Kalla, D. J, U., Zahraddeen, D., Abubakar, M., Oladotu, F. B. And Jibia, S. B (2005). Influence of speecies and processing methods on red meat acceptance among panelists of various cultural background in Bauchi. Journal of Agriculture, Business and Technology, 3(2): 51-57.

Mohammed (2020). Polysaccharides, protein and lipid – based natural edbible films in food packaging: a review.

Williams , P. G. (2017). Nutritional composition of red meat. Nutrition & Dietetics, 64(4):S113-S119.

PROXIMATE COMPOSITION AND SENSORY EVALUATION OF DIFFERENT MEAT PRODUCTS PRODUCED FROM BEEF

Gyang, D. D., Kalla, D. J. U and Doma, U. D

Department of Animal Production, Abubakar Tafawa Balewa University, Bauchi

Correspondence authors email: dungdalyopgyang@gmail.com; 08036270667

ABSTRACT

The study was conducted to determine the proximate composition and sensory evaluation of different meat products produced from beef. Five kilograms (5 kg) of beef was purchased from Jos abattoir. The meat sample was then processed into four different meat products (*tsire, balangu, danbu nama* and *kilishi*) which were coded as A, B, C and D respectively. The processed meat products were taken to the laboratory for proximate composition analysis. The meat products were also subjected to sensory evaluation using 50 panelist selected at random. The sensory parameters determined were palatability, juiciness and tenderness. The result of proximate composition showed that, there was significant ($P<0.05$) difference in the proximate composition of all the meat products. The result of the sensory evaluation showed that, tsire made from beef had the highest scores in most of the parameters considered (colour, juiciness, palatability, tenderness and over all acceptability of the meat). There were significant ($P<0.05$) differences across all the parameters considered for proximate and tsire had the highest scores in all the parameters which was followed by kilishi while balangu had the least scores. The result of the proximate composition of the meat samples showed similarly significant differences across most of the parameters considered. Tsire was highest in crude protein content (37.44%). Tsire was also highest in ash content with 7.18%. It was concluded that, tsire had the highest overall acceptability, followed by kilishi, while balangu had the least overall acceptability and tsire is the most nutritive in terms of the protein content of the different meat products. Tsire and kilishi were therefore recommended to be consumed due to its high acceptability and nutrient contents.

Key words: proximate composition, sensory evaluation, beef, meat products

INTRODUCTION

Meat and meat products are vital sources of essential protein and other nutrients required for healthy growth and development. The amount of meat consumed by an individual varies with income, social status, economic and political influence and religious beliefs (FAO, 2010). Lambert *et al.* (2015) stated that, the quantity of meat consumed in developing countries largely depends on the price of meat in relation to individual income and meat availability. A wide range of processing techniques are used for different meat preparations. Several processing methods have been identified for meat and include boiling, frying, roasting, smoking and shredding (Okubanjo, 2020). Cooking methods have been known to affect degree of doneness in meat as well as its desirability and consumer acceptability (lkeme *et al.,* 2017). In northern Nigeria, tsire, balangu, kilishi, dambun-nama and ragadada are the commonest meat products. Often, tsire, balangu and kilishi are collectively referred to as Suya. Earlier study (Ogunsola and Omojola, 2018) reported detailed description of Suya products consumed in northern Nigeria. Beef, mutton, chevon and of recent camel meat are being used in the production of Tsire and Balangu that are commonly served or sold along streets, in club houses, at picnics, restaurants and within institutions of learning. These products are now mass-consumed fast foods, whose consumption is invariant with respect to ethnicity, religion, socioeconomic factors and sex (Igene *et al*., 2017). The consumer attitude to meat shows preference depending on a criteria considered to be important, such criteria may include species type, age at slaughter and eating quality of meat. Sensory evaluation is an excellent guide to nutrition and in choice of meat processing method (Fernandez-Gines *et al.,* 2018). The method used in meat processing affects its composition and biological value (FAO, 2010). Meat is not only a product with good flavour, it is also a source of protein and essential minerals and vitamins, especially the B vitamins. Its consumption

varies with social, economic, political, and geographical differences worldwide. Differences in consumption patterns may be due to the fact that some consumers are becoming more health-conscious, probably because some media or popular press articles have labelled red meat as harmful to good health and longevity. The need for effective, cheap and simple preservative techniques cannot therefore be over emphasized (Bender, 2022)

MATERIALS AND METHODS

The study was conducted in Jos, Plateau State. The meat sample used for this study was beef. The meat sample was produced as per the procedures laid down by Mohammad *et al*., (2010). Five kilograms (5 kg) of the meat was purchased from the Jos abattoir. The meat sample was then processed into four different meat products (*tsire, balangu, danbu nama* and *kilishi*). Samples of processed meat products obtained were taken to laboratory for analysis of proximate composition such as crude fibre, crude protein, ether extract, nitrogen free extract, metabolizable energy moisture, lipids and ash. The meat products were subjected to sensory evaluation and 50 persons were selected at random to taste the meat. The sensory parameters determined were palatability, juiciness and tenderness. The different hedonic scale used for the sensory evaluation were as follows;

1- Dislike extremely; 2- Dislike very much; 3-Dislike moderately; 4- Dislike; 5-Neither like nor dislike; 6- Like slightly; 7- Like moderately; 8-Like very much and 9-Like extremely. Data generated during the experiment were subjected to Analysis of Variance (ANOVA) technique as outlined by Steel and Torrie (1990). The treatment means were separated by Duncan's new multiple range test (Duncan, 1995).

RESULTS AND DISCUSSION

The results of the sensory evaluation of different processed meat products made from beef were as presented in Table 1

Table 1: Sensory evaluation of different processed meat products made from beef

Meat product	Parameters					
	Colour	**Juiciness**	**Flavour**	**Palatability**	**Tenderness**	**Over all acceptability**
Tsire	5.56±0.12^{a}	5.91±0.26^{a}	7.10±0.71^{ab}	6.02±0.40^{a}	7.88±0.14^{a}	9.87±0.32^{a}
Balangu	2.20±0.81^{b}	2.93±0.80^{b}	4.15±0.57^{a}	3.30±0.49^{b}	4.50±0.66^{ab}	7.93±0.58^{a}
Danbu	3.83±0.11^{c}	3.70±0.20^{b}	5.44±0.58^{b}	4.26±0.23^{b}	5.94±0.59^{b}	5.66±0.56^{b}
Kilishi	4.92±0.56^{a}	4.88±0.78^{a}	6.93±0.24^{ab}	5.98±0.61^{a}	6.72±0.90^{ab}	8.88±0.66^{a}

^{abc}: means on the same column with different superscripts are significantly different (P<0.05).

The result of the sensory evaluation showed that, tsire made from beef had the highest scores in most of the parameters considered (colour, juiciness, palatability, tenderness and over all acceptability of the meat). There were significant (P<0.05) differences across all the parameters considered and tsire had the highest scores in all the parameters which was followed by kilishi while balangu had the least scores. These results were in agreement with the findings of Okubanjo, (2020).

Table 2: Proximate composition (%) of different meat products made from beef

Meat products	Parameters (%)

	Moisture	Crude protein	Crude fibre	Lipids	Ash	NFE	M.E (cal)	Overall mean
Tsire	41.48	37.44	7.66	11.21	7.18	0.08	243.21	51.73
Balangu	45.08	31.42	4.47	15.89	6.43	0.01	211.87	42.65
Danbu	42.02	34.22	5.20	14.06	6.48	0.02	220.50	41.93
Kilishi	40.04	35.10	6.29	10.14	6.50	0.05	226.67	47.97

NFE- Nitrogen free extract; M.E- Metabolizable energy

The results of the proximate composition of different meat products made from beef were as presented in Table 2. It was observed that there was significant ($P<0.05$) difference in the proximate composition of all the meat products (Table 3). There were significant ($P<0.05$) differences in most of the variables analysed. Tsire was highest in crude protein content (37.44%). Crude protein value was higher ($P<0.05$) in tsire (37.44%) than in other meat products. It was followed by kilishi which had 35.10% while balangu had the least crude protein (31.42%). The average value in crude protein for tsire were similar to those observed by Fernandez-Gines *et al*. (2018) and Williams (2017). Similarly, the average value for protein in kilishi and danbu as observed in this study were similar to the values reported by Burke (2019) and Williams (2017). The values were also similar to the results observed by Dvorak and Vognarova, (2021). The moisture content of balangu (45.08%) was significantly higher ($P<0.05$) than other treatments while tsire (41.48%) and kilishi (40.04%) were significantly lower ($P<0.05$) than danbu in moisture content. The values obtained were similar to those reported by Andrzej, (2020). The crude fibre values were however not significant ($P>0.05$) but had highest values in tsire (7.66%). These values were similar to what had been reported by Ogunsola and Omojola (2018) for tsire and kilishi. The result is also in accordance with the observations of Dvorak and Vognarova (2021), Williams (2017) and Fernandez-Gines *et al*. (2018). The ash content was significantly ($P>0.05$) higher in tsire (7.18%) but lower in balangu and danbu with tsire having the highest figure of 7.18%. The present result in beef products is similar to the results published by Fernandez-Gines *et al*. (2018) and Lambert, *et al*. (2015). Also, the results for ash % of tsire and kilishi were similar to those obtained by Ogunsola O.O and Omojola (2018). Proximate composition of different meat products have been investigated by several researchers (Igene *et al*., 2017). The report of other parameters such as ether extract and ash contents followed similar trend. These differences observed among the four products might be due to muscular fat contents of the animals. The proximate composition of the different meat products to determine the crude protein, ether extract showed values that were comparable with Okubanjo (2020) who reported dry matter contents of 93.8 to 95.9% using monogastric and ruminants *tsire.*

Table 3: **Mineral composition (%) of different meat products made from beef**

Meat product	**Parameters**				
	Calcium	**Phosphorus**	**Sodium**	**Potassium**	**Overall mean**
Tsire	1.99	0.07	0.08	0.003	0.50
Balangu	1.25	0.04	0.04	0.002	0.24
Danbu	1.29	0.05	0.06	0.001	0.39

Kilishi	1.58	0.06	0.07	0.003	0.45

The results of the mineral composition of minced meat *(tsire)* processed from different meat types were as presented in table 3. The mineral composition of the different meat products constitute of calcium, Phosphorus, Sodium and Potassium as reported by Bender (2022). Tsire had more of calcium (1.99%), phosphorus (0.07%) as compared to others. Tsire and kilishi also have high potassium content (0.03) among other meat products. The calcium and phosphorus content is in conformity with Cofrades *et al*. (2020); Andrzej (2020).

CONCLUSION AND RECOMMENDATIONS

From the research conducted, it was concluded that, tsire had the highest overall acceptability, followed by kilishi, while balangu had the least overall acceptability. Tsire is the most nutritive in terms of the protein content of the different meat products. Tsire and kilishi are therefore recommended to be consumed due to its high acceptability and nutrient contents. Further research were also recommended to be carried out in other parts of the country to determine the acceptability of the four meat products

REFERENCES

Andrzej S (2020). Water-Holding Capacity of Fresh Meat. Published as a National Pork Board/ American Meat Science Association Fact Sheet. Author Elisabeth Huff-Lonergan, Iowa State University, America. pp. 20-26.

Bender, A., (2022). Meat and meat products in human nutrition in developing countries. Food and Agriculture Organization of the United Nations (FAO), Food and Nutrition Paper 53,

Burke, C., (2019). Functional foods rising sun. *Prepared Foods*. 167: 31-31.

Cofrades, S., M.A. Guerra, J. Carballo, F. Fernandez-Martin and F. Jimenez-Colmenero, (2020). Plasma protein and soy fiber content effect on bologna sausage properties as influenced by fat level. *Journal of Food Sci*ence. 65: 281-287

Dvorak, Z., and Vognarova, I. (2021). Nutritive value of the proteins of veal, beef and pork determination on the basis of available essential amino acids or hydroxyproline analysis *Journal of Science and Food Agriculture*. 20: 146-149.

FAO (2010). Legumes Trees and Other Fodder Trees as Protein Sources for Livestock. Food and Agriculture Organisation of the United Nation, FAO, Rome. Animal Production Health Paper. 102: 14 18.

Fernandez-Gines, J.M., J. Fernandez-Lopez, E. Sayas-Barbera, E. Sendra and J.A. PerezAlvarez, (2018). Lemon albedo as a new source of dietary fiber: Application to bologna sausages. *Meat Sci*ence. 67: 7-13.

Igene, J.O; Pearson, A.M.; Gray, Dugan,L.R. and Price, J.F.(2017). Role of triglycerides and phospholipids on development of rancidity in model meat systems during frozen storage. *Food Chemistry*. 5: 263

Lambert, A.D., Smith, J.P. and Dodds, K.L. (2015). Shelf life extension and microbiological safety of fresh meat- A review. *Food Microbiology* 8: 267-297.

Ogunsola O.O and Omojola, A.B (2018). Nutritional evaluation of dehydrated shredded meat products (*dambu nama). Pakistan Journal of Nutrition*. Pp. 554-556.

Okubanjo, A. O. (2020**).** Meat for Nigeria's millions. Faculty lecture series, Faculty of Agriculture and forestryUniversity, of Ibadan, Ibadan. 3: 13-15.

Williams S.J (2017). Factors Affecting the Micro Flora of Chilled Foods. In: **Chilled Foods**, Stringer, M. and C. Dennis (Eds.). Wood Head Publishing, London, Pp. 157-178.