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Proximate Analysis, Ascorbic Acid, Phytochemicals and Some Heavy Metals Composition of *Lagenaria Breviflora* (Wild Colocynth) Fruit, Seed and Leaf from Bushy Uncultivated Area in Henshaw Town, Cross River State, Nigeria

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ABSTRACT: Fruits provide nutrients for growing seeds. Seeds are important organs for the distribution of plants, while leaves are very essential in the manufacture of food for the plant. Therefore, the objective of this paper is to evaluate the proximate analysis, ascorbic acid, phytochemical and some heavy metals composition of *Lagenaria breviflora* (Wild colocynth) fruit, seed, leaf from a bushy uncultivated area in Henshaw Town, Calabar, Cross River State, Nigeria.using standard analytical methods. The result of the proximate composition was shown to be 10% ash, 0.26% protein, 1.5% fat, 43.3% fibre, 88% moisture 44.94% carbohydrate in the fruit sample result revealed 22.5% ash, 1.50% protein, 12.5% fat, 16.60% fibre 42% moisture, 47.15% carbohydrate in the leaf sample. The seed sample was found to contained 5.5% ash, 1.69% protein, 16.25% fat, 40% fibre, 84% moisture and 36.56% carbohydrate. The ascorbic acid contents were found to be 85.88% in the fruit, 65.12% in the seed and 66.88% in the leaf samples. Result of the phytochemicals determination revealed the presence of alkaloid, flavonoid, tannin and phytate in the fruit, leaf and seed. The results show alkaloid content to be 0.026% in the fruit, 0.044% in the seed and 0.018% in the 0.240% in the leaf. Percent tannin content was 2.1% in the fruit, 1.9% in the seed and 2.0% in the leaf. Phytate was also found to be 0.9% in the fruit, 1.9% in the seed and 2.0% in the leaf. Phytate was also found to be 0.9% in the fruit, 0.5% in the seed, and 0.9% in the leaf. The heavy metals analysis of the samples indicated that cadmium and lead were not detected in the three samples, the fruit contained 0.0053 mg/kg of chromium, 0.006 mg/kg of iron, the seed contained 0.0012mg/kg of Chromium, 0.0037mg/kg iron. The leaf was found to contain 0.0021 mg/kg of chromium, 0.0110 mg/kg of iron. These values were within the permissible limits of WHO. Fruit, seed and leaf have good nutritional status from the high carbohydrate, fibre, moisture and ascorbic acid content, and are suitable for consumption as food, especially the fruit.

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Lagenaria breviflora is a genius of gourd bearing vines from the family of *Cucurbitaceae*, also known as the squash family. Other species of the group are *Lagenaria siceraria*, *Lagenaria sphaerica* and *Lagenaria vulgaris*. It is a perennial climbing pant that grows wild in bushes in Nigeria particularly in rain forest zones. Some of its common names are: wild colocynth in English, ndise ekpo in Efik, gojin jima in

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Hausa, eso gbegbe in Yoruba and anyummuo in Igbo languages of Nigeria. Its leaves are used medicinally in Africa and its leaves are reported to have several biological activities including anti-implantation, miracicidal and cercaridal (Ajayi *et al.*, 2002), antibacterial activities with low toxicity (Saba *et al*., 2009a), Saba *et al.*, 2009b). 'Studies also show that the ethanol extract of the whole fruit of *Lagenaria breviflora* exhibit potent anti-inflammatory, analgesics (Adedapo *et al.*, 2012), anti-oxidant or anti ulcerogenic activities (Onasanwo *et al.*, 2011) and were comparable to diclofenac, indomethancin and ibuprofen'. The triterpenoid saponins from fruit of *Lagenaria breviflora*, from the methanol extract of the fruit pulp (Elujoba *et al.*, 1990) report that three new saponnins were characterize as 3-0-beta-galactopyronosyl, 28-0-betapyranosyl (1-6)-beta xylopyranosly-(1-3)-alpha arabinoapyransylolean-12-en-28-oic acid ester, Oleanolic acid and hydrolytic products of the pulp. 'The antibacterial activity of ethanol extract of the whole fruit of *Lagenaria breviflora* was investigated (Tomori *et al.*, 2007), showing the efficacy of ethanolic extract of the whole fruit of *Lagenaria breviflora* against common bacteria species such as *B. subtitis*, *S. aureus*, *S. gallinarium*, *P. aeruginosa*, *Klebsiella Spp.*, *Proteus Spp.* and *E. coli* was investigated by agar-well diffusion method'. 'The effect of the extract was compared with that of the two standard antibiotics (Oflaxacin and Erythromycin) used. An Analytical Research Group from School of Pharmacy, University of Bradford reported on the chromatographic and spectroscopic analysis of bound and unbound phenolic acids in *Lagenaria breviflora* fruit' (Elujoba *et al.*, 1991). Isolation and characteristics of these compounds was based on column chromatography, Thin layer chromatography, paper chromatography, ultraviolet, infrared and Gas chromatograph-mass spectrophotometer. While P-hydroxybenzoic and vanilic acids were found to occur as free and bound acids in the pulp, ferulic acid was found to occur only as an ester. 'An optimized high pressure liquid chromatography procedure for the quantitative analysis of these acids was developed, featuring short retention times, high sensitivity and excellent resolution' (Elujoba *et al*., 1991).

The plant extract reduced the formation of Oedema induced by carrageenan and histamine significantly, as well as reduced the number of writhes in acetic acid-induced writhing models and dose-dependent decreases of licking frequency rats injected with 2.5% formalin, 'the result validated the basis for the traditional use of *Lagenaria breviflora* against inflamed purulent wounds, swellings, and bruises seen in some infectious disease'. Oridupa *et al.* (2012) also studied the anti-inflammatory and analgesic properties of the ethanolic extract of the fruit and reported that the fruit extract exhibited significant anti-inflammatory and analgesic activities. Phytochemicals are a group of organic compounds like phenols, saponins, tannins, flavonoids, phytates, alkaloids, terpenoids, carotenes etc. that are produced by plants via primary or secondary biological synthesis or process (Akpe *et al.*, 2021a). They are responsible for antioxidant, nutritional and curative properties of plants among others. They are found in plant materials namely; nuts, fruits, leaves and seeds, as well as herbal preparations, beverages, fruit juices, fermented foods etc. (Vattem *et al.*, 2005; Wolke and Parrish, 2005). Heavy metals are metals whose specific gravity is 5.0 or greater and are usually poisonous (Hardy *et al.*, 2008). 'Heavy metals include transition metals, some metalloids, lanthanides and actinides, some of which are need in trace amounts in biological systems of plants and animals like Fe, Zn, Mo, Cu etc., and are used to produce many household goods namely cooking utensils, alloys, electrical appliances etc'. (Akpe and Ubua, 2019). Heavy metals are natural components of the earth's crust, making them persistent in the environment but they enter the human body via drinking water, food or air. However, the source of heavy metals in the environment varies from place to place depending on the kind of anthropogenic activities occurring and the waste management/ disposal method used in those places (Akpe, 2018). Some metals like mercury lead cadmium are poisonous and has no role to play in organisms (Akpe *et al*., 2021b). Besides, metals like cadmium, lead and mercury are considered toxic contaminants for living beings, even at low concentrations (Dauguet *et al.*, 2011; Akpe *et al*., 2020), with lead causing brain damage especially for children and cadmium causing bone damage or weakening.

Vitamin C (L-Ascorbic acid) is a water-soluble vitamin naturally present in some foods or added to others but a very essential dietary component as humans cannot synthesize it endogenously (Li and Schellhom, 2007). It aids in the healing of wound, acts as an antioxidant and anti-cancer agent in the human body. 'The daily intake (Daily Value) for vitamin C is 90 mg for adults and children of four years and above (FDA, 2016). According to US-Food and Drug Administration (US-FDA), foods providing 20% or more of the Daily Value (90 mg) are considered to be high or rich sources of Vitamin C. Some researchers have carried out investigation on the antibacterial activity of the leaf and fruit extract of *Lagenaria breviflora* and phytochemical content the leaves, but not much has been done on the proximate composition of the fruit and the vitamin C content of the fruit.

Besides, the fruit is not eaten in this part of the world though its leaves and fruit extracts are used for medicinal purposes, and plant is considered wild. Thus, the objective of this paper is to evaluate the proximate analysis, ascorbic acid, phytochemical and some heavy metals composition of *Lagenaria breviflora* (Wild colocynth) fruit, seed, leaf from a bushy uncultivated area in Henshaw Town, Calabar, Cross River State, Nigeria.

MATERIALS AND METHODS

Reagents: Trichloroacetic acid, potassium iodide, starch indicator, copper (II) tetraoxosulphate acid. Tetraoxosulphate (vi) acid, sodium hydroxide, methanol, distilled water, perchloric acid, Nitric acid, potassium ferrocyanide, Acetic acid, ethanol, dilute ammonium hydrochloric acid.

Instruments and Apparatus: UV spectrophotometer, Atomic absorption spectrophotometer, Muffle furnace, weighing balance, water bath, hot plate, heating mantle, oven beakers, measuring cylinder, spatula, funnel, dessicator, filter papers spectrophotometer, test tube, crucible Soxhlet extractor set, anti-bombing granule, round bottom flask. Litmus paper, conical flasks, Kjeldahl flask, tongs, volumetric flask, distillation sets, burette, pipette, indicator dropper, retort stand, electric stove stirrer, Hallow Cathode Lamp.

Sample collection and preparation: The fresh fruit and leaf samples of *Lagenaria breviflora* were obtained from a bushy uncultivated area in Henshaw Town, Calabar South Local Government Area of Cross River State, Nigeria in the month of March 2023. The samples were identified at the Herbarium centre, Botany Department of University of Calabar. The fruits and leaves were washed carefully with distilled water and the fruits were cut into four portions to get the seeds out, the fruit and leaves were slice into pieces. 10 g of each of the samples was taken out for moisture and ascorbic acid determinations and the remaining portions dried in the oven at 60^0C before grinding to powder form.

Proximate analysis: The *Lagenaria breviflora* samples were analyzed according to (Onwuka, 2005). The protein content was determined using Kjeldahl method.

Moisture Content determination: The powdered samples (5 g) were weighed into pre-weighed crucibles and kept in an oven at 105^0C for 8 hours to dry to constant weight. The three crucibles and their contents were cooled in a desiccator and re-weighted. This process was repeated at 2 hours' interval for each of the samples and moisture content as calculated in equation 1.

$$\%\ Moisture\ content = \frac{(W_1 - W_2)}{W_3} * 100 \quad (1)$$

Where W_1 = weight of sample before drying; W_2 = weight of sample after drying; W_3 = weight of sample taken

Determination of Crude Fat content: Procedure: 4 g of each of the powdered samples (fruit, seed and leaf) of *Lagenaria breviflora* were weighted on a filter paper and transferred to the timble of the soxhlet extractor fitted on a pre-weighed 250 mL round bottom flask containing 150 mL petroleum ether and ant-bombing granules. The flask was connected to a reflux condenser and placed on an electrochemical heater at a temperature of 60^0C to reflux for 45 minutes. After this period, the timble was removed from the soxhlet with the defatted sample. The petroleum ether was evaporated off from the flask by heating with the hot plate. The lipid extract in the flask was then cooled in a desiccator and their weights taken as calculated in equation 2

$$\%\ Fat = \frac{\text{Weight of fat extract X 100}}{\text{Weight of Sample}} \quad (2)$$

Determination of Ash content: Procedure: 2 g of each of the powdered samples fruits, seeds and leaves) of *Lagenaria breviflora* was weighed into pre-weighed labeled crucibles and placed in the muffle furnace initially at low temperature of 28^0C, the temperature increased to 550^0C to ash the fruit, seed and leaf samples at 50 minutes, 40 minutes, 40 mins respectively. The furnace was allowed to cool before removing the crucible with its content, the crucible was later cooled in a desiccator and reweighed to get the ash content as in equation 3.

$$\%\ Ash = \frac{\text{Weight of ash x 100}}{\text{Weight of Sample}} \quad (3)$$

Determination of Crude Fibre content procedure: The defatted sample (3 g) of the fruit, seed and leaf of *Lagernaria breviflora* were weighed and transferred into a 400 ml beakers. 50 mL of 1.25% H_2SO_4 was added make up to 200 mL with distilled water and was boiled for 30 minutes, it was then cooled in a desiccator and filtered thereafter with a filter paper in a funnel. The residues were washed with hot water and tested for acid with litmus paper, this was done until the residues were acid free. The residues were transferred into the 400 mL beakers again and digested

with 50 mL of 1.25% NaOH, made up to 200 mL with distilled water and boiled for another 30 minutes. The digests were allowed to cool, filtered and washed with hot water until the residues was alkaline free. The weight of the oven dried residues were noted after cooling in a desiccator.

$$\%\ Crude\ fibre = \frac{\text{Weight of ash X 100}}{\text{Weight of defatted sample}} \quad (4)$$

Determination of Protein content (modified Kjeldahl method): The analysis was carried out in three stages, these were: The digestion stage, distillation stage and the titration stage. The powdered samples (5 g) were weighed into 3 different 250 mL Kjeldahl flask. 0.5 g of each of the Kjeldahl catalysts (copper sulphate and sodium sulphate) were weighed into the Kjeldahl flasks. Anti-bombing granule was added and 50 mL of concentrated sulphuric acid was also added to the flask. The digestion flask was then place on the heating mantle to heat gently for an hour before being transferred to electric stove. The digestion process proceed with occasional swirling until a clear solution was obtained. The clear solution was transferred into a 100 mL standard flask and made up to the mark with distilled water.

10 mL of the digest was measured into the micro distillation apparatus; 12.5 mL of sodium hydroxide was also added to the flask. A condenser was connected from the distillation apparatus to a volumetric flask containing 5 mL of 5% boric acid and 2 drops of double indicator (methyl red and methyl blue). This was distilled for 50 minutes; the distillate was then titrated with 0.1M standard hydrochloric acid until a pale pink colour end point was obtained. The volume of acid used was noted. The blank determination was also carried out.

$$\%\ Nitrogen = \frac{\text{mL of HCl(sample)} - mL\ of\ HCl\ (blank) X\ molarity X\ 14X\ 100\ X100}{\text{mL of digest X Weight of sample X 1000}} \quad (5)$$

$$\%\ Crude\ protein = \%\ Nitrogen\ X\ Protein\ factor \quad (6)$$

Where the Protein factor and Nitrogen factor are 6.25 and 14 respectively.

Determination of Carbohydrate content: The carbohydrate content of each sample using the fornula below:

$$\%\ Carbohydrate = 100 - (\%\ Ash + \%\ Protein + \%Fat + \%Fibre) \quad (7)$$

Determination of Ascorbic acid content: Procedure: Each of the samples (5 g) fruit, seed and leaf of *Lagenaria breviflora* were homogenized with 50 ml of 0.1M Trichloroacetic acid and 30 ml of 0.1M Ethylene diamine tetra acetic acid extraction solution for 10 minutes using a stirrer.

The final volume of the extracts was measured and 10 mL of 30% potassium iodide and 4 drops of starch indicator was added to the conical flasks containing 20 mL of the extract, the flask was then shake for 5 minutes. The solutions were titrated with 0.01M Copper (11) tetraoxosulphate (vi) acid to a blue black endpoint. Blank determination was carried out by the same procedure but in the absent of the sample.

Table 1: Titration values for Vitamin C determination

	Fruit		Seed		Leaf	
Burette Readings	1ST Reading	2nd Reading	1st Reading	2nd Reading	1st Reading	2nd Reading
Final	3.50	3.20	2.70	2.90	6.20	6.10
Initial	0.00	0.00	0.00	0.00	3.00	4.00
Total Volume Used	3.50	4.20	2.70	2.90	3.20	2.10

$$Average\ volume\ of\ acid\ used\ (Average\ Titre) = \frac{\pi}{2}\ (1st\ Reading + 2nd\ Reading) \quad (8)$$

$$\%\ Ascorbic\ acid\ content = \frac{mL\ of\ CuSO4 - mL\ of\ CuSO4\ for\ blank\ X\ Vol.of\ sample\ extract\ X\ 0.88\ X100}{\text{Vol.of extract used for titration X Weight of sample}} \quad (9)$$

Where, 0.88 g is the Ascorbic acid factor.

Phytochemical analysis of Lagenaria breviflora: Alkaloid content: 5 g of each of the samples were weighed into a beaker, 100 cm^3 of 100% acetic acid in ethanol (1:1) was measured into the sample beakers and covered with filter paper to stand for 4hrs after which it was filtered. It was then concentrated using water bath to a quarter of the original volume. Ammonia solution was added to the concentrated sample (extract) drop wise until the precipitation was completed. The precipitate was allowed to settled,

filtered and washed with dilute ammonium hydroxide. The residue left was dried in an oven and weighted.

$$\%\ Alkaloid\ content = \frac{(W2 - W1)\ x\ 100}{W} \quad (10)$$

Where, W_2 = Weight of filter paper + precipitate, W_1 = Weight of empty filter paper and W = Weight of sample

Flavonoid content: Method: The powdered sample (5 g) of the fruit, seed and leaf was weighed into a beaker and extracted with 50 cm^3 of methanol at room temperature for 1 hour. The solution was filtered through filter paper and the filtrate was evaporated to dryness over water bath and oven at 80^0C. The weight of the dried extract was taken using equation 11 ((Onwuka, 2005)) and the results recorded.

$$\%\ Flavonoid\ content = \frac{(W2 - W1)\ x\ 100}{W} \quad (11)$$

Where: W_2 = weight of beaker + extract, W_1 = weight of empty beaker and W = weight of sample.

Tannin Content: Method: The powdered sample (0.5 g each) were weighted into different beakers and 20 cm^3 of distilled water was added and stirred with a stirrer for 1hr, it was then filtered and 3 cm^3 of the filtrate was measured into a test tube and mixed with 3 cm^3 of 0.1M HCl and 3 drops of ferrocyanide. It was allowed to stand for 10 min, then the tannin content was measured using the UV spectrophotometer at 605 nm wavelength and calculated as in equation 12 (Onwuka, 2005).

$$\%\ Tannins = \frac{\text{An x C x 100 x Vf}}{As\ x\ Wx\ Va} \quad (12)$$

Where: A_n = Absorbance of test sample, A_s = Absorbance of standard solution, C = Concentration of standard sample, V_f = Total volume of extract, V_a = Volume of extract analysed and W= weight of sample used.

*Phytate content: Method***:** Each of the 3 samples (5 g) were weighed into 3 beakers 25 cm^3 of 0.5 M NaCl was added and shaken for 30 minutes, it was filtered using filter paper. 25 cm^3 of Ferric chloride solution was added to the filtrates, and ferric phytates precipitate was observed. The precipitate was converted to sodium phytates by the addition of 3 cm^3 sodium hydroxide solution. The precipitate was then digested with 2 mL portion of concentrated Sulphuric and perchloric acids. The liberated phosphorus was quantitated by UV spectrophotometer at 620 nm and calculated as in equation 13 (Onwuka, 2005).

$$\%\ Phytate = \frac{\text{An x C x 100 x Vf}}{\text{As x W x Va}} \quad (13)$$

Where: A_n = Absorbance of test sample, A_s = Absorbance of standard solution, C= Concentration of standard sample, V_F = Total volume of extract, V_a = Volume of extract analysed and W = weight of sample used.

Heavy metal analysis: Each of the powdered samples (1 g) was weighed into 3 different crucibles and ignited in a muffle furnace at 550^0C for 50 minutes it was allowed to cooled before being used for the elemental analysis. 20 mL of 4M Nitric acid and 50% perchloric acid solutions were added and heated to digest the ashed samples into digests.

The digested samples were diluted to 100 mL volume with distilled water before they were used for the determination of Cadmium, Chromium, Iron, and Lead in the samples. The elemental analysis of the fruit, seed and leaf samples was carried out using Buck Scientific Atomic Absorption Spectrophotometer model 210 VGP at their different wavelengths namely; Cd (228.9), Cr (357.0 nm), Fe (248.0 nm) and Pb (283.3 nm) as reported by Akpe *et al.* (2019).

RESULTS AND DISCUSSION

Table 2 shows the results of the proximate composition of *Lagenaria breviflora* to be 10% Ash, 0.26% Protein, 1.5% Fat, 43.3% Fibre, 88% Moisture, 44.94% Carbohydrate in the Fruit. The result shows the *Lagenaria breviflora* Leaf to contain 22.5% Ash, 1. 1.50% Protein, 12.25% Fat, 16.60% Fibre, 84% moisture and 47.15% Carbohydrate. The seed was found to contain 5.5% Ash 1.69% Protein, 16.25% Fat, 40.0% Fibre, 84% Moisture and 36.56% Carbohydrate. Table 3 shows the results of the Ascorbic acid content to be 85.88% in the fruit, 66.88% in the leaf and 65.12% in the seed of the *Lagenaria breviflora*. Table 4 shows the results of the phytochemical parameters analysed to be 0.03% alkaloid, 2.11% Tannins, 0.11% Flavonoid, and 0.58% Phytate content in the *Lagenaria breviflora* fruit.

The leaf contains 0.02% Alkaloid, 1.98% Tannin, 0.24% Flavonoid and 0.92% Phytate. The seed was found to contained 0.04% Alkaloid, 1.89 Tannin, 0.69% Flavonoid and 0.46% phytate.

Table 2: Proximate composition of the fruit, leaf and seed samples of *Lagenaria breviflora* (% dry weight)

Sample	Ash (%)	Protein (%)	Fat (%)	Fibre (%)	Moisture (%)	Carbohydrate (%)
Fruit	10±1.0	0.26±0.04	1.50±0.1.	43.3±1.2	88±2.0	44.94±1.06
Leaf	22.5±1.5	1.50±0.05	12.25±0.5	16.60±0.40	42±1.0	47.15±1.05
Seed	5.5±0.5	1.69±0.21	16.25±0.75	40.0±0.5	84±1.0	36.56±1.04

N/B: Values reported in mean ± SD format, with N=3.

The results of the heavy meals analysis (Table 5) shows the *Lagenaria breviflora* Fruit to contain 0.0014 mg/g Chromium, 0.0060 mg/g Iron. The Leaf contained 0.0021 mg/g of Chronmium, 0.011 mg/g of

Iron. The Seed was found to contain 0.0012mg/g of Chromium, 0.0037 mg/g of Iron. The amount of Cadmium and Lead was not detected by the instrument, same with Lead in the fruit and seed sample.

Table 3: Ascorbic and content of *Lagenari breviflora* (% wet weight)

Sample	Ascorbic Acid Content (%)
Fruit	85.88±1.20
Leaf	66.88±1.00
Seed	65.12±0.58

N/B: Values reported in mean ± SD format with N=3.

Table 4: Phytochemical analysis of fruit, leaf and seed samples of *Lagenaria breviflora.*

Sample	Alkaloids (%)	Tannins (%)	Flavonoids (%)	Phytate (%)
Fruit	0.03±0.01	2.11±0.05	0.11±0.02	0.58±0.03
Leaf	0.02±0.01	1.98±0.02	0.24±0.05	0.92±0.03
Seed	0.04±0.01	1.89±0.02	0.69± 0.02	0.46± 0.04

N/B: Values reported in mean ± SD format, with N=3.

Table 5: Mean levels of some heavy metals in the fruit, leaf and seed samples of *Lagenaria breviflora*

Sample	Cd (mg/kg)	Cr (mg/kg)	(Fe) (mg/kg)	Pb (mg/kg)
Fruit	N.D	0.0014±0.0010	0.0060±0.0010	ND
Leaf	N.D	0.0021±0.0020	0.0110±0.0010	ND
Seed	N.D	0.0012±0.0010	0.0037±0.0013	ND

N/B: N.D means Not Detected, values reported in mean ± SD format with N=3.

Ash content: The results of the analysis in Table 2 showed a higher ash content of 22.5% in the leaf followed by 10% ash in the fruit with the seed having the lowest value of 5.5% comparing this result with that obtained for other members of the *Cucurbitaceae* family, *Lagenaria spaerica* seed of 2.68% (Chinyere *et al*., 2009) and pumpkin leaf of 6.30% (Aruah *et al.*, 2011). Since the ash content is said to be a measure of the mineral content, the *Lagenaria breviflora* Leaf has a higher Mineral content followed by the Fruit and with the Seed as the least.

Protein content: The result of the analysis (Table 2) carried out revealed the crude protein content of 0.26% in the Fruit, 1.69% in the seed and 1.50% in the leaf of *Lagenaria breviflora* samples. From the analysis, the seed has the highest protein content followed by the leaf while the fruit has the lowest valve. Also, comparing the result obtained with other result reported for some members of the same family, revealed the protein content of the seed to be lower than 23.45% for *Lagenaria sphaerica* seed extract reported by (Chinyere *et al.*, 2009). The *Lagenaria breviflora* leaf contained lower protein when compared to 8.38% of pumpkin leaf (Aruah *et al.*, 2011). The plant is shown to have a low protein content and cannot therefore serve as a good source of protein.

Crude fat content: The crude fat content of *Lagenaria breviflora* as revealed from the result (Table 2) shows the seed to have the highest crude fat content of 16.25%, followed by 12.25% in the leaf and 1.5% in the Fruit, Chinyere *et al.* (2009) also reported fat content of seed of *Lagenaria sphaerica*. Thus its seed is a good source of crude fat.

Fibre content: Fibre content represents the indigestible or rough matter in food (Sathe, 1999). From the results (Table 2), the Fruit of *Lagenaria breviflora* is shown to have a highest fibre content of 43.3% for the leaf sample. In comparison, the fibre content of the leaf was found higher than 5.23% reported for pumpkin leaf (Aruah *et al.*, 2011). The result of the analysis revealed that the fruit and seed of the plant can serve as a good source of fibre.

Moisture content: The moisture content of *Lagenaria breviflora* samples were observed to be 88% in the Fruit, 84% in the seed and 42% in the leaf. This shows the amount of water content in each of the samples. The obtained result for the seed is higher than 7.92% reported for *Lagenaria sphaerica* seed and 73.8% of pumpkin leaf as reported (Aruah *et al.*, 2011) and 7.92% moisture content of *Lageneria spaerica* seed (Chinyere *et al.*, 2009). The results show that the Fruit and Seed have shorter shelf life than the leaf.

Carbohydrate content: The result of the analysis shows that leaf sample has the highest value of 47.15% followed by 44.94% of the fruit sample and 35.56% for the seed sample. From the result, it is observed that L*agenaria breviflora* to a rich source of carbohydrate compare to 4.91% *Lagenaria spaerica* seed (Chinyere *et al.*, 2009).

Ascorbic acid content: The results of the analysis (Table 3) shows that the fruit sample has the highest concentration of 85.88% Ascorbic acid, followed by 66.88% in the seed and 65.12% in the leaf. The result reveals that the *Lagenaria breviflora* fruits, seeds and leaves could be used as a good source of ascorbic acid supplement. According to US-FDA (2016), *L. breviflora* is a rich source of Vitamin C, because foods providing 20% or more of the Daily Value (90 mg) are considered to be high or rich sources of Vitamin C.

Phytochemicals qualitative analysis: The result of the qualitative analysis indicates the presence of alkaloid slightly (+) in the fruit and seed samples of *Lagenaria breviflora* while it was found to be absent (-) in the leaf sample Tannin was found to be moderately (++) in the seed and fruit samples fruit samples, slightly present

(+) in the leaf sample. Flavonoid was observed to be absent (-) in each of the three samples white phytates was moderately present (++) in the leaf sample, slightly present (+) in the fruit and seed samples.

Quantitative analysis of Phytochemicals: The quantitative analysis of the phytochemical parameters of *Lagenaria breviflora* shows that the fruit sample has 0.026% Alkaloid, 2.11% Tannin, 0.11% Flavonoid and 0.58% phytate. The seed contained 0.044% Alkaloid, 0.69% Flavonoid, 1.89% Tannin, and 0.46% phytate. The leaf was found to obtain 0.018% Alkaloid, Flavonoid, 1.98% Tannin and 0.92% phytate. The result of the heavy metal composition determination shows that the *Lagenaria breviflora* contains some heavy metals at concentrations which are not toxic to human health. The Chromium value of 0.0014 mg/g in the Fruit and 0.0021 mg/g in the leaf were found to be within the permissible limits of WHO, same with iron. Thus, the leaf, fruit and seed are fit for consumption.

Conclusion: The study revealed that *Lagenaria breviflora* leaf has the highest mineral content due to its increased percent ash, this is followed by its fruit, its high moisture content makes it deteriorate fast, and the plant is a good source of ascorbic acid, crude fibre and carbohydrates. The Phytochemical parameters investigated were in considerable levels, the heavy metals determination shows the presence of chromium and iron at low levels which makes the *Lagenaria breviflora* fruits, seeds and leaves fit for consumption. The fruits, seeds and leaves could be beneficial to the biological sector owing to its good medicinal value.

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Data Availability Statement: Data are available upon request from the first author or corresponding author.

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