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Proximate Compostion Of Various Shea Nut Kernels

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A B S T R A C T

The proximate analysis carried out on shea nut kernel samples obtained from Illo . Kwanga and, Kwere areas of Kebbi state revealed the following; Crude protein (g/100g)DM; 9.04±0.13[b], 10.00±0.18[a] and 10.2 ± 0.40[c] respectively, Moisture Content(g/100g) FP; 6.67 ± 2.89[a], 8.33 ± 2.89[a] and 6.33 ± 3.21[a] respectively, Ash Content (g/100g) DM; 4.00 ± 1.73[a], 5.67 ± 1.15[a] and 6.33 ± 3.40[a] respectively. Crude Lipid content (g/100g)DM; 2.28± 0.39[a] , 1.48 ± 0.18[bc] and 2.10 ± 0.07[b] respectively, Crude Fibre (g/100g)DM; 0.50 ± 0.14[a], 0.33 ± 0.04[a] and 0.45 ± 0.35[a] respectively. Total Carbohydrate (g/100g) DM; 77.64±4.26[ab], 74.29 ± 1.66[c], 78.54 ± 4.58[a] respectively. The results showed adequate nutrients for both nutrition and health benefits.

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Key words: *Shea nut kernel, proximate, Quality, nutrition, health*

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Introduction

The nutritional value of indigenous fruit bearing tree species indicates that many are rich in sugars, essential vitamins and minerals while some of their seeds are high in edible oil and proteins. The seeds have the potential of serving as the main source of edible vegetable oil for many rural people and in the economy of many countries [1].

The shea tree (*Vitellaria paradoxa*) is one of such indigenous wild fruit trees with enormous nutritional benefits. This fruit tree is found in the parkland belts stretching from Senegal through The fruit is edible with a nutritious sweet and spice able flavor pulp. The fruit pulp is also a source of food for other animals such as elephants, sheep, pigs, bats and birds [2]. Apart from the fruit playing an important role in the diets it is also sold in local markets [3]. The fruit pulp and oil from the shea nuts have been reported to be vital for supporting the livelihoods of the parklands communities [4;5; 6] .Shea oil extracted from the seed kernels is the main source of fat for preparation of sauce, frying and baking in addition to being a cosmetic and traditional medicine in many rural areas. In fact the seed kernels produce high oil content which is nutritious with unsaturated fatty acids such as oleic and linoleic fatty acids and fat soluble vitamins [7;8]

Materials and method

Materials

Sample collection and identification

A selected sample of *Vitellaria paradoxa* shea nuts were obtained from the market of Kwanga town (Ngaski Local Government), Kwere town (Zuru Local Government) and Illo town (Bagudo Local Government). The taxanomic identification was authenticated by Dr. Dhramemdra Singh of the Botany unit Biological Sciences Department, Kebbi State University of Science and technology, Aliero. Confirmation of taxonomic identity of the stem and leaves of *Vitellaria paradoxa* (voucher No.320) was achieved by comparing them with the specimens kept in the Herbarium of Department of Biological of Sciences.

Sample preparation

The fruits where cut in halves and the seeds were scooped out, washed with distilled water. The seeds were allowed to dry and epicarp were removed and dried under the sun for two days. The seeds were pulverized with the aid of a grinding machine and stored in a plastic container for later use in carrying out analysis on proximate composition.

Proximate analysis

Proximate composition of the samples were carried out in triplicates according to the standard methods of analysis, as described by the Association of Official Analytical Chemists [9]

Determination of percentage Crude Protein (By Kjeldhals method)

Two grams of sample was weighed into a dried 500ml macro-kjeldahl flask then 20ml of distilled water was added, the flask was swirled for few minutes and allowed to stand for 30mins. A tablet of selenium catalyst was added together with 10ml of conc. H_2SO_4 using an automatic pipette. The flask was cautiously heated with low heat on the digestion block until a clear digest was obtained and was further boiled for 3-4hrs. The flask was allowed to cool, and then 50ml of distilled water was slowly added to the flask. 10ml of the digest was transferred into another clean macro kjeldahl flask (750ml). The stand residue was then washed with 20ml distill water four times and digested sample transferred into the flask. 20ml of 40% NaOH was added and the mixture was kept in kjeldhal flask to cool (below 30^0C) by allowing sufficient cold water to flow through and also regulating heat to minimize frothing and prevent suck back . 20ml of boric acid (H_3BO_3) indicator solution was added into a 250ml conical flask which was then placed under the distillation apparatus, it collects ammonia from the mixture into boric acid indicator where the color changes from dark red to dark green which indicates contact with ammonia, the distillate was determined by titrating with 0.01N H_2SO_4 using a 25ml burette graduated at 0.1ml intervals. The color changes at the end point from green point.
The percentage Nitrogen was calculated by the formula;

$$\%Nitrogen = \frac{\text{TV} \times \text{NA (0.01N)} \times \text{D.F (0.014)} \times 50}{\text{Volume of aliquot} \times \text{weight of sample}} \times 100$$

NA = Normality of acid (0.01N)
TV = Titer value
DF = Dilution Factor
Volume of aliquot = 10ml
Normality of acid used for titration = 0.01
Nitrogen factor = 0.014
Volume of sample diluted after digestion = 50
Unit % = 100

Determination of Percentage Crude Fibre

Two grams sample was weighed into 1 liter conical flask (W_1), 200ml of boiling 1.25%H_2SO_4 and 20ml of water was added gently and boiled for 30mins using cooling finger to maintain a constant volume. A muslin cloth was used to filter which was stretched over 9cm Buchner funnel, distilled water was used in rinsing. Spatula was used to scrape the material back into the flask. 20ml of boiling 1.25%NaOH was added to boiled for 30mins using a cooling finger to maintained a constant temperature. A poplin cloth was used in filtering, the residue was rinsed thoroughly with hot distilled water, and was also rinsed once with 10%HCl and twice with ethanol, petroleum ether was finally used to rinse three times. It was allowed to dry over night in the oven at 100^0C, was then cooled in a desiccators and weighed (W_2), kept in the muffle furnace to ash at 550^0C for 90mins. It was cooled and weighed (W_3). (Percentage fiber was obtained by the formula:

$$\%Fiber = \frac{W_2 - W_3}{W_1} \times 100$$

W_1 = weight of sample (g)
W_2 = weight of dried sample
W_3 = weight of ash

Determination of Percentage Moisture

The crucible was weighed (W_1), 2g of the sample was added into the crucible and weighed (W_2), dried in the hot air oven for 24hrs at 105^0C. Cooled in a desiccators and the weight was taken (W_3). The dried sample was returned into the oven for further 24hrs to make sure drying is completed. The percentage was obtained by the formula

$$\%Moisture = \frac{\text{Weight of sample after drying}}{\text{Weight of sample before drying}} \times 100$$

Determination of percentage Crude lipid

An extraction flask was wash and dried in an oven at 100^0C, placed in a cool and the extraction flask was weighed. 2g of the grounded sample was weighed into a labeled porous thimble. The thimble mouth was covered with white clean cotton wool. 100ml of n-hexane was added into 250ml extraction flask. The covered porous thimble was placed into the condenser and the apparatus was assembled for subsequent extraction which continues for 6hrs. The porous thimble was removed and the extraction flask was placed on the water bath to make it free from n-hexane. The extraction flask containing the oil was oven dried for 1hr, then cooled in a desiccator and weighed. Percentage fat was calculated as follow;

Weight of empty porous thimble = W_0

Weight of thimble + Ground Sample = W_1

Weight of ground Sample = $W_1 - W_0$

Weight of empty extraction flask = W_2

Weight of extraction flask + oil = W_3

$$\%Fat = \frac{W_3 - W_2}{W_1 - W_0} \times 100$$

Determination of Percentage Ash Content

The crucible was weighed (W_1), 2g of the sample was added into the crucible and weighed (W_2), and was placed in the muffle furnace at 500^0C for 6hr for ashing. Cooled in a desiccator and the weighed was taken (W_3). Percentage ash was calculated as;

$$\%Ash = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

Determination of Percentage carbohydrate (by difference)

Percentage content was measured by subtracting all values gotten from 100. The value obtained represents percentage carbohydrate content of the sample.

Total carbohydrate = 100-(%**crude protein**+ %crude fat+ %crude fibre+ %crude total ash)

Results

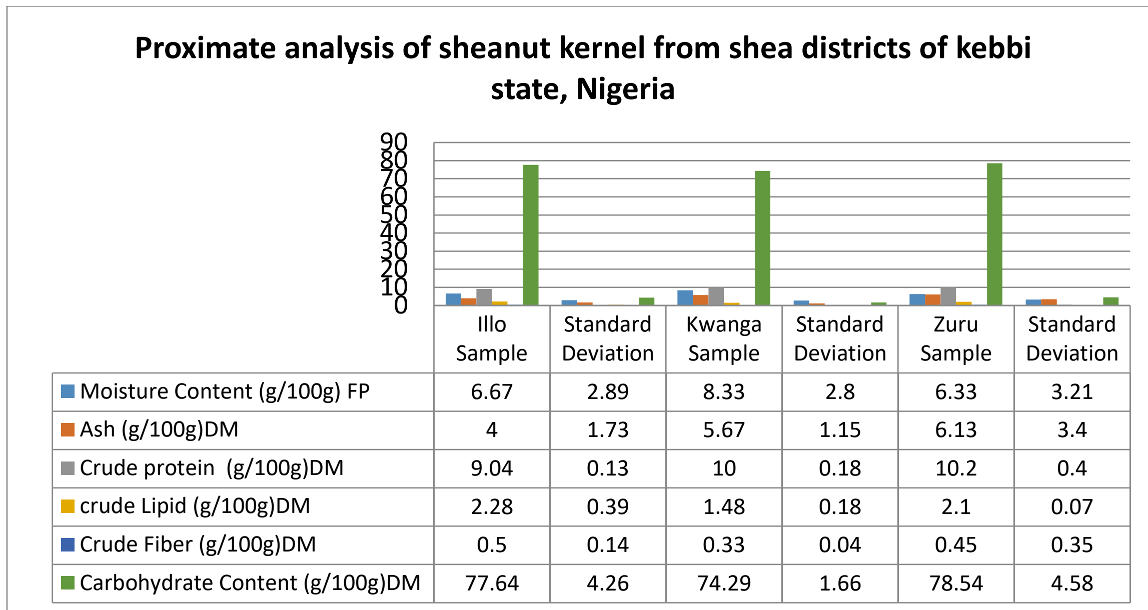
Table 1: Proximate analysis of sheanut kernel from selected shea districts of kebbi state, Nigeria

Parameters	Districts Illo Sample	Kwanga Sample	Kwere Sample
Crude protein (g/100g)DM	9.04 ± 0.13^b	10.00 ± 0.18^a	10.2 ± 0.40^c
Moisture Content(g/100g) FP	6.67 ± 2.89^a	8.33 ± 2.89^a	6.33 ± 3.21^a
Ash Content (g/100g) DM	4.00 ± 1.73^a	5.67 ± 1.15^a	6.33 ± 3.40^a
Crude Lipid content (g/100g)DM	2.28 ± 0.39^a	1.48 ± 0.18^{bc}	2.10 ± 0.07^b
Crude Fibre (g/100g)DM	0.50 ± 0.14^a	0.33 ± 0.04^a	0.45 ± 0.35^a
Total Carbohydrate (g/100g)DM	77.64 ± 4.26^{ab}	74.29 ± 1.66^c	78.54 ± 4.58^a

Values are in mean±standard deviation of triplicate determinations. The same subscript indicates that there is no significant difference while different subscript letters indicates that there is significant difference in the proximate analysis of sheanut oil.

Discussion

The proximate compositions of the shea nut analyzed are presented in Table 3. Moisture content was highest (8.33±2.89) in Kwanga seeds, followed by Illo seeds having a value of 6.67±2.89 and lowest (6.33±3.40) in Zuru seed. The low moisture levels of those three samples could store for a longer time without spoilage, since higher moisture content could lead to food spoilage through increasing microbial action [10]. Ash content was highest (6.33±3.40) in Zuru seeds, followed by Kwanga seeds having a value of 5.67±1.15 and lowest (4.00±1.73) in Illo seeds. Ash signifies availability of minerals [11] Protein content was highest (10.2±0.40) in Zuru seeds followed by Kwanga seeds (10±0.18) and lowest (9.04±0.13) in Illo seeds which are lower than the range (15.76 -17.52 %) reported [12] probably due to variety used. Carbohydrate content is highest (77.54±4.58) in Zuru seeds followed by Illo seeds (77.64±4.26) and lowest (74.29±1.66) in Kwanga seeds. Values of total carbohydrates in the range of 40-60% are for both edible domestic [13]. Carbohydrates are very vital in nutrition because they are good sources of energy [14] Crude fibre ranges between 0.33-0.55percent. The crude fibre content is beneficial in diet of man because it plays an important role in decreasing many disorders such as constipation, diabetes, cardiovascular diseases and obesity [15]



	Illo Sample	Standard Deviation	Kwanga Sample	Standard Deviation	Zuru Sample	Standard Deviation
Moisture Content (g/100g) FP	6.67	2.89	8.33	2.8	6.33	3.21
Ash (g/100g)DM	4	1.73	5.67	1.15	6.13	3.4
Crude protein (g/100g)DM	9.04	0.13	10	0.18	10.2	0.4
crude Lipid (g/100g)DM	2.28	0.39	1.48	0.18	2.1	0.07
Crude Fiber (g/100g)DM	0.5	0.14	0.33	0.04	0.45	0.35
Carbohydrate Content (g/100g)DM	77.64	4.26	74.29	1.66	78.54	4.58

Figure 1

Conclusion

The proximate analysis of the shea fruit pulp showed adequate nutrients for both nutrition and health benefits hence its consumption needs to be promoted among communities in the shea producing zone.

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