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Proximate analysis of beninseed: Chemical compositions and fatty acid profile

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ABSTRACT

Five Samples of Beniseed (Sesame indiucum) were analysed for its proximate composition. The parametrs and the range of thier values are: Moisture Content 6.5-6.8; Fat Content 46.75-47.12; Crude Protein 24.94-25.00; Ash Content 5.80-5.78; and Carbohydrate Content 28.28-27.88% respectively. Fe, Na and Mn were the most abuundant minerals. Other minerals determined are Cu, Zn, Mg, Ca, K, and P. The major fatty acids of the seed oil include Linoleic (29.30%), Linolenic (20.30%) and Oleic acids (14.41%) which are unsaturated; and Palmitic (23.56%), a stturated fatty acid. The essential fatty acid content was higher than those found in some other pulses.

KEYWORDS

Benin seed;
Proximate composition;
Fatty acid.

INTRODUCTION

Benin seed as it is called in Nigeria is biologically called sesamum *indicum*, and it belongs to the plant family *Pedaliacea*[11]. The oil from the seed was indicated by[9] to be a highly prized oil in Babylon and Assyria about 1000 years ago. The name sesame is used in literature wordwide. It is known as 'Sim Sim' in East Africa, and it has its indigenous name among the major tribes in Nigeria, called Ridi by the Hausas, Ekukus and Isasa by the Igbos and Yorubas respectively[10]. The Worldwide cultivation of the crop is about six millon hectares of which twenty five percent is in Africa mainly Nigeria, Ethopia and Sudan, eight percent in America-mainly Venezuela, Mexicos Guatemala and Columbia[4].

In the export market of the seed, the white-coloured variety are in high demand compared to the black-coloured seed and the white coloured seed variety are produced in South America[4]. The fruit of the seed is an oblong, mucronate pubescent capsule which contains numerous small oval seeds which could be yellow,white and brown or black in colour[8]. Total annual World consumption is said to be about 65% for oil extraction and 35% for food and that its oil consists of about 43% oleic and linoleic each, 9% palmitic acid about 4% stearic fatty acid.

Morris,[4] had reported that there are 869 available genetic accessions of the seed worldwide,but that only four is available in Nigeria. It is a known that the chemical composition of agricultural product may vary according to variation in soil and climate among other factors[2] thus, the reason for the present study, to evaluate the chemical composition of five different samples of the Benin seed which is a mixture of brown and white coloured variety.

MATERIALS AND METHOD OF ANALYSIS

Five smples of matured seeds of Sesame were

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bought from five different market locations in Osogbo, Osun State, Nigeria. 500g of each were ground and the aliquots were drawn for analysis. The moisture, ash, crude oil and fibre contents were determined by the AOAC[3] methods. Crude protein by multiplying the percentage Kjeldahl nitrogen by a factor of 6.25 and the carbohydrate otained by difference.

Mineral elements were determined by digesting with 3.00mol/dm3 hydrochloric acid and using flame photometer to determine sodium and potassium while atomic Absorption Spectrophotometer was used to determine Ca, Cu, Mg, Mn, and Zn[2]. Phosphorus (P) was also determined colorimetrically using Phospho vanado molybdate method[1].

Methyl esters were prepared from the crude oil extract using boron trifluoride-Methanol reagent[7]. The acid methyl ester was chromatographed using HP-INNowax (Cross-linked PEG) Packed in glass colum 30.0m x 0.32mm i.d on HP 6890 Powered with Chemstation Rev. A 09.10(1206) software, equiped with a Flame Inonisation Dectector (FID) and injection temperature of 275 and 230°C respectively and at 10°C/min. to 25°C for 11 minuites, constant at 250°C for 10.0 minuites for the column temperature with Nitrogen as carrier gas flowing at 30ml/min. Peaks of the methyl esters were identified by comparison of their retention times with those of standards under same operating conditions. The peaks were calculted to give the percentage of each fatty acid methyl esters.

RESULTS AND DISCUSSION

There were five samples and the average values of the triplicate analysis for the proximate composition of sample is shown in TABLE 1.

TABLE 1 : Average result of the proximate composition of benin seed; (Average of Three result; DM=Dry Matter)

Sample	Moisture Content % wet wt.	Crude Protein %DM	Crude oil % DM	Crude Fibre % DM	Ash %DM	Carbohydrate % DM
A	4.50	20.00	43.60	6.00	4.35	21.55
B	4.60	19.80	44.00	6.00	4.00	21.60
C	4.40	19.90	43.80	5.90	4.00	22.00
D	4.45	20.15	43.60	5.70	4.00	22.10
E	4.55	20.20	43.60	5.60	4.15	21.90

The moisture content of the seed ranged from4.40-4.60%wet weight,the value is comparable to that reported by[8]. The lower amount of moisture content will enhance the shelf life of the seed. The crude protein alsoranged from 19.80-20.18% dry weight, the result is lower than the crude protein of canavalia Enisformis seed, but comparable to many common pulses in Nigeria such as *Vagna Vaguicalte, cajanus cajan and Phaseolus lunatus* as reported by[2] and[5].

The crude oil content ranged between 43.60-44.00%dry weight,the amount is higher than the amountpresent in *C. Eniformis* but comparable to other pulsesfound in Nigeria[1] and[2]. The crude fibre ranged from 5.60-6.00% dry weight; the ashcontent also ranged between 4.00-4.35% dry weight and the carbonhydrate value also ranged between21.55-22.10% dry weight. The crude fibre is comparable to that of *C. eniformis* seed and that reported by[6]. for the same seed, so also the ash content anf the carbohydrate value, are comparable, but its carbohydrate value is less than that for *C. eniformis*.

TABLE 2 shows the mineral element composotion of the sample,the most prominent is magnesium. It ranged from 18.00-18.30%mg/100; magnesium is said to be an activator of many enzyme systems,that maintains the electrical potentials in nerves[6] The amount of sodium element in the seed ranged between 9.98-

TABLE 2 : Mineral element omposition of the Benin seed; (Average of Three Determinations)

Sample	Elements in mg/100g								
	Mn	*Fe*	*Cu*	*Zn*	*Ca*	*Mg*	*P*	*K*	*Na*
A	2.80	8.43	1.55	0.33	1.93	18.00	1.01	0.89	10.23
B	2.79	8.45	1.56	0.32	2.00	18.20	1.06	0.88	9.98
C	2.88	8.44	1.57	0.34	1.89	18.10	1.08	0.89	10.10
D	2.90	8.40	1.54	0.35	1.98	18.01	1.11	0.90	10.00
E	3.00	8.42	1.58	0.36	2.01	18.30	1.02	0.91	10.00

10.23mg/100, and is lower than that for *C.eniforms*[2]. Analysis indicate the presence of other elements- Mn, Fe,Cu,Zn,Ca,P and K, even though at a lower quantity,when compared to those in *C.eniforms*[2]. The fat and oils in the seed recorded a range value of 43.60-47.50% of dry seed which is closely related to those reported in literature for Jathoropha Carcass seed 45.88%[1] but higher than that reported for *C.eniforms*[2] and for *Crysophyllum albidum* 16.56%[1].

The physico-chemical properties of the hexane extracted oil is shown in TABLE 3.

The colour of the extracted oil is yellow,with a specific gravity value that ranged between 0.910-0.913 and refractive index of 1.487-1.489. The saponification value ranged between 173.98-174.43 and it falls within the range of some values for some vegetable oils[10]. The Iodine value anged from 106.56-106.94 *Wijs*,thus above 100 wijs,it could therfore be catigorised as non-drying oil,[11] infact its drying time was recorded as 3 hours.

The fatty acid composition ofthe oil is shown in table 4. The linolenic C18:2 an unsaturated fatty acid,has the highest value and it ranged between 29.30-29.31%,folllwed by linolenic (C18:3) and it ranged between 20.30-20.31%, andoleic (C18:1) with a value that ranged between 14.38-14.42%, hence the total unsaturated fatty acid ranged between 64.00-64.01%, thus the oil is siutable for utilisation in dietry and industrial usage[10]. There are other saturated fatty acids but their total percentage is less than 40% of the fatty acid, thus fatty acid composition compared well with those of some other oils from edible seeds and nuts[2].

TABLE 3 : Physico-chemical properties of the hexane extracted oil

Sample	Colour	Saponification Value	Specific Gravity	Refractive Index	Peroxide value	Iodine value	Beta-Carotene	Acid Value
A	Yellow	174.40	0.912	1.488	1.88	106.65	326.000	0.297
B	Ditto	174.41	0.911	1.489	1.86	106.95	326.500	0.300
C	,,	174.42	0.913	1.487	1.89	106.88	326.400	0.295
D	,,	174.43	0.911	1.488	1.89	106.90	327.800	0.298
E	,,	173.98	0.910	1.488	1.87	106.94	329.900	0.301

TABLE 4 : Fatty acid composition of the hexane extract of Benin seed

Sample	Myristic acid C_{14} Saturated	Palmitic acid $C_{16:0}$ Saturated	Palmitoleic acid $C_{16:1}$ Saturated	Stearic acid $C_{18:0}$ Saturated	Oleic acid $C_{18:2}$ Unsaturated	Linoleic acid $C_{18:2}$ Unsaturated	Linolenic acid $C_{18:3}$ Unsaturated	Arachidonic acid $C_{20:0}$ Saturssated
A	0.123	23.56	1.31	10.99	14.41	29.30	20.30	0.007
B	0.123	23.56	1.32	10.98	14.42	29.29	20.30	0.004
C	0.124	23.55	1.29	10.99	14.42	29.31	20.31	0.003
D	0.122	23.55	1.31	11.00	14.41	29.30	20.30	0.005
E	0.121	23.55	1.32	11.00	14.38	29.30	20.31	0.007

CONCLUSION

In the developing nations, pulses are impotant sources of dietry protein, but there are limitations as to their acceptability due to the presence of anti-nutritional factors, such as low levels of tanin[6]. However,its chemical composition revealed a good source of crude protein,certain minerals and essential fatty acid especially when compared with some other consumed pulses in Nigeria, and this has accounted for the spectrum of uses of the seed in Nigeria.

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