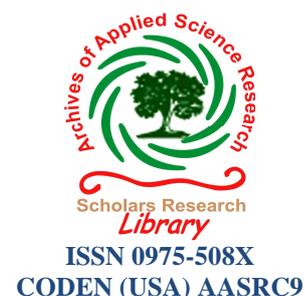




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# Mineral content and sensory evaluation of “Onunu” and “Mgbam”, Traditional diets of the Ikwerre People of Nigeria

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## ABSTRACT

*The mineral contents and sensory properties of “Onunu” and “Mgbam”, traditional diets of the Ikwerre people of Nigeria were evaluated. In this study, both recipes were prepared using the ordinary traditional cooking methods and subsequently analyzed for mineral composition and sensory properties. A wide range of mineral elements in varying concentration were detected in the diets but the most abundant was phosphorus in the diet “Mgbam” (404.25±0.32mg/100g) followed by sodium in “Onunu” (348.00±3.25mg/100g). Values of sodium and iron were significantly higher ( $p<0.05$ ) in “Onunu” but there was no significant difference ( $p>0.05$ ) in the potassium, calcium, manganese, copper, zinc and magnesium contents of both diets. The ratio of Na/k was less than 1 while the ratio of Ca/P was less than 0.5 in “Mgbam”. Sensory evaluation indicated that Mgbam (7.95±0.68) was more acceptable. The present study has shown that both traditional diets have good organoleptic properties and also good sources of the minerals studied.*

**Key words:** Minerals, Sensory properties, Traditional diets, Ikwerre.

## INTRODUCTION

From time immemorial, people have known that they have to eat to survive. They always must have been conscious that certain foods were more desirable than others because of the taste, odour and sense of satisfaction derived when these were eaten [1].

According to FAO [2], traditional foods are those foods which have specific feature or features which distinguishes it clearly from other similar products of the same category in terms of the use of traditional ingredients (materials of primary products) or traditional composition or traditional type of product or processing method. Such foods has been transmitted from generation to generation through oral tradition or other means and its processing methods has remained in line with methods used originally, thereby maintaining the intrinsic (physical, chemical, microbiological and organoleptic) features of such foods.

Mineral deficiencies are a major public health problem in both developed and developing nations of the world, due to their enormous health, social and economic impact [3]. Long-term answers to preventing mineral deficiencies lie in nutrition education, modifying diets and eating habits, food fortification and the sustainable production of micronutrient-rich foods such as traditional foods.

“Onunu” and “Mgbam” are some of such local delicacies which form part of the cultural heritage of the Ikwerre people in Rivers State, Nigeria. “Onunu” is peculiar to both the Ikwerre and Kalabari people and prepared mainly with white yam (*Dioscorea rotundata*) and ripe plantain (*Musa paradisiaca*) while “Mgbam” is a melon-fungus cake peculiar to only the Ikwerre people [4].

Several attempts have been made by individuals and groups to determine the nutrient composition of Nigerian foods/diets. Some include the works of Eka and Edijale [5] and others [1, 3, 4, 6, 7, 8, 9, 10, and 11].

This study therefore aims at determining the mineral content and sensory evaluation of “Onunu” and “Mgbam”. This is to promote the consumption of these diets which are rich naturally in minerals and thus their role in providing food security to the people.

## MATERIALS AND METHODS

The study of “Onunu” and “Mgbam” preparation was carried out in Isiokpo Community in Ikwerre Local Government Area of Rivers State, South-South, Nigeria where they are produced for home consumption.

**Materials:** The ingredients used in the preparation of “Onunu” and “Mgbam” were purchased from local markets in Isiokpo, Ikwerre Local Government Area of Rivers State, South-South, Nigeria.

### Preparation of “Onunu” and “Mgbam”

The preparation of the diets, “Onunu” and “Mgbam” was carried out using the traditional methods as described by Amadi *et al.* [4, 11].

### Preparation of samples for assay

The prepared samples of “Onunu” with stew mixed homogenously and “Mgbam” were dried in an oven (Gallenkamp, size 3, hot box, London, UK) at 70°C for 48 hours. The dried samples were grouped with a hand mill into powdered form and stored in air tight containers at 4°C until required for analyses.

### Mineral Analysis

The samples (1g each) were digested in a mixture of 65% nitric acid (6ml) and 30% hydrogen peroxide (1ml). Phosphorus was determined using a spectrophotometer (Shimadzu UV 106A, Japan) using the ammonium molybdate method [12]. Absorbance values were read at 400nm. Sodium and potassium were determined using a flame photometer (Corning UK Model 403) using NaCl and KCl to prepare the standards. All other minerals were determined using atomic absorption spectrophotometer (Perkin-Elmer model 403, WalK CT, USA).

### Sensory Evaluation

The freshly prepared traditional food samples were subjected to sensory evaluation. 20 different panelists were served a freshly prepared food and provided with questionnaires where they were asked to score (evaluate) the food in terms of appearance, taste, aroma, colour, texture and overall acceptability using a nine-point hedonic scale with 1 being “Dislike extremely” and 9 being “Prefer extremely” as reported by Ibanoglu *et al.* [13].

### Statistical Analysis

Results were presented as means  $\pm$  standard deviation. Student’s t-test as described by Pearson and Hartley [14] and Steel and Torris [15] were used for test of significance between the samples.

## RESULTS AND DISCUSSION

The mineral content and Na/K and Ca/P ratios of “Onunu” and “Mgbam” are presented in Tables 1 and 2 respectively. The result shows that both diets contain appreciable quantities of the mineral elements analyzed. The diet, “Mgbam” showed a significant decrease ( $p < 0.05$ ) in the Na and Fe content when compared to “Onunu”, however, no significant difference ( $p > 0.05$ ) was observed in the K, Ca, Mn, Cu, Zn and Mg content of both diets. Sodium was the most abundant metallic element in both diets and was derived mainly from table salt.

**Table 1: Mineral concentration (mg/100g) of the traditional diets, “Onunu” and “Mgbam”**

Mineral Elements	Diets	
	“Onunu”	“Mgbam”
Na	348.00 $\pm$ 3.25	26.50 $\pm$ 1.20
K	46.00 $\pm$ 2.05	38.06 $\pm$ 1.05
Ca	45.06 $\pm$ 0.10	44.10 $\pm$ 0.12
Mn	0.66 $\pm$ 0.02	0.62 $\pm$ 0.04
Cu	0.26 $\pm$ 0.11	0.23 $\pm$ 0.05
Zn	0.31 $\pm$ 0.20	0.29 $\pm$ 0.19
Fe	0.60 $\pm$ 0.30	0.24 $\pm$ 0.13
Mg	50.12 $\pm$ 0.20	38.06 $\pm$ 0.12
P	57.78 $\pm$ 0.21	404.25 $\pm$ 0.32

*Values are means  $\pm$  SD of triplicate determinations*

The high levels of sodium observed in “Onunu” (348 $\pm$ 3.23mg/100g) may be attributed to the addition of aliquots of table salt during the pounding of boiled yam and ripe plantain to “Onunu” paste on one hand and also the addition of another salt during the preparation of “Onunu” stew and the fish sauce on the other hand. The sodium content of both diets in the present work is considered as normal compared to some Chinese foods which ranged from 230 to 800g/100g [16] and also those of traditional foods consumed in the Arab Gulf States that ranged from 116mg/100g to 4,204mg/100g [17]. The potassium content of “Onunu” (46.00 $\pm$ 2.05mg/100g) increased insignificantly ( $p > 0.05$ ) when compared to “Mgbam” (38.06 $\pm$ 1.05mg/100g). These values were compared to those reported in some Cameroonian household foods which ranged between 197.33mg/100g to 1346.30mg/100g [18] and those of Beniseed soup (cherished in some parts of Nigeria-Cross Rivers State) cooked for 15 to 60 mg/100g [19]. Potassium helps to maintain osmotic pressure and the acid-base balance of the body [20]. The Na/K ratio in the body is of great concern for prevention of high blood pressure and Na/K less than one is recommended [21]. The ratio of Na/K in “Mgbam” was less than one, hence would be considered capable of reducing incidences of high blood pressure.

**Table 2: Na/K and Ca/P ratio on Onunu and Mgbam**

	Diets	
	Onunu	Mgbam
Na/K	7.56	0.69
Ca/P	0.78	0.11

The iron content of “Onunu” ( $0.60 \pm 0.30 \text{mg}/100\text{g}$ ) decreased significantly ( $p < 0.05$ ) compared to “Mgbam” ( $38.06 \pm 0.12 \text{mg}/100\text{g}$ ). These values were much lower compared to those reported by Umoh [1] on some traditional diets of South-Eastern Nigeria that ranged between  $8.34 \text{mg}/100\text{g}$  and  $16.57 \text{mg}/100\text{g}$  and also lower compared to those of sweet potato dishes consumed in Kwara State, Nigeria [22], some regional recipes of Assam, India [23]. Bioavailability of iron is very influenced with the meal content and mostly when it is from plant source [24]. Many authors [25, 26] stated that about 90% of iron taken as foods in developing countries is non-heme. Majority of Nigerians consume more of plant foods because of their economic level. Litter and River [27] further stated that the absorption rate of non-heme iron can be enhanced with intake of vitamin C in foods.

The element phosphorus is normally present as phosphates of the major elements, potassium, magnesium and calcium [30]. The phosphorus content of “Mgbam” ( $404.25 \pm 0.32 \text{mg}/100\text{g}$ ) was significantly ( $p < 0.05$ ) higher than that of “Onunu” ( $57.78 \pm 0.21 \text{mg}/100\text{g}$ ) however both values were higher compared to those reported by Kana Sop *et al.* [18] in Cameroonian dishes and Umeta *et al.* [28] in Ethiopian dishes. The phosphorus content of “Mgbam” is also comparable with the value ( $480 \text{mg}/100\text{g}$ ) reported by Kayode *et al.* [29] for “egusi soup with Oha”.

The Ca/P ratio is another important index used to determine calcium utility [21]. If the Ca/P ratio is low (low calcium, high phosphorus intake), a great amount of calcium may be lost in the urine decreasing the calcium levels in the bones. Food is considered “poor” if the ratio is less than 0.5 while Ca/P above two helps to increase the absorption of calcium in the small intestine. The Ca/P ratio in Mgbam (0.11) is less than 0.5 indicating that the food may be considered a poor source of calcium. Calcium helps in regulating muscle contraction [31].

The sensory evaluation of Onunu and Mgbam are presented in Table 3. The rating by the sensory panel showed that appearance, taste, aroma and colour did not significantly ( $p < 0.05$ ) affect the diets.

**Table 3: Sensory evaluation of Onunu and Mgbam**

	Diets	
	Onunu	Mgbam
Appearance	$8.15 \pm 0.49$	$7.35 \pm 0.67$
Taste	$7.70 \pm 0.80$	$7.90 \pm 0.78$
Aroma	$7.55 \pm 0.82$	$7.80 \pm 1.10$
Texture	$7.85 \pm 0.98$	$7.00 \pm 0.79$
Colour	$7.65 \pm 0.67$	$7.55 \pm 0.76$
Overall acceptability	$7.95 \pm 0.68$	$8.10 \pm 0.64$

*Values are means  $\pm$  SD of 20 panelists*

According to overall acceptance, “Mgbam” ( $8.10 \pm 0.64$ ) was more preferable to the panelists even though the decrease in overall acceptability between “Mgbam” and “Onunu” ( $7.95 \pm 0.68$ ) was not significant ( $p > 0.05$ ). This result agrees with the report of Ibanoglu *et al.* [13] on tarhana,

a Turkish traditional food where commercial tarhana was the most liked (8.20) although no significant difference was found in the overall acceptability between it and others.

In conclusion, the present study have shown that the traditional diets, “Onunu” and “Mgbam” can provide substantial amount of minerals to the normal diets of the Ikwerre people however “Mgbam” was more preferable in the overall acceptability of both diets.

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