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, 348.56-1825.54 mg/kg sodium, 12.35-234.72 mg/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 0.4 mg/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

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 ways depending on the consumption, source, native and processing patterns. But among the various methods of classification are 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, brands and uses of food seasonings have increased. In a 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, jollof rice, porridge etc prepared at both home kitchen and food outlets viz fast food, restaurant etc. Dried thyme, powdered curry, bouillon cubes, mixed spices, and natural unprocessed are spices among the common seasonings commonly used in Nigeria. Furthermore, most of the seasonings have plant extracts as active ingredients.

Food seasonings 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 unbalanced 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 countries 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 different sellers within the market. The samples were well packaged in sealed polyethylene sachets before they were transported to the laboratory.

Ingredients of the various seasonings and culinary condiments

In this study, various spices and 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.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACF</td>
<td>Iodized salt, Monosodium glutamate, Disodium inosinate, Disodium guanylate, Starch, Sugar, Vegetable fat, Coconut meat, Pepper, Carrot, Nutmeg, Onions.</td>
</tr>
<tr>
<td>FYJFS</td>
<td>Salt, Monosodium glutamate, Starch, Sugar, Vegetable fat, Natural colors, Spices, Vegetable extracts.</td>
</tr>
<tr>
<td>GVP</td>
<td>Turmeric, Ginger, Fennel, Coriander, Salt, Cumin, Fenugreek, Nutmeg And Garlic.</td>
</tr>
<tr>
<td>KGBSP</td>
<td>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.</td>
</tr>
<tr>
<td>KGCF</td>
<td>Salt, Sugar, Monosodium Glutamate, Corn powder, Corn starch, Soy Sauce powder, Dextrin, Chicken seasoning powder, Shrimp powder, Onion powder, Garlic powder, Black pepper powder.</td>
</tr>
<tr>
<td>KGMS</td>
<td>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.</td>
</tr>
</tbody>
</table>

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. 5 g 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-shash. The samples were left to cool in a desiccator for about half an hour. The ash was digested using mixture of 10 ml of 1 N nitric acid (HNO₃) and 10 ml of 1 N hydrochloric acid (HCl) which formed a solution. A reagent blank containing acid similar mixtures was also prepared, and all acid solutions were made up to 20 ml using distilled water. Samples and reagent blanks were aspirated into the GBC Avanta PM A6600 Flame Atomic Absorption Spectrophotometer and the corresponding analyte concentrations were reported in mg/kg units. The different macro nutrients were analyzed at wavelengths of 422.7nm calcium, 202.6 magnesium, 330.2nm sodium and 769.9 nm 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 seasonings and culinary condiments used in Nigeria. The concentration of potassium ranged from 56.59 mg/kg (NVGMF) to 4203.06 mg/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 SSJSP) and ([KGCF and KGMS]).

Citation: Aigberua AO, Alagoa KJ, Izah SC (2018) Macro Nutrient Composition in Selected Seasonings used in Nigeria. MOJ Food Process Technol 6(4): 00155. DOI: 10.15406/mofjpt.2018.06.00155
Table 2: Elemental composition of some nutrients in seasoning and culinary condiments used in Nigeria.

<table>
<thead>
<tr>
<th>Sample Code</th>
<th>Potassium mg/kg</th>
<th>Sodium mg/kg</th>
<th>Magnesium mg/kg</th>
<th>Calcium mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACF</td>
<td>93.12±0.14b</td>
<td>1688.24±1.22h</td>
<td>17.83±0.11b</td>
<td>16.12±0.02d</td>
</tr>
<tr>
<td>FYJS</td>
<td>237.66±0.20c</td>
<td>1625.54±1.43m</td>
<td>144.03±0.02i</td>
<td>94.68±0.05h</td>
</tr>
<tr>
<td>GVP</td>
<td>420.03±0.62</td>
<td>1820.70±0.51</td>
<td>234.67±0.23i</td>
<td>21.172±0.02i</td>
</tr>
<tr>
<td>KGBSP</td>
<td>587.55±0.20f</td>
<td>1615.50±1.13d</td>
<td>70.18±0.16g</td>
<td>9.75±0.02b</td>
</tr>
<tr>
<td>KGCF</td>
<td>508.50±0.25e</td>
<td>1825.54±1.43m</td>
<td>144.03±0.02i</td>
<td>94.68±0.05h</td>
</tr>
<tr>
<td>KGBSP</td>
<td>530.60±0.12e</td>
<td>1708.15±1.53</td>
<td>76.63±0.07h</td>
<td>9.77±0.21b</td>
</tr>
<tr>
<td>MCS</td>
<td>307.65±0.23d</td>
<td>1694.55±1.29g</td>
<td>68.30±0.22f</td>
<td>4.33±0.05f</td>
</tr>
<tr>
<td>NVGMF</td>
<td>56.59±0.07a</td>
<td>1664.44±1.28f</td>
<td>12.35±0.23a</td>
<td>4.85±0.02a</td>
</tr>
<tr>
<td>SFRSP</td>
<td>102.55±0.23b</td>
<td>1767.06±1.62k</td>
<td>33.41±0.22c</td>
<td>33.36±0.03e</td>
</tr>
<tr>
<td>SSJSP</td>
<td>104.48±0.32b</td>
<td>1756.36±0.69j</td>
<td>55.62±0.04d</td>
<td>33.9±0.03e</td>
</tr>
<tr>
<td>TCP</td>
<td>402.84±0.00h</td>
<td>1051.89±0.000</td>
<td>234.72±0.000</td>
<td>224.68±2.03j</td>
</tr>
<tr>
<td>TGP</td>
<td>412.34±98.10i</td>
<td>597.63±0.28b</td>
<td>233.68±0.28k</td>
<td>65.24±0.11g</td>
</tr>
<tr>
<td>TTL</td>
<td>2857.55±0.289</td>
<td>3485.6±0.00a</td>
<td>230.82±0.00j</td>
<td>245.50±0.21k</td>
</tr>
</tbody>
</table>

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

Sodium concentration ranged from 348.56 mg/kg (TTL) to 1825.54 mg/kg (KGCF). Significant variation (P<0.05) exists among all the different brands of seasonings being assessed. Magnesium concentration ranged from 12.35 mg/kg (NVGMF) to 234.72 mg/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 4.85 mg/kg (NVGMF) to 245.50 mg/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 concentrations. For instance, sodium plays an essential role in the maintenance of electrolyte, fluid balance, nerve impulse and some organs 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 aids in the normal functioning of the nerves, heart 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 0.4 mg/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 under study 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.

**Acknowledgement**

The authors wish to thank Anal Concept Limited Port Harcourt, Nigeria for providing the laboratory facilities to carry out this research.

**Conflict of Interest**

None.
References


