PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 11 (1): 11-13, 2012
ISSN 1680-5194

Effect of Natural Fermentation on the Nutritive Value and Mineral Composition of African Locust Beans

Olakunle Moses Makanjuola and Adebola Ajayi
Department of Food Technology, Federal Polytechnic, P.M.B. 50, Ilaro, Ogun State, Nigeria

Abstract: Effect of natural fermentation on the nutritive value and mineral composition of African Locust beans were investigated in this present paper. The seeds were soaked, boiled, dehulled and fermented naturally for three days. The raw, unfermented (boiled) and fermented seeds were subjected to analysis. There were slight increase in the protein contents of the unfermented (boiled) seeds (32%) and significant increase in the fermented seeds (37.34%). The moisture, fat, crude fibre, ash and carbohydrate contents in unfermented seeds (boiled) were 37.0%, 15.2%, 7.4%, 4.9% and 23.01% respectively as against 42.8%, 24.21%, 5.3%, 3.55% and 17.0% in fermented seeds. Fermentation caused a significant increase in the pH values, with unfermented seeds (boiled) 6.3 and fermented seeds 8.4. However, there was no significant change in the mineral composition during fermentation.

Key words: African locust beans, fermentation, proximate composition, mineral composition

INTRODUCTION

The African Locust bean (*Parkia biglobosa*) called Irugba (Yoruba) is a tree that is widely distributed in Northern Nigeria. It belongs to the legume family, leguminosae. The pods are flat, large, irregular clusters from which the locust bean seeds are obtained (Omafunbe *et al*., 2004). It contains about 14.3% water, 25.4% protein, 1.5% fat, 7.1% fibre, 3.2% fibre and 48.5% carbohydrate. The African locust bean is consumed mainly because the fruit is rich in minerals and provide valuation protein (Odunfa, 1983).

Fermented foods are defined as those foods which have been subjected to the action of micro organisms so that desirable biochemical changes cause significant modification to the food. Fermentation makes the food to be more nutritious, digestible and safer with better flavour. The raw African Locust beans are nutritionally deficient and unpalatable but when fermented into condiment, Iru, the physical, chemical and nutritional characteristics of the seeds changes (Amoa-Awu *et al*., 2005). It is normally used as a soup and flavouring materials in stew and constitutes an essential ingredient in preparation of local soup or stew (Odunfa, 1983). Iru is a cheap source of protein in South Western, Nigeria.

Iru is prepared by boiling African locust beans for 12 h and further soaking the beans in boiling water for another 12 h, preferably overnight. Excess water will be drained off and the seeds dehulled by marching the seeds with the feet in a large wooden mortar. Further removal of the seed coat is achieved by rubbing the cotyledons between the palms of the hand and thereafter washing with water. The cotyledons are then cooked for 6 h, the hot boiled water is drained off and the cotyledons are then spread into calabash trays and covered with wooden trays, wrapped with jute bags and fermented for 3-4 days to produce Iru.

After fermentation, the fermented locust beans has a strongly proteolytic and slightly ammonia like smell. Removing the jute cover from the trays, exposing the fermenting beans to the air, terminates fermentation and Iru is obtained. Iru is preserved by salting. The present study is to monitor the effect of natural fermentation on the nutritive value and mineral composition of African locust beans in order to improve the processing and nutritional values of Iru.

MATERIALS AND METHODS

Collection of samples: The raw African locust bean seeds were purchased from a local market in Ilaro, Ogun State, South West, Nigeria and brought to the department of Food Technology of Federal Polytechnic, Ilaro. The seeds were sorted, soaked, boiled and dehulled. The boiled seeds were divided into two parts.

Fermentation: The dried African locust bean seeds were boiled for 12 h and allowed to soak for another 12 h in the boiled water. The seeds were then dehulled and washed for the removal of the seed coat in order to obtain cotyledons. The cotyledons were further boiled for 6 h before spreading them into calabash trays and covered with wooden trays. Natural fermentation was allowed to proceed after wrapping the covered calabash trays with jute bags. The fermentation lasted for three days to produce Iru.

Corresponding Author: Olakunle Moses Makanjuola, Department of Food Technology, Federal Polytechnic, P.M.B. 50, Ilaro, Ogun State, Nigeria

Table 1: Proximate composition and pH of African locust bean seeds (%)

Chemical components	Raw	Unfermented (boiled)	Fermented
Moisture content	12.76±0.11	37.00±0.20	42.80±0.11
Crude protein	29.00±0.20	32.00±0.11	37.34±0.01
Crude fat	17.70±0.02	15.20±0.12	24.21±0.01
Crude fibre	10.01±0.20	7.40±0.30	5.30±0.02
Ash	5.40±0.03	4.90±0.30	3.55±0.21
Carbohydrate	24.40±0.03	23.01±0.18	17.00±0.12
pH	6.20	6.3	8.4

Analysis of samples

Proximate composition: The moisture, protein, crude fat, ash and carbohydrate contents for the raw, unfermented (boiled) and fermented African locust bean seeds were determined following the methods of The Association of Analytical Chemists Official Method of Analysis (AOAC, 2000).

Mineral determination: Atomic absorption spectrophotometer was used to evaluate the mineral contents. The mineral analyzed includes, Iron, Calcium, Magnesium, Phosphorus and Potassium.

pH determination: The pH of the samples were determined using a pye unicam pH metere (model 290 MK2).

The results are mean of three determinations.

RESULTS AND DISCUSSION

The proximate composition and pH values of raw, unfermented(boiled) and fermented African Locust beans are shown in Table 1. The results obtained showed that the moisture content of raw, unfermented (boiled) and fermented seeds were 12.76%, 37.00% and 42.80% respectively. The moisture content in fermented sample was higher than in both raw and unfermented (boiled) samples. The increase was due to the addition of water used in soaking and boiling prior to fermentation. Omafunbe *et al*. (2004) reported that there was an increase in the moisture content of fermented African Locust beans as a result of boiling in water followed by soaking in water. Crude protein contents of 29.00%, 32.00% and 37.34% were obtained for the raw, unfermented (boiled) and fermented African Locust beans respectively. Fermentation caused an increase in protein content as reflected by the result in Table 1. The crude protein of raw seeds agreed with 30.06% reported by Eka (1979). The increase might be due to the reduction in the crude fibre and carbohydrate occasioned by fermentation. It was also reported by Oboh (2006) that apparent increase was due to microbial proliferation or microorganisms in form of single cell protein. The ash content of raw, unfermented (boiled) and fermented seeds were 5.40%, 4.90% and 3.55%. The values obtained for the raw seeds agreed favourably with 5.1% reported earlier by Eka (1979).

Table 2: Mineral composition of raw, unfermented and fermented of African locust bean seed (mg/100 g)

Minerals	Raw	U	Fermented
Calcium	9.45±0.010	9.30±0.023	9.01±0.020
Potassium	230.00±0.003	210.00±0.026	205.00±0.016
Phosphorus	80.00±0.340	75.00±0.210	73.00±0.320
Magnesium	45.00±0.014	39.00±0.510	35.00±0.410
Iron	3.4±0.0560	3.35±0.040	3.31±0.010

Values are means of triplicate determinations with standard deviations. U = Unfermented (boiled)

Fermentation decreased the ash content due to boiling, soaking in water and dehulling of the bean seeds. Crude fibre content of 11.7% for raw African Locust bean was reported by Omafunbe *et al*. (2004). The report agreed with the value of 10.01% obtained. Fermentation decreased the crude fibre of raw seeds from 10.01% to 5.30% in fermented seeds. That pattern agreed with the observations of Enujiugha (2003). Fermentation also caused an increase in the crude fat as reported by Eka (1979).

As shown in Table 1, the value of carbohydrate decreased with fermentation. The result agreed with the result of Oladunmoye (2007). The reduction might be attributed to the ability of fermenting microfloral to hydrolyze and metabolize carbohydrate as carbon source in order to synthesize cell biomass (Madigan *et al*., 2002).

The pH increased from 6.2 to 8.4 with fermentation. The observed pH trend was reported by Popoola *et al*. (2007) during fermentation of Soybean seeds. Increase in pH during fermentation has been attributed to proteolytic activities and the release of ammonia by microorganisms involved in fermentation. It was also reported that the released ammonia was responsible for the pungent smell that usually accompanied most vegetative protein fermentation.

Table 2 showed the mineral composition of raw, unfermented (boiled) and fermented African Locust bean seeds (mg/100 g). Potassium, Phosphorus and magnesium reduced slightly in all the samples evaluated. Soaking, boiling and dehulling might be responsible for these reductions (leaching in water used for processing). Oladunmoye (2007) reported that during processing, some of the minerals may be leached into the growth medium. The minerals are also used up by microbes as nutrients source during growth. However,

fermentation did not affect calcium and iron contents of the samples due to the insolubility of these minerals in water and hence, could not be easily leached.

Conclusion: The production of Iru offers a means of utilizing African Locust bean seeds as a food, since the locust beans are inedible on their own. Therefore, fermentation of African Locust bean to its condiment is desirable nutritionally as the process increases the nutrients most especially protein.

REFERENCES

Amoa-Awu, W.F., M. Owusu and P. Feglo, 2005. Utilization of unfermented cassava flour for the production for indigenous African fermented Food, Agbelina. World. J. Microbial. Biotechnol., 21: 1201-1207.

AOAC, 2000. Association of Official Analytical Chemists. Official Method of Analysis. 17th Edn., Gaithersburg, USA.

Eka, O.U., 1979. Effect of fermentation on the nutritional status of African Locust beans. Food Chem., 5: 303-308.

Enujiugha, V.N., 2003. Nutrient changes during fermentation of African oil beans (*Pentaclethra macrophylla* Benth) seeds. Pak. J. Nutr., 2: 320-323.

Madigan, T.M., J.M. Martinko and J. Parker, 2002. Brock. Biology of microorganisms, Prentice Hall, 9th Edn., pp: 991.

Oboh, G., 2006. Nutrient enrichment of cassava peels using a mixture of *Saccharomyces cerevisae* and *Lactobacillus* species, solid fermentation. Electronic J. Biochem., 9: 47-50.

Odunfa, S.A., 1983. Biochemical changes during production of ogiri, a fermented melon (*Citrullus vulgaris orchard*) product. Qualities Planetering Plant Food for Human Nutr., 32: 11-18.

Oladunmoye, M.K., 2007. Effect of fermentation on nutrient enrichment of locust beans (*Parkia biglobosa*). Res. J. Microbiol., 2: 185-189.

Omafunbe, B.O., O.S. Falade, B.A. Osuntogun and S.R.A. Adewusi, 2004. Chemical and biochemical change in African locust beans (*Parkia biglobosa*) and melon (*Citrullus vulgaris*) seeds during fermentation to condiments. Pak. J. Nutr., 3: 140-145.

Popoola, T.O.S., A.L. Kolapo and O.R. Afolabi, 2007. Biochemical deterioration of soybean daddawa-a condiment. J. Food Agric. Environ., 5: 67-70.