

**NSAP****47th Annual
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(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****PROXIMATE COMPOSITION, ACCEPTABILITY AND SENSORY EVALUATION OF STEAK
MEAT (*tsire*) MADE FROM DIFFERENT MEAT TYPES****Musa, N. S; Mancha, Y. P; Abubakar, A, A and Igila, T. T****Department of Animal Production, Abubakar Tafawa Balewa University, Bauchi****Phone No.: 08025595696; email; nancymusa54@gmail.com****Abstract**

The study was conducted to determine the proximate composition and sensory evaluation of *tsire* made from beef, chevon mutton and camel. The meat was processed into *tsire* by cutting the meat into smaller slice and putting them on sticks. Spices were applied on the meat and roasted round a glowing fire. The meat samples were gotten from four animal species (cattle, sheep goat and camel). Processed meat samples were taken to laboratory for proximate composition analysis. The *tsire* 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 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) while chevon had the highest value for flavour. There were significant ($P < 0.05$) differences across all the parameters considered and beef had the highest scores in all the parameters which was followed by camel while mutton had the least scores. The result of the proximate composition of the meat samples showed similarly significant differences across most of the parameters considered except the crude fibre. Camel was highest in crude protein content (36.10%) but least in phosphorus content (0.04%). Beef was highest in ash content with 7.18% but least in crude fibre content (3.06%). Mutton on the other hand was least in calcium content (1.49%). It was then concluded that camel and mutton is the most nutritive in terms of the protein content of the different meat types and was recommended for consumption due it high protein content and high acceptability score among *tsire* consumers in the study area.

Key words: proximate composition, sensory evaluation, *tsire*, meat types,**Introduction**

The majority (80%) of the world's 6.892 billion people live in the developing countries. By 2025 and 2050, Nigeria's current population of 190.3 m will reach 217.4 million and 326.4 respectively (World Population Data Sheet, 2010). The feeding of the current 6.892 billion people (8.108 billion in 2025 and 9.485 billion in 2050) is an enormous task that must be done. The provision of adequate food, especially of animal origin, to the ever increasing teeming population of the world is a great challenge to mankind. Foods of animal origin such as meat and meat products contain important nutrients like amino acids, vitamins, minerals and fatty acids which are essential for growth and development (World Population Data Sheet, 2010). Further processing of meat offers the opportunity to add value, reduce prices, improve food safety and extend shelf-life, resulting in increased household income and improved nutrition. Global per caput meat consumption (presently 41.9 kg per year) varies greatly between developed countries (80.7 kg) and developing countries (31.6 kg) of the world (Speedy, 2003). While some countries consume more than 90 kg meat per annum, with Uruguay and USA consuming the highest (126.5 kg and 124 kg respectively), others consume less than 10 kg of meat per annum which is insufficient and often leads to under nourishment and malnutrition (Speedy, 2003). Moreover, more than 2 million people in the world are deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc. Highly nutritious foods such as meat are required by women, children and HIV AIDS infected people. Reduction of protein malnutrition in many sub-Saharan African countries which are poor and have low life-expectancy requires evaluation of simple, appropriate and affordable technologies applicable to local environment. This is because sophisticated modern techniques of meat preservation require constant reliable power supply which is almost absent in most developing countries. Animal products such as dressed carcass or fresh meat and milk are highly perishable. Microbial growth (and spoilage of food) is controlled by both intrinsic or food related factors and extrinsic or environment related



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factors. The intrinsic factors include pH, moisture content, water activity or availability, oxidation-reduction potential, physical structure of the food, available nutrients, and the possible presence of natural antimicrobial agents. The extrinsic factors include temperature, relative humidity, gases (CO_2 , O_2) present, and the types and numbers of microorganisms present in the food. Meat and dairy products, because of their high nutritional value and the presence of easily usable carbohydrates, fats, and proteins, provide ideal environments for microbial spoilage. To prevent its spoilage, meat is usually processed into products using many techniques such as *tsire* (Abubakar *et al.*, 2011). *Tsire* is a Nigerian grilled meat product consumed as evening delicacies. *Tsire* is synonymous to suya. *Tsire* vendors often have left over from their daily sales thus the chance of contamination is high as storage facilities are often unavailable or inadequate. *Tsire* is prepared using de-boned meat (often beef) spiced with ingredients such as common salt (NaCl), garlic, pepper, groundnut cake etc. Studies by Onilude *et al.* (2002) established that lactic cultures influence the quality attributes of *tsire* and Olaoye (2010) also found that organisms such as *Pediococcus acidilactici* could be used as starter cultures for extending the shelf-life of the product.

Materials and Methods

The study was conducted in Jos, Plateau state. Plateau State is located in Nigeria's middle belt. The four different fresh raw meat; beef, mutton, chevon and camel were obtained as per the procedures laid down by Mohammad *et al.*, 2010. 1 kg each of the chevon, beef and mutton were purchased from Jos abattoir, Plateau State and were processed into *tsire*. Processed meat samples were taken to National Veterinary Research Institute laboratory, Vom for analysis of proximate composition as per procedures laid down by AOAC, (1995). The *tsire* 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 result of the overall acceptability of the three meat samples indicated that, beef and camel were rated higher than mutton which is in accordance with Okubanjo, (1990) who reported that most citizens of developing countries like Nigeria prefer more tender meat or meat product probably for longer chewability. The result was also in line with the findings of Smith *et al.*, (1974) who compared sensory characteristics of goat meat with beef and reported that the goat meat had less overall satisfaction when compared to beef. It also agreed with the findings of Griffin *et al.*, (1992) who reported that goat meat had less overall satisfaction compared to camel meat and beef.

Table 3: Sensory evaluation of *tsire* made from different meat types

Meat type	Parameters					
	Colour	Juiciness	Flavour	Palatability	Tenderness	Over all acceptability
Beef	4.16±0.12 ^a	4.81±0.26 ^a	6.00±0.71 ^{ab}	4.02±0.40 ^a	3.78±0.14 ^a	7.37±0.32 ^a
Chevon	3.90±0.81 ^b	3.93±0.80 ^b	6.85±0.57 ^a	3.70±0.49 ^b	3.30±0.66 ^{ab}	7.03±0.58 ^a
Mutton	2.86±0.11 ^c	3.00±0.20 ^b	5.14±0.58 ^b	3.46±0.23 ^b	2.14±0.59 ^b	4.06±0.56 ^b
Camel	4.02±0.56 ^a	4.00±0.78 ^a	6.23±0.24 ^{ab}	3.98±0.61 ^a	3.12±0.90 ^{ab}	7.08±0.66 ^a

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



The results of the proximate composition of minced meat (*tsire*) made from different meat types showed that there was significant ($P < 0.05$) difference in the proximate composition of all the meat types. There were significant ($P < 0.05$) differences in most of the variables analysed. Similarly, the average value for protein in chevon and mutton as observed in this study were similar to the values reported by Schonfeldt (1989) and Williams (2007). The values were also similar to the results observed by Ghita *et al.* (2009).

Table 4: Proximate composition (%) of minced meat (*tsire*) made from different meat types

Meat type	Parameters (%)							
	Moisture	Crude protein	Crude fibre	Lipids	Ash	NFE	M.E (cal)	Overall mean
Beef	49.48	34.04	3.06	6.21	7.18	0.03	192.17	41.73
Chevon	41.78	31.42	4.47	15.89	6.43	0.01	268.57	52.65
Mutton	42.02	34.22	3.20	14.06	6.48	0.02	263.50	51.93
Camel	42.04	36.10	5.19	10.14	6.50	0.03	235.78	47.97

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

The mineral composition of minced meat (*tsire*) the constituent of calcium, Phosphorus, Sodium and Potassium as reported by Bube (2003). Beef had more of calcium (1.89%), phosphorus (0.04%) where by camel tends to have more sodium (0.07) as compared to others. However, beef and camel with high potassium content (0.03) among other meat types.

The calcium and phosphorus content is in conformity with Bube (2003); Kalla *et al.* (2003). phosphorus was high in chevon than other meat types.

Table 5: Mineral composition (%) of minced meat (*tsire*) made from different meat types

Meat type	Parameters				
	Calcium	Phosphorus	Sodium	Potassium	Overall mean
Beef	1.89	0.04	0.05	0.003	0.50
Chevon	1.65	0.05	0.06	0.002	0.44
Mutton	1.49	0.04	0.03	0.001	0.39
Camel	1.58	0.04	0.07	0.003	0.43

The result revealed that, it took longer time to process minced meat (*tsire*) made from camel than other meat types, while it took a shorter time to prepare (16mins.) to process chevon.

The time differences observed in *tsire* processed from various animal sources is a reflection of differences in species from which this product was processed.

These differences were similarly reported by Ojewola and Onwukain, (2001) in their study with five different types of *suya* processed from pork, beef, chicken, rabbit and goat meat.

Table 6: Duration of preparation of minced meat (*tsire*) made from different meat types

Time (min.)	Meat types			
	Beef	Chevon	Mutton	Camel

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1 st turn	6.00	4.00	7.00	5.00
2 nd turn	5.00	4.00	5.00	5.00
3 rd turn	5.00	4.00	3.00	5.00
4 th turn	3.00	4.00	5.00	6.00
Total time	19.00	16.00	20.00	21.00

Conclusion and Recommendations

From the research conducted it was concluded, camel had the highest overall acceptability, followed by beef, while mutton had the least overall acceptability. Camel is the most nutritive in terms of the protein content of the different meat types. It was therefore recommended that, camel and beef should be consumed due to its high acceptability and nutrient contents. Further research should be carried out in other parts of the country to determine the acceptability of the four meat samples in these areas. Further research were also recommended on the quality of protein and ether extract fraction of the different meat types.

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