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The Processing and Preference for Locust Beans Products (*Parka biglobosa*) in Lagos, Nigeria

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Abstract
Dawadawa is an important condiment that is traditionally fermented from locust beans (*Parka biglobasa)*. This study examined its supply sources, marketing channels, and processing in terms of two products viz the sun dried and the salted products. A sensory evaluation was carried out by panelists. This is made up of lecturers, food processors, students of Hotel and Catering Management, housewives, pregnant woman and nursing mother. The hypothesis that salted product was preferred to the sun dried product was accepted. The salted product was recommended by various homes and social gatherings though the sun dried was also accepted by some group.
Keywords: Processing, preference, Parkia products, Lagos Nigeria

INTRODUCTION

Locust bean (Parkia biglobosa) is an economic tree. There are two species of Parkia in Nigeria. These are Parkia biocolor and Parkia biglobosa (Syn.P. Clappertoniana) (Keay et al., 1964). This tree is protected by the peasant farmers and rural dwellers for its many benefits. Its wood is a source of fuel energy. It helps to enrich the soil's nutrient (Fagbemi, 1989, 1994). It is also one of the indigenous species now being used for making pulp. This is an input for paper manufacturing at Jebba Paper Mill, Nigeria (Medu as quoted by Fagbemi, 1994). Oyenuga (1967) highlighted the importance of the species in the livestock industry. All parts of the fruit including the sweet, mealy pulpy pod and the seeds are known to be valuable cattle feed. The tree's most valuable component is its seed. The fermented locust bean seed is an important form of vegetable protein in Nigeria today.

The Yoruba of Southwestern Nigeria call it "Iru" and the Hausas in the North call it "Dawadawa". The locust bean is made up of 39%-47% of protein, 31%-40% oil, 11.7-15.4% of carbohydrate (Campbell-Platt, 1980). It was reported that while the amount of protein and fat increased during fermentation, the carbohydrate level decreases (Eka, 1980).

Dawadawa is the Hausa name for fermented African locust bean Parkia *biglobasa*. It is the most important food condiment in the savanna region of West and Central Africa. This condiment which is the traditional equivalent of bouillon cubes constitutes a significant part of the diet of many West Africans. It is used for flavouring. It is described as a miracle crop and a good source of body building protein. It could help to satisfy the protein deficiency currently experienced in the country. This deficiency is due to the high cost of animal protein which is almost beyond the reach of low socio-economic groups.

However in the savannah zone where Parkia is abundant, there has been a shift in the intensity of food production. There is an extensive clearing of land for arable farming. About 350,000 ha of the country's forest and savannah

lands are deforested every year (Nwoboshi, 1986). The population of Parkia has been affected. The supply of its products has thus declined over the years. There are no Parkia plantations anywhere in Nigeria to date

Objectives

This paper tends to address a general objective of upgrading of the production technology. This is because like other African fermented foods, the production of dawadawa has remained a traditional family art. This is practiced in homes with rudimentary utensil. Consequently, the production of dawadawa has not increased substantially or refined. It's declining popularity, especially among the urban population has led to a rapid increase in the importation of foreign soup flavours. The specific objectives are

-To carry out a nutritional analysis of the components of dawadawa

-To present the amino acid profile of the product

-To compare the vitamin and toxicant content of fermented and unfermented beans

-To present the traditional and modern processing methods of dawadawa

-To assess the acceptability of the different dawadawa products by consumers

Working Hypothesis

Ho: There is no significant difference in preference between the salted and sun-dried products.

Hi: There is a significant difference in preference between the salted and sun-dried products

Literature Review

The locust bean tree is planted mainly because of the value of its fruit. These fruits provide a constant source of reliable nutrient in the dry season (from January to March). The locust bean tree is also used for medicinal purpose and as a source of mouthwash to relieve toothaches (Lawson, 1965).

The processing of locust bean into dawadawa is carried out exclusively by women as specified trade and commercial activity. Hence, dawadawa is almost always a purchased food. The mature pods of the African locust bean tree occur in large bunches. Each pod may vary between 12 and 30cm in length. The mature pod contain a yellow dry powdery pulp *(dorowa hav)* in which a number of dark brown or black seeds are embedded. The seeds are removed from the pod by gently pounding them in a mortar. The pounded pods are then sieved to remove the powdery yellow pulp. This is finally sun dried.

Sources of the Fruits

The P*arkia. Bicolor*, Igba-Odo (Yoruba) or dorowa (Hausa) is found in the forest regions of West African. The fruits are not eaten by humans but they served as food for forest animals. Colobley and Steel (1976) estimated that about 200,00 tons of beans are gathered each year in Northern Nigerian alone. In addition, large quantities are produced in the savanna regions of Kwara and Oyo state in southwestern Nigerian. Each locust bean tree yields about 25 to 52kg of pods from which 6 to 13kg of beans may be obtained about 250,000 tons of locus beans are produced, from which 170,000 tons of dawadawa are made.

The amino acid content of unfermented and fermented dawadawa appears small. The commodity is characterized by decrease in sulfur containing amino acids, and a greater decrease in aspartic and glutamic. Hence, like many dry beans locust beans are low in the sulfur-containing amino acids cysteine, and acid leucine, isoleucine, phenylanine, and tryptophan. The deficiency of dawadawa in some of the essential amino acids detracts from the value of

dawadawa as source of high quality protein. However, dawadawa is not consumed alone, but added to stew and other vegetables as a flavouring or thickening agent. The essential amino acids in the main meal help to complement the low levels in dawadawa.

Table 1: Nutrition Analysis of Dawadawa

Component	Amount
Crude protein (%)	40.0-47.4g
Fat (%)	31.4-42.9g
Carbohydrate (%)	15.0g
Crude fiber (%)	3.1-7.7g
Ash (%)	3.3-5.6g
Calcium (mg/100g)	300.0-880.0g
Iron (mg/roog)	7.0-51.0g
Phosphorus (mg/100g)	517.0-51.0g
Metabolisable energy (kcal/100g)	480.0-5460g
Gross energy (kcal/100g)	5.17.0-618.0g

Source: Campbell-Platt (1980), Faliga *et al.*, (1993).

Table 2: Amino Acids Profile of Unfermented and Fermented Dawadawa

Amino acid	Unfermented	Fermented
Lysine	6.79	6.17
Histidine	3.14	2.54
Arginine	66.58	6.68
Tryptophan	0.83	0.82
Aspartic acid	8.42	3.49
Threonine	2.45	2.48
Serine	3.66	3.89
Ctutamine acid	14.90	10.82
Proline	7.90	7.92
Glyline	3.44	4.66
Alanine	3.79	3.86
Cystine	1.80	1.68
Methionine	0.83	0.58
Isoleucine	3.41	3.62
Leucine	6.22	6.44
Tryrosine	1.98	1.94
Phenylalanine	3.84	3.97

Source: Campbell-Platt (1980), Faliga *et al.*, (1993) . Note: Expressed as g per 16g Nitrogen

Unfermented locust beans contain (up to 49%) amount of carbohydrates. Much of the available reducing sugars and other carbohydrates are utilized by micro organism during fermentation. Unfermented locust beans contain the

raffinose family of oligosaccharides and sources. They are reported to be responsible for flatus production in humans and animals. Fully fermented dawadawa contains very little or low amount of reducing sugars of less than 0.1% glucose, 0.3% fructose and no starch or sources in fermented dawadawa.

Table 3: Changes in oligosaccharides during fermentation of locust beans

Oligosaccharide (mg/g dry weight)			
Ferment time	Source	Raffnose	Stachyose
Unfermented (0 hr)	31.0 ± 4.0	12.0 ± 2.0	28.0 ± 40
Fermented (24 hr)	5.5 ± 0.0	-	5.0 ± 0.8
Fermented (36 hr)	-	-	

Source: Campbell-Platt (1980), Faliga *et al.*, (1993). Note: Mean value with plus or minus standard deviation

Table 4: Vitamin and Toxicant Content of Unfermented and Fermented Dawadawa

	Unfermented	Fermented
Components		
Thiamin (mg/100g)	0.65	1.35
Riboflavin (mg/100)	0.45	1.30
Oxalate (g/100g)	0.21	0.12
Phytic acid p (g/100g)	15.00	7.50

Source: Campbell-Platt (1980), Faliga *et al.*, (1993).

The results reported by Eka et al., Whithy Platt and Leaning et al., showed an increase of up to three fold riboflan content during dawadawa fermentation.

It is generally observed that vitamin C is reduced by heat treatment dawadawa also contains appreciable amount of foliate. Of 24 foodstuff and analysed, dawadawa is the second highest in Foliate content after sweet potatoes. Foliate content in dawadawa ranges from 0.98 to 0.95/µg/g on a dry weight basis. Significant amount of Foliate can be derived from dawadawa to satisfy the adult RDA requirement for Foliate.

Dawadawa contains most of the important materials with the exception of calcium, which is deficient in the diet of many West Africans. The amount of mineral present in dawadawa and other food is adequate to meet the RDA requirement. The microbial load of the condiments showed that the average count of spore formers was between 10-7 to 10-gefµ/g.

Clean, dehulled locust beans are packed into fermentation trays while they are hot. This provides a high initial incubation temperature. This can selectively favour the growth of Bacillus spp and Lactobacillus spp. As it is used the proportion of Lactobacillus spp decreases significantly during fermentation. Starter cultures are not generally used in dawadawa fermentation. The micro organisms are naturally present in the fermented beans. Bacillus subtilis is a common contamination microorganism of ubiquitous distribution, and it may come from the air or the calabash trays on which cooked beans are spread. The Lactobacilli are often naturally present in plant materials. The post fermentation treatment of dawadawa varies with local practice.

The Yoruba of South Western Nigerian add salt to the fermented beans as one method of fermentation treatment. The salted beans are molded into balls that are about 3cm in diameter. Balls of dawadawa are arranged in calabash tray for marketing. The calabash trays are covered with flat raffia tray to keep away flies and other insects. The freshly prepared dawadawa must be sold within 3 days, otherwise comes instead with maggots. Refrigeration is not normally available to the dawadawa producers. A second common post fermentation treatment involves sun drying the dawadawa. Sun drying yields a stable dark brown to black product. The color is from polyhenol oxidation. Dried dawadawa is usually stored in earthenware pots for up to two weeks subsequently pounded and made it into flat cakes. Dried root powder of a shrub (Grewia mollis) may be added to the cakes, presumably as a binder of preservative. The extent of drying varies with the locality and the moist were content may vary between 9 and 19%.
Some of the factors that affect the structure, nutritive value, chemical and physical composition of the seed are:

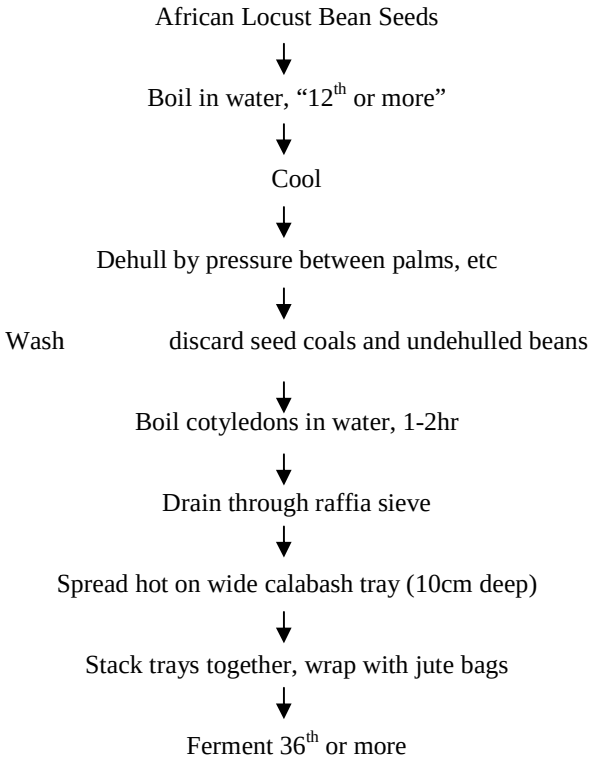
i. Excessively high temperatures of extreme winters are harmful to the pod
ii. High moisture content will lead to mould and fungal growth that can impart a mouldy odour to reduce the beans to sample grade
iii. Certain condition of storage of the pods causes hardening of the hull, there by increasing the time required for the locust bean to soften during cooking

Ingredient for the Improved Production of Dawadawa

500g white locust bean seed
50g wood ash

1 litre boiling water

Flow Sheet for the Preparation of Dawadawa



Traditional Processing

However, production of dawadawa from locust bean is still a traditional family art done by rural women in rather unhygienic conditions with inconsistence in quality. The processing system starts by de hulling the seed coat by boiling it in water for between 8 to 12 hours. The boiled seed is washed and treaded on with bare feet by the processors. This is done along streams, which may not be total clean of impurities. This process generates a lot of foul smelling waste that takes days to evaporate. They claim that water supply situation in the study area are forced them to use this source. A better method is to pound the boiled seed in a mortar. In this case some "clean" sand is added to serve as catalyst in the removal of the testa.

The pounded seeds (testa) are then transferred into a local sieve called (Ajere) which is a calabash with perforations. This is used to further process the testa by washing to obtain clean cotyledon. This latter product is put in cooking pot(s) with adequate water. To this is added a starter-culture (Kuru) that is made from ground seed of Hibiscus sabderriffa (Isapa). The content is boiled a second time until the water dries up.

The processors will then allow the cooked cotyledon are spread ferment for between 24-36 hours. The cotyledon are spread in a real calabash-tray with wood ash rubbed on its inside surface leaves may be used in place of the ash. The calabash is then tightly covered and the whole assemblage is wrapped with thick clothes (Sacks) go generate the necessary heat to complete the process. An average of about 3 ½ days are said to be needed to accomplish all the stages involved.

According to the processors, two products types are obtainable. One, is the soft and marshy form of the beans. This is obtained when "Kuru" is added in the second stage of boiling and then the process is completed. This is called "Iru Pete" or marshed beans and is a paste. Two, is the beans that are not that soft. They are loose and often identifiable and thick to the touch called "Iru-woro". The equipment in use includes pots, calabash, sand, mortar, sacks (clothes) and starter-culture. The processors thus operate under low processing technology.

Results

Table 5 : Analysis of Variance of Preference for Dawadawa Products

Sources of variance	DF	SS	MS	F (VR)
Sample	1	0	0	0
Judges	8	8	1	2
Error	8	4	0.5	
Total	17	12	6	

Table calculated variance ratio = 0

At 5% level 0 < 3.01 (No significant differences)

At 1% level 0 < 4.72 (No significant differences)

The result of the analysis showed that there was no significant difference in the preservation, taste and slightly difference in viscosity of the products. However, the more acceptable flavoured Dawadawa is the salted product

Conclusion

The production of dawadawa offers a method of utilizing locust beans as a food. Otherwise the locust beans are inedible. Dawadawa is generally used as a flavouring agent rather than as a source of dietary protein or calories. It is commonly substituted for food favours in urban areas. This underscores the importance of soup flavor in Nigeria.

In order to increase the acceptability of dawadawa as a flavoring agent and increase its production, it is essential to modernize the production process, preservation treatment and present the product in the market in better forms. With this improvement dawadawa has a great potential as a key protein source and as a flavoring condiment.

The response surface methodology (RSM) was used to determine the optimum combination of two process variables that will produce the more acceptable preservative treatment. The two preservative ways influence the treatment of dawadawa and there was strong interactive effect among the factors. The test had shown the responsibility of preserving locust beans by sundrying and it will retain it flavor, taste and appearance while the fresh and salted treatment which has been inexistence is still more acceptable.

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