



Extraction and proccession of agbono cotyledon for long shelf-life.

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ABSTRACT

This research work is an investigation into how agbono cotyledon extracted from the seed of a specie of the agbono plant (*Irvingia excelsa*) can be processed for long-shelf life. The agbono chaff extracted from agbono cotyledon through solvent extraction using petroleum spirit(60-80)^oC was preserved in desiccators and also in black polyethene bags. The findings showed that agbono cotyledon can be processed and preserved to retain the cherished characteristics (sliminess, taste, aroma, etc) without moulding or fungal growth. The processed agbono was welcomed by the general public. It is recommended that agbono cotyledons be processed by defatting and preserved for food preparations.

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Introduction

“Agbono” a dicotyledonous plant, belongs to irvingiaceae family. It is also known and called by the following names; Bush mango, Bobo, Boboru, Wanini, Andok, Meba, Mueba, Oro, Oba duiker nut, Boborou, Manguer sauvage, Irvingia, Tenuifolia and Irvingia barteri, but the tree that furnished the agbono cotyledon often used as food item is botanically called *Irvingia excelsa* var *gabonensis*. The varieties: *excelsa* and *gabonensis* are differentiated from their fruits with the former having small quite bitter mesocarp, possessing smaller size cotyledons than the latter. *Irvingia excelsa* (botanical name), specie of moist dense, gallery and semi deciduous forest is grown in African and West African countries and bears fruits twice a year between January to Febuary and July to August (Ladipo and Anegebe, 1995). The tree is large reaching 50m high when naturally grown but exceeding 22.5m when grown with the present mechanized pattern of farming, with its bole usually straight, cylindrical and slightly buttressed. The crown is always well developed, dense and much branched. The trunk is cylindrical, only exceptionally exceeding one meter in diameter with a well-developed and maintained support. *Irvingia excelsa*'s leaf is 1.5-1.7cm long, arranged spirally and grouped towards the tips. It is alternate, simple, elliptic and shiny on both surfaces. The wood is hard, heavy and durable. It has a fine grain and takes polish readily. It is resistant to termites.

At the age of 8-10 years, the flowers produced during fruiting are arranged in axillary's recemes, are fragrant, small, greenish and hermaphrodite. They contain disks that becomes bright and yellow during ripening stage (Alston,1992). The fully matured fruit is a greenish yellow drup resembling a small fibrous compressed Indian mango 5-6cm long and 3-4cm broad. *Irvingia excelsa* fruits whether eaten or not are allowed to dry before cracking to release the cotyledon, the uses of agbono include: thickening in soup (Ohochuku, 2005), cake preparations i.e dika gbono chocolate cake (Okafor, 1974), fruit pulp is suitable for fruit jam, fruit juice, and is also eaten raw for its nutrients, good aroma despite its slight bitter taste. The tree finishes good chewing stick, the wood is used as cooking

biomass, constructing and building material and in fibre paper making (FAO, 1983). Agbono is among soup thickeners which embrace those condiments or ingredients used in thickening soup during its preparations and there are different types of them as shown in Table 1 below (Tonye, 2004).

Table 1: Essential characteristics of some soup thickeners.

Botanical Name	Local Name	Drawability	Fat (%)	Protein (%)	Others (%)
Afzelia Africa	Akpalata	43.08 %	-	-	-
Brachystegia	Achi	37.00 %	14.10 %	3.93 %	82.07 %
-	Ofor	32.01 %	16.00 %	2.81 %	49.98 %
<i>Irvingia gabonensis</i>	Ugiri	64.01 %	71.97 %	8.65 %	19.38 %
<i>Irvingia excelsa</i>	Agbono	91.05 %	72.01 %	8.66 %	19.34 %

Research results show that among soup thickeners, agbono cotyledon has the best drawability and has gained wide popularity amongst users of thickeners. Preservation of farm products aids in increasing food sufficiency in times of need. This which avoids food wastage/spoilage, also saves farm products from pest infestation. Through preservation methods (canning/bottling, pasteurization, siloing, salting and coating with sugar, refrigeration/freezing, drying/ dehydration, barns and sheds, bagging and warehousing, etc), seeds are reserved for replanting during next cropping season and also adequate uses of perishable crops are made. It also makes good quality food and products available at any point in time.

Agbono cotyledon has been preserved in so many ways for the purposes of giving it long shelf life, such methods used include: users leave the cotyledon in the seed which is placed near fire place, released when needed. Cotyledons are lost by pest attack or over-drying during this process. Released cotyledons have also been stored in gourds or bottles and stored near fire place. Cotyledons so stored acquire different taste, odour, colour and other things imparted to them by the gourd and smoke from wood fire. Free cotyledons are also spread out to dry in the open and dried to undetermined moisture content

and stored in bags and baskets. In Cameroun, parts of Nigeria and some Francophone countries, cotyledons are powdered, pressed into cakes (Dika cake) and sold for use in food preparations (Ashiru, 1996). In Nigeria, powdered cotyledon is mixed with little red oil and sold.

Drying of cotyledons is essential because in the dried state, it can last for six (6) months (a shelf life common to most dried food items), retaining its characteristic drawability, aroma, colour and taste. Without drying, stored cotyledons become discoloured, and prone to fungal attack and this is a major determinant of quality (Harris, 1996). Once cotyledons are milled (powder), the aforementioned characteristics depreciate very fast to the extent of becoming nil within one month due to the fat content in the warm cotyledons. *Irvingia excelsa* contains 75% fat (a white solid at room temperature), made up of C14:0 (45.5%), C12:0 (38.2%), and very minor quantities of C16:0 (6.6%), C18:0 (0.45%), C18:1 (0.27%) and C18:2 (2.2%) organic acid residue Ohochuku (2005a).

Ohochuku (2005b) reports that soups cooked with the later becomes discoloured, rancid (salty) and develops lumps after few days, as a result of the organic acid residues. The cherished qualities (drawability, aroma, colour and taste) of agbono cotyledon are enhanced by defatting Okafor (1974). From common observation, air, water and sun light are the major contributors to the short shelf life of agbono cotyledons especially when milled. This work intends therefore to remove the fatty content of the cotyledon, to store the defatted chaff in the dried state in a desiccators out of direct sun light, also to seal the defatted chaff in black polyethene bags after pressing off air as much as possible. The chaff stored by the two methods will be tasted for drawability, aroma, taste and colour at chosen time intervals over a long period and for moulding or fungal growth at the end of the period.

Purpose of the Study

The major purpose of this study is to find out how the cherished qualities of agbono cotyledon can be preserved through processing of the cotyledons.

Significance of the Study

The significance of this study is that it will improve the shelf life of agbono cotyledon. The cherished characteristics (drawability, aroma, taste and colour) will also be retained.

Research Hypothesis

The processing of agbono cotyledon by defatting the cotyledons will improve its qualities and give it longer shelf life.

Experiments

Purification of the Extracting Solvent

The petroleum spirit (60-80)°C was distilled in a distillation set-up. The fraction distilling over between 60-80°C was collected and used for extraction.

Cleaning Of Agbono Cotyledons

Purchased four cups of agbono cotyledons from mile three market, were soaked in warm water (40°C, 30mins.), the piles and coats removed, cleaned cotyledons wiped dry with absorbent towel, dried under subdued day light four days (96 hours) and milled into powder with manual grinder.

Extraction using Petroleum Spirit (60-80)°C

350 grams of clean and powdered cotyledons was carefully turned into an extracting thimble. The thimble with its content was dropped into extraction soxhlet (1 litre) and petroleum spirit poured into the soxhlet containing the thimble until its contents have been submerged with the solvent and refluxed into a two litre flask. The set-up was heated on water bath and the liquid in the flask boiled with the vapour condensing into the soxhlet compartment until the liquid and the extracted fat refluxed into

the flask again. The refluxing was allowed to take place for eight times to complete fat removal.

Drying and Sealing.

The defatted agbono chaff in the thimble was spread out to dry (24 hours) under subdued day light, stored in an amber bottle when dried and using sealing machine, polyethene bags (4x4cm) were made from black polyethene sheets. 10 grams of the defatted dried chaff was sealed in each polyethene bag after pressing off as much air as possible.

Preservation using Calcined Calcium Chloride (CaCl).

Dried chaff in a flat plate was stored in working desiccators and stored in a cupboard.

Determination of Defatted Chaff Viscosity (sliminess).

10 grams of defatted agbono chaff from the desiccators stored was stirred into 300 ml of boiling water until a homogeneous mixture was formed. The solution was allowed to cool to room temperature (29°C) and the viscosity determined as follows. 50cm³ of the solution was poured into a ford's cup stoppered with the finger. The stoppered hole was opened for the solution to flow and simultaneously the stop watch was started. The stop watch was stopped immediately the flow of the solution stopped (when the liquid thread first breaks). This was repeated three times and the mean taken. The solution was kept for five days with warming every morning and evening and the viscosity determination carried out every morning on the cooled solution. This same process was also carried out on other packets of preserved defatted agbono chaff, 30, 69, 90, 120, 150, 180, 210, 240, 270, 300, 330 and 360 days from the day of preservation. Each of the polyethene stored samples (10g content) was similarly treated at appropriate intervals.

Examination for Moulding and Fungal Growth

Three stored samples in each case (desiccator and polyethene) were visually examined for black spots which are indicative of moulding and also examined through the microscope for fungal growth and moulding. The samples were further wetted with sterile water and kept for four days in a disinfected covered petridishes after which the samples were examined under microscope.

Results and discussion

Purification of the Extracting Solvent

Distillation of the extracting solvent gave the required fraction of the solvent that distilled between 60-80°C which was for the extraction process.

Cleaning of Agbono Cotyledons

The removal of the taste from the cotyledons gave on milling and drying clean material in place of the brown or dark-tan coloured mass obtained with uncleaned agbono cotyledons. Therefore cleaning of the gives neater material for soup cooking.

Extraction using Petroleum Spirit (60-80)°C

The extraction gave a yellowish coloured solution due to the presence of the agbono wax (fat), which on evaporation of the excess solvent gave a whitish mass of agbono wax. The chaff insoluble in the solvent was recovered from the thimble and air dried to remove all the solvent. Its colour was light buff, as it lacked the odour of the extracting solvent.

Drying and Sealing

The drying of the chaff gave a light solid material. The sealing in amber coloured bottle before storage reduced the action of UV light on the defatted chaff.

Storage by Sealing in Dark 4x4cm Plastic Bags

The light buff coloured chaff with the basic characteristics on drying, gave a more lighter buff coloured chaff.

Storage in Desiccator

Desiccator preserved chaff was lighter, buff coloured and drier with the cherished characteristics.

Viscosity determination: Polyethene stored chaff

The results of the viscosity determination are shown in Table 1. It is observed that the viscosity of the solution from each stored sample generally increased as the solution is stored and depreciated on further storage. This can be explained on the basis of dissolution of more lumps during the solution process in the first day making the solution more slimy. Since the solution is exposed to air and it is known that air and water deteriorate the sliminess, one would expect a decrease in sliminess as the solution is stored, and this is what is observed.

Table 1: Viscosity Determination Values for Polyethene Stored Chaff.

STORAGE TIME (DAYS)	SAMPLE	DAYS					Mean of 5 days measurement
		Mean of each day determination					
		1	2	3	4	5	
30 days	B ₁	13	16	17	20	9	15
60 days	B ₂	9	16	13	26	20	16
90 days	B ₃	22	23	24	20	13	20
130 days	B ₄	21	23	25	22	23	23
150 days	B ₅	20	23	24	26	22	23
180 days	B ₆	23	24	25	26	20	24
243 days	B ₇	22	20	24	26	25	24
270 days	B ₈	22	24	26	27	24	25
300 days	B ₉	20	21	25	24	23	23
330 days	B ₁₀	18	22	25	26	20	22
360 days	B ₁₁	21	23	24	20	19	21

Figure1: Result graph for the Table 1 where average time flow (seconds) is plotted against number of days.

Desiccator Stored Chaff.

The viscosity of the chaff preserved in the desiccator gave a more slimy solution because it was stored with perfect removal of water, and partially avoided day light. The viscosity of the sample increased generally from the second day as the lumps in the solution got dissolved with the depreciation setting in from the fourth day as air, water and day light acted on the sliminess of the solution.

Table 2: Readings for Viscosity Measurement for Desiccator Preserved Chaff.

STORAGE TIME (DAYS)	SAMPLE	DAYS					Mean of 5 days measurement
		Mean of each day determination					
		1	2	3	4	5	
30 days	D ₁	22	20	20	18	19	20
60 days	D ₂	23	24	21	20	18	21
90 days	D ₃	20	21	24	20	18	21
130 days	D ₄	19	23	21	23	19	22
150 days	D ₅	23	25	24	22	21	23
180 days	D ₆	22	24	26	26	20	24
243 days	D ₇	27	29	26	25	20	25
270 days	D ₈	25	27	28	26	24	26
300 days	D ₉	27	28	21	29	19	27
330 days	D ₁₀	21	27	28	26	20	24
360 days	D ₁₁	20	23	25	26	19	23

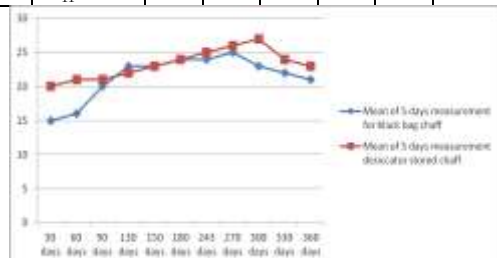


Figure 2: Result graph for the Table 1 where average time flow (seconds) is plotted against number of days.

Moulding and Fungal Growth

Both visual and microscopic examinations showed negative results. The wetted samples kept in petridishes for four days also failed to show any signs of moulding or fungal growth. These results showed that the storage processes were efficient and adequate and that the samples were safe for consumption.

Conclusion

The work showed that agbono cotyledons can be processed for long shelf life by defatting and storing the chaff in dry condition and out of direct sunlight. The processed cotyledon stored for more than eleven months still retaining all the essential cherished characteristics and without moulding or fungal growth. The desiccators stored chaff though gave more consistent viscosities showing better storage, this desiccators is not within reach of the common man. Packing the desiccators dried sample in polyethene bags will make for easier making of the processed product.

Recommendations

It is recommended that agbono cotyledons be defatted before use in soup preparations since such soups retains its cherished qualities for a longer time. Defatting agbono by solvent extraction is a simple process which can be commercialized for the production of agbono chaff as cubes, tablets or powders, processed for long shelf life. This will boost the agbono trade.

It is recommended here that n-hexane be used as extracting solvent for the extraction of agbono chaff from agbono cotyledons, since the chaff will be used for food. More extracting methods such as decantation should be used for this singular course because in a laboratory where there is no soxhlet extracting set-up, other methods becomes the alternative.

In the bid to frontier knowledge in this course, other natural food products i.i melon be used in place of agbono cotyledons to find out if their shelf-life can be preserved.

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