

Nutritional, microbiological and sensory quality assessment of "pito" a home-prepared traditional Nigerian beverage

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ABSTRACT

"Pito" (PT) was prepared using traditional methods with or without enrichment with soybean milk at the ratio of 2:1 (v/v). Assessment of the nutrient content, microbiological assay and acceptability of the home-prepared beverage were made and the nutrient content was enriched with soybean. Similar samples of the beverage were also bought from the vendors and compared with laboratory prepared samples. Nutrient values were evaluated on the vendor as well as enriched samples using standard methods of analysis, while bacterial counts were analyzed using nutrient and MacConkey agar. Sensory evaluation was carried out on the local beverage enriched with soybean milk using a 9 hedonic point scale by 48 panelists. Results of chemical analyses revealed an improved nutrient content in PT enriched with soybean compared with home-prepared and laboratory beverage. The value of protein, fat, and carbohydrate contents of enriched and home prepared beverages were $2.6 \pm 0.4\text{g}$, $10.3 \pm 2.1\text{g}$, $0.3 \pm 0.3\text{g}$ and $1.8 \pm 0.2\text{g}$, 9.0 ± 0.9 , $7.0 \pm 0.9\text{g}/100\text{g}$ sample, respectively. The beverage enriched with soybean milk was also widely accepted. The enriched beverage could be a source of contribution to daily nutrient intake of individuals.

KEY WORDS: home-prepared, non-alcoholic, beverage, *pito*, nutritional, sensory, microbial quality.

INTRODUCTION

Food remains an important requirement for sustenance of life either for plants or animals. The demand therefore, cannot be overemphasized (1). In Nigeria, a wide variety of foods are prepared through indigenous technology from many plant products. They include non-alcoholic beverages such as wine, cocoa drink and fruit juices.

Beverages are food items that are quite different and distinct from other foods. Firstly, they are liquids and are consumed in the liquid state but have lower food values relative to milk and milk products. Secondly, they are consumed either for their thirst quenching properties or for their stimulating effects (2). Beverages may exist as liquid or thin gruel preparations with high water content which supplies the body with water necessary to maintain health (3).

The beverages often consumed include beer, wine, spirits, fruit juices, tea, coffee, cocoa drink, carbonated soft drinks and carbonated water (4). Beverages serve as source of fluid intake by man. It is easier to consume a large volume of beverages than the same volume of water. Artisans, traders, market women, commercial

drivers and children drink home prepared beverages frequently while working under tropical heat to quench thirst (5). The consumption of the beverage is convenient for those who work under tropical heat. The beverage is also affordable, readily available and cheaper than carbonated beverages (6).

Pito is consumed in various parts of Nigeria (7). It is prepared from maize or sorghum or a combination of both. The mixture is soaked for two days and malted by leaving for five days in baskets lined with moistened banana leaves. The malted grains are milled, mixed with water and boiled. The mesh is allowed to cool and is filtered through a fine mash basket. The filtrate is left overnight until it tastes slightly sour. It is then boiled to concentrate it. A starter culture which is a portion of the previous brew is added to the cooled concentrate and left to ferment overnight. The taste of the resulting product varies from sweet to bitter.

However, "pito" that is found in Ibadan is the non-alcoholic one because the maize or sorghum is not allowed to ferment (Fig.1). "Pito" is cheaper and more nutritious than the carbonated beverages. This contributes not only to thirst

quenching but also to daily nutrient intake of the individuals. Enrichment provides the safest way through which the desired nutrient is delivered to the individual using familiar foods as delivery vehicles. Staple foods such as cereal grain products and soybeans are considered appropriate vehicles for enrichment. It is therefore worthwhile to ensure safety of this beverage and its contribution to daily nutrient intake of the individual.

There is paucity of information on nutrient composition, microbial count and safety of consumption of "pito" (non-alcoholic beverage). It is therefore the aim and objective of this work to supply this information.

MATERIALS AND METHODS

The production processes of "pito" are as follows: maize or sorghum or combinations of the two were cleaned. The grains were inspected to remove rotten maize or sorghum. Ginger was then added and the mixture milled into a very fine paste. A fairly large amount of water was added to the paste to form thin slurry which is then sieved through a cheese cloth (7). The slurry is placed in a pot and brought to boil. Caramel and sugar were

added to boiling slurry to taste and the mixture stirred. The drink was cooled, packaged and refrigerated (Fig.1). The beverage was prepared using traditional methods with or without enrichment with soybean milk at the ratio of 2:1(v/v) (Fig.2). The commercially prepared "pito" were bought from selected market in Ibadan e.g. Sango, Ojoo, Bodija, Beere, Oje, while the laboratory prepared beverage was prepared in the Department of Human Nutrition, University of Ibadan following Hazard Analysis Critical Control Points. Equal amounts of maize and sorghum were used. The raw materials were obtained from Bodija market, Ibadan.

Analysis

Nutrient content of the samples were evaluated using the methods of the AOAC (8), bacterial counts were analyzed using nutrient, McConkey and MRS Agar. Sensory quality was determined using a 9 point hedonic scale, where 9=Like very much and 1=Dislike very much. The method described by Larmond (9) was used to calculate Analysis of Variance (ANOVA). Least significant difference (LSD) were used to separate the means and significance judged at $p < 0.05$.

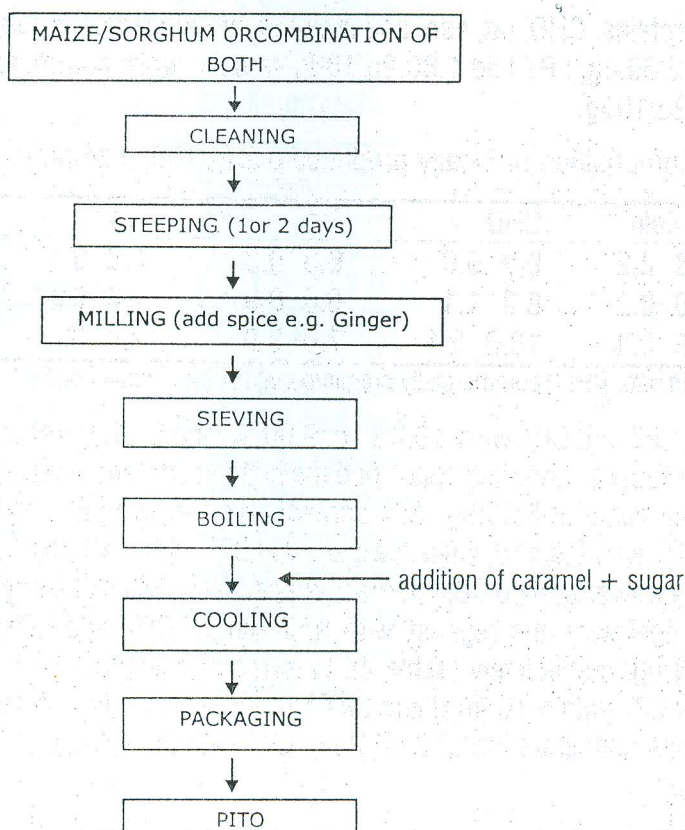


Fig 1: Flow chart in preparation of "pito"

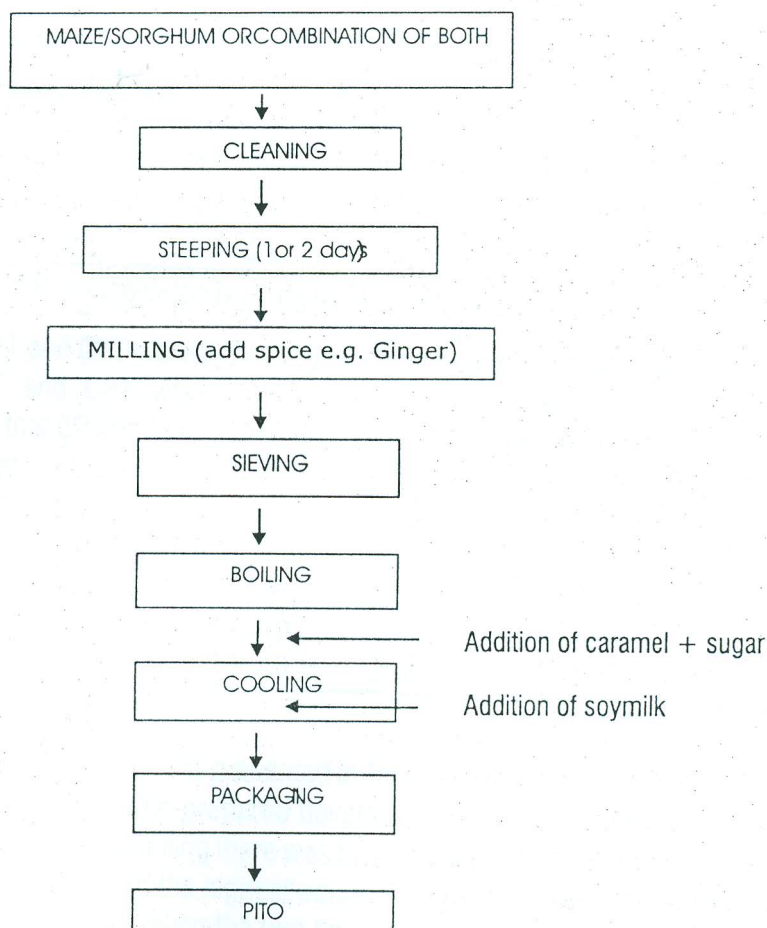


Fig 2: Flow chart in preparation of fortified "pito"

RESULTS

The concentration of proteins, CHO, fat, ash, and moisture are presented in Table 1. EPT had the highest crude protein value of 2.60.4g, LPT had 1.80.2g/100g sample, while commercially prepared "pito" had the least value of 1.60.2g/100g.

Table 1: Proximate composition of locally produced *pito* (g/100g sample)

Beverage	Protein	CHO	Fat	A sh	Moisture
LPT	1.8 0.2	9.0 0.9	6.3 0.3	1.8 0.1	80.3 0.3
CPT	1.6 0.2	8.2 1.1	6.0 0.9	1.4 0.1	80.3 0.3
EPT	2.6 0.4	10.3 2.1	7.0 0.9	2.4 0.4	78.1 0.2

LPT=laboratory prepared *pito*; CPT=commercially prepared *pito*; EPT=enriched *pito*

The CHO value of EPT, LPT and CPT were 10.32.1g, 9.00.9g and 8.21.1g respectively. Fat content of the beverage are shown in Table 1. Enriched "pito" had the highest content of fat 7.00.9g, LPT with 6.30.3g, while CPT had the least value of 6.00.9g. Ash content however, was highest in EPT with the value of 2.40.4g, followed by LPT with 1.80.1g, while the least was CPT with 1.40.1g. The moisture content of CPT and LPT were at the same level with 80.30.3 percent, respectively, while EPT had 78.10.2.

Vitamin C content of EPT was the highest with 0.50.02mg. CPT and LPT had ascorbate value of 0.20.01mg and 0.31.1mg, respectively (Table 2). In terms of calcium, EPT had the highest amount of 6.00.3mg, followed by LPT with 5.10.4mg and CPT had the least value of 4.10.3mg. Similarly, EPT had the highest phosphorous concentration of 2.50.2mg, LPT with the value of 1.30.1mg and CPT had the least value of 1.00.1mg.

Table 2: Mineral and vitamin C composition of pito (mg/100g)

Beverage	Calcium	Phosphorus	Potassium	Copper	Manganese	Vit. C (mg)
LPT	5.1 0.4	1.3 0.1	1.8 0.2	0.3 0.01	1.2 0.1	0.3 1.1
CPT	4.1 0.3	1.0 0.1	1.5 0.1	0.2 0.01	1.0 0.1	0.2 0.01
EPT	6.0 0.3	2.5 0.2	2.0 0.2	0.7 0.01	1.6 0.1	0.5 0.02

LPT=laboratory prepared pito; CPT=commercially prepared pito; EPT=enriched pito

Potassium content of EPT, LPT and CPT were 2.00.2mg, 1.80.2mg and 1.50.1mg respectively. Likewise, copper values of EPT, LPT and CPT were 0.70.01mg, 0.30.01mg and 0.20.01mg respectively. Manganese content revealed that EPT had the highest value of 1.60.1mg, LPT had 1.20.1mg, while CPT had the least value of 1.00.1mg.

Table 3 : Total bacteria counts of LPT and EPT (cfu/ml).

Beverage	Roasting	Milling	Slurry	Sieving	Boiling	Packaging
LPT	1.5×10^5	1.6×10^4	1.6×10^5	1.5×10^4	No growth	No growth
EPT	2.4×10^2	2.6×10^3	2.6×10^4	2.6×10^5	No growth	No growth

LPT=laboratory prepared pito; EPT=enriched pito

The microbial counts obtained in LPT and EPT is presented in Table 3. The Hazard Analysis Critical Control Points (HACCP) was introduced to the home-prepared beverage. The products (LPT and EPT) recorded no growth after boiling the sample. During milling there was bacterial count of LPT (1.6×10^4) and EPT (2.6×10^3) cfu/ml, respectively. EPT sample had the highest counts of 2.6×10^5 , while LPT had 1.5×10^4 cfu/ml during sieving. It was observed that after boiling the two beverages with high temperate, no growth was recorded (Table 3).

Table 4 : Sensory Analysis

Product	Taste	Aroma	Colour	Consistency	Overall acceptability
CPT	3.6	5.5	5.7	4.3	4.8 ^b
EPT	5.3	5.6	6.8	6.0	6.8 ^a

Mean value of forty eight (48) judges scores. Mean for each attribute followed by the same letters are not significantly different by Tukeys test. Higher values indicate greater preference.

The sensory evaluation of the beverage revealed significant differences for taste, aroma, colour, consistency and overall acceptability of the products as shown in Table 4. The overall acceptability showed that majority preferred the drink EPT than the CPT. The enriched "pito" (EPT) had a mean score of 6.8, while commercial "pito" (CPT) had a mean score of 4.8. There was significant difference between CPT and EPT samples ($P < 0.05$).

DISCUSSION

Of all the suggestions of the respondents about the improvement of the beverage, soybean was more popular. It is high protein seed and therefore a potential supplement for malnourished and protein deficient people, including many Nigerians. The

bean is always available. The raw materials used in preparing the beverage especially cereal food, are deficient in protein and their proximate composition has been reported by Inatimi and Gaffa (10). Most (98.1%) of the respondents believed that the beverage can be taken to quench thirst.

The results of this work showed that the nutrient content especially protein had increased from the original value 1.80.2g to 2.60.4g/100g. It showed that the addition of soybeans to the beverage had improved its crude protein content, which will contribute to meeting the daily requirement of protein intake by the body. Food enrichment, according to Shelton (11) is an essential element in nutrition strategies to alleviate protein deficiencies.

Apart from protein, the carbohydrate and lipid content of the beverage had been improved. There were also improvement in the micronutrients such as calcium, phosphorus, and potassium, copper and manganese.

The sensory attributes (taste, aroma, colour, consistency and overall acceptability of the beverage ("pito") revealed that if the beverage was placed on the market, enriched "pito" would be best preferred by the consumers. The bacteria isolates identified in this present study were similar to those reported by earlier workers (12). The presence of *Aspergillus niger* was not surprising as they are common spoilage organisms of carbohydrate foods of many cereals (13).

Comparing the results of laboratory samples monitored along critical control points of processing of the beverage, it was revealed that no pathogenic organisms were recorded. This may be due to hygienic practices introduced during the processing of the beverage. Commercially prepared beverage, especially samples collected from the rural areas, had pathogenic organisms recorded; for example *E.coli*, *klebsiella sp* were in

the finished products offered for sale to the public. This could be due to the unhygienic practices on the part of the producers of the beverage, poor personal hygiene, poor handling and poor source of water for the preparation of the beverage. The presence of microorganisms constitutes a health hazard depending on the type and the number present in food (14). The presence of microorganisms observed in the beverage suggested that the raw materials contained some microbes either right from the source or during handling, and even may be present in the containers used (15).

CONCLUSION

It can be concluded from the results of this study that the home prepared traditional Nigerian beverage ("pito") can be enriched with soybeans. This fortified beverage is safe for consumption. The beverage enriched with soybean had an increase in macronutrient and was also widely accepted. The enriched beverage could be a source of contribution to daily nutrient intake of an individual.

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