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Full Length Research Paper

Assessment of the quality of ogi made from malted millet

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Ogi, a cereal fermented paste was produced from millet containing different levels (0, 5, 10%) of millet malts. Proximate composition of the ogi samples determined using the AOAC method showed increase in moisture, protein, ash and crude fibre contents with increasing malting levels. The increased protein value is a striking observation that could be advantageously utilized to improve nutrition of infants, and children as well as adults. The study also recorded breakdown of fat and carbohydrate and a reduction in viscosity. Sensory evaluation of the samples was carried out using a semi-trained panel consisting of ogi porridge consumers who where familiar with ogi porridge quality. All the samples produced were rated acceptable when based on a 9 point scale (with 9 = highly acceptable and 1 = highly unacceptable). The malted ogi porridges were preferred to unmalted sample. The problem of bulkiness with ogi from unmalted cereal is hereby addressed since the ogi produced from malted millet is less viscous with high nutrients. This can be used as a top-quality weaning food.

Key words: Assessment, ogi, malted millet.

INTRODUCTION

Ogi porridge is prepared from fermented maize, sorghum or millet paste or cake in West Africa. Ogi is often marketed as a wet cake wrapped in leaves or transparent polythene bags. Gelatinized ogi is called pap and is mainly used as a traditional infant weaning food as well as breakfast meal for many adults. In most parts of Nigeria and Africa, children are fed with mashed adult food or gelatinized cereal flour slurries to complement breastmilk from 4–6 months of age. These slurries absorb a large quantity of water and swell up greatly when mixed either with cold or hot water. The foods are therefore bulky due to the high viscosity. Due to the fact that high bulk reduces food intake by a child often resulting in malnutrition, the development of nutritionally balanced calorie-dense, low dietary bulk and easily digestible weaning foods are being sought for. This involves the use of simple traditional technology as malting and fermentation (Marero et al., 1989). The interest with malting and fermentation techniques lies in their potential to modify the starch content of the cereals so that they do not thicken and would therefore not require dilutions. Other benefits from these processes included the inhibition of growth of pathogens through the fermentation process.

Ogi is an example of traditional fermented food, which has been upgraded to a semi-industrial scale (Achi, 2005). Traditional and industrialized methods for manufacturing ogi have been reported (Banigo et al., 1974). Microbiological and nutritional studies by Akinrele (1970) showed that the lactic acid bacterium *Lactobacillus plantarum,* the aerobic bacteria *Corynebacterium* and *Aerobacter*, the yeasts *Candida mycoderma*, *Sacchyaromyces cervisiae* and *Rhodotorula* and molds *Cephalosporuim, Fusarium, Aspergillus* and *Penicillium* are the major organisms responsible for the fermentation and nutritional improvement of ogi. Odunfa (1985) determined that *L. plantarum* was the predominant organism in the fermentation, responsible for lactic acid production, *Corynebacterium* hydrolyzed corn starch to organic acids while *S. cerevisiae* and *Candida mycoderma* contributed to flavour development.

Attempts have been made to modify the processing of

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ogi to enhance its nutritional qualities. These include the improvement by the Federal Institute of Industrial Research, Oshodi Nigeria (FIIRO) in the manufacture of soy-ogi (Achi, 2005). However, information is lacking on the use of malted millet for nutritional improvement of ogi.

The millets are the staple food in many parts of Africa, Asia, Central America and the Arab countries of the Middle East and serve as the main source of beverage in some other countries (Kent, 1983). The grain is a superior food stuff containing at least 9% protein and a good balance of amino acids. It has more oil than maize and is a high-energy cereal. It has neither the tannins, nor the other compounds that reduce digestibility in sorghum. The result of the assessment of the quality of ogi from malted/fermented millet would be of great value in Nigeria and many countries of the world where most low–income earners frequently consume the food. It would also alleviate the problem of malnutrition and its accompanying results particularly of infant morbidity and mortality.

MATERIALS AND METHOD

Procurement of millet grains

Samples of millet were purchased from five traders in a local market in Makurdi, Nigeria. The grains were dry when purchased and were mixed together before preparation of ogi.

Preparation of dry milled ogi from fermented millet (unmalted)

The procedure as described by Adeyemi (1983) was used with minor modification in choice of cereal grain. The millet grains were washed, steeped/ fermented for 72 h and the water drained. The fermented grains were dried, milled, sieved and packaged as shown in Figure 1.

Preparation of dry milled ogi from malted millet

Millet grain was malted according to the method described by Okoli and Adeyemi (1989). Millet grains were cleaned and weighed then steeped in water at room temperature (30^{o}C) for 18 h. The steeped grains were washed thrice at 6 h intervals to prevent fermentation. After steeping, the grains were spread on a jute bag and covered, watered and left to germinate in a dark cupboard at room temperature for 72h. Germinated grains were dried in the sun. Five percent and 10% malted samples were prepared by mixing malted millet and unmalted samples on 1:19 (w/w) and 1:9 (w/w), respectively. Each of these samples was steeped for 72 h to ferment, after which it was dried in the sun, milled, sieved and packaged.

Physicochemical and proximate analyses of ogi flour

The pH and titratable acidity (% lactic acid) was determined by AOAC (1984) method. Viscosity was determined by the method of Mosha and Svanberg (1983). The moisture content of the samples, ash, crude fibre, fat and protein were all determined using

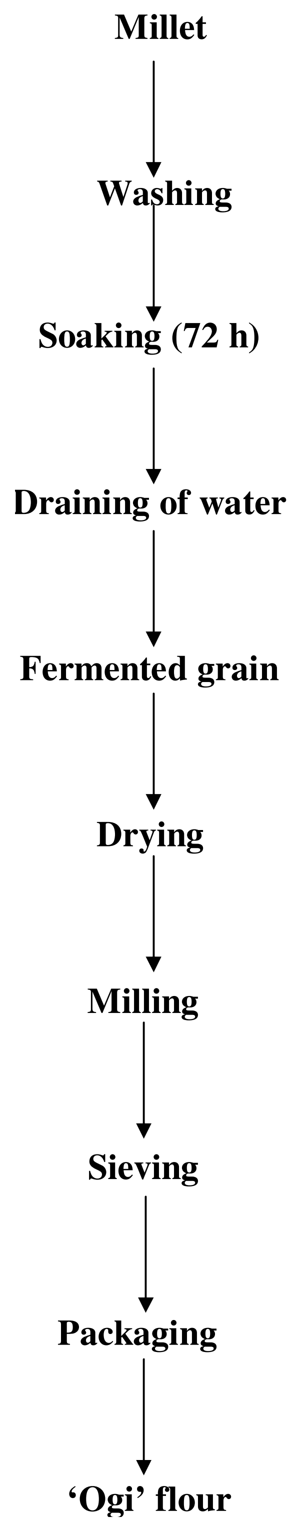

Figure 1. Flow diagram for the production of 'Ogi' made from fermented millet.

AOAC method (1984). Carbohydrate was calculated by difference.

Table 1. Some physicochemical and proximate composition of ogi samples.

	Samples		
Parameters	**0% Malted ogi**	**5% Malted ogi**	**10% Malted ogi**
pH	5.41	5.05	4.81
TTA (%Lactic acid)	0.45	0.65	0.69
Viscosity (cP)	10,360	6,140	5,050
Moisture (%)	8.00	9.00	9.49
Ash (%)	1.10	1.30	1.92
Crude fibre (%)	2.70	3.30	3.90
Protein (%)	13.13	14.25	15.31
Fat (%)	5.15	4.40	4.25
Carbohydrate (%)	69.92	67.75	65.16
Energy (Kcal/100 g)	361.07	350.66	343.81

Sensory evaluation

Twelve-member panel was used to evaluate the ogi porridge. The panel was semi-trained but consisted of ogi porridge consumers who were familiar with ogi porridge quality. Selection was based on interest and availability. The ogi porridge was prepared by mixing 30 g ogi flour dissolved in 15 ml tap water and 9 g sugar with boiling water to gelatinization. It was served hot on randomly coded plates. The panel members were seated in an open well-illuminated laboratory. They rated the ogi's colour/appearance, flavour and consistency on a 9-point scale, where 9 represented like extremely and 1 dislike extremely. Overall acceptability of the samples was also rated on same scale with 9 = highly acceptable and 1 = highly unacceptable. Data for all parameters were reported as means of 12 judgements. Analysis of variance was computed for each sensory attribute.

RESULTS AND DISCUSSION

The pH of the ogi flour decreased with increase in the level of malt (Table 1). Low pH and high titratable acidity (TTA) of the flour are due to organic acids (Akinrele, 1970), and lower pH in foods suggests longer shelf-life. Malted samples had higher TTA than the unmalted sample (Table 1). This increase in acidity in malted samples could also be as a result of hydrolysis of some complex organic molecules. The three main sources of acid in cereals have been identified as lipids, phytin and protein with lipids being hydrolysed to fatty acids, phytin to acid phosphates and proteins to free amino acids. Thus, the increase in acidity accompanying germination could be an indication of extent of hydrolysis of these complex molecules (Adeyemo et al., 1992), and therefore of the digestibility of germinated millet products. The acidity of all samples were within the reported range of 0.11–1.2% (lactic acid basis) for ogi (Adeyemi and Beckley, 1986). Viscosities varied among the samples (Table 1) with 10% malted ogi having lowest viscosity. Some reduction in viscosity could have resulted from starch degradation during germination as well as enzymic hydrolysis of polysacharides on cooking of the porridge. Okoli and Adeyemi (1989) observed similar trend in viscosity of ogi prepared from malted corn. Mosha and Svanberg (1983) reported viscosities ranging from 9,000–16,000 cP at 40°C for four gruels prepared from ungerminated sorghum which is comparable with that for unmalted millet in this study. The percentage moisture increased with increased level of malt (8.00, 9.00 and 9.49, respectively) (Table 1).

It can be deduced that the flour was reasonably dry with the added advantage of longer shelf life. Osagie and Eka (1998) also observed moisture levels of 8.6–12.0% for fermented sprouted millet seeds. A significant decrease in ash content of cereal grains during ogi production has been reported (Oke, 1967). However with malting, there was not much loss in ash as in unmalted ogi during this investigation. This could be attributed to the fact that there is an elaboration of mineral contents in ogi that is made from malted grains. Protein was also observed to increase with increasing malting levels (Table 1), similar to the observation with ogi made form malted corn (Okoli and Adeyemi, 1989). The content and quality of cereal proteins may be improved by fermentation (Cahvan et al., 1988). Also, increase in protein resulting from germination may be due to dry matter loss. It could also be as a result of mobilization of storage nitrogen of millet to produce the nutritionally high quality proteins which the young plant needs for its development as suggested by Tsai et al. (1975). This associated increase in protein may be advantageously utilized to improve nutrition of infants and children, particularly in developing countries like Nigeria where millet is consumed in large quantity by this class of people. The fat content on the other hand was reduced in the malted ogi indicating more breakdown of fat during production. Opoku et al. (1983) suggested that millet grains be germinated for at least 72 h during malt making for the high lipid content to be lowered. This breakdown of lipids occurs in the post germination period (after 18 h) and low lipid levels are known to increase shelf-life. Malting and fermentation also reduce the carbohydrate content (Marero et al., 1989).

All the ogi samples were rated acceptable but unmalted ogi was least preferred in terms of colour / appearance, flavour and consistency. Although the colour / appearance, flavour and consistency of the 10% malted ogi were preferred by the panelists, there was no significant difference (P<0.05) with the 5% malted sample.

In conclusion, Ogi made from malted millet up to 10% malt level is hereby recommended for children of the weaning age and adults alike due to its high quality and acceptability. Ogi flour made by dry milling is also recommended for easy handling, better keeping quality, convenience, faster preparation and its easy and adequate blending during fortification. Dry milling is also preferred because it is more hygienic and retains the nutrients in cereals.

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