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Full Length Research Paper

Effect of storage period on selected functional, chemical stability and sensory properties of bush mango (irvingia Gabonensis) seed flour

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Abstract

The effect of storage period (zero to four weeks) on selected functional, chemical and organoleptic properties of Bush mango popularly called Ogbono (Irvingia gabonensis) seed flour were investigated. Selected functional properties of least gelation concentration, oil absorption capacity, viscosity and parameters such as free fatty acid (FFA), peroxide value (PV) and moisture content were determined prior to and after storage for four weeks. The Ogbono seed flour was used in preparing Ogbono soup. Organoleptic properties of Ogbono soup prepared from the Ogbono seed flour during the storage period were evaluated for taste, drawability thickness and overall acceptability. The results showed that the least gelation property increased from 6% prior to storage to 10% after four weeks of storage indicating that the soup needs more Ogbono seed flour to thicken. Oil absorption capacity was significantly (P<0.05) affected by the storage period as the values decreased from 0.67g/g prior to storage to 0.42g/g after four weeks of storage. The storage period also significantly (P < 0.05) affected the viscosity of the Ogbono soup as the values decreased from 1.50 Pa.s to 0.99 Pa.s after four weeks of storage. There was a significant difference (P<0.05) in the values of free fatty acid which increased from 1.06% prior to storage to 3.87% at the fourth week of storage. The peroxide value also increased significantly (P<0.05) from 2.98 mEq/kg to 13.78 mEq/kg after four weeks of storage. There was a significant decrease in the sensory parameters with storage.

Keywords: Ogbono seed flour, organoleptic properties, functional properties taste, flavour, drawability thickness and overall acceptability.

INTRODUCTION

Bush (wild) mango popularly called Ogbono in Nigeria is a seed of the fruit of plant that grows freely in the tropical rain forest and it is called bush or wild mango (Irvingia gabonensis) (Joseph and Aworh, 1991).

The Ogbono seed is obtained by collecting the bush mango's fruit, split to obtain the kernel or seed and the fresh seed is sun dried, ground to flour and used in the preparation of the popular Ogbono soup or draw soup which impart a unique flavour, drawability and thickening properties to the soup. The Ogbono tree is mostly found scattered naturally in high forest habitat of parts of Africa extending from Senegal to the Sudan and to Angola.

The seed has about 10.6% protein and 54 – 67% fat and hence it is ranked as an oil seed (Oke and Umoh, 1978). Oil seed proteins are gaining increased acceptance as food ingredient world-wide. Studies on the functional potentials of oil seeds such as cotton seed, sun flower, groundnut and fluted pumpkin flours have been carried out by several researchers (Lawhon and Cater, 1971; Mc Watters and Cherry 1977; Giami and Bekebain, 1992; Giami et al., 1994).

Ogbono seed is wildly used in Nigeria as a flavouring ingredient in soups thickness because of its viscous properties. Ogbono seed is very expensive in the Nigerian markets only the middle class and the upper class can buy enough quantity for soup preparation.

In recent times, the Nigeria retail market has deviced small retail packs to meet the need of the lower class

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Table 1. Ogbono Soup Recipe

Ingredient	Weight/measurement
Ground ogbono	38gm
Oil	60ml
Water	700ml
Dry fish	40gm
Onion	10gm
Maggi	3cubes
Pepper	2gm
Salt	To taste

Ogbono consumes by milling the seed into flour and tying them in cellophane bags of 100g sold at very low price of N50. There has been complaint by the consumers of these retail packs about rancid odour and lost of drawability and thickening properties of some of these retail packs.

The objective of this study therefore was the investigation of the effect of storage period on selected functional properties, chemical stability of the seed flour. Also to examine the soup prepared from the ogbono seed flour and to determine the sensory properties of the soup.

MATERIALS AND METHODS

Materials

Ogbono (irvingia gabonensis) seed was purchased from Zarama market in Bayelsa state, Nigeria. Low density cellophane bags of 0.1mm thickness, was purchased from mile one market in Port Harcourt, Nigeria. The materials were transported to the Department of food science and technology, Rivers state university of science and technology Nigeria, for processing.

Preparation of Ogbono seed flour

Two (2)kg of Ogbono seeds was cleaned, sorted and oven dried (50^{o}C, 24h) in a hot-air fan oven (model QUB, 305010G, Gallenkamp, UK), ground using a laboratory mill (Numex Pep Grinding Mill, India and screened through a 0.25mm British standard sieve (Model B5410, Endecotts Ltd, London, UK).

The flour was divided into fifteen lots of 100gms each and was packaged into low density (0.1mm) cellophane bags by tying the bags as practiced locally.

Storage stability studies

The fifteen bags of the tied Ogbono flour were stored at room temperature (28$\pm$ 1^{0}C). Samples were removed at intervals of one week during storage and analyzed for moisture content, free fatty acid content, peroxide value, selected functional properties of (oil absorption least geletion concentration and viscosity) and sensory properties were also evaluated. Moisture was determined according to AOAC (1984) method 14.004. Free fatty acid (FFA) content and peroxide value (PV) were determined using the methods described by Egan et al. (1981).

Selected functional properties

The Ogbono flour samples for functional property were defatted by solvent extraction in a soxhlet apparatus (Tecator Inc.Colorod. U.S.A) for 8h using n-hexane. Oil absorption capacities of the samples were determined according to the procedure outlined by Beuchat (1977), as modified by Giami et al. (1994). The values are expressed as grams of oil absorbed by 1g of Ogbono flour.

The least gelation concentration of the Ogbono flour samples was determined according to the method of Coffman and Garcia (1977) with small modifications. Sample suspensions of 2-20% were prepared in 5ml distilled water. The test tubes containing these suspensions were then heated for 1h in a boiling water bath followed by rapid cooling under cold running tap water. The test-tubes were then further cooled for 2h at 4^{0}C. The least gelation concentration (LGC) was determined as that concentration when the sample from the inverted test tube did not fall or slip (Table 1, Figure 1).

Viscosity of the Ogbono Soup

The viscosity of the Ogbono soups prepared from stored samples from week (0) to week (4) was determined with the aid of a Rotary digital viscometer (NDJ – 85) China using spindle number 3 at 30 rpm.

Two hundred and fifty grams (250g) of the soup was transferred into a 250ml beaker placed on the rotating

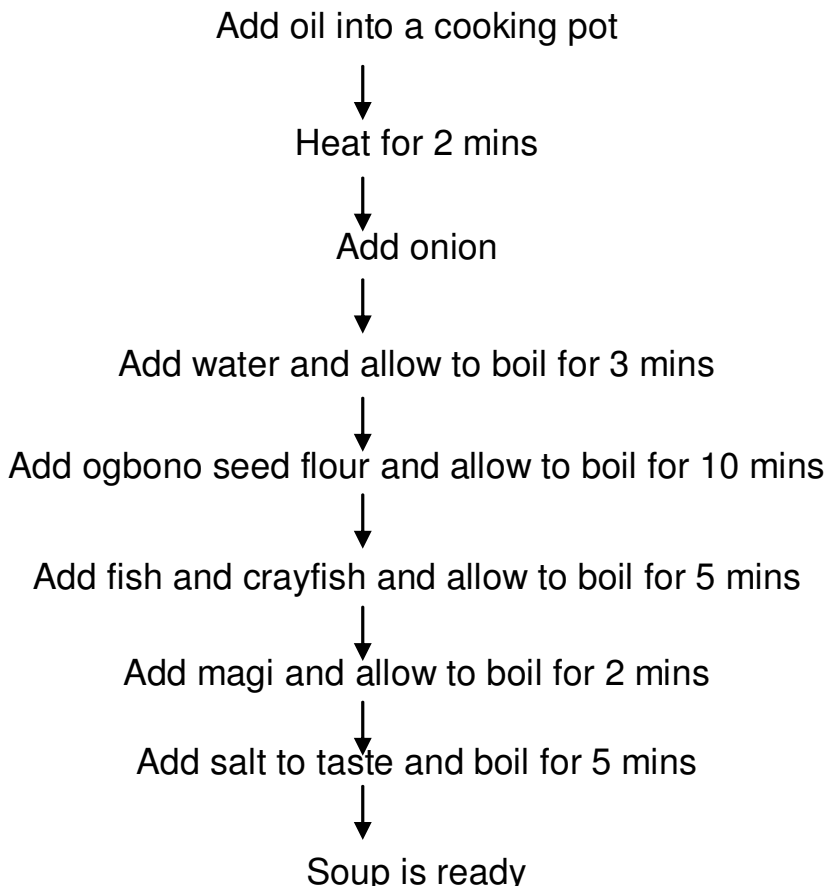

Figure 1. Flow chart for the preparation of Ogbono soup

spindle and the values of the viscosity of the soup displayed on the LCD screen and read in Pa.s.

Sensory evaluation

A 20 – man member panel (semi trained) consisting of staff and students of the Rivers State University of Science and Technology, Port Harcourt, Nigeria was selected based on experience and familiarity with Ogbono soup for sensory evaluation of appearance, color, taste, flavour, drawability, thickness of the soup, and overall acceptability based on a 9-point Hedonic scale (IWe, 2002). The rating of the sample ranged from 1 (dislike extremely through 5 (neither like nor dislike) to 9 (like extremely). The evaluation was done alongside a reference, sample that was not stored.

Statistical analysis

Data were subjected to analysis of variance (ANOVA) significance was accepted at 0.05 level of probability.

RESULTS AND DISCUSSION

The effect of storage period on the functional properties of the Ogbono seed flour are presented in Figure 3. The values obtained showed that the oil absorption capacity of the Ogbono flour decreases with increase in storage period (0.50g/g for week 0 to 0.44 g/g at week 4).

The least gelation concentration for the stored Ogbono seed flour were found to significantly increased from 6.0% at week zero to 10% at week 4. Fleming et al. (1975) stated that protein concentration especially globulin fraction and interactions between proteins, carbohydrate and lipids are responsible for the gelation capacity of legumes and oil seed protein. They further argued that most probably as the storage period increases, hydrolysis set in due to absorption of water and increase the number of hydrophilic group on the proteins thus increasing the gelation capacity of the Ogbono flour. This study showed that as the storage time increases more Ogbono flour will be needed to thicken the soup which will increase the quantity. The Ogbono needed for the soup preparation hence higher cost incurred. The observation above is further confirmed

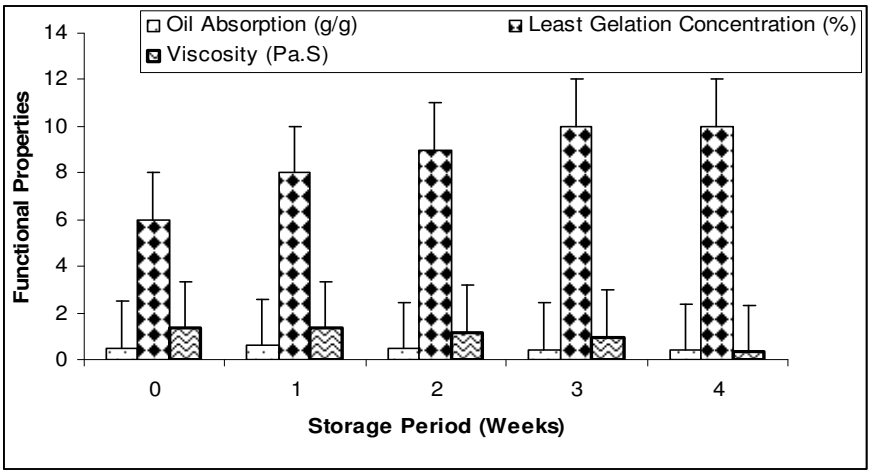

Figure 2. Effect of storage period on functional properties of Ogbono seed flour

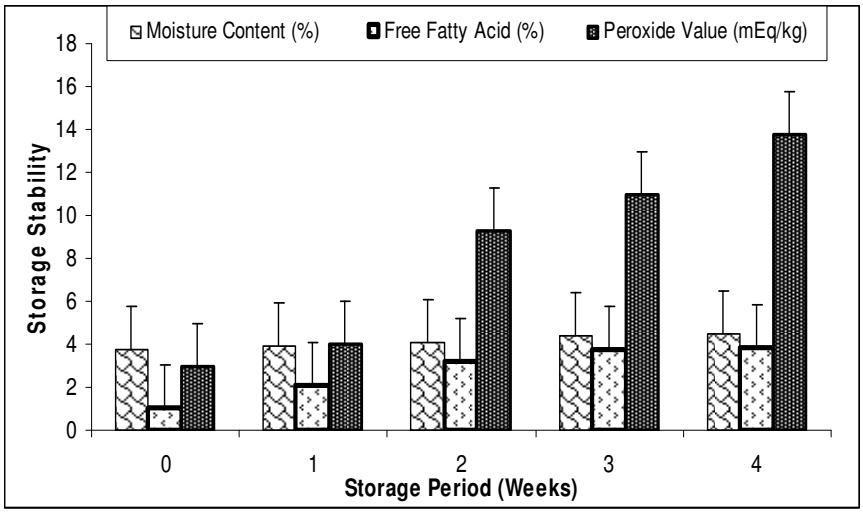

Figure 3. Effect of storage period on chemical stability of Ogbono seed flour

in the result of the viscosity determination of the Ogbono soup prepared from the stored flour. The viscosity values obtained showed that it decreases with increase in the storage time of the Ogbono seed flour (from 1.35 Pa.s at week zero to 0.88 Pa.s at week four). Therefore the least gelation concentration of the stored Ogbono seed flour is inversely proportional to the viscosity of the Ogbono soup prepared as shown in Figure 2.

Storage stability studies

Changes in moisture content, free fatty acid content and peroxide value due to storage of the Ogbono seed flour are presented in Figure 3.

The moisture content, free fatty acid content and peroxide values significantly increased in all samples during storage. The observed increases were in all samples during storage. The observed increased were indicative of hydrolysis of lipids during storage.

Egan et al. (1981) reported that acidity and a rancid taste often begins to be noticeable in foods when free fatty acid content is about 0.5 to 1.5% and peroxide values are about between 20 to 40 meq/kg. Since the freed fatty acid content increased from 1.06(%) at week zero to 4.52% at week four and the peroxide values increased from 2.98 mEq/g at week zero to 13.98 mEq/kg at week four. The values for free fatty acid are above safe limits while the values for peroxides are approaching the unacceptable limits. It can be suggested that the shelf life of the package Ogbono flour cannot be guaranteed beyond the four weeks of storage.

Table 2 shows the effect of storage period on the sensory properties of the Ogbono soup prepared from Ogbono flour. All the sensory properties of the Ogbono

Table 2. The mean Effect of storage period on sensory properties of Ogbono soup prepared from stored Ogbono seed flour

Sensory attributes	Storage period (weeks)				
	0	1	2	3	4
Appearance	1.69[a]	1.68[a]	1.60[b]	1.51[c]	1.47[c]
Color	1.75[a]	1.70[a]	1.64[b]	1.55[c]	1.50[c]
Taste	1.67[a]	1.63[a]	1.50[b]	1.43[c]	1.35[d]
Flavour	1.61[a]	1.53[b]	1.48[b]	1.40[c]	1.38[c]
Drawability	1.78[a]	1.70[a]	1.58[b]	1.51[b]	1.48[b]
Thickness	1.65[a]	1.59[b]	1.53[b]	1.41[c]	1.35[d]
Overall acceptability	1.78[a]	1.73[a]	1.56[b]	1.49[c]	1.34[d]

Means in a row with the same letters are not significantly different ($p \leq 0.05$).

soup were significantly affected as the storage period increases from week zero to week four especially the flavour, taste, drawability, thickness and overall acceptability.

CONCLUSION

As the Ogbono seed flour storage exceed four weeks, free fatty acid and peroxide values increases indicating the occurrence of hydrolysis and rancidity of the lipids. Beyond four weeks of storage organoleptic qualities such as flavour, taste, drawability, thickness and overall acceptability of soup prepared from such flour will be significantly ($P<0.05$) decreased.

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