 98.

Serra, X., L. Guerrero G ua`rdia, M. G ila, C. San˜udo, B. Panea, M .M . Campob, J.L. Olletab and M.D. Garcý´a-Cacha´n, 2007. J. Piedrafita d, M.A. Oliver a eating quality of young bulls from three Spanish beef breed-production systems and its relationships with chemical and instrumental meat quality. Meat Sciences.

Shalash, M.R., 1979. In: Workshop on Camel. Khartoum, International Foundation for Science.

Vittadini, E., M. Rinaldi, E. Chiavaro, D. Barbanti and R. Massini, 2005. The effect of different convection cooking methods on the instrumental quality and yield of pork Longissimus dorsi. Meat Sci., 69: 749-756.

Wilson, R.T., 1978. Studies on the livestock of Southern Darfur, Sudan. V. Notes on camels. Trop. Anim. Health Prod., 10: 25-29.

Zegeye, A., 1999. A note on the influence of heat treatment, salting and smoking on the acceptability of camel meat products. Meat Sci., 53: 217-219.