

EVALUATION OF CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF *TSIRE* SOLD IN KANO METROPOLIS

Abba A. I. Inusa S.K., Abdullahi, M. H. & Adamu A.S.

Department of Animal Science, Faculty of Agriculture,
Bayero University, PMB 3011, Kano.

karkarna63@gmail.com

ABSTRACT

The study was conducted to evaluate the chemical and microbiological properties of *Tsire*, a ready-to-eat meat product snack sold in Kano metropolis northwest Nigeria. Samples for the study were purchased at four different locations, Gwarzo Road, Sabon Gari Market, Rimi Market and Zoo Road within the metropolis. At each location, samples were collected in triplicates and were subjected to proximate and microbiological analyses. The proximate analysis revealed that there were significant ($P < 0.05$) differences in protein content of the samples. 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 across the samples. The indicator organisms were identified as *Staphylococcus aureus* and *Escherichia coli*. Higher counts *Staphylococcus aureus* was obtained from Rimi market and was significantly difference ($P < 0.05$) from counts at other locations. Also, there was significant difference in *Fecal coliform* where by Sabon Gari Market samples had the highest (23 MPN/g). *E. coli* was significantly ($P < 0.05$) lower than *S. aureus* at all the locations. This study shows the *Tsire*, harbors microorganism of public health importance in numbers that could likely cause health problems. Therefore, 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: *Escherichia coli*, meat, public health, *Staphylococcus aureus*, *Tsire*.

INTRODUCTION

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 and meat cause visual, textural and organoleptic changes when they release metabolites (Jackson and McGowan, 2001).

Tsire is a consumer meat product fast food which is processed and sold along streets often under unhygienic conditions (Uzeh *et al.*, 2006). At sales location, *Tsire* is usually packaged with old newspapers, brown papers and other used paper materials. Also, 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 contaminants, 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 has previously been reported (Edema *et al.*, 2008). This practice might create an avenue for microbial contamination. These micro-organisms are capable of endangering human lives by causing health problems.

This experiment was conducted to evaluate the chemical and microbiological properties of *Tsire* sold in Kano Metropolis.

MATERIALS AND METHODS

The experiment was conducted at Food and Science Laboratory, Kano State 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. The State occupies a land area of 20,400km² 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.

Ready-to-eat *Tsire* samples were purchased at four different locations in Kano Metropolis. These places are Gwarzo Road, Sabon Gari market, Rimi Market, and Zoo Road. The sampling was triplicated at each of the designated locations. 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).

Completely Randomized Design (CRD) was used for the experimental design. Data obtained were analyzed with SAS (2002), while the means were separated using the Least Significance Difference (LSD) method.

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of *Tsire* sold at different locations in Kano Metropolis. The value obtained revealed significant ($P<0.05$) differences in protein content and ether extract across the locations where *Tsire* samples were collected. The highest and lowest protein contents (38.59% and 31.73%) of *Tsire* samples were recorded at 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 (Abdulahi *et al.*, 2004) for fat and ash level which respectively were 23.7% and 2.4%, agreed closely with that obtained by Abdullah *et al.* (2004). There was no significant ($P<0.05$) differences in moisture content across all the locations. This closely agreed with the finding of Apata, *et al.* (2013). Rimi Market recorded the highest ash (5.13 %) while there were no significant differences among the others values.

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

Nutrients	Locations				LSD
	Gwarzo Road	S/Gari Market	Rimi Market	Zoo Road	
Protein	33.90 ^c	35.74 ^b	31.73 ^d	38.59 ^a	0.972
Ether extract	23.96 ^b	20.57 ^c	25.37 ^a	18.31 ^d	1.111
Moisture	35.62	37.09	34.68	36.07	3.567
Ash	1.80 ^b	1.70 ^b	2.10 ^a	1.90 ^b	0.633

a, b, c and d means in the same row with different superscripts are significantly different ($P<0.05$)

Table 2 shows the microbial counts of *Staphylococcus aureus*, *Salmonella spp* (cfu/g) and fecal coliform MPN/g in the *Tsire* samples. There was significant ($P<0.05$) differences in *Staphylococcus aureus* and *Salmonella spp* (cfu/g) across the locations. Results obtained for highest *S. aureus* count of 2.26×10^4 cfu/g was slightly higher than the 1.97×10^4 reported previously (Edema *et al.*, 2008). Similar, high *S. aureus* values were reported by Yousuf *et al.* (2008) and Okonko *et al.* (2009). The reason for the high counts of these organisms in the *Tsire* could be environmental, handling

contamination issue and holding time. Rimi and Sabon Gari markets are situated closer to waste dumping sites and gutters more than the two other locations, hence contributing to the higher microbial counts. It showed that Rimi Market had the highest count (2.26×10^4) of *Staphylococcus aureus* while Gwarzo Road recorded the least *Staphylococcus aureus* (1.14×10^4). There was no fecal coliform MPN/g in *Tsire* samples obtained from Gwarzo Road while Sabon Gari with 23 MPN/g *Fecal coliform* had the highest count. No *Salmonella spp* were isolated from all the *Tsire* samples.

Table 2: Microbial counts of *Staphylococcus aureus*, *Salmonella spp* (cfu/g) and Fecal coliform MPN/g of *Tsire* samples

Indicator organisms	Location			
	Gwarzo Road	S/Gari Market	Rimi Market	Zoo Road
<i>Staphylococcus</i> (cfu/g)	1.14×10^4	2.13×10^4	2.26×10^4	1.73×10^3
<i>Fecal coliform</i> MPN/g	–	23	<3	4
<i>Salmonella</i> (cfu/g)	–	–	–	–

S/Gari market = Sabon Gari market

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 *et al.* (2009) who reported *S. aureus*, *E. coli*, *Klebsiella spp* and *Pseudomonas spp* in meat pie. *Escherichia coli* occurred in the *Tsire* samples obtained from Sabon Gari market and Zoo road, while *Salmonella spp* was not present in all the *Tsire* samples.

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

Isolates	<i>Tsire</i> sample s											
	GR	GR	GR	SBG	SBG2	SBG	RM	RM	RM	ZR	ZR	ZR
	1	2	3	1		3	1	2	3	1	2	3
<i>Staphylococcus aureus</i> (cfu/g)	+	+	+	+	+	+	+	+	+	+	+	+
<i>Escherichia coli</i>	–	–	–	+	–	–	–	–	–	+	–	–
<i>Salmonella</i> (cfu/g)	–	–	–	–	–	–	–	–	–	–	–	–

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

CONCLUSION AND RECOMMENDATIONS

Some of the bacteria isolated and identified in *Tsire* are of public health importance and their presence can cause food poisoning and food borne diseases. There is need for proper handling and the establishment of legislation regarding the sale of *Tsire* and other meat products at strategic locations to reduce the level of contamination in such product

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