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An Assessment into Physical and Proximate Analysis of Processed Locust Bean (*Parkia biglobosa*) Preserved with Common Salt

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Abstract: This study was aimed at assessing the effect of salt on the nutritive value and proximate composition of processed Locust bean seeds (*Parkia biglobosa*) which were preserved with salt. In this work, salted and unsalted processed locust bean were subjected to organoleptic and proximate analyses at one week interval of for four consecutive weeks. There was 7.98% reduction in the moisture content of the salted samples after 4 weeks (against 4.86% increase in the unsalted). This shows that salting decreased the moisture content, thus discouraging microbial growth and food spoilage. The carbohydrate content of the salted and unsalted samples decreased alike by 51.51%. The results obtained showed that the salting is a good method of preserving locust bean; as the method retained its physical characteristics.

Key words: Proximate, moisture, *Parkia biglobosa*, organoleptic

INTRODUCTION

The African continent is one of the continents endowed with the richest biodiversity in the world, with an avalanche of many food plants used as herbs, health foods and for therapeutic purposes (Farombi, 2003). One of the problems in processing such plant is the lack of good storage procedures due to lack of technology in this direction. As such, many of the products obtained from such rich plants are wasted and man cannot maximally obtain the total economic, nutritional and therapeutic values of such plants.

Parkia biglobosa is a popular food condiment in Nigeria and other West African countries. It is popularly called "Locust bean" in English and "Iru" in Yoruba language. This plant is a perennial leguminous tree which belongs to the sub-family Mimosoideae and family Leguminosae. It grows in the savannah region of West Africa up to the southern edge of the Sahel zone 13°N (Campbell-platt, 1980). The tree is not normally cultivated but can be seen in population of two or more in the savannah region of West Africa (Hopkins, 1993).

The processing of locust bean involves several stages which include cooking, dehulling, washing, fermentation, salting and refrigerating. Oil seeds such as African locust bean, melon seed, castor oil seed, mesquite bean and soybean are also fermented to give condiments (Omafuvbe *et al.*, 2004). At some stages in the preparation of the seed, fermentation is required to bring out the desired nutritional value and other organoleptic properties such as taste, flavour and texture. Previous studies have shown that fermentation improves the digestibility, nutritive value and flavour of

the raw seeds (Omafuvbe *et al.*, 2004; Odunfa, 1985; Reddy and Pierson, 1999; Barimala and Antai, 1989). The bacterium responsible for the fermentation in *Parkia biglobosa* has been identified to be *Bacillus subtilis* and *Staphylococcus* (Odunfa, 1985). *Bacillus* species were the most predominant species and produced the highest ammoniacal smell characteristic of typical indigenous fermented food condiments. There was a general increase in the microbial population throughout the fermentation period (Ogunshie *et al.*, 2006).

According to Nout (1985) amongst the various factors working against traditional fermented foods is lack of durability (shelf life). Hence, fermentation has to be controlled/stopped after sometime to prevent further microbial growth which can lead to spoilage. This can be achieved by preserving the seed after processing.

Food preservation is the process of treating and handling food to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accelerated by micro-organisms. This is culturally dependent, as what qualifies as food fit for humans in one culture may not qualify in another culture. Preservation usually involves preventing the growth of bacteria, fungi and other micro-organisms, as well as retarding the oxidation of fats which cause rancidity. It also includes processes to inhibit natural ageing and discolouration that can occur during food preparation such as the enzymatic browning reaction in apples after they are cut. Some preservation methods require the food to be sealed after treatment to prevent recontamination with microbes; others, such as drying, allow food to be stored without any special containment

for long periods (Wikipedia, 2010). Common methods of preserving seeds of locust bean include drying, salting, smoking, freeze drying, freezing, vacuum-packing, canning and preserving in syrup.

Salting is the preservation of food with dry salt. It is related to pickling (preparing food with brine, i.e. salty water). It is one of the oldest methods of preserving food and it is used because most bacteria, fungi and other potentially pathogenic organisms cannot survive in a highly salty environment, due to the hypertonic nature of salt. Salting draws moisture from the preserved food through a process of osmosis. As such, any living cell in such an environment will become dehydrated through osmosis and die or become temporarily inactivated (Wikipedia, 2010). Sodium chloride (NaCl), or common salt, is probably the oldest known antimicrobial agent. Antimicrobials are most often used with other preservation techniques, such as refrigeration, in order to inhibit the growth of spoilage and pathogenic microorganisms. Chemical food preservatives are substances which, under certain conditions, either delay the growth of microorganisms without necessarily destroying them or prevent deterioration of quality during manufacture and distribution. The former group includes some natural food constituents which, when added to foods, retard or prevent the growth of microorganisms (Encyclopædia Britannica, 2010).

MATERIALS AND METHODS

Raw locust bean was bought at the local market in Bodija, Ibadan. Standard seasoning salts were bought at supermarket in Ibadan. The locust bean was processed at the Locust Bean Laboratory of the Forestry Research Institute Ibadan, using the traditional method described below.

Raw locust bean was boiled for 8 h and left in the boiled water overnight. Boiling was repeated for another 4 h the next day. Excess water was drained off using a sieve and the seeds were dehulled using a mortar and pestle. To achieve proper dehulling of the seed, the seeds were further rubbed in between the palms. The dehulled shafts were washed off from the cotyledon by the use of sieve and washing with much water. The cotyledons were again cooked for 40 min. The hot water was drained off and the cotyledons were spread in calabash tray, covered and wrapped with jute sacks. This was left in a big cupboard in the laboratory and left to ferment for 2 days.

Processed locust bean was divided into two portions (groups). The first portion was mixed with salt and divided into five containers. This group was labeled Group 1. The second portion was unsalted and divided into five containers. The second group was labeled Group 2 and it serves as the control. The organoleptic

and proximate analyses were determined at one week interval for four consecutive weeks.

Determination of moisture content: 6 g of the sample was weighed into a previously weighed crucible. The crucible plus sample taken was then transferred into the oven set at 100°C to dry to a constant weight for 24 h overnight. At the end of the 24 h, the crucible plus the sample was removed from the oven and transferred to dessicator, cooled for ten minutes and weighed. This was done until constant weight was obtained. The moisture content was calculated as percentage moisture according to the methods of Owoso and Ogunmoyela (2001).

Determination of ash: 10 g of the sample were weighed into a porcelain crucible. This was transferred into the muffle furnace set at 550°C and left for 1 h. About this time it had turned to white Ash. The crucible and its content were cooled to about 100°C in the air, then room temperature in the dessicator and weighed. This was done in duplicate. The percentage ash was then calculated according to the methods of Udo and Ogunwale (1986).

Determination of crude fibre: 2 g of the sample were ground and diluted in 100 ml distilled water in a conical flask. 20 ml of 10% sulphuric acid were added and boiled gently for 30 min. The sample was then cooled and filtered. The filtrate was subjected to treatment using 10% sodium hydroxide. The residue was passed through 20 ml of ethanol and petroleum ether and then dried at 105°C. The sample was weighed and ashed at 100°C for 90 min, cooled and reweighed and the percentage of crude fibre calculated (Owoso *et al.*, 2000).

Determination of Carbohydrate (CHO): 2 g of the samples were collected and dried in the oven at 70°C, ground and defatted. The soluble sugars were extracted with 80% ethanol (v/v) following the methods of Omafuvbe *et al.* (2004). The total soluble sugar was determined by the anthrone reagent method of Morris (1948) and reducing sugar was determined by the calorimetric method (Somogyi, 1945) using standard curve of glucose.

Protein content determination: 20 ml of concentrated sulphuric acid was introduced into the micro-kjeldahl flask containing 2 g of ground sample. Two kjeldahl catalyst tablets were added and digested for 4 h, cool overnight in a fume cupboard and the contents diluted with water to 250 cm. A distillation unit was then used and the percentage nitrogen determined according to the Kjeldahl techniques of the AOAC (1990).

Table 1: Nutritional value and physical characteristics of salted *Parkia biglobosa* for four weeks

	Moisture (%)	Ash (%)	Crude fiber (%)	CHO (%)	Crude protein (%)	Aroma	Taste
Week 1	56.4±0.8	2.90±0.2	4.5±0.8	33.2±0.4	32.7±0.1	Pleasant	Fresh
Week 2	55.7±0.6	2.80±0.1	5.7±0.1	26.0±1.0	31.8±0.6	Pleasant	Fresh
Week 3	55.3±0.2	2.71±0.2	5.5±0.1	20.8±0.3	31.2±0.2	Pleasant	Fresh
Week 4	51.9±4.9	2.70±0.3	4.3±0.2	16.1±0.6	31.1±0.1	Pleasant	Fresh

Values are mean±SD (n = 5)

Table 2: Nutritional value and physical characteristics of unsalted *Parkia biglobosa* for four weeks

	Moisture (%)	Ash (%)	Crude fiber (%)	CHO (%)	Crude protein (%)	Aroma	Taste
Week 1	55.1±0.4	2.9±0.1	4.5±0.2	33.2±0.4	32.7±0.4	Pleasant	Fairly fresh
Week 2	55.4±0.1	3.5±0.2	4.4±0.2	26.0±1.0	32.5±1.0	Pungent	Decay
Week 3	56.1±0.2	3.5±0.1	4.3±0.1	21.8±0.3	32.1±0.5	Offensive	Decay
Week 4	58.2±0.3	3.6±0.1	4.3±0.1	16.1±0.4	32.0±0.3	Offensive	Decay

Values are mean±SD (n = 5)

Determination of organoleptic properties: Salted and the unsalted samples were subjected to organoleptically evaluated by a panel of 20 tasters of 10 males and ten females within the ages of 18 and 30 years. They compared its properties according to the methods of Njoku *et al.* (1991) and Wokoma and Aziagba (2002). Three attributes were assessed, namely colour, aroma and taste.

RESULTS AND DISCUSSION

Results from Table 1 and 2 show that the moisture content of salted iru in group 1 decreases by 7.98% while that of group 2 (unsalted) continued to increase by 4.86% throughout the duration of the experiment. This is a convenient evidence to show that the presence of salt in group 1 helps remove water through osmosis, discourage microbial growth and prevent the spoilage of the locust bean. This is inconsonance with the report of Wikipedia (2010).

The results also showed that salting was able to preserve the physical characteristics of the processed locust bean seeds. This is evident in that the group 1 seeds still maintained the aroma and taste after four weeks, while the unsalted seeds deteriorated fast. As early as the first week, the group 2 seeds started giving obnoxious smell and irritating appearance (See Table 1 and 2). Hence, salting is probably a way out of part of the problem of lack of durability (shelf life) of fermented foods discussed by Nout (1985). The ash content increased in the unsalted sample by 21.4%. This is an evidence of progressive spoilage in the unsalted samples.

The result further shows that the percentage of carbohydrate content significantly decreased by 51.51% in both groups (salted and unsalted) alike. Yabaya (2006) obtained a similar result in a similar work carried out on fermented and raw locust beans. *Bacillus spp* isolated by Oyewole and Odunfa (1990) from locust beans were all said to be proteolytic, lipolytic and amyloytic. Whitaker (1978) reported that at the commencement of the fermentation can be caused by

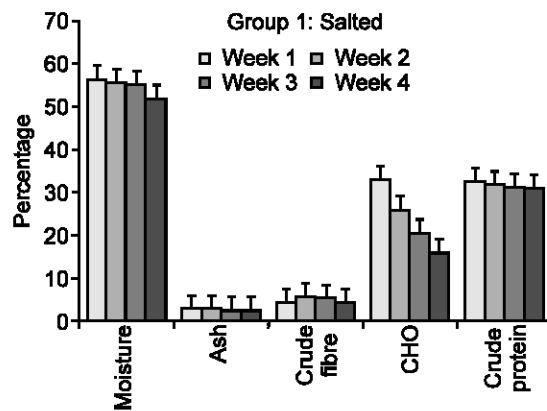


Fig. 1: Result of the proximate analysis of salted *Parkia biglobosa* for four weeks

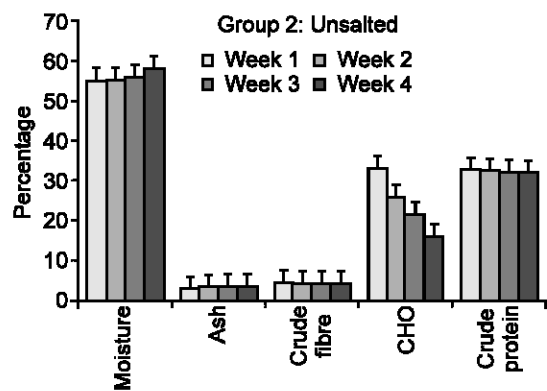


Fig. 2: Result of the proximate analysis of unsalted *Parkia biglobosa* for four weeks

the fermenting microbes which might have started fermentation by hydrolyzing available carbohydrate to acid before embarking on extensive proteolysis. The percentage carbohydrate composition reduced in both groups perhaps due to the continuous hydrolysis of available carbohydrate. Our result shows that salting cannot influence the hydrolysis of the carbohydrate in the fermented locust beans.

The percentage composition of crude protein decreased by 4.8% and 2.2% in groups 1 and 2 respectively. The decrease in protein content is consistent with the findings of Omafuvbe *et al.* (2004). The decrease in protein can be explained by the presence of proteolytic enzyme present in the fermented iru as reported by Oyewole and Odunfa (1990). This enzyme is responsible for the breakdown of protein and the release of ammonia gas.

Salting is one of the oldest traditional methods of preservation of foods. In this work, salting proved efficient in preserving both the physical and proximate characteristics. Although this work shows that salting can preserve locust bean, further works needed to be done on other parameters and methods which can enhance its shelf life.

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