



Research Paper

PROXIMATE COMPOSITION AND SENSORY QUALITIES OF POWDERED OGI (FERMENTED MAIZE MEAL) FORTIFIED WITH POWDERED UNFERMENTED LOCUST BEAN SEEDS (PAKIA BIGLOBOSA)

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Abstract

Maize and locust beans were processed into flours mixed in the ratio 90:10, 80:20, 70:30, 60:40 respectively with 100% maize flour as control. The proximate compositions as well as sensory qualities of the flour were evaluated using standard methods. There was gradual increase in the amount of protein present as the level of substitution with soy flour increases. Protein contents obtained were 8.10%, 9.80%, 11.40% and 13.10% for 90:10%, 80:20%, 70:30% and 60:40% substitutions respectively while that of the unsubstituted maize flour was 6.50%. All other nutrients evaluated showed similar trend, except for carbohydrate that decreased as the substitution level increased. For the sensory evaluation test, 100%maize gruel (control) was adjudged to be more acceptable in terms of quality index (taste, aroma, texture, colour and overall acceptability) at $P \leq 0.05$, closely followed by a 10% fortification, suggesting that fortifying *Ogi* with unfermented locust bean has the tendency to provide a cheap source of protein and other nutrients to people in the developing countries in the world.

Key words: Proximate Composition, Sensory qualities, powdered *Ogi*, unfermented locust bean seeds.

INTRODUCTION

Cereal is a staple food of people in the tropics of most Africa countries and some other parts of the world. Cereal belongs to the grass family *graminae* that provides 75% of calories intake. Maize grain accounts for about 15% to 56% of the total daily calories in diets of people in about 25 developing countries particularly Africa and Latin America [1]. Like other cereals, maize is an excellent source of carbohydrate which accounts for about 72% - 73% of the kernel. Maize is processed into various products such as porridges gruels (*uji*, *ogi*, *mawe*, flat breads (*kenkey*) and beverage (*obiolor*, *kwete*, kaffir beer). Many of the traditional foods in Africa are produced from fermented or

germinated maize, which increases the vitamin content, mineral bioavailability and the quality of protein [2].

Ogi is a gruel which is produced from natural fermentation of maize. It is a very important food for weaning infants and convalescing adults in many parts of West Africa [3]. It serves different categories of people in terms of its uses such as weaning food for babies, breakfast cereal for adults, a meal to enhance breakfast milk production for nursing mothers and recovery diet for the sick [4].

Locust beans (*Parkia biglobosa*) are a perennial leguminous plant which is used to make *iru*, a fermented product used as food condiment. Its nutritional potential includes the possession of relatively higher level of methionine, phenylalanine, and valine than other legumes.

Ogi has been observed as one of the malnutrition food among infants [4]. Most of the nutrients contents such as protein and mineral are lost during the processing and led to many research works on the fortification of the gruel to enhance its nutritional value [5,6] One of the strategies to enhance the cereal meal is by supplementation with legumes that are rich in lysine, methionine, threonine and tryptophan. The combination of maize gruel (*Ogi*) with unfermented locust bean seeds is culturally and biologically critical since the nutrient value of *Ogi* will be significantly enhanced by the addition of locust seed as it is a source of protein. Therefore, the aim of this present research work is to produce a cereal based product from maize and unfermented locust bean seeds, and improving the nutritional composition of the *Ogi* through fortification at different substitutional levels

MATERIALS AND METHODS

Source of material:

Disease-free and wholesome maize and unfermented locust bean seeds were purchased from a local market, Sayedero in Ilaro, Ogun State, Nigeria and transported to the laboratories of Department of Food Technology, Federal Polytechnic, Ilaro, Ogun State. Reagents and chemicals used for the research work are of analytical grade.

Sample preparation:

Production of *Ogi*

Ogi was produced using the method described by [7]. Maize grains were soaked in clean portable water for 48hours. The soaked grains were then milled and the slurry was passed through sieves and the suspension obtained was left to stand for one hour for the *Ogi* (slurry) to settle. The supernatant was decanted and the *Ogi* was collected in clean stainless bowl. It was then dried in a cabinet dryer at 100°C for 2 hours. The dried *Ogi* was milling using a milling machine to fine powder.

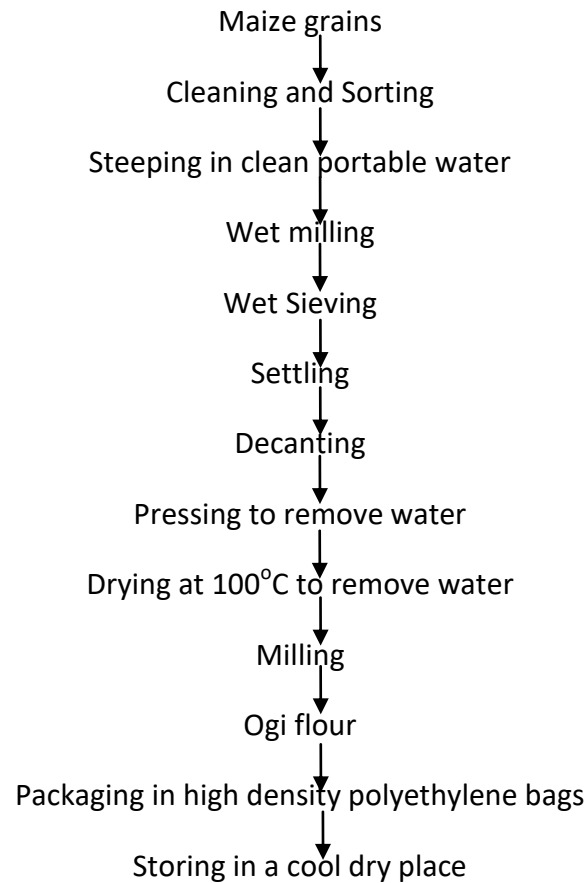


Fig1: Flow chart for the procedure of powdered *Ogi*

Production of unfermented locust bean seed to powder

Raw African locust beans were boiled for 12 hours to soften the firmly attached seed coat, and further soaked in boiling water for another 12 hours. Excess water was drained off and the seeds were dehulled by slightly pounding the seeds with large wooden mortar and pestle. Further removals of the seed coats were achieved by rubbing the cotyledons between the palms of the hand and washing with water. The cotyledons were again soaked in hot water for another 6 hours, the hot water was then drained off and the cotyledons were then over dried at 75°C for 12 hours, milled into powder using a milling machine.

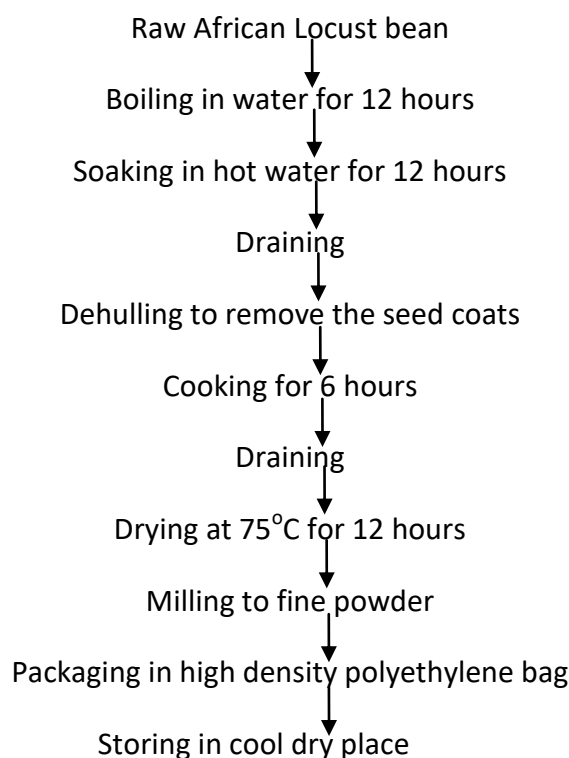


Fig 2: Flow chart for the production of unfermented locust-bean powder

Fortification of *Ogi* powder with unfermented locust bean powder.

Substitutional level of *Ogi* with unfermented locust bean powder were carried as follows:

A= 100% powdered *Ogi* (control)

B= 90% powdered with 10% powdered locust bean

C= 80% powdered *Ogi* with 20% powdered locust bean

D= 70% powdered *Ogi* with 30% powdered locust bean

E= 60% powdered *Ogi* with 40% powdered locust bean

Analysis:

Determination of proximate composition

The proximate compositions of unfortified and fortified *Ogi* samples were carried out using methods of [8]

Sensory evaluation:

Reconstitution of *Ogi* samples

Hot water was used in preparing porridges (paps) from each of the fortified and unfortified samples by stirring in hot water until pastes are formed. The paste (paps) were served to 30 members semi-trained panel, were evaluation was done based on ratings on the bases of taste, aroma, texture, color and overall acceptability: the ratings of the of the samples were done on a 9-point hedonic scale(9=like extremely, 8=like very much,7=like moderately, 6=like slightly, 5=neither like nor dislike, 4=dislike slightly, 3=dislike moderately, 2=dislike very much, 1=dislike. [9]

Statistical Analysis

The data obtained were analyzed using statistical package for social and science (SPSS). All treatment were done on triplicate and the results were subjected to Analysis

of Variance (ANOVA) using software package statistic 9.0 (USA). The significant of difference was evaluated by Duncan's test at $P \leq 0.05$. The results were represented as mean \pm standard deviation [9]

RESULTS AND DISCUSSION

Data on the chemical composition of the samples are represented in Table1 revealed that increasing proportion of mixes with powdered unfermented locust bean resulted in gradual but substitutional increase in the level of protein, increasing from 6.50% in the sample to 13.10% in the sample with 40% level of substitution. I.e. 6.50%, 8.10%, 9.80%, 11.40% and 13.10% of protein were obtained at 0%, 20%, 30%, and 40% substitution with locust bean powdered. The values obtained for carbohydrate contents however showed a reversed trend, decreasing from 66.10% in the unfortified sample to 56.10% in the sample fortified with 40% locust bean flour. The values got in this present work compared favorably with those obtained by earlier studies in which other plant material were used to supplement *Ogi* [10,11]. The carbohydrate content was significantly higher ($P \leq 0.05$) in sample A which is 100% maize flour (66.10%) compared to other samples (fortified samples). These observations may not be unexpected since unfermented locust bean powder has been adjudged to be far richer in protein, fat, crude fiber and ash than maize used for *Ogi* production [12,13]

The moisture content ranged from 9.54% to 10.30% for all the samples under investigation. The moisture observed for five samples is a good indication of their potential to have longer shelf life. This is in agreement with a previous work [14]. It is believed that materials such as flour and starch containing more than 12% moisture content will have less storage stability than those with lower moisture content. The moisture content obtained in this present work is not above acceptable values specified for flours and this must have been due to dehydration process involved during drying operation.

Table1. Proximate composition of powdered *Ogi* fortified with unfermented locust beans at different substitution levels

Samples	Parameters (%)					
	Moisture	CHO	Protein	Ash	Fibre	Fat
A	10.30 \pm 0.02	66.10 \pm 0.01	6.50 \pm 0.01	1.80 \pm 0.02	10.60 \pm 0.04	4.70 \pm 0.01
B	10.11 \pm 0.02	64.00 \pm 0.02	8.10 \pm 0.01	2.04 \pm 0.01	10.67 \pm 0.01	5.08 \pm 0.03
C	9.92 \pm 0.01	61.00 \pm 0.02	9.80 \pm 0.02	2.29 \pm 0.02	10.98 \pm 0.01	6.01 \pm 0.03
D	9.73 \pm 0.02	58.50 \pm 0.01	11.40 \pm 0.01	2.53 \pm 0.01	11.02 \pm 0.02	6.82 \pm 0.03
E	9.54 \pm 0.01	56.10 \pm 0.01	13.10 \pm 0.02	2.78 \pm 0.01	11.06 \pm 0.01	7.42 \pm 0.02

Values are mean \pm standard deviations.

A= 100% powdered *Ogi*,

B= 90:10 powdered *Ogi* - powdered unfermented locust bean,

C= 80:20 powdered *Ogi* - powdered unfermented locust bean,

D= 70:30 powdered *Ogi* - powdered unfermented locust bean,

E= 60:40 powdered *Ogi* - powdered unfermented locust bean

The ash which is the inorganic compound in food varied between 1.80% to 2.78% for all the samples, revealing that the higher the increase in level of substitution the higher the ash content. However, the increase in the level of ash content is an indication of high level of minerals in locust beans. Slight increase was observed in

crude fiber content for the samples. It ranged from 10.60% to 11.06%. This is good for the product because fibers adds bulk and facilitate bowel movement and hence prevent many gastro intestinal diseases in man [15]. Furthermore there was increase in the level of fats, ranging from 4.70% in the unfortified sample to 7.12% in the fortified sample. Locust beans seeds, being a legume are richer in fat content than cereal. [16].

Sensory Evaluation

Table 2 showed the results of the sensory qualities of the paste made from maize-locust bean flour. The mean score of the control paste and those of composite paste (flour) differed significantly ($P \leq 0.05$) in taste, aroma, texture, color and overall acceptability. The taste, aroma, texture, color and overall acceptability ranged between like extremely to dislike extremely. Color is an important sensory attribute of any food because if its influence on acceptability revealing the raw materials used for the preparation. The control had more acceptability in all the sensory attributes evaluated.

Table2. Mean sensory scores of *Ogi* paste prepared from powdered *Ogi* fortified with unfermented locust bean at different substitution level

Samples	Sensory Attributes				Overall Acceptability
	Taste	Aroma	Texture	Color	
A	7.78 ^a	7.22 ^a	8.00 ^a	8.22 ^a	7.67 ^a
B	6.78 ^a	6.00 ^b	6.44 ^{a,b}	6.22 ^{a,b}	6.87 ^a
C	5.67 ^b	5.44 ^c	5.67 ^c	5.33 ^c	5.67 ^{a,b}
D	4.44 ^c	4.22 ^d	4.89 ^c	4.56 ^d	5.22 ^c
E	3.55 ^c	3.22 ^e	3.33 ^d	3.22 ^e	3.67 ^d

A= 100% powdered *Ogi*,

B= 90:10 powdered *Ogi* - powdered unfermented locust bean,

C= 80:20 powdered *Ogi* - powdered unfermented locust bean,

D= 70:30 powdered *Ogi* - powdered unfermented locust bean,

E= 60:40 powdered *Ogi* - powdered unfermented locust bean.

This could be as a result of the familiarity of the product in taste, colour, and aroma. However, this formulation has the tendency to provide the required protein needed to combat protein deficiency in cereal based products, most especially in the rural areas of Nigeria (Bilsbororough *et al.*, 2006).

CONCLUSION

The results of this present study have clearly shown that fortifying *Ogi* with unfermented locust bean is an attempt in obtaining cheap protein source that can combat protein deficiency syndrome in developing countries such as Nigeria. However appropriate coloring and flavoring may be needed to promote consumer acceptability

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