MINERALS EVALUATION OF *TSIRE* OFFERED FOR SALE AT RETAIL OUTLETS IN HADEJIA LOCAL GOVERNMENT AREA OF JIGAWA STATE, NIGERIA

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ABSTRACT

The study was carried out to assess the minerals composition of *Tsire* offered for sale at retail outlets in Hadejia Local Government Area of Jigawa State. Triplicate raw meat and *Tsire* samples sold in three different locations namely: Gagulmari (T1), Dubantu (T2) and Matsaro (T3) were purchased using simple random sampling method. Three samples from each outlet were collected fortnightly from 3rd to 17th April, 2018. Each location serves as a treatment; treatments were replicated three (3) times making a total of fifty four samples. The samples were immediately packaged in Ziploc bags and transported to Soil Science Laboratory, Bayero University, Kano for minerals analysis. The minerals determined were Calcium (Ca), Magnesium, Copper (Cu) and Iron (Fe) using Atomic Absorption Spectrophotometer (Buck Scientific Model 210 VGP), and Sodium (Na) and Potassium (K) using Flame Photometer. The experiment was laid in a Completely Randomized Design (CRD). Data obtained were subjected to Analysis of Variance (ANOVA) using the General Linear Model Univariate Procedure of SPSS 17.0 and significant differences of means were compared using LSD at 5% level of probability. Results showed that there were significant differences ($P< 0.05$) in Calcium and Potassium between the treatments in both raw meat and *Tsire*. It was concluded that higher values of calcium and copper were reported at TI for both raw and processed meat.

Key words: Minerals, *Tsire*, Outlet, Hadejia and Jigawa

INTRODUCTION

Meat is an animal's flesh that is eaten as food; human has hunted and killed animals for meat since prehistoric time. The advance of civilization allowed the domestication of animals such as chickens, sheep, goats, pigs and cattle and eventually their uses in meat production at an industrial scale (Muhammad *et al*., 2012). Meat is mainly composed of proteins, fats and water. It is normally eaten after it has been cooked and seasoned or processed in variety of ways (Lawrie *et al*., 2006).

Most often, meat refers to the skeletal muscles, associated fat and other tissues and offal. Meat is sometimes also used in a more restrictive sense as the flesh of mammalian species such as cattle, sheep, goats, camels, pigs and dogs raised and prepared for human consumption. Meat obtained from poultry, cattle, sheep and goat are called chicken, beef mutton and chevon, respectively (FAO, 2007).

Poultry is raised for the production of meat and eggs; cattle for meat, milk and hide; sheep and goats for meat, milk and skin; pigs for meat: and camel for meat, milk and hide (Purchas *et al*., 2005). Poultry are now found in almost all parts of the world, regardless of the climatic condition. There is an estimated one domestic chicken for every human being in the world (FAO, 2007).

Muscle tissues is very rich in protein containing all the essential amino acids; it is also a good source of Zinc, Selenium, Phosphorous, Iron, Niacin, Chloride, Riboflavin, Vitamin B6, B12 and Vitamin K (Jokanovic *et al.*, 2014). The fat contain of meat can vary widely depending on species and breed of animals, the way the animals were raised, including what it was fed, the anatomical part of the body and the methods of butchering and cooking (Prasanna *et al.*, 2014).

Meat contains quality protein, vitamins, fatty acids and minerals. Meat has an alluring aroma, social value, is prestigious and yield income (Amanda *et al.*, 2007). In many parts of the world, meat makes

up a considerable portion of a typical diet. It contributes protein, minerals, vitamin and fat and these nutrients are important for their beneficial effect on well being. Understanding the nutrients composition of meat can help to make positive choice when selecting food for daily diet (FAO/WHO, 1997).

Meat is cooked and processed into difference ways such as *Tsire, Balangu, Kilishi and Dambun-Nama*.

The aim of the research is to examine the minerals contents of *Tsire* offered for sale at Hadejia Metropolis.

MATERIALS AND METHODS

The research was conducted at Hadejia Local Government Area of Jigawa State. Hadejia is one of the oldest Local Government Areas created since 1975, from the then Kano State (now Jigawa State) of the northern Nigeria. Hadejia Emirate comprises of Hadejia, Mallam -Madori, Kafin-Hausa, Birniwa, Guri, Kaugama, KiriKasamma and Auyo Local Government areas. It is 6,880 square kilometer and located in the Northern Savannah Zone of Nigeria.

Hadejia town is the capital of Hadejia Emirate and is located at the central part of the emirate. It lies approximately between longitude 10.00 ^{0} E and latitude 12.25^0 N. The population of the area was 47,400 (NPC, 2006). The major tribes of the town are Hausa, Fulani and Kanuri. The town is served by Federal Truck linking it to Nguru in the East, Kano in the North, Katagum in the South and Dutse (capital of the state) in the South-West.

The area has an annual rainfall ranging from 100-110mm which is accompanied by heavy wind. The temperature ranged from 31 to 40^0 C. There are two seasons in a year, it has about 6-8 months of dry season and the rainy season lasts for about 4 months.

Tsire is a boneless lean meat which is cut into pieces and sliced with a sharp knife, staked on a wooden/iron stick and heavily dusted with a mixture of spices made up of groundnut cake paste, red pepper, seasoning, salt, ground ginger, garlic, ground nut oil and other aromatic spices. The staked meat is roasted around a glowing charcoal fire as described by Abubakar *et al.* (2014).

Triplicate raw meat and *Tsire* samples sold in three different locations namely Atafi (T1), Yayari (T2) and Yan-Koli (T3) in Hadejia metropolis were purchased using simple random sampling method. Three samples from each outlet were collected fortnightly from 3rd to 17th April, 2018. A total of fifty four meat samples (Table 1) were collected. The samples were immediately packaged in Ziploc bags and transported to Soil Science Laboratory, Bayero University, Kano for minerals analysis.

Table 1: Total Number of Samples Collected for Minerals Assessment

S/No.	Type of meat	Number of Samples
1	Raw	27
2	*Tsire*	27
	Total	54

One (1g) gram from both raw and processed meat products (*Tsire*) were collected from the three different treatments and inoculated in a vacuum plastic container which were immediately transported to the laboratory for analysis. The minerals determined were Calcium (Ca), Magnesium (Mg), Copper (Cu) and Iron (Fe) using Atomic Absorption Spectrophotometer (Buck Scientific Model 210 VGP), and Sodium (Na) and Potassium (K) using Flame Photometer.

The experiment was laid in a Completely Randomized Design (CRD). Data obtained were subjected to Analysis of Variance (ANOVA) using the General Linear Model Univariate Procedure of SPSS 17.0 and significant differences of means were compared using LSD at 5% level of probability.

RESULTS AND DISCUSSIONS

The minerals composition of raw meat (mg/kg) offered for sale at Hadejia Metropolis is presented at Table 2. There was significant difference ($P< 0.05$) in Ca, Mg and K between the treatments. Highest values (mg/kg) for Cu (6.10), Fe (5.36) and K (1.29) were reported at T3 while lowest values (mg/kg) for Ca (3.13) and K (1.24) were reported at T 2.

Table 2: Minerals Composition of Raw Meat (mg/kg) Offered for Sale at Hadejia Metropolis

Minerals	Treatment			
	T1	T2	T3	SE(±)
Ca	4.17[a]	3.13[c]	3.33[b]	0.003
Mg	2.09[b]	2.50[a]	0.83[c]	0.005
Cu	6.10[a]	3.66[b]	6.10[a]	0.005
Fe	3.57[b]	3.57[b]	5.36[a]	0.004
Na	2.01[b]	2.29[a]	2.01[b]	0.005
K	1.27[b]	1.24[c]	1.29[a]	0.107

[a, b and c] means on the same row having different superscripts are statistically different

Table 3 showed the results of the minerals composition of *Tsire* (mg/kg) offered for sale at Hadejia metropolis. There was significant difference (P<0.05) in Ca, Cu, Fe and K between three treatments. Highest values (mg/kg) for Ca (3.75), Mg (1.67), Cu (29.59), Fe (8.54) and Na (2.15) were reported for T1 while lowest values (mg/kg) for Ca (2.50), Cu (19.39), Fe (4.75) and K (1.17) were reported from T3.

Table 3: Minerals Composition of *Tsire* (mg/kg) Offered for Sale at Hadejia Metropolis

Minerals)	Treatment			
	T1	T2	T3	SE(±)
Ca	3.75[a]	2.92[b]	2.50[c]	0.001
Mg	1.67[a]	1.33[b]	1.25[b]	0.047
Cu	29.59[a]	24.49[b]	19.39[c]	0.001
Fe	8.54[b]	7.32[b]	4.75[c]	0.079
Na	2.15[a]	1.70[b]	1.48[b]	0.125
K	1.40[a]	1.24[b]	1.17[c]	0.002

[a, b and c] means on the same raw having different superscripts are statistically different

Abulude (2004) reported higher Cu (10.23 mg 100 g^{-1}) and lower Ca, Mg and Na contents which is similar to this finding. Dietary Cu is not toxic to humans because its intake is usually low and body can usually regulate its storage through binary excretion. Meat is a good source of K, Mg, Ca, Na and Fe. The amount of Zn obtained in this report suggests that the sample could provide a significant portion of Zn. Meat is the richest source of Zn in the diet and supplies one third to one half of the total Zn intake for meat eaters. Similar Fe (5.20 mg 100 g^{-1}) in millipede content obtained by Abulude and Folorunso (2003) is comparably with the current results. Fe in meat is well absorbs (20-30%). It also enhances the absorption of Fe from other sources. Inadequate Fe in the diet is associated with poorer learning and decrease cognitive development (FAO/WHO, 1997). The differences in the minerals contents of the samples could be due to soil, water, plant nutrient content and the rate of mineral uptake by animal.

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