ASSESSMENT OF CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF SPICED ROASTED BEEF (*TSIRE)* SOLD IN KANO METROPOLIS, NIGERIA

Abdullahi, M.H [1], Mohammed, A [2], Inusa, S.K [3], Abba, A.I [3], Salihu A.A [3] and Dandara, G.B[4] .

[1]*Department of Animal Science, Faculty of Agriculture, Federal University of Kashere, Gombe.*

[2]*Department of Animal Science, Faculty of Agriculture, Federal University Gashua, Yobe State.*

[3]*Department of Animal Science, Faculty of Agriculture, Bayero University, Kano.*

[4]*Department of Animal Production and Health, Faculty of Agriculture, Federal University Oye-Ekiti.*

Corresponding Author Email: abdullahimharis@gmail.com

ABSTRACT

The study was conducted to evaluate the chemical and microbiological properties of Tsire, a ready-to-eat snack meat product sold in Kano Metropolis. Samples for the study were purchased from four different locations. These were Gwarzo Road, Sabon Gari Market, Rimi Market and Zoo Road. Samples were collected in triplicates from each location. All samples were subjected to proximate and microbiological analyses. The proximate analysis revealed that there were significant (P<0.05) differences in protein content. Zoo Road had the highest protein content (38.59%) while Rimi Market had the least (31.73%). The highest ether extract and ash contents were recorded in Tsire samples from Rimi market whereas Zoo Road had the lowest. There was no significant (P>0.05) differences in moisture content among all the samples. The indicator organisms identified were Staphylococcus aureus and Escherichia coli. No Samonella spp. was isolated. Higher Staphylococcus aureus was obtained from Rimi market. There was significant difference (P< 0.05) between S. aureus isolated from Rimi Market and other locations. Also there was significant difference in Fecal coliform where by S/Gari Market had the highest (23 MPN/g). E. coli was significantly (P< 0.05) lower than S. aureus in all the locations. Organisms capable of endangering human lives were isolated from the samples and in numbers that could likely cause health problems. However, proper hygiene in the process-line and the processing environment of Tsire is recommended to prevent the likely detrimental health implications to consumers.

Key words: *Tsire*, Meat Products, Indicator organisms, Public health, Proper Hygiene

1.0 INTRODUCTION

Animal protein intake is dismally low in less developed countries, below the recommended minimum daily requirement of 35g (FAO, 2006). The protein from animal source has high biological value compared to those of plant origin as it provides useful amount of riboflavin, niacin, thiamine, iron, zinc and vitamin A and C(Kim*et al.,*2020). Meat is the animal flesh that is eaten by man as food (Lawrie&Ledward 2006). The use of meat as food has been in existence since prehistoric times (Leroy &Praet 2015; Klaudia&Wojciech 2018). Meat belongs to one of the six major classes of food that provides the body with high quality essential proteins, minerals, vitamins and nutrients (Oh *et al.,* 2016), as well as minerals and vitamins in order for the body to

remain strong and healthy (Tsegay*et al.,* 2015). Meat can be processed or from other animal tissues that are suitable for human consumption (Soniran&Okunbanjo 2002; Ameha 2006). Meat obtained from cattle is usually referred to as beef (Piatti-Farnell 2013).

Meat plays an important role in human diet by contributing high quality protein and macro and micro nutrients that are required for growth and good health maintenance. The rate of increase in *per capita* consumption of meat was found to be very high in developed countries when compared with the developing nations (Anjaneyulu*et al.,* 2007). Meat is high in nutrients, especially proteins, minerals and vitamins. It is however prone to spoilage (Anna *et al.,* 2005). Meat is considered to be spoiled when it is unfit for human consumption. Meat is subjected to changes by its own enzyme, by microbial action and its fat may be oxidized chemically. Microorganisms grow on meat causing visual, textural and organoleptic changes when they release metabolites (Jackson &Mcgowan, 2001). According to Clarence et al., (2009), food borne diseases are diseases resulting from ingestion of bacteria, toxins and cells produced by microorganisms present in food. The intensity of the signs and symptoms may vary with the amount of contaminated food ingested and susceptibility of the individuals to the toxin (Clarence et al., 2009).

Tsire is a fast food which is processed and sold along streets often under unhygienic conditions (Uzeh*et al.,* 2006). *Tsire*on sale is usually packaged in old newspapers, brown papers and other used paper materials. Also most of the stages for processing the product, the materials used, the handlers and the environment where it is processed and sold can serve as sources of contamination (Uzeh *et al.,* 2006). It was reported by Omojola (2008), that the meat and some of the ingredients used for processing *Tsire*can also serve as the product contaminant especially defatted groundnut cake powder.
The fact that *Tsire* is not consumed immediately after preparation but held at ambient temperature for more than 5 hours before serving, this will create an avenue for microbial contamination; these micro-organisms are capable of endangering human lives by causing health problems (Edema *et al.,*2008). The research also evaluated the proximate composition in order to know the nutritive contents of *Tsire.*

2.0 MATERIALS AND METHODS

The experiment was conducted at Food Science Laboratory, Kano University of Science and Technology, Wudil, Kano State. Kano State lies between longitude 9°30' and 12°30' North and latitude 9°30'and 8°42' East. The area is characterized by tropical wet and dry climate. Kano State has two distinct vegetations. The State occupies a land area of 20,400km^2 with a population of over 9,383,682 (NPC, 2006). Hausa-Fulani are the major ethnic groups in the area and Islam is the dominant religion.

The State has a large number of markets categorized into rural and urban markets where agricultural commodities including livestock are assembled. Most of the rural markets are periodic in nature whereas the urban ones operate more often. This attracts market participants not only from within the State but from all over Nigeria and neighboring countries. Generally, beef cattle marketing activity is practiced in the three ADP zones (KNARDA, 1995).

Ready-to-eat *Tsire* samples were purchased from four (4) different places in Kano Metropolis. These places are Gwarzo Road, Sabon Gari market, Rimi Market and Zoo Road. The sampling was triplicated in each of the designated places. All the purchased samples were transported to the Laboratory in labeled sealed bags for analyses. All the*Tsire* samples were subjected to proximate analysis according to the procedures of AOAC (2007) while microbial analysis was conducted according to the procedures of APHA (2005). Complete Randomized Design (CRD) was used for this study. Data obtained was analyzed with SAS (2002), while the means were separated using Least Significance Difference (LSD).

3.0 RESULTS AND DISCUSSION

3.1 Proximate Composition of*Tsire*sold in Kano Metropolis.

Table 1 shows the proximate composition of *Tsire*s old at different places in Kano Metropolis. The value obtained revealed significant (P<0.05) differences in protein content and ether extract across the locations where the *Tsire* samples were collected. The highest and lowest protein contents (38.59% and 31.73%) of*Tsire* samples were found in Zoo road and Rimi Market. The ether extract was highest (2.10%) in *Tsire* samples obtained from Rimi Market. The percentage protein content of the samples agreed with 31.8% reported by Abdulahi *et al.* (2004). Also the values obtained by (Abdulahi *et al.,*2004) for fat and ash level were 23.7% and 2.4% respectively, agreed closely to that obtained in this study. There was no significant (P>0.05) differences in moisture content across all the locations. This is also in agreement with the findings of Apata *et al.* (2013). Rimi Market recorded the highest ash (5.13 %).while there were no significant differences among all other locations.

Table 1: Proximate Composition of*Tsire*sold in Kano Metropolis.

Nutrients	Locations				
	Gwarzo Road	S/Gari Market	Rimi Market	Zoo Road	LSD
Protein	33.90^{c}	35.74^{b}	31.73^{d}	38.59^{a}	0.97
Ether extract	23.96^{b}	20.57^{c}	25.37^{a}	18.31^{d}	1.11
Moisture	35.62	37.09	34.68	36.07	3.56
Ash	1.80^{b}	1.70^{b}	2.10^{a}	1.90^{b}	0.63

a,b,c and d: means in the same row with different superscripts are significantly different (P<0.05) LSD least Significant Difference

3.2 MPN/g of *S.aureus, Salmonella spp* and fecal coliform of *Tsire*samples

Table 2 shows the microbial counts of *Staphylococcus aureus, Salmonella spp* (cfu/g) and fecal coliform MPN/g of *Tsire* samples. The findings indicated significant (P<0.05) differences added *Staphylococcus aureus* and *Salmonella spp* (cfu/g) across the locations. Results obtained shows highest *S. aureus*count of 2.26 x 10^{4}cfu/g which was not in agreement with the 1.97 x 10^{4} reported previously by Edema *et al*.(2008).

Similarly, high *S. aureus* added were reported by Yousuf *et al.* (2008) and Okonko*et al.* (2009). The reason for the high level of these organisms isolated from *Tsire* could be environmental, handling contaminated issue and or holding time. Rim3i and Sabon Gari markets were situated closer to waste dump sites and gutters compare to two (2) other locations, hence had more microbial counts. It showed that Rimi Market had the highest count (2.26 x 10^4cfu/g) of *Staphylococcus aureus* while Gwarzo road Market recorded the least *Staphylococcus aureus*(1.14 x 10^4cfu/g). There was no *fecal coliform* MPN/g in *Tsire* samples obtained from Gwarzo Road Market while SabonGari Market had 23 MPN/g *Fecal coliform*. No *Salmonella spp*was isolated from all the *Tsire* samples.

Table 2: MPN/g of *S.aureus, Salmonella spp* and fecal coliform of *Tsire*samples

Indicator organisms	Location			
	Gwarzo Road	**S/Gari Market**	**Rimi Market**	**Zoo Road**
S. aureus(cfu/g)	1.14 x 10^4	2.13 x 10^4	2.26 x 10^4	1.73 x 10^3
Fecal coliform (MPN/g)	_	23	< 3	4
Salmonella (cfu/g)	_	_	_	_

S/Gari market = SabonGari market

3.3 Occurrence of Indicator Organisms in Experimental *Tsire* Samples.

Table 3 shows the occurrence of indicator organisms. The results revealed that *Staphylococcus aureus*was the most predominant pathogen because it occurred in all the*Tsire*samples. This agrees with previous report by Clarence, Obinna & Shalom (2009) who reported *S. aureus, E. coli, Klebsiellaspp*and *Pseudomonas spp* in meat pie in Benin City metropolis. *Escherichia coli* occurred in the*Tsire* samples obtained from Sabon Gari Market and Zoo Road. *Salmonella spp* was not present in all the *Tsire*samples.

Table 3: Occurrence of Indicator Organisms in Experimental *Tsire* Samples.

Isolates	***Tsire*samples**											
	GR1	**GR2**	**GR3**	**SBG1**	**SBG2**	**SBG3**	**RM1**	**RM2**	**RM3**	**ZR1**	**ZR2**	**ZR3**
Staphylococcus aureus(cfu/g)	+	+	+	+	+	+	+	+	+	+	+	+
Escherichia coli	_	_	_	+	_	_	_	_	_	+	_	_
Salmonella (cfu/g)	_	_	_	_	_	_	_	_	_	_	_	_

GR= Gwarzo Road Market, SBG = Sabongari Market, RM = Rimi Market and ZR = Zoo Road.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Tsire from zoo road had the best array of Nutrients
Staphylococcus aureus and *Escherichiacoli* identified in *Tsire* are of public health importance and their presence can cause food poisoning and food borne diseases.

4.2 Recommendations

Hygienic environment, handling and materials used in the processing line is essential to minimize the risk of direct and cross-contamination of the meat, thereby ensuring the meat is safe for human consumption.

REFERENCES

Abdullahi I.O., Umoh V.J., and Galadima M. (2004). Hazards associated with *kilishi*preparationin Zaria, Nigeria. *Nigerian Journal of Microbiology* **18** (1-2): 338-345.

Ameha S. (2006): Meat Quality of Selected Ethiopian Goat Genotypes under Varying Nutritional Conditions. Ph.D. Thesis. University of Pretoria, South Africa. Pp. 26.

Anjaneyulu, A. S. R., Thomas, R., and Kondaiah.(2007). Technologies for Value Added Buffalo meat products-A Review.*American Journal of Food Technology, 2*(3), 104-114. Retrieved on 14/04/2012 http://dx.doi.org/10.3923/ajft.2007.104.114

Anna, A. M., Lackshmannan, V., Mendiratta, S. K., Anjaneyulu, A. S. R., and Bisht, G. S. (2005). Development and quality characteristics of extruded tripe snack from buffalo rumen meat and corn flour. *Journal of Food Science andTechnology, 42*, 263-267.

AOAC (2007). Association of Official Analytical Chemists.Methods of Analysis, 15th Edition Washington D.C.

Apata E. S., Kuku I. A., Apata O. C. and Adeyemi K. O.(2013): An Intermediate Moisture Meat Product in Ogun State, *Nigeria Journal of Food Research*; **2**(1):234-250

APHA.(2005). Compendium of method for the microbiological examination of foods, 3rd edition American Public Health Association.In C. Vanderzant, & D. F. Splitsloesser (Eds.). Michigan, USA. Retrieved fromhttp://www.apha.org

Clarence S. Y., Obinna C.N., and Shalom N.C. (2009). Assessment of bacteriological quality of ready to eat food (Meat pie) in Benin City metropolis, Nigeria.*African Journal of Microbiology*. Res., 2009; **3**(6): 390-395

FAO (2006). Food and Agriculture Organization of the United Nations.Bulletin of Statistics. *The Merk Veterinary Manual,* 9th edition Merk and Co. Inc USA pp 138–139.Assessed 10–5 – 2007.

Jackson D. andMcgowan C.H. (2001). Diet management effects on carcass attributes and meat quality of young goats.*Small Ruminant Research*; **28**(1): 93-98

Kim W., Wang Y. and Selomulya C. (2020). Dairy and plant proteins as natural food emulsifiers (Review). *Trends in Food Science and Technology,* 105, 261-272.

Klaudia M. and Wojciech P. (2018): Selected Psychological Aspects of Meat Consumption— A Short Review *Nutrients*. 10(9):1-14.

KNARDA, (1995). Kano Agricultural and Rural Development Authority Headquarters, Kano- 1995 Bulletin.

Lawrie, RA. AndLedward, DA. (2006): Lawrie's meat science (7th Ed.). Cambridge: *Woodhead Publishing Limited*. Pp. 2.

Leroy F. and Praet I. (2015): Meat Traditions: The Co- Evolution of Humans and Meat. Appetite 90:200–211.

NPC (2006). National Population Commission, National Census. Retrieved on 02/04/2014 http://www.population.gov.ng

Oh, M., Kim, E., Jeon, B. and Tang, Y. (2016): Chemical Compositions, Free Amino Acid Contents and Antioxidant Activities of Hanwoo (Bos Taurus Coreanae) Beef by Cut *Meat Science*. 119:16–21.

Okonko I. O., Ogunjobi A. A., Fajobi E. A., Onoja B. A., Babalola E. T., Adedeji A. O. (2009). Comparative studies and microbial risk assessment of different Ready-to-Eat (RTE) frozen sea-foods processed in Ijora-olopa, Lagos State, Nigeria. *African Journal of Biotechnology*, **7**(16): 2898-2901

Omojola, A. B. (2008). Yield and Organoleptic Characteristics of Suya (an intermediate moisture meat) prepared from three different muscles of a matured bull. *African Journal Biotechnology, 7*(13), 2254-2257.

Piatti-Farnell L. (2013). Beef: A Global History. London: Reaktion Books. Pp. 7.

SAS (2002). Statistical Analysis System, Computer software, version 9: Statistic SAS Institute Inc. Cary, NC2751, U.S.A

Soniran OG. and Okubanjo AO. (2002): Physico-Chemical and Sensory Characteristics of Pork Loin Roasted, Cooked to Three Internal Temperatures. *Nigerian Journal of Animal Production* 29(1):138-141.

Tsegay L., Mohammed B. and Sandip B. (2015): Quality of Beef, Chevon and Mutton at Hawassa, Southern Ethiopia, *African Journal of Food Science* 9(5):301-306.

Uzeh, R. E., Ohenhen, R. E., and Adeniji, O. O. (2006). Bacterial Contamination of *Tsire-Suya*a Nigerian Meat Product.*Pakistan Journal Nutrition, 5*(5), 458-460. Retrieved on 14/04/2011 http://dx.doi.org/10.3923/pjn.2006.458.460

Yousuf A.H.M., Ahmed M.K, Yeasmin, S., Ahsan, N, Rahman, M.M., Islam M.M. (2008). Prevalence of Microbial Load inShrimp, *Penaeusmonodon*and Prawn, *Macrobrachiumrosenbergii*from Bangladesh.*World Journal of Agricultural Sciences*: **4(**3): 852-855