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Effect of Firm Ripe Plantain Fruit Flour Addition on the Chemical, Sensory and Microbial Quality of *Fura* Powder

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ABSTRACT

This study was carried out to determine the effect of firm ripe plantain fruit flour addition on the chemical, sensory and microbial quality of *fura* powder. Millet flour was supplemented with plantain flour at substitution levels of 0, 10, 20, 30 and 40 to obtain *fura* powder. The chemical composition, sensory properties and microbial quality were determined using standard methods of analysis. Addition of firm ripe plantain fruit flour significantly ($p < 0.05$) increased vitamin A, vitamin C, potassium, fibre and soluble solids (°Brix) levels of plantain-*fura* with the increasing level of plantain flour substitution. Fat content decreased from 6.0% to 3.0% with increased levels of plantain fruit flour addition. Similar trend was observed in protein content as it decreased from 13.0% to 10.0%. Microbial analysis results during three months of storage showed significant ($p > 0.05$) decrease in the microbial population with the increasing level of plantain flour addition. The results showed that blending of firm ripe plantain flour with millet flour would produce *fura* that is shelf stable, rich in natural anti-oxidant vitamins and safe for consumption.

Keywords: Plantain, millet, fura, powder, grain.

Introduction

Cereals are widely cultivated and consumed crops on a global basis especially in the Northern parts of Nigeria and are the major sources of energy in the diets of the people. Several traditional foods are produced from such cereals; one of such traditional foods is *fura.*

Fura is prepared principally from pearl millet *(Pennisetum glaucum)* grains flour blended with spices and water (Abdul-Fatah *et al.*, 2010). *Fura* is traditionally made in dough form which is reconstituted in water with fermented milk, *nono* or yoghurt and consumed as a beverage, weaning food, refreshing drink, snacks and food for adults and children. *Fura* in its traditional dough form has a limited shelf life of two days, after which it shows cracks on the surface with visible mould growth (Jideani *et al.*, 1995). *Fura* is predominantly starchy, high in fat and a good source of B vitamins. However, *fura* is deficient in protein (though complemented with the addition of *nono*), low in potassium, fibre, vitamin C and vitamin A, a major micronutrient problem among children.

Plantains *(Musa paradisiaca)* are potent sources of micronutrients especially vitamins A and C, potassium and fibre. Over 2.3 million metric tons of plantains are produced in Nigeria annually (FAO, 2009), however, about 35 to 60% post harvest losses was reported and attributed to lack of storage facilities and inappropriate technologies for food processing (Abioye *et al.*, 2011). Adeniyi *et al.* (2006) reported that firm ripe plantains have

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high carbohydrate content, are good sources of vitamins and minerals in addition to being low in fat. USDA (2009) reported that plantains provide a better source of vitamin A than most other staples. Plantains contain low sodium in dietary terms hence recommended for low sodium diets.

The production of food powders is on the increase due to rapid urbanization and globalization. Apart from extending the storage life of foods, powder products are easy to handle in terms of transport and convenience.

Addition of firm ripe plantain flour into *fura* powder could be used to address the problems of micronutrient deficiencies among *fura* consumers. Firm ripe plantain flour could also serve as natural sweetener in *fura*.

The present research therefore aimed at determining the effect of firm ripe plantain fruit flour addition on the proximate, micronutrient improvement, sensory and microbiological quality of *fura* powder.

Materials and Methods

Pearl millet *(Pennisetum glaucum)*, firm ripe plantain fruits and spices (cloves, pepper, ginger) where obtained from Kabba in Kogi State. The Department of Food, Nutrition and Home Sciences, Kogi State University, Anyigba, provided the facilities for this work.

Preparation of plantain flour

The method described by Enwere (1998) was used to prepare the plantain flour. Firm ripe plantain fruits were washed to remove adhering soil particles, peeled and sliced into thin thickness of about 2 mm. 5.25 ml of 2.0% sodium metabisulphite was added to each 500 g weighed chopped pulp and allowed to stand for 20 min and dried in the cabinet dryer at 50^0C for 24 h. The dried plantain slices were milled into flour using a hammer mill and sieved through 250 μm sieve. The flour was packed and sealed in polyethylene bags.

Preparation of millet flour

Two kilograms (2.0kg) of millet was sorted, cleaned and washed with tap water. The grains were drained and dehulled using a local wooden pestle and mortal. The dehulled grains were winnowed, washed and dried in the cabinet dryer at 60^0C for 10 hrs. The dried grains were milled in a hammer mill and sieved through 250 μm sieve. The millet flour was mixed with 3% spices (ginger, cloves and pepper) and packaged in a polyethylene bag.

Preparation of fura powder from blends of millet-plantain flour

Millet flour was supplemented with plantain flour at substitution levels of 0, 10, 20, 30 and 40 for the production of fura powder as described by Igyor *et al.* (2011) shown in Fig 1.

Chemical analysis

The moisture, crude protein, fat, crude fibre and ash contents were determined following the procedure outlined by AOAC (2000), while carbohydrate was calculated by difference (Ihekoronye and Ngoddy, 1985). The soluble solids expressed as ^{o}Brix were determined using a refractometer as described by Akubor (2011). Beta carotene, vitamin C, calcium and potassium contents were determined according to the methods described by Onwuka (2005).

Microbiological analysis

Microbiological analyses were carried out according to the method described by Adegoke (2004). One gram each of *fura* sample was homogenized in 10 ml of sterile peptone water. Dilutions were made by mixing 1.0 ml of the homogenate in 9.0 ml of the sterile peptone water to obtain 10^{-1} dilution. The dilution was then made to 10^{-2}, 10^{-3}, 10^{-4} and 10^{-5}.

Total viable counts of bacteria were determined by enumerating the Colony Forming Units (cfu) by pour plating on nutrient agar plates and cultured at 37^0C for 2 days. Mould and yeast counts were determined by pour plating on acidified potato dextrose agar plates and incubated at room temperature (30 ± 2^0C) for 5 days and total coliform counts were determined by pour plating on MacConkey agar plates and incubated at 37^0C for 2 days. The experiments were carried out in duplicates.

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