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Research Article

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Nutrient loss during traditional *ogi* production

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ABSTRACT

The low nutritive content of ogi is a known major drawback of this cereal based slurry. The aim of the study is to investigate the extent of nutrient loss during traditional production of ogi. The nutritive content of the grains used in its production are not as bad though. Quantitative determination of nutrients contained in the commonly used cereals i.e. maize, sorghum and millet in ogi production in Nigeria was carried out using AOAC methods. The results of the proximate composition were then compared to the proximate composition of the ogi products from the same grain having been produced through the normal traditional method as practised in most parts of Nigeria. The results showed significant loss of the vital nutrients such as carbohydrates, protein, ether extract, crude fibre and ash. This huge loss may be responsible for the well-known poor nutritive quality of ogi. We hereby suggest the fortification of ogi with the nutrient that are lost during ogi production.

Key words: Ogi, maize, sorghum, millet, proximate composition, nutrient loss, nutritive quality.

INTRODUCTION

Ogi is a popular food in Nigeria and in most parts of West Africa [1,2]. It is a fermented cereal porridge made from maize (*Zea mays*), sorghum (*Sorghum vulgare*) or millet (*Pennisetum typoideum*). It is smooth texture is almost as that of a hot blancmange and a sour taste that reminds one of yoghurt .The colour of *ogi* depends on the colour of the cereal used and includes: cream colour for maize *ogi*, reddish-brown colour for sorghum *ogi* [1,3,4,5].

Over the years in different parts of Nigeria, *ogi* has been consumed by both old and young and has been used to wean babies and also as a food of choice for breakfast and for people recovering from one ailment or the other [1,4]. However, despite the nutritional requirements of these groups of people, *ogi* falls short of the necessary level essential nutrients needed to help them at the critical stage they depend on it. Several efforts have been made in the past to improve the protein content of *ogi*, but some of these methods are either too deeply rooted in science or microbiological techniques or too tedious for the average man to undertake.

During *ogi* production, nutrients including proteins and minerals are lost thereby reducing nutritional quality of the product. A number of studies have been carried out to improve the nutritive value of *ogi* over the years. A reduction in protein loss was achieved by using an improved wet-milling technique [1,2] while no nutrient losses occurred during production from high-lysine corn using an improved method [1,6]. The nutritive value of *ogi* was also improved by fortification with amino acids [7] and plant proteins [8].

Okra seed meal has been used to fortify *ogi* [9] while soybeans were used to fortify *ogi* made from germinated sorghum [10]. The use of pawpaw fruit in improving the nutritional value of sorghum-*ogi* has been investigated and they reported significant increase in protein, ash, fat, ascorbic acid, and sugar contents [11]. Sorghum-*ogi* has been fortified with groundnut (*Arachis hypogaea* L.) and reported considerable increase in protein, ash, and fat contents

[12]. Fresh crayfish (*Paranephrops planifrons*) has been used to enhance the nutrient value of sorghum - *ogi* and reported significant improvements in protein and fat contents and an amylograph pasting analysis also indicated improved stability of the *ogi* produced [13]. Also maize-*ogi* has been fortified with pigeon pea (*Cajanus cajan*) and they reported improvement in the protein content of the *ogi* [14].

All the efforts above were undertaken in order to solve the well documented poor nutritive value of *ogi* but a more comprehensive understanding of the problem is required in terms of the extent of nutrient loss quantitatively in order to serve as a proper guide during development of either fortification or production method. Hence, this study was undertaken to investigate the extent of nutrient loss during traditional production of *ogi* and possible give a clue of what to add to fortify if traditional method is going to be used to produce *ogi*.

EXPERIMENTAL SECTION

Samples
Six kilograms (6Kg) each of maize (*Zea mays L*), millet (*Pennisetum typoideum*) and sorghum (*Sorghum vulgare*) were purchased from Ajoke market in Oka Akoko Ondo State, Nigeria. They were all transported to the laboratory in clean well-tied polythene bags for later us. Impurities such as shaft, stones, bad seeds and pieces of wood were meticulously removed.

Preparation of 'ogi' slurry from the cereals
Two kilograms (2Kg) of each of the cereals was weighed and poured into already cleaned plastic containers normally used for such purposes in Nigerian homes. Five litres of water was then added to each container and were allowed to steep for 72 hours. The steeped grains were washed, wet-milled and wet-sieved. The sieved *ogi* was now left to ferment (souring) under room temperature (28 ± 2°C) for 48 hours.

Determination of Proximate Composition
Crude protein, ash, ether extract, moisture and fibre were all evaluated using the procedure of AOAC [15]. Moisture content was determined by transferring known weights of samples into the crucibles and drying at a temperature between 103°-105°C. The dried samples were cooled in desiccators and the weights noted. They were later returned to the oven and the process continued until constant weights were obtained. Protein was determined by multiplying total nitrogen evaluated by standard micro-Kjedahl method by factor 6.26. Ash content was calculated by transferring already ignited samples by placing them over a low flame to char the organic matter with lid removed to crucible which was then placed in muffle furnace at 600°C for 6hrs until it ashed completely. Percentage ash is calculated by using the first and last weights. Crude fat was determined by Soxhlet extraction method while crude fibre by loss in ignition. Carbohydrate was calculated by percentage differences (i.e. % CHO = 100-(sum of the percentages of moisture, ash, fat, protein and crude fibre).

RESULTS AND DISCUSSION

The quality of water used throughout the study in terms of pH, total dissolved solids, total solid and conductivity were within the maximum permissible level (MPL) for human consumption as shown in Table 1 [16].

The proximate composition of the grains used in the study shows that maize was richest in proteins, millet in carbohydrates and sorghum in ash as shown in Table 2. On the other hand, maize has the lowest moisture and ash, millet has the lowest proteins, ether extract and crude fibre and sorghum has the lowest crude fibre and carbohydrates (Table 2). The values are similar to those earlier reported [17]. It shows there is no significant difference between the moisture content of the grains. There is however significant difference in the protein content of maize when compared with millet but not sorghum. There is no significant difference in fat content of the grains. The same is applicable to fibre. However, millet was found to contain significantly higher carbohydrate than the remaining two grains.

Table 1. Chemical composition of water used in the study

Parameters	Values	WHO MPL
pH	6.80	6.5-8.5
Temperature °C	37.50	-
Total dissolved solids (mg/L)	123.33	<1000
Total solids (mg/L)	133.33	<1000
Conductivity (µS)	363	<1000

Proximate composition of the 'ogi' products is presented in Table 3. The 'ogi from maize was rich in ash, millet in moisture and proteins while sorghum in carbohydrates. On the other hand, the 'ogi' from maize has lowest proteins and ether extract, millet has the lowest ether extract, ash and crude fibre while sorghum has the lowest moisture (Table 3). The values obtained were same has previously reported on dry matter basis [18]. It shows how *ogi* production increased the moisture content but caused a reduction in all the other nutrients.

Table 2. Proximate composition of the grains

Parameters	Maize	Millet	Sorghum
Moisture	9.77 ± 0.09^a	10.37 ± 0.09^b	10.23 ± 0.09^b
Protein%	10.53 ± 0.07^c	9.60 ± 0.06^a	10.20 ± 0.06^b
Ether extract(fat)%	3.50 ± 0.06^b	3.07 ± 0.03^a	3.47 ± 0.03^b
Ash%	1.63 ± 0.07^a	2.03 ± 0.03^b	2.73 ± 0.03^c
Crude fibre%	1.87 ± 0.03^b	1.67 ± 0.03^a	1.70 ± 0.06^a
Carbohydrate(By diff)	72.67 ± 0.03^b	73.17 ± 0.03^c	71.67 ± 0.15^a

Values presented as mean ± standard error of mean. Different superscript along a row indicate significant difference at p< 0.05

Table 3. Proximate composition of the 'ogi' products

Nutrients	Maize 'ogi'	Millet 'ogi'	Sorghum 'ogi'
Moisture (%)	55.47 ± 0.32^b	57.73 ± 0.12^c	54.20 ± 0.09^a
Protein (%)	2.57 ± 0.07^a	3.73 ± 0.03^c	2.97 ± 0.03^b
Ether extract (%)	$0.63 \pm 0.03^{a,b}$	0.57 ± 0.03^a	0.80 ± 0.06^b
Ash (%)	1.53 ± 0.03^c	1.23 ± 0.03^a	1.37 ± 0.03^b
Crude fibre (%)	0.67 ± 0.03^b	0.53 ± 0.03^a	0.63 ± 0.03^b
Carbohydrate (by difference)	38.60 ± 0.27^b	36.10 ± 0.10^a	39.90 ± 0.21^c

Values presented as mean ± standard error of mean. Different superscript along a row indicate significant difference at p< 0.05

Table 4. Percentage nutrient loss during traditional 'ogi' production

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Nutrients	Grains			Unfortified 'ogi'			% nutrient loss		
	Sorghum	Millet	Maize	Sorghum	Millet	Maize	Sorghum	Millet	Maize
Protein (%)	10.20	9.60	10.53	2.97	3.73	2.57	70.88	61.14	75.59
Fat (%)	3.47	3.07	3.50	0.8	0.57	0.63	76.94	81.43	82
Ash (%)	2.73	2.03	1.63	1.37	1.23	1.53	49.81	39.40	61.3
Fibre (%)	1.70	1.67	1.87	0.63	0.53	0.67	62.94	68.26	64.17
Carbohydrate (%)	71.67	73.17	72.67	39.90	36.10	38.60	55.67	49.33	53.11

A vivid picture of the extent of nutrient loss suffered by each of the grains after 'ogi' production is presented in Table 4. There was more loss of protein by maize (75.59%) when compared to millet (61.14%) and sorghum (70.88%). Millet (81.43%) and maize (82%) lost more fat than sorghum (76.94%). The loss in ash was not much when compared to either protein or fat with each recording a percentage less than fifty. However, it must be mentioned that maize did retain much of its ash content by losing just 6.13% of it. Loss in fibre is also significant with each grain recording figures above 60%.millet however lost more than maize and sorghum. The loss in carbohydrate was also significant with millet the only grain to lose less than 60%.

These huge losses in nutrients arising from the method employed in producing *ogi* have been a major concern for researchers. This is partly due to the fact that *ogi* has been used in weaning and also to build appetite of patients recovering from ailment. These sets of people are those who need much nutrient as at when they depend on *ogi* but sadly ca not guarantee them adequate supply. It is therefore suggested that better methods of production be developed or fortification of *ogi* with sources rich in nutrients already shown to be low in *ogi* be encouraged.

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