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Proximate Composition and Some Functional Properties of Three Varieties of *Lagenaria Siceraria* Melon Seeds

Ogundele Joan O. and Oshodi Aladesanmi A

Chemistry Department, Federal University of Technology, Akure, Nigeria.

Abstract: Dried seeds of *Lagenaria Siceraria* (African wine kettle), *Lagenaria Siceraria* (Basketball gourd) and *Lagenaria Siceraria* (Bushel Giant Gourd) were produced into flour and subjected to proximate analysis and determination of some functional properties. The proximate analysis (%) shows that the seeds have fat and protein contents (46.03±1.41, 53.35±0.24, 50.91±1.28) and (34.64±0.08,27.71±0.41, 32.70±0.03) respectively. They also have Total ash contents (3.75±0.14, 4.07±0.22, 4.5±0.18), Moisture contents (5.67±0.05, 5.13±0.04, 5.67±0.09), and Carbohydrate (8.29±1.04, 8.99±0.49, 5.12±1.36). respectively. The water and oil absorption capacity (%g/g) are (65.00±4.08, 101.70±6.25, 75.00±4.08) and (111.51±9.10, 84.46±11.95, 167.44±15.76) respectively. These results show the three varieties of *Lagenaria Siceraria* to be good sources of oil and fat, with functional properties that are favourable human consumption and for industrial applications.

Key words: *Lagenaria Siceraria,* functional properties, Fat, Protein, Absorption, Gourd.

INTRODUCTION

Lagenaria Siceraria are gourds grown in most parts of Nigeria. Gourd seeds (Cucurbitaceae) are vasitile and include hundereds of species of vine bearing coiled climbing tendrils and some of the most unusual fruits in the world[16]. Some *Lagenaria Siceraria gourds* are grown in Yoruba land mostly for utility purposes. *Lagenaria Siceraria* (African wine kettle), otherwise called Akeregbe in Yoruba land, *Lagenaria Siceraria* (Basketball gourd) is called Igbaademu and *Lagenaria Siceraria* (Bushel Giant Gourd) is known as Igba-je. However, some indigenous rural dwellers eat the seeds of these Gourd plants as soup thickners and are called Melon or Egusi in Yoruba. Like some common egusi that have been worked on, they are very good sources of fats and protein[14]. The determination of the functional properties of these varieties of *Lagenaria Siceraria* will enhance the knowledge of these properties and their possible applications in the Food Industry. Functional properties are the intrinsic physico-chemical characteristics which may affect the behaviour of food system during processing and storage e.g. protein solubility, gelation, foamability and emultion properties [15]. The sturdies of the functional properties of these seeds are of great importance and application especially in Food Industry. The comparatively high water absorption capacity of *Tetracarpidium conophorum* (defatted-raw seed) was reported to be an indication of it's being used as composite flour for baking[6]. However it has been observed that not much has been reported on the analysis of these three varieties of *Lagenaria Siceraria,* especially on their functional properties, hence the need to carry out such a research work as this.

MATERIALS AND METHODS

Seeds of *Lagenaria Siceraria* (African wine kettle), *Lagenaria Siceraria* (Basketball gourd) and *Lagenaria Siceraria* (Bushel Giant Gourd) were purchased from Ilora market in Oyo. The seeds were dehusked and further sun dried before grinding into fine powder. The powder were put in polytene bags and then in air tight plastic containers and labelled appropriately.

Proximate Analysis: Standard procedures recommended by Association of Official Analytical Chemists[3] were used for Sample treatment and analysis.

The fat content (FC) was determined using solvent extraction method with n-hexane/Petroleum ether (b.p. 40-60 ^{o} C) in a soxhlet extractor. The moisture content (MC) was determined using air oven as weight difference after oven-drying for 4-5 hours at 105^{o} C . Crude Protein (CP) was determined by Kjeldahal's method as N x 6.25. Total ash Content (TAC) was determined by weight difference after incinerating a known weight to ash in a muffle furnace. The Crude Fibre (CF) was determined according to Pearson, 1981. Carbohydrate was determined by difference (100 -

Corresponding Author: Ogundele Joan O., Chemistry Department, Federal University of Technology, Akure, Nigeria.
E-mail: O.ogundele@yahoo.co.uk

ΣFC, MC, CP, TA, and CF). The Proximate analysis was carried out in triplicates and the results are in % dry weight of flour.

Functional Properties: The water absorption capacity (WAC) was determined by the method described by Beuchat[4]. 1.00g of flour sample was mixed with 10.00cm^3 distilled water and centrifuged for 30mins at 35000r/min. The supernatant was decanted into a 10.00cm^3 graduated measuring cylinder. The volume noted was used to determine the volume of water absorbed by difference and was converted to gram assuming the density of water to be 1.00g/cm^3.

Beuchat[4] method was also used for the determination of Oil absorption capacity (OAC) of the flour samples. 0.5g flour sample was mixed with 10.00ml JOF Soya vegetable oil (Density=0.9095g/cm^3). The mixture was centrifuged at 3000r/min for 30 mins. The excess oil was decanted into a 10.00cm^3 graduated measuring cylinder and the volume noted. The bonded oil volume was determined by difference and converted to grams. The percentage OAC was expressed as g/g % of the flour sample.

Foaming Capacity (FC) was determined using the method of Coffmann and Garcia[5]. 2.00g flour sample was whipped with 50.00cm^3 distilled water in a Lapriva LA-999A blender. The mixture was immediately poured into a 100.00cm^3 graduated measuring cylinder. The Foaming capacity was the foam volume increase immediately after mixing. The Foaming Stabilities (FS) were determined as a function of time for 0-24 hrs.

The effect of pH on the protein solubility of the flour samples were carried out according to the method described by Ige *et. al.*[8]. Mixture of 0.5g of the flour and 10ml of distilled water was homogenised and left to solubulise at room temperature for about 5 minutes.

The pH of the mixture was adjusted to pH 2-11 with the aid of 0.1 M HCl and 0.1 M NaOH. The samples were then centrifuged at 3500 r/min for 30 mins. The supernatant was decanted and the solube protein determined using Kjeldahl's method.[3]. The values were expre ssed as the percentage of the protein content of each flour sample.

Analysis of Data: A one way analysis of variance (ANOVA) and Least Significance Difference (LSD) were carried out on the data generated.. The results are expressed as mean±standard deviation.

RESULTS AND DISCUSSION

The result of the proximate analysis (Table 1) shows that the three varieties of *Lagenaria Siceraria* have almost the same Moisture contents ranging from5.13 to 5.67 with a mean value of 5.49. This is close to the moisture content reported for *Cucurbita mannil* (5.03 ±1.91) by Loukou *et.al.* [10].

The seeds are very rich in fat content with *L. Siceraria* (BBG) having the highest value of 53.35 ±0.24 and *L. Siceraria* (AWK) having the least value of 46.03±1.14.

These values are within the range of the fat contents of *Citrullus lanatus .C. mannii and C. melo* (56.67±4.90, 45.89±4.73, 42.67±3.43) as reported by Loukou *et.al.* [10]. These seeds are therefore good sources of vegetable oil for human consumption and for industrial applications like in the cosmetics and food industries. The values of the Crude protein for the three samples are 34.64±0.08,27.71±0.41, and 32.70±0.03 respectively, with *L. Siceraria* (AWK) having the highest and *L. Siceraria* (BBG) having the least. However these three varieties of *L. Siceraria* can be said to be considerably high in protein and can compete favourably with some other good sources of protein like Conophor nut (29.09%) and *Jatropha curcas* seeds (29.40%) and. *Colocynthis citrullus L*. and *Cucumeropsis edulis* which are other varieties of egusi, that were reported to contain 28.4% and 31.85% protein respectively[1,2], Hence, *L. Siceraria species* are good sources of protein for human consumption and as good substitute for animal protein for the fast growing need of protein for the fast growing world population. On the other hand, *L. Siceraria* will also serve as good sources of protein concentrate for human and animal food formulation.

The crude fibre contents of these seed flours are considerably low with the mean value of (1.15±0.69). This value is comparable with the crude fibe reported for several indigenous cucurbits like the melon *Cucurbita lanatus* (1.33±0.52) and for raw *Jatropha catharica* (1.60±0.18).[1,2].

The mean values of the Total Ash and Carbohydrate (4.11±0.31 and 7.47±1.68) are close to the values reported for *Cucumeropsis edulis* Total Ash(4.33±0.02) and *Jatropha cathtica* carbohydrate (6.45±0.50).

Table 2 shows the result of some functional properties of the three varieties of *Lagenaria Siceraria*. The seeds have moderate water absorption capacities close to that reported for full fat fluted Pumpkin seeds (85±0.50) by Fagbemi and Oshodi[7]. However,these values(65.00±4.08,101.70±6.25 and 75.00±4.080) are comparatively lower than the values reported for Benniseed flour (182%) by Ogungbenle *et. al.*[12] and Pigeon pea flour (138%)[15]. The oil absorption capacities of L. Siceraria (BBG) (84.46±11.95) is the smallest and *L. Siceraria*(BGG) (167.44±15.75) the highest. However these values are close to the values of the oil absorption capacities reported for full fat fluted Pumpkin seeds (142.50)[7]. The foaming capacities of the seeds range from 9.33±0.94 to 12.22±0.47. These are comparable with the Foaming capacity reported for full fat fluted Pumpkin seeds (10.80±0.5)[7], but lower than that reported for Benniseed flour (18.00±1.2)[12]. The foaming stability of the seeds after 2 hours are appreciable and are also close to the values reported for full fat fluted Pumpkin seeds (5.00±0.1)[7]. The variation of the foaming stability with time is stated in table 3. The three seed flours attained their stable foam after 1.50 hours with *L. Siceraria*(BBG) having the least value (5.66±.47) and *L. Siceraria*(GGB) having the highest (8.67±0.14).

The Protein solubility profile of the seed are seen in figures 1, 2, and 3 respectively. *L. Siceraria* (AWK) has the highest protein solubility (50.50) at pH 10, after which there is a little drop at pH11 and the least value (5.05) at pH5. The protein solubility of *L.Siceraria* (BBG) at pH2 (22.10) is higher than in *L. Siceraria* (AWK) (17.68) at the same pH, but almost of the same value with that in *L. Siceraria* (GGB) at pH2. The minimum Protein solubility concentration of *L. Siceraria* (BBG) of (5.51) is also at pH4 with the maximum protein solubility (60.01) at pH11. The Protein solubility profile of *L. Siceraria* (GGB) however assumes a little different curve in that it has it's lowest protein solubility spread (5.35) over pH3 to pH5. In comparison with the other two varieties *L. Siceraria* has the highest Protein solubility (96.33) at pH11. This is similar to the result reported for Benniseed at pH10 which is about 92.00% [12].

Table 1: Proximate composition (%) of the three varieties of *Lagenaria Siceraria* Seed Flour

Composition	*L. Siceraria*(AWK)	*L. Siceraria* (BBG)	*L. Siceraria* (BGG)	Mean
Moisture	5.67±0.05	5.13±0.04	5.67±0.09	5.49±0.22
Fat content	46.03±1.14	53.35±0.24	50.91±1.28	50.10±3.04
Crude Protein	34.64±0.08	27.71±0.41	32.70±0.03	31.68±2.92
Crude Fibre	1.61±0.25	0.75±0.15	1.10±0.12	1.15±0.69
T. Ash	3.75±0.14	4.07±0.22	4.50±0.18	4.11±0.31
Carbohydrate	8.29±1.04	8.99±0.49	5.12±1.36	7.47±1.68

Table 2: Some Functional Properties (%) of the three varieties of *Lagenaria Siceraria* Seed Flour

Samples	Functional Properties			
	Water absorption Capacity	Oil absorption capacity	Foaming capacity	Foaming stability(2hrs)
L. Siceraria(AWK)	65.00±4.08	111.51±9.10	12.00±1.63	7.67±0.47
L. Siceraria(BBG)	101.70±6.25	84.46±11.95	9.33±0.94	5.67±0.42
L. Siceraria(BGG)	75.00±4.08	167.44±15.76	11.67±0.47	8.67±0.14

Table 3: Foaming Stability as a function of time for *Lagenaria Siceraria* Seed Flours

Time (Hrs)	*L. Siceraria* (AWK)	*L. Siceraria*(BBG)	*L. Siceraria*(GGB)
0.00	12.00±1.63	9.33±0.94	11.67±0.47
0.25	11.33±2.05	9.00±0.082	10.67±0.47
0.50	11.33±2.05	8.00±0.00	9.67±0.47
1.00	10.67±1.25	5.66±0.47	9.33±0.47
1.50	7.67±0.47	5.66±0.47	8.67±0.47
2.00	7.67±0.47	5.66±0.47	8.67±0.14
24.00	7.67±0.47	5.66±0.47	8.67±0.14

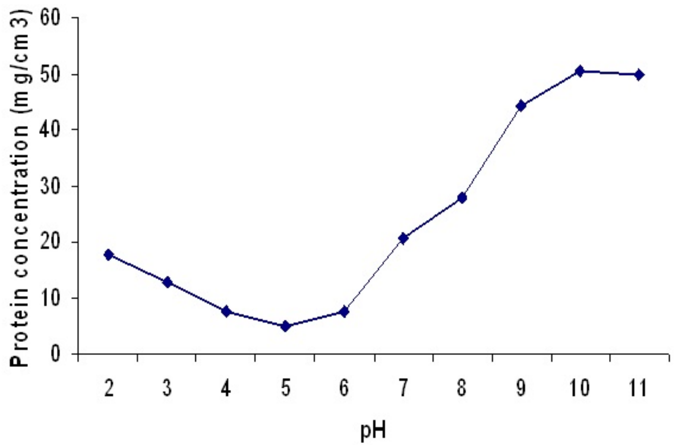

Fig. 1: Protein solubility of Lagenaria Siceraria (AWG) as a function of pH

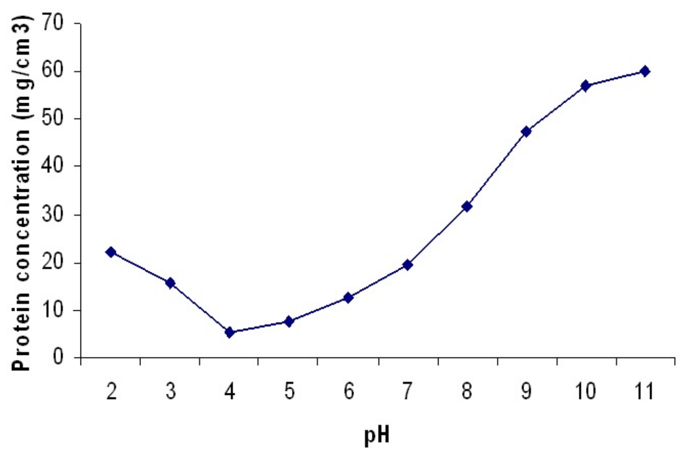

Fig. 2: Protein solubility of Lagenaria Siceraria (BBG) as a function of pH

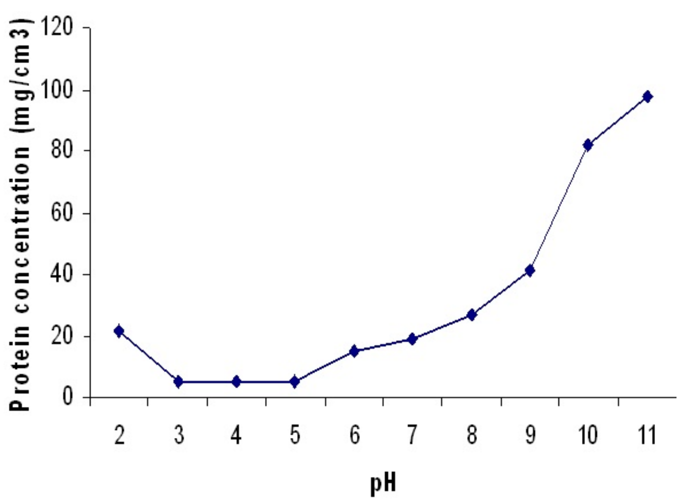

Fig. 3: Protein solubility of Lagenaria Siceraria (BGG) as a function of pH

Conclusion: The three varieties of *Lagenaria Siceraria* Seeds are closely related in Proximate compositions, are good sources of fats and protein. The Iso electric point of the seeds are between pH3-pH5 and with appreciable functional properties that will be suitable for innovative applications in the Food Industry.

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