

Macro nutrient composition in selected seasonings used in Nigeria

Abstract

This study evaluated the level of macro nutrients in some selected seasonings used in Nigeria. Replicate samples of 13 brands/products of seasonings were purchased in Port Harcourt, Nigeria. The samples were processed and analyzed. The results showed 56.59-4203.06 mg/kg potassium, 348.56-1825.54mg/kg sodium, 12.35-234.72mg/kg magnesium and 4.85-245.50 mg/kg calcium. Analysis of variance showed significant variation ($P < 0.05$) among the different brands/products for each of the macro nutrients under study. The values of the macro nutrients were higher than 0.4mg/kg limits (for calcium, potassium, sodium and magnesium) recommended for seasonings by the National Agency for Food and Drug Administration and Control (NAFDAC)-a Nigerian Agency. Furthermore, since small quantity of the seasoning is required in human diet there may be no major effects. Based on the results of this study there is the need for adequate surveillance of these seasonings with regard to elemental concentration.

Keywords: calcium, condiments, food, magnesium, potassium, sodium

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Abbreviations: NAFDAC, national agency for food and drug administration and control; HCl, hydrochloric acid; SPSS, statistical package for social science

Introduction

Foods are required by living organisms for optimal growth, development and functioning of the different parts of the body.¹⁻³ Food is the major source of nutrients required for metabolic and cellular functions. Food based products are classified in various way depending on the consumption, source, native and processing patterns. But among the various method of classification, readiness for consumption is one of the most frequently used methods. This classification is ready to eat food and food that required further processing prior to consumption.^{1,4}

Food condiments are basic ingredients including sauce and spice that contain one or more extract that is added to food to enhance its flavor. Food condiments can either be basic or compound ingredients that are used for food preparations. Basic ingredients are condiment that is essential for food preparation and in most times homogenous. A typical example includes garlic, onion, pepper, salt etc.⁵ Furthermore, compound ingredients are mixture of two or more edible materials used to attain a specific flavor. Chilli sauce, chutney, horseradish sauce, meat sauce, mint sauce, prepared mustard, soya sauce, sweet, sour sauce, tomato ketchup etc are some common example of compound ingredients.⁵ Basic ingredients are required for most food preparation, while compound condiments are added to improve a specific flavor. Food seasonings are mostly compound condiments containing one or more spices/extracts which are added to food during preparation and or packaging/production. Food seasonings are basically used to enhance the overall acceptability of the food products by consumer. Nearly all food seasonings are applied in food during processing.

Recently, the brands, uses and food seasonings have increased. In developing country like Nigeria, some food seasonings being used is imported from countries like India, China and Korea. Seasonings have

been widely used in boiling/cooking of meats, sauce, stew, soup, fried rice, joll of rice, porridge etc prepared at both home kitchen and food outlets *viz*: fast food, restaurant etc. Dried thyme, powdered curry, bouillon cubes, mixed spices, natural unprocessed are among the common seasonings commonly used in Nigeria. Furthermore, most of the seasonings have plant extracts as active ingredients.

Food seasoning are known to contain minerals such as macro nutrients (calcium, magnesium, potassium and sodium, and heavy metals (cadmium, lead).⁶ Furthermore, heavy metals have been widely detected in food natural spices-vegetables.⁶⁻⁸

Among the electrolytes, Sodium, potassium and calcium are the major indispensable nutrients required by the body. This is because an unbalance nutrient could pose a harmful effect to the body. Opoku-Okrah et al.⁹ described sodium as essential electrolyte in the extracellular fluid. Low concentration of sodium in diets may predispose the body to diabetes, heart disease and some kidney disorders.¹⁰ Potassium plays essential role in several metabolic processes.^{9,10} Calcium is vital for bones formation. Abnormal concentration of potassium, calcium, magnesium and sodium could lead to chronic medical health condition.

The utilization of food seasonings have increased in developing country like Nigeria. Different brands are available in markets at different quantity. As such, there is a need to continuously assess the concentration of chemical constituents. Therefore, this study aimed at assessing the level of some macro nutrients (calcium, magnesium, sodium and potassium) in some food seasonings used in Nigeria.

Materials and methods

Sample procurements

Port Harcourt is the capital of Rivers State. It is highly populated, this may have resulted from the fact that it hosts several reservoirs of crude oil scattered across its communities hence, breeding a highly industrialized environment with lots of booming business activities

and its fair share of attendant adverse environmental impacts. One of the most popular markets in this city is the Oil mill market located along the Port Harcourt-Aba Road axis of the state. This market is patronized on a once-weekly basis while attracting traders from the neighboring state of Abia. The market often causes heavy traffic within and around its axis. Several food spices and sauces that are commonly purchased by the general public were bought from several sellers within the market. The samples were already well packaged in sealed polyethylene sachets before they were transported to the laboratory.

Table 1 Different studied spices brands with their codes along with their labeled constituents

ACF	Iodized salt, Monosodium glutamate, Disodium inosinate, Disodium guanylate, Starch, Sugar, vegetable fat, Coconut meat, Pepper, Carrot, Nutmeg, Onions.
FYJFS	Salt, Monosodium glutamate, Starch, Sugar, Vegetable fat, Natural colors, Spices, Vegetable extracts.
GVP	Turmeric, Ginger, Fennel, Coriander, Salt, Cumin, Fenugreek, Nutmeg And Garlic.
KGBSP	Salt, Monosodium glutamate, Sugar, Corn Powder, Beef seasoning powder, Dextrin, Vegetable protein powder, Soy sauce powder, Corn starch, Black pepper powder, Onions powder and Garlic powder.
KGCF	Salt, Sugar, Monosodium Glutamate, Corn powder, Corn starch, Soy Sauce powder, Dextrin, Chicken seasoning powder, Shrimp powder, Onion powder, Garlic powder, Black pepper powder.
KGMS	Salt, Sugar, Monosodium glutamate, Corn starch, Corn powder, Soy sauce powder, Dextrin, Chicken seasoning powder, Caramel color, Curry powder, Nutmeg, Turmeric, Black pepper powder, Onion powder, Garlic powder, Cinnamon, Coriander, Clove.
MCS	Salt, Corn starch, Wheat flour, Palm stearin, Sugar, Monosodium Glutamate, Disodium guanylate, Disodium Inosinate, Carrots, Garlic, Onion, Celery, Parsley, Leek, Chiye, oil, Chicken meat powder, Chicken fat, Turmeric, Flavoring chicken, Acidity regulator, Citric acid, Ginger, May contain eggs, Milk, Soya, Mustard and Sesame seeds.
NVGMF	Salt, Sugar, Monosodium glutamate, Starch, Malt dextrin, Vegetable fat, Mutton Cream essence, Caramel, Red pigment, Curcumin, Meaty peptide, Mutton flavor, Spices.
SFRSP	Salt, Sugar, Monosodium glutamate, Starch, Malt dextrin, Vegetable fat, Meaty peptide, Spices, Edible pigment: Tetrazine.
SSJSP	Salt, Monosodium glutamate, Starch, Sugar, vegetable fat, Vegetable extracts, Natural colors and Spices.
TCP	Turmeric, Nutmeg, Coriander, Fennel, Cumin, Clove, Mustard, Cardamom, Dill and Fenugreek.
TGP	Ginger powder
TTL	Thyme leaves

Sample preparation and laboratory analysis

The samples were prepared according to the method previously described by Aigberua et al.¹¹ Each food spice and condiment sample bought from the market was oven-dried in seven replicates using a Memmert U27 drying oven at a temperature of 70°C for 24 hours. 5g each of dried samples were each transferred into clean porcelain crucibles and dry-ashed in an Oceanic SX-2 type muffle furnace at a temperature of 450°C until the samples were grayish-ash. The samples were left to cool in a dessicator for about half an hour. The ash was digested using 10ml of 1N nitric acid (HNO₃) and 10ml of 1N hydrochloric acid (HCl) which formed a solution. A reagent blank containing acid mixtures was also prepared, and all

Ingredients of the various seasonings and culinary condiments

In this study, various spices brand of different origins were assessed namely: TTL (made in Nigeria), TGP, TCP and GVP (made in India), ACF, FYJFS, SSJSP, SFRSP and NVGMF (made in China), MCS (made in Ukraine), KGMS, KGCF and KGBSP (made in Korea). Each brand constituent is illustrated in Table 1.

acid solutions were made up to 20ml using distilled water. Samples and reagent blanks were aspirated into the GBC Avanta PM A6600 Flame Atomic Absorption Spectrophotometer and the corresponding analyze concentrations were reported in mg/kg units. The different macro nutrients were analyzed at a wavelength of 422.7nm calcium, 202.6 magnesium, 330.2nm sodium and 769.9nm potassium.

Statistical analysis

Statistical package for social science (SPSS version 20, USA) was used to carry out the statistical analysis. The values were expressed as mean±standard deviation (n=7). Analysis of variance was carried out and significance was determined at P<0.05. Duncan multiple comparisons were carried out to show the source of the variation.

Results and discussion

Table 2 presents the concentration of some macro nutrients in selected seasoning and culinary condiments used in Nigeria. The concentration of potassium ranged from 56.59mg/kg (NVGMF)

to 4203.06mg/kg (GVP). There was significant variation ($P < 0.05$) among the various seasonings. Furthermore, there was no significant difference ($P > 0.05$) between mean values for [(ACF), SFRSP and SSJP) and (KGCF and KGMS)].

Table 2 Elemental composition of some nutrients in seasoning and culinary condiments used in Nigeria

Sample Code	Potassium mg/kg	Sodium mg/kg	Magnesium mg/kg	Calcium mg/kg
ACF	93.12±0.14b	1688.24±1.22h	17.83±0.11b	16.12±0.02d
FYJFS	237.66±0.20c	1622.59±0.58e	60.65±0.16e	12.13±0.01c
GVP	4203.06±2.07j	1820.70±0.511	234.67±0.23l	211.72±0.02i
KGBSP	587.55±0.20f	1615.50±1.13d	70.18±0.16g	9.75±0.02b
KGCF	508.50±0.25e	1825.54±1.43m	144.03±0.02i	94.68±0.05h
KGMS	530.60±0.21e	1708.15±1.53i	76.63±0.07h	9.77±0.21b
MCS	307.65±0.23d	1684.55±1.29g	68.30±0.22f	44.31±0.05f
NVGMF	56.59±0.07a	1664.44±1.28f	12.35±0.23a	4.85±0.02a
SFRSP	102.55±0.23b	1767.06±1.62k	33.41±0.22c	33.36±0.03e
SSJSP	104.48±0.32b	1756.36±0.69j	55.62±0.04d	33.94±0.03e
TCP	4028.28±0.00h	1051.89±0.00c	234.72±0.00l	224.68±2.03j
TGP	4123.64±98.10i	597.63±0.28b	233.68±0.28k	65.24±0.11g
TTL	2857.55±0.289	348.56±0.00a	230.82±0.00j	245.50±0.21k

Different letters along the column indicate significant variation ($P < 0.05$) based on Duncan statistics.

Sodium concentration ranged from 348.56mg/kg (TTL) to 1825.54mg/kg (KGCF). Significant variation ($P < 0.05$) exist among all the different seasonings. Magnesium concentration ranged from 12.35mg/kg (NVGMF) to 234.72mg/kg (TCP), being significantly different ($P < 0.05$) among most of the means. Furthermore, there was no significant difference ($P > 0.05$) between GVP and TCP.

Calcium concentration ranged from 4.85mg/kg (NVGMF) to 245.50mg/kg (TTL). There was significant variation ($P < 0.05$) among the various means apart from SFRSP and SSJSP which showed no significant variation ($P > 0.05$).

The significant variations that exist with regard to potassium, sodium, magnesium and calcium concentration in the various brands of seasonings and culinary condiments under study may be associated to the feedstocks/ ingredients of each brand, manufacturing processes, variation in brands, and contamination from exogenous sources. The macro nutrients under study have several roles in human health at certain concentration. For instance, sodium plays an essential role in the maintenance of electrolyte, fluid balance, nerve impulse and some organ that have metabolic functions.¹² Calcium is essential for normal bone formation and skeleton,¹³ nerves, muscle contraction, blood clotting, activation of some enzymes.¹² Potassium is essential for carbohydrate metabolism, amino acids and glycogen synthesis, enzymatic processes necessary for cellular biochemical reactions,^{9,12,14} maintenance of body pH and skeletal salt balance.^{12,13} Potassium also aid in the normal functioning of the nerves, hearts and muscles (*viz*: some voluntary and involuntary muscles). Magnesium is essential for ATP metabolism, bone and skeleton formation and maintenance and co-factor to several enzymes to aid in mineral metabolism.^{12,13} Low

and high concentration of these macro nutrients could be detrimental to the body, for instance excess potassium in the blood stream could lead to Hyperkalemia.

In all cases, the concentration of the macronutrients recorded in this study was far higher than 0.4mg/kg recommended for food seasonings by National Agency for Food and Drug Administration and Control.⁶ The values reported in this present study were also higher than the values observed in some food seasonings (*viz*: Royco, Maggi, Ajinomoto, Knorr, Dinor, Vedan, Onga stew and Onga classic). However, the analyzed nutrients values in this study could not pose a major health risk to healthy individuals owing to the fact that small quantities of these seasonings are consumed through the diet.⁸

Conclusion

This study investigated macro nutrients (*viz*: calcium, sodium potassium and magnesium) concentration in some seasonings and culinary condiments used for cooking in Nigeria. The results found that the food condiments under study contain calcium, sodium potassium and magnesium above National Agency for Food and Drug Administration and Control limits. Therefore, there is the need for appropriate agencies to checkmate the level of these nutrients in foods bearing in mind that their presence in high concentrations could be detrimental to human health over a long period of time.

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Conflict of interest

The author declares no conflict of interest.

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