

Level of Copper, Manganese and Zinc in common traditional foods in Minna, North-Central zone of Nigeria

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Abstract—Eleven (11) common traditional foods widely consumed in Minna city were examined for their copper, manganese and Zinc content selected based on the analysis of food consumption survey conducted through the administration of questionnaire. Copper, Manganese and Zinc elements were determined using Atomic Absorption Spectrophotometry (AAS). Result indicates that Kunu Tsamiya, Tuwon Alkama da miyan Kuka, and Fura da nono are reliable sources of optimum value of copper (8.23mgKg^{-1}), manganese (22.30mgKg^{-1}) and zinc (70.19mgKg^{-1}) respectively. The levels of the elements found in the examined foods were not excessive to cause harm and are therefore generally safe to health. However, within the limit of the detection of the instrument used, copper is lacking in Tuwon Shinkafa da miyan wake, kosai and Fura da nono. Similarly, no traceable detection of manganese in Masa da miyan ganye, Kunu Tsamiya, Tuwon Masara da miyan bushekubewa and Kosai. The study showed that daily square meals of these foods in terms of repetition or combination would yield values of these essential trace elements that can meet the Required Dietary requirement (RDA) as approved by the Food and Agricultural Organization (FAO) and the World Health Organisation (WHO). It is therefore implied that well guided consumption pattern of these traditional foods, can be a veritable green health tool in remedy and prevention of mineral malnutrition in Nigeria. The foods have great potential to contribute to management and sustainability of healthy living.

Keywords- traditional foods, copper, manganese, zinc, green health, mineral malnutrition, healthy living.

1. INTRODUCTION

Foods are chemical substances or material taken to provide support for the body and life pleasure. Mineral constitutes a minute but very important class of food. It has a lot to stake in the wellbeing of individuals as food and health are positively related. Copper, Manganese and Zinc elements are essential

minerals needed in trace quantities to play health roles above which may constitute health hazards [1]. Foods taken by human being normally constitute source of total trace element intake by humans [2]

Minna is the capital city of Niger State located in the North-Central Zone of Nigeria. It has a wide expanse of land suitable for agriculture and rearing of live-stock. It is originally inhabited by the Gwari speaking tribes. Because of its proximity with the federal capital territory of Nigeria, Minna serves as a dwelling place for many Nigerians of diverse ethnic backgrounds. However, like most other states in the North, the general language is Hausa. This has a lot of influence on its culture and food. Hence the traditional foods are named in the language.

Copper is a basic component of enzymes. The major role of copper is the promotion of iron absorption [3]. It is a trace element which is found to be important for the haematologic and neurologic systems [4]. It is necessary for bone formation and growth. Myelin sheaths in the nervous systems requires the presence of copper. Copper also helps in the compounding of iron in the haemoglobin. It plays a great role in the absorption of iron from the Gastro-Intestinal Tract as well as in the transfer of iron from tissues to the plasma [5,6]. Rheumatoid, arthritis, cirrhosis are common health disorder associated with increased levels of copper. Increased level is also as a result of malnutrition [5]. Health problems due to copper deficiencies are Skin pigmentation, abnormal hair growth, bone disorders, anaemia, impaired growth and reproductive performance, gastrointestinal disturbances and heart failure. Copper deficiency has also been associated with cardiac hypertrophy and sudden cardiac failure. Recommended Daily Allowance (RDA) of manganese [7] is 1.5 - 3 mg.

Manganese is an essential trace element required, in many syntheses, to activate several important enzyme systems. Bones and skeletal defects in shell quality is usually as a result of low manganese intake [8]. The absorption and retention of manganese from foods low in iron, such as milk, are relatively high. Supplementation of milk with iron lowers the manganese absorbable [9]. Manganese is an essential element in connective tissue development. Excessive intake or over exposure to manganese may have an adverse effect on the mood and functioning of Central Nervous System [4]. The normal Recommended Daily Allowance (RDA) of manganese [5] is 2.5 – 5.0 mg.

Zinc is an integral part of the enzymes (metallo-enzyme) and in others it serves to catalyze the action of zinc dependent enzymes. Growth in humans suffering from zinc deficiency is severely stunted often to the point of dwarfing. Since zinc has its most profound influence on rapidly growing tissues its effect on reproduction is significant. Zinc supplements can be used to promote rapid healing [2]. It is essential in normal glucose tolerance. It is also involved in the transport of metabolites across cell membranes. The Recommended Daily Allowance (RDA) of zinc [7] is 12-15 mg.

There is paucity of data on table ready to eat local foods. Most cited works are from raw studies of foodstuffs. There is therefore a need to generate some essential mineral data on mixed, cooked and ready-to-eat traditional foods. This study is aimed at determining the level of Copper, Zinc and Manganese in some selected local foods using Atomic absorption Spectroscopy in order to evaluate the adequacy or otherwise of these essential trace elements. This will hence be suggestive of the potentiality of foods in natural and green health scheme.

11. MATERIALS AND METHODS

A. Collection and treatment of Samples

Minna. The food samples selected and their major components are as shown on table 1.

Most of these food samples were obtained from three well patronized restaurants in Minna city while others were bought from three notable markets in Minna. These food samples were homogenized and were oven dried at 100°C, pounded into fine powder using laboratory mortar and pestle and sealed in polyethylene bags ready for digestion.

The collected food samples representing adult size of 200g average weight were obtained from six different location of Minna city from well patronized traditional food kitchens. Others not obtained from the kitchens were obtained from local markets around.

B. Sample Pretreatment and Ashing

All glass wares including ceramic Pestle and mortar used were previously filled to brim with 10% (v/v) nitric acid for 24hours. They were then washed with distilled water and

rinsed with de-ionised water. This is to avoid or minimize contamination.

These food samples were homogenized thoroughly in the ceramic pestle and mortar accommodating the minute test component of the food mixture. The mixing continued until homogeneous blend which was later transferred to oven in previously cleaned porcelain crucibles. The samples were fully dried at 110°C for 48 hours. Dried sample was grinded into fine powder in titanium blade grinding machine. The fine powder of 100g was the average dried sample obtained. This was then kept separately in polyethylene bags, sealed, labeled and kept until further actions.

1.0g of each dried food samples was carefully weighed into 250cm³ beaker. And 18ml of nitric acid, 2.0ml of Perchloric acid and 1.0ml of Sulphuric acid was added to the sample and heated on a hot plate at about 80°C. The digestion continued until a clear solution was obtained to signify a complete digestion. After cooling, the digested sample were filtered and diluted to 250ml with distilled water into a 250ml volumetric flask which was then transferred into a sample bottle for further analysis.

Flame atomic absorption spectroscopy (FAAS) determined the copper, manganese and zinc content of the samples.

Table 2: Mean values of the mineral content of the dried samples in mgKg⁻¹.

Sample	Mn	Cu	Zn
A	22.30	6.40	39.10
B	12.40	5.60	43.30
C	14.00	5.50	41.22
D	N.D	8.10	66.00
E	13.02	N.D	44.50
F	12.60	7.90	35.14
G	N.D	8.23	31.05
H	16.41	8.05	33.72
I	N.D	1.32	26.50
J	N.D	N.D	31.62
K	14.60	N.D	70.19

ND: NOT DETECTED

Eleven traditional foods were documented. They rep

Table 1. Table of studied traditional food and their ingredient contents

Code	Traditional Food	Main Ingredients
A	<i>Tuwon Alkama da miyan kuka</i>	Wheat, baoba, red oil, pepper, onion, locust beans, magi, salt, meat and water
B	<i>Sakwara da miyan agushi</i>	Yam, melon, pumpkin leaves, crayfish, red oil, onion, pepper, tomatoes, maggi,salt, meat and water
C	<i>Tuwon Semo da miyan kubewa</i>	Semovita, fresh okra, garlic, onion, pepper, maggi,salt, red oil, fish, meat, water
D	<i>Masa da miyan ganye</i>	Rice, Sugar, vegetable, leaves, baking powder, yeast, pepper, tomatoes, salt, magi, redoil, groundnut oil, meat and water
E	<i>Tuwon Shinkafa da miyan wake</i>	Rice,beans,redoil,seasoning,salt,pepper, tomatoes,meat,water,onion.
F	<i>Tuwon doya da miyan ayayo</i>	Powdered yam, jute vegetable, locust bean salt, pepper, water meat.
G	<i>Kunu Tsamiya</i>	Millet,sugar,tamarend, clover ,ginger,pepper.
H	<i>Kunu Gyada</i>	Groundnut,corn,bitter lemon,sugar.
I	<i>Tuwon Masara da miyan bushekubewa</i>	Maize,water,dried okra,meat,onion,pepper,salt and seasoning.
J	<i>Kosai</i>	Beans,pepper,salt and water.
K	<i>Fura da nono</i>	Millet, kaninfari,ginger,pepper and milk.

III. DISCUSSION

Copper levels were detectable and comparable with the 4.5 – 8.8 mgKg⁻¹ within the range obtained by [10] for some food items in the south-west zone of Nigeria. The Minna food copper content level is however and thus more adequate when compared to the Douala, Cameroon foods [11] which ranged from 1.2-3.3 mgKg⁻¹. Optimum copper intake can be sourced from Kunun Tsamiya (G).

Manganese value in the foods is high in *Tuwo Alkama da miyan Kuka* (A), *Kunu Gyada* (H) and *Tuwon semo da miyan dayan kubewa* (C). The average value of the Manganese contents where detectable is 15.05 mgKg⁻¹. This is a little higher, though within required level, when compared with the Cameroonians food reported by [11].

Zinc can be obtained appreciably from all foods within safe limit in the range 26.50 mgKg⁻¹ in *Tuwon Masara da miyan bushekubewa* (I) and 70.19 mgKg⁻¹ in *Fura da nono* (K) respectively. The average value of zinc in Minna foods is higher than the 0.06 – 56.9 mgKg⁻¹ obtained for the study on southwest, Nigeria [12]. [10] reported 24.4 -30.8 mgKg⁻¹ for selected foods studied in south-west Nigeria. Similarly, [13] in Egypt, it was also reported 2.35-15.86 mgKg⁻¹ as the range of zinc levels of some foods. Comparing with other studies, the zinc intake through the studied food is more adequate. The study further buttressed the invaluableity of the foods such as *Tuwon shinkafa da miyan wake* (E) and *furan da nono* (K) similar to what was reported in [14].

IV. CONCLUSION

From the comparison of mineral contents of the foods it is observable that the *Tuwos* (finely grinded cereals) contributed to the largest part of these trace elements content. Most of the foods analyzed were moderate sources of these trace essential minerals.

The overall result shows that mineral malnourishment as related to the elements studied is unlikely among the people of Minna. The common traditional foods eaten in Minna, if well exploited, has capability of preventing mineral malnutrition as well as maintenance and sustainability of healthy living through their rich and safe level of trace element. The foods can be exploited as natural and green remedy to combat the scourge of the mineral deficiency diseases of Zinc, Copper and Manganese).

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