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Nutritive Value of *Lagenaria sphaerica* Seed (Wild Bottle Gourds) from South-Eastern Nigeria

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Abstract: The nutritive value of *Lagenaria sphaerica* (Wild Bottle Gourd) from South-Eastern Nigeria was studied. The results show that the nutritional value of this seed is similar to those of *curcubitacae* (Melon) seeds. Its moisture (7.92%), crude fibre (3.65%) and ash (2.68%) levels compare to those of peanuts, sesame and sunflower but its carbohydrate level is (14.22%) lower. The *Lagenaria sphaerica* seed is rich in protein (23.48%) and minerals (73.12%). It also contains high lipid levels (44.54%) similar to those of the other oilseeds. The fatty acid profile show *linoleate* (18.2) as the most abundant (62%). This seed can thus be considered as a rich source of proteins and oils.

Key words: *Lagenaria sphaerica,* bottle gourds, oilseeds

Introduction

Bottle Gourds (*Lagenaria specie*) play important horticultural role in Africa. There are different species of this plant found worldwide and both mature and immature fruits are employed in medicinal practices (Jeffrey, 1978). Bottle Gourds are vigorous climbers and a close relative of the calabash (*Lagenaria siceraria)*. The plant exhibits fruit size variations ranging from as small as a cricket ball to sizes larger than melon (*cucurbitacae species)*. The larger sizes are abundant in southern region of Nigeria.

Lagenaria sphaerica is perennial and the fruits are indehiscent berry with many flattened seeds. The fruits are found hanging from a stout 30-100 mm long stalk, greenish in colour with white patches. The specie found in South-Eastern Nigeria can bear up to 200 fruits in a single plant. The bitter taste of the fruits are attributed to elastase activity by Brandwijk-Breyer and Watt (1962).

There are variable reports on the medical uses of parts of this plant (Hutchings *et al.*, 1996). The leaves of different species of *lagenaria* have been reportedly used as food condiments (Rood, 1994; Wyk and Gericke, 2000). Oilseeds of cucurbitaceae are widely employed in domestic activities and have high nutritive values (Achu *et al.*, 2005). These oilseeds are good sources of lipids and proteins with defatted cakes capable of being used as a protein supplement in human nutrition.

However, there are scanty reports on the uses of *Lagenaria sphaerica* seeds and seedoils. This research therefore aimed at evaluating the nutritional value of Wild Bottle Gourd (*Lagenaria sphaerica*) specie from South-Eastern Nigeria. This will aid in promoting the use of its seeds and seed oil in the management of nutrition related problems in Nigeria in particular and Africa in general. This research consists of analyzing the content in moisture, crude proteins, total lipids, ash, crude fibre, minerals, carbohydrates, fatty acid composition and *flavonoids*. Also determined were alkaloid content saponins and dry matter. The physical and chemical characteristics of the seedoil were also analyzed.

Materials and Methods

Collection and treatment of samples: The fruits of *Lagenaria sphaerica* were collected from bushes in Ovim, Isuikwuato Local Government Area, Abia State Nigeria. They were identified as *Lagenaria sphaerica* (Wild Bottle Gourd) by the Taxonomy Department, Michael Okpara University of Agriculture Umudike-Umuahia, Abia State, Nigeria. The harvested fruits were stored in dry non-humid conditions to avoid rot.

Processing: The fruits were cut open to expose the seeds inside. The seeds were carefully collected, washed, sundried for three days, shredded and the brittle husk discarded. The freshly oil seeds were wrapped in cellophane and stored in a refrigerator (4-10°C) to avoid deterioration.

Assays: Fleshy oilseeds of samples were grinded mechanically in a mortar and the following parameters determined.

The crude protein content was evaluated by digestion of the sample, nitrogen determined by *spectrophotometric* method described by Devani *et al.* (1989) and the protein content obtained by multiplying the quantity of nitrogen by the coefficient 6.25. Total lipid was determined by continuous extraction in soxhlet apparatus for 8 hours using n-hexane as solvent. Ash was measured by incineration in a furnace at 550°C as described by James (1995). The soluble carbohydrate content was obtained by method of Udoh and Ogunwale (1986), while alkaloids were measured by Harboune (1973) method. The moisture content was obtained through drying in an oven at 100-105°C to constant weight (AOAC, 1980), while *saponins* and *flavonoids* were measured by methods of Pearson (1976). All the values for minerals were obtained using Atomic Absorption Spectroscopy (AAS) and fatty acid profile obtained through High Performance Liquid Chromatography (HPLC) with relevant standards. The specific gravity of the seedoil was obtained using specific gravity bottle as described by Pearson (1980). Iodine value was by Wiji's method, *saponifications* number, acid value and peroxide values were as recommended by AOAC (1984). All the analyses were done in triplicate and reagents used were of analytical grade.

Results and Discussion

The results of the analysis are presented in Tables 1-4. In Table 1 the nutritive contents of the wholeseed are shown. The moisture content is expressed in grams per 100 g of fresh weight (g 100 g^{-1} F.W.) and the contents in crude proteins, total lipids, ash, crude fibre and carbohydrates in grams per 100 grams dry weight (g 100 g^{-1} d.w.). Also expressed in grams per 100 grams dry weight are the alkaloids *saponins* and *flavonoids*. However the mineral contents of the seed oils are represented in milligrams per Kilogram (mg kg^{-1} f.w.) fresh weight. The moisture content of this seed obtained was 7.92 g 100g^{-1} (F.W.). This value is similar to those obtained by Achu *et al.* (2005) for *cucurbita moschata* (8.21 g 100g^{-1}), *Lagenaria siceraria* (6.09 g 100g^{-1}), *Cucumeropsis manni* (6.49 g 100g^{-1}) and FAO (1970) reported (5.7%) for *C. Lanatus*. Similar values have also been obtained for other edible oilseeds thus, cottonseeds (6.48%), Palm Kernel (5.31%) and sunflower seeds (8.55%) by Kershaw and Hackett (1987). The low moisture levels of *Lagenaria* sphaerica is advantageous as it will enable the seeds be preserved for long periods of time as done for melon; (Cucurbitaceae specie).

The protein content of the *Lagenaria sphaerica* was 23.48 g 100g^{-1} (d.w.). This value compare well with 25.8% obtained for *C. Lanatus* (FAO, 1970), *C. Sativas* 28. 66% (Achu *et al.*, 2005) *L. Siceraria* from Niger, 16.9% (Silou *et al.*, 1999) and those of other oilseeds such as cashew (22.8%), cottonseed (21.9%), Sesame (18.7%) (FAO, 1982) and African pear (25.9%) (Omoli and Okiy 1987). The protein content of *Lagenaria shacrica* though lower than that obtained by Valnet (1985) for soybean seed (40%) could be employed as a nutritional supplement for the malnourished, children, pregnant women and old people who need high protein diet for sustenance.

The oil extracted from wild bottle gourd using n-hexane was liquid at room temperature, yellow in colour with an agreeable odour. This seed yielded 44.54 g 100 g^{-1} seed and was quite *saponifiable* (Table 3). This yield was similar to those obtained for various oilseeds by other workers. Idouraine *et al.* (1996) reported a yield of 34.5-45.5% for C. peposeeds and Martin (1998) a yield of 50% for melons, squashes and pumpkins. Our values are similar to those reported by FAO (1982) for sunflower (45.6%), peanuts (47.5%) but less than that for melon (C. Lanatus) 59% by Cherry (1998). The percentage yield of this wild bottle gourd is high and can be considered as a good source of vegetable oils.

The ash content of this seed was 2.68 g 100 g^{-1} which is lower than those obtained by Achu *et al.* (2005) for cucurbitaceae and Idouraine *et al.* (1996) for C. peposeeds. However, our result is similar to those obtained by Silou *et al.* (1999) for melon from Nigeria (2-5%) and peanuts (2.78%) (Oyenuga, 1968).

The crude fibre content of 3.65% is close to that obtained by Achu *et al.* (2005) for *cucurbitaceae* but much lower than that for cottonseeds (FAO, 1982) and African pear (17.9%) Omoli and Okiy, 1987). Crude fibre is essential for enhanced faecal bulk, prevents constipation and stimulates peristasis.

A carbohydrate content of 14.22 g 100 g^{-1} was obtained and is similar to those reported for pumpkin seed (10%), sesame (20.2%) and sunflower seeds (25%) (FAO, 1982).

Low concentrations of *saponins* (2.81 g 100 g^{-1}), Alkaloids (0.86 g 100 g^{-1}) and flavonoids (2.23 g 100 g^{-1}) were obtained for the wild bottle gourd. These values are low and considered of no nutritional significance.Of the minerals identified in the seed, Calcium (49.72 mg kg^{-1}) magnesium (54.84 mg kg^{-1}) sodium (69.60 mg kg^{-1}) and potassium (73.12 mg kg^{-1}) were of high values. While, sodium and potassium are important ions in the body fluid, calcium plays an essential role in bone formation and magnesium is involved in enhancement of activities of metabolic enzymes. The oilseed can therefore serve as an important source of the minerals.

In Table 3, the physical and chemical properties of the seedoil are shown. An iodine value of 41.05 is indicative of high levels of unsaturated fatty acids and can explain its liquid state on storage at room temperature. An acid value of 2.33 was obtained for the bottle gourd seedoil. This low value makes it acceptable as edible oil. Similar values were reported for *P. macrophylla* and *T. occidentalis* in our earlier research (Akubugwo *et al.*, 2008). Also, the low peroxide value of 4.83 indicates freshness of the seedoil from wild bottle gourd. Peroxide value is used as an indicator of deterioration of oils. Fresh oils have values less than 10 M. Eq. Kg^{-1}. Values between 20 and 40 result to rancid taste (Pearson 1976). The high saponification value of 196 indicates that the seedoil can be used industrially. Highly saponifiable oils have vast industrial applications, (Amoo *et al.*, 2004).

Table 1: Nutritive content of whole wild bottle gourd seed (g 100 g^{-1} f.w.)

Moisture content	Protein content	Lipid content	Ash content	Carbohydrate content	Crude fibre content	Alkaloids	Saponins	Flavoniod	Tannin
7.92	23.48	44.54	2.68	14.22	3.65	0.65	2.81	2.23	Absent

Table 2: Mineral composition of whole wild bottle gourd seed (mg kg^{-1} f.w)

Lead	Copper	Manganese	Iron	Zinc	Calcium	Magnesium	Sodium	Potassium
1.44	9.01	13.88	14.40	15.16	49.72	54.84	69.60	73.12

Table 3: Physical and chemical properties of seed oil extract of wild bottle gourd

Acid value (meq kg^{-1})	Iodine value	Peroxide value	Saponification value	Specific gravity	Percentage yield	State at 29°C	Colour	Odour
2.33±0.4	41.05±0.65	4.83±2.00	196.10±42	0.71±01	44.81±0.6	Liquiid	Yellow	Agreable

Table 4: Percentage fatty acid composition of wild bottle gourd

Fatty acid	(%)
C14:0	0.2
C16:0	14.4
C16:1	0.3
C18:0	5.8
C18:1	16.2
C18:2	62.0
C18:3	0.3
Others	0.9

Lastly a GLC analysis indicated the presence of seven fatty acids (Table 4), with *Linoleate* (18:2) the most abundant fatty acid (68.5%) for melon (cucurbitaceae specie). This high level of *polyunsa* turated fatty acid in the seedoil can be harnessed in the management of cardiovascular diseases.

Conclusion: This research has shown that seedoils of *Lagenaria sphaerica* are edible, compare favourably with those of melon and has nutritional qualities that can improve the health status of consumers. All the physicochemical properties of the seed oil compared favorably with those of related (consumed) seeds. The colour and odour of the seedoil were agreeable and the antinutritional factors present were of manageable levels.

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