Comparism Of The Quality Parameters Of The Seed And Condiment Oil Of *Adansonia Digitata*

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Abstracts: The oil quality parameters of the seed and condiment oil of *Adansonia digitata* were evaluated. The Iodine value, Peroxide value, Saponification value and percentage Free Fatty Acid (FFA) were 98.07g/100g, 1.4mEq/Kg, 122.60mg/g and 0.21% respectively for seed oil and 71.06g/100g, 10.20mEq/Kg, 142.80mg/g and 6.37% respectively for the condiment oil. The variation in the parameters from seed oil to condiment oil observed include increased in peroxide value, FFA and Saponification value and decreased in Iodine value. The changes have been interpreted to be due to some structural changes in the Triglyceride leading to the formation of new chemical properties and products. The Infra Red (IR) spectra have also given an identification of Rancidity of the condiment oil due to bands observed at 3400- 2700 and 1705 cm^{-1} indicating the possible formation or absence of acid and aldehyde respectively; which are products of oxidative Rancidity.

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1. Introduction

Adansonia digitata (baobab) is a tree found in the savanna areas of Africa and Asia. In Nigeria it is found in the northern part of the country. The leaves are the major ingredient for a variety of food preparations. The pulp is also used for cooling drinks, used as an appetizer for seasoning food or curdling milk, used as a coagulant of rubber, and as a fumigant for domestic animals (Nkafamiya, 2007). The leaves, pulp and seed are used in traditional medicine for the treatment of kidney diseases, dysentery and fever, the bark of the tree is used as a substitute for quinine bark in the treatment of malaria fever. The ashes made from the seeds are rich in potash and phosphate and are used as fertilizers. The outer part of the bark is used for making packing materials and the spongy wood for making wide canoes **(**Otto, 1989**)**.

The seed oil content is about 33% of the seed bulb which consist of oleic, and linoleic acids as the major fatty acid constitute and other fatty and non fatty substances (Theodore, 1989). The high content of the linoleic and oleic acids helps in softening skin, restore and moisturize the epidermis and helps in regenerating epithelial tissues which gave the seed oil a very good carrier and useful in the cosmetic industry (Theodore, 1989).

2. Material and Methods

Sample Collection and Preparation

The seed sample of *Adansonia digitata* was obtained from Bayara village in Bauchi State, Nigeria on the 1st January, 2010. The seed coat was stone-cracked in order to collect the seeds and then crushed into powder subsequently referred to as powdered sample and was kept for condiment preparation.

Condiment Preparation

The powdered sample was made into a thick paste by mixing it in a beaker with water (100g powdered sample in 10ml of water). The resulting solution was covered with aluminium at normal room temperature and pressure for five (5) days. And was then dried at room temperature and crushed into powder subsequently referred to as condiment sample.

Oil Content Determination

The condiment sample (100g) was defatted exhaustively with petroleum ether (60- 80^{OC}) in a soxhlet apparatus and concentrated in-vacuo to produce a dark brown mass (50g). The marc was then left in the fume cardboard for about twelve hours in order to remove any spill over petroleum ether and the percentage extract recovery expressed as the weight of oil (g) divided by the weight of sample on dry mass and the resultant multiplied by one hundred percent.

***Moisture Content* Determination**

An evaporating dish was heated to a constant weight in an oven at 105^0C and its constant weight noted. 3g of the powered drug was accurately weighed into the dish. The dish with its content was then put in the oven at 105^0C and the content dried to a constant weight at 30 minutes interval after the initial drying of one hour. Two consecutive same weights confirm a constant weight. The total loss in weight (weight of the moisture) was determined by subtracting the constant weight of the dish and powered drug after heating from the weight of the dish and its content before heating. The percentage of the moisture contents with reference to the initial weight of the powered drug was then calculated.

This was achieved by dividing the weight of the moisture by the weight of the drug (condiment & oil) taken and multiplied by a hundred. Three different determinations were carried out and the average of the three gives the moisture content of the drug (Evans, 1996).

Iodine Value (IV) Determination

The method described by Marshall (2005) was adopted**.** Oil sample (0.5g) was placed in a 250ml conical flask and 10ml of anhydrous chloroform was added. This was followed by 30ml of Hanus solution and the flask was Stoppard and allowed to stand in the drawer for 30 minutes after which Potassium iodide (10ml 0f 15% v/v) was added to the content of the flask so as to wash down any iodine that might be present on the Stoppard. The resulting solution was titrated with sodium thiosulphate solution (0.14M) until the light yellow color formed disappeared. The determination for the blank was conducted in the same manner but without the oil. The iodine value was calculated as:

IV = (B - S) × M × 12.69/ sample weight (g). {Where: M = molarity of sodium thiosulphate (0.14M), 12.69 = conversion factor from Meq. Sodium thiosulphate to gram iodine, B = blank titre value, S (ml) = sample titre value}

Peroxide Value (PV) Determination

The method described by Nkafamiya et al (2007) was adopted. The oil (5g) was placed in 30ml glacial acetic acid: chloroform (3:2 v/v %) and saturated solution of potassium iodide (0.5ml) was added to liberate iodine by reacting with the peroxide. The resulting solution was titrated against sodium thiosulphate (0.01M) using starch solution (1%) as indicator, until the yellow color just disappeared. The peroxide value was calculated as follows:

PV (meq/Kg) = (S-B) × M× 1000/ sample weight (g). {Where: B = blank titre value, S (ml) = sample titre value M = molarity of sodium thiosulphate solution (0.01M)}.

Percentage Free Fatty Acid (%FFA) Determination

Nkafamiya et al (2007) procedure was used. Oil sample (2 g) was weighed into a 250 ml conical flask and 10ml of ethanol (95%) was added, the resulting mixture was titrated with sodium hydroxide (0.1 M) using phenolphthalein as indicator. The titration was done with constant shaking until a pink color persisted for 30 seconds. The %FFA was then calculated from the following equation:

%FFA = V × M × 2.82 mg/sample weight (g). {Where V (ml) = volume of sodium hydroxide solution used M = molarity of sodium hydroxide solution used, 2.82 = conversion factor for oleic acid}.

The acid value AV = % FFA × 1.99

Saponification Value (SV) Determination

The method described by Nkafamiya et al (2007) was used. The Oil sample (2 g) was added to alcoholic potassium hydroxide (4g of KOH dissolved in 100 ml of ethanol); the resulting solution was heated at 60^{o}c with constant stirring for two minutes to saponify the oil. The unreacted KOH was back titrated with HCl (1 M) using phenolphthalein as indicator. The titration took place until the solution turned pink. The Saponification value was then calculated as follows:

SV = (B-S) × M× 56.1/sample weight (g). {Where B = blank titre value, S (ml) = sample titre value M = molarity of HCl (0.1 M) and 56.1 = molecular weight of potassium hydroxide}.

PHYSICAL AND PHYSICOCHEMICAL PARAMETERS DETERMINATION

The physical parameters used include: colour, odour and specific gravity. The specific gravity is given by: weight of oil sample divided by weight of equal volume of water. Infrared (IR) analysis was performed on the oil samples and the absorption bands (cm^{-1}) showing the functional groups present in the oil was collected from the spectra.

Preparation of Reagents

All reagents used were of technical grade.
Preparation of Hanus solution

The method described by (Marshall, 1975) was adopted. Iodine crystal (3.3 g) was dissolved in small quantity of glacial acetic acid (about 10 ml) and the volume was made up to 250 ml in a volumetric flask with glacial acetic acid. The solution was then stored in brown Stoppard bottle.

Preparation of starch solution

Starch powder (1 g) was dissolved in 100 ml of distilled water, and the mixture agitated to ensure complete dissolution.

3. Results

Oil Extraction and Physical Parameters

Adansonia digitata seed oil and condiment oil were extracted by hot solvent extraction method using petroleum ether. The color, texture, odour, moisture content (%), specific gravity and oil yield and percentage recovery are shown in Table 1 below.

Table 1: Extract Recovery and Physical Quality

Sample	Oil yield of extract (ml)	Oil yield of extract (g)	Percent-age recovery (%)	Percent-age moisture content (%)	Spec-ific gravity
Seed oil	35	33	35.9	8	0.943
Condime-nt oil	33	30	31.6	5	0.909

From the Table 1, it can be seen that the seed oil has higher percent recovery and moisture content and also slightly denser than the condiment oil (which indicates possible oxidation or hydrolysis reaction of the oil during the condiment preparation). The sharp odor of the condiment oil may be due to the presence of aldehyde of medium molecular weight(heptylic or nonoic aldehydes), such compounds may be formed by oxidation and rapture of fatty acid chain which might have taken place during fermentation in the condiment preparation. The oxidation will also lead to reduction of oil content. The infrared spectroscopy analysis is shown in Fig 1, Fig 2 and Table 2.

Table 2: Samples Infrared Spectroscopy Information

Seed Oil		
Absorption (cm-1)	Absorption intensity	Inference
3000	narrow absorption	=C – H Stretching
	medium absorption	C – H Stretching
1750	medium absorption	C=O Stretching
1640	medium absorption	C = C Stretching
1250 – 1150	broad absorption	C – O – C Stretching
Condiment oil		
3400 – 2700	Broad absorption	O – H Stretching
3000	narrow absorption	=C – H Stretching
2980 – 2820	medium absorption	C – H Stretching
1750	Medium absorption	C = O Stretching
1705	Medium absorption	C = O Stretching
1640	Medium absorption	C = C Stretching
1250 – 1150	Broad absorption	C – O – C Stretching

Table 3: Sample Titre Values

Parameter	Blank titre value (ml)	Seed oil sample titre value (ml)	Condiment oil sample titre value (ml)
Iodine value	40.2	12.4	20.2
Saponification value	3.2	46.9	54.1
Peroxide value	2.0	2.7	7.1
%FFA		1.5	45.2

Table 4: Results of Chemical Parameters

Sample	PV (mEq/Kg)	IV (g/100g)	SV (mg KOH/g)	Acid value	%FFA
Seed oil	1.4	98.068	122.6	0.421	0.2115
Condiment oil	10.2	71.064	142.8	12.68	6.3732

4. Discussion

From Tables 3 and 4, the Peroxide value, the Saponification value, the %FFA are higher in the condiment oil than those of the seed oil except the iodine value which is higher for the seed oil as shown in table 4. The decrease in iodine value of the condiment oil (71.064) compared to the seed oil (98.068) is an indication of lipid oxidation, since there is a decrease in unsaturation during oxidation. The value of %FFA for the condiment oil (6.3732%) indicates a high level of free fatty acids in comparison to the seed oil (0.2115%), the increase in free fatty acids indicates that free fatty acids are formed during fermentation in the condiment preparation, and the high free fatty acid content of the condiment oil makes it unsuitable for food preparation. The higher Saponification value of the condiment oil (142.8) indicates the formation of lower molecular weight oxidation products for example aldehyde and carboxylic acids; it also explains the use of the oil as an ingredient in tooth paste. Peroxide value is also increased for the condiment oil (10.2) which indicates oil deterioration in the formation of hydro peroxide. The infrared spectra of the seed and condiment oils indicate the presence of unsaturated fatty acid and unsaturated oils. Infrared Absorbance (Table 2) at 1705 cm^{-1} in the condiment oil spectra, which is absent in seed oil spectra indicates the presence of an aldehyde in the condiment. The O – H broad absorbance (3400 – 2700cm^{-1}) for carboxylic acid in the condiment oil indicates the presence of free fatty acid in the condiment oil component.

5. Conclusion

The seed oil is very good for soap preparation due to its high Saponification value. The condiment oil is not good for use as food due to it's the high free fatty acid content, which is above the maximum acid value for edible oils; therefore it is used mainly in the preparation of soap and as an ingredient in tooth paste.

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