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Full Length Research Paper

Qualitative determination of chemical and nutritional composition of *Parkia biglobosa* (Jacq.) Benth

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Qualitative determination of chemical and nutritional composition of *Parkia biglobosa* seeds an underexploited crop seed in Nigeria was carried out. Seeds of *P. biglobosa* were found to be rich in lipid, protein, carbohydrate, soluble sugars and ascorbic acid. The cotyledon was very nutritious, has less fibre and ash contents when compared to that of testa. The oil content was suitable for consumption since it contains very low acid and iodine contents. The oil has very high saponification value and hence would be useful in soap industry. Some simple reducing sugars, including lactose, were identified.

Key words: *Parkia bioglobosa*, Qualitative determination, Industrial use, Saponification, underexploited.

INTRODUCTION

The African locust bean tree, *Parkia biglobosa* is a perenial tree legume which belongs to the sub-family M*imosoideae* and family *Leguminosae.* It grows in the savannah region of West Africa up to the southern edge of the Sahel zone 13°N (Campbell-Platt, 1980). These trees are not normally cultivated but can be seen in population of two or more in the savannah region of Nigeria (Schnell, 1957: Hopkins, 1983). The Parkia tree play vital ecological role in cycling of nutrients from deep soils, by holding the soil particles to prevent soil erosion with the aid of roots. The trees also provide shades for farmers (Campbell-Platt, 1980).

Parkia tree is used as timber for making pestles, mortars, bows, hoe handles and seats (Hagos, 1962; Irvine, 1961). The trees of the *Parkia* species are usually and carefully preserved by the inhabitants of the area where they grow because they are valuable sources of reliable food, especially the seeds which serves as source of useful ingredients for consumption (Campbell-Pratt, 1980). It has been reported that the husks and pods are good food for livestock (Douglass et al., 1976; Obiozoba, 1998).

Earlier investigations have mentioned the food and nutritive values of *P. biglobosa* and other species seeds (Fetuga et al., 1973; Odunfa, 1983; Alabi, 1993, Alabi et al., 2004). However, there has been no comprehensive report on *P. biglobosa* seeds for industrial usage, which is the purpose of this study.

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MATERIALS AND METHODS

Parkia biglobosa seeds were collected from Abeokuta, Saki, Igbo-ora and Ago-sasa in South Western Nigeria. The seeds were soaked in distilled water for 24 h to remove any inhibitory materials and later boiled for 12 h with constant replacement of water. After cooling, the pulp was removed by washing the seeds with several changes of water. Then the testa was separated from the cotyledons and both were air dried for 3 weeks to almost constant weight before milling separately using pestle and mortar. The powdered forms were kept in sample bottles prior to analysis.

The assays were carried out to obtain the nitrogen, crude protein, lipid, carbohydrates, saponification, acid, iodine, starch, total reducing sugars, total oxalates, total hydrocyanic acid and ascorbic acid contents.

The crude protein was determined according to the method described by AOAC (1980). The total carbohydrates was estimated using the method of Dubois et al. (1951). The total starch was estimated using the diastase hydrolysis method as modified by

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Table 1. Proximate analysis of *P. biglobosa* seeds.

Seed part	Lipid (mg/100 g)	Crude protein (mg/ 100g)	Carbohydrate (mg/100 g)	Total soluble sugars (mg/100g)	Starch (mg/100g)
Cotyledon	16.86±61[a]	34.02±1.20[a]	20.70 ± 0.80[a]	25.66 ± 1.30[a]	10.25 ± 0.32[c]
Pulp	2.96 ± 0.30[b]	6.62 ± 1.02[a]	4.61 ± 0.70[b]	3.72 ± 0.50[b]	25.65 ± 1.30[b]
Testa (cover tissue)	1.05 ± 0.25[c]	1.63 ±0.70[c]		2.79 ± 0.46[bc]	22.25±1.10[ab]

Results are means of five replicates. Values followed by same alphabet within each column are not significant at p = 0.05.

Table 2. Qualitative analysis of some chemical contents of seeds of *Parkia biglobosa.*

Seed parts	Dry matter %	Moisture content %	Crude Fibre mg/100g	Total ash mg/100 g	Cellulose content mg/100g
Cotyledon	39.55±1.0[c]	60.45±1.35[a]	2.21±0.12[c]	3.95. ±30[c]	1.64±0.15[c]
Pulp	59.89±1.3[b]	40.36±1.88[b]	ab (30.65±1.30)	a (13.25±1.10)	3.86±0.40[b]
Testa(cover tissue)	90.60±3.2[a]	9.40±0.65[a]	32.15±2.60[a]	12.96±1.26[ab]	24.62±1.36[a]

Results are means of five replicates. values followed by same alphabet within each column are not significant at p = 0.05.

Table 3. Qualitative analysis of saponification, acid and iodine value contents from seeds of *p. biglobosa.*

Seed parts	Saponification mg/100 g	Acid content mg/100 g	Iodine content mg/100 g
Cotyledon	160.60±1.21[a]	1.90± 0.52[c]	1.05± 0.11[c]
Pulp	12.81± 1.20[b]	14.42± 1.05[ab]	12.35 ± 1.02[ab]
Testa (covering Tissue)	3.25 ± 0.40[c]	16.26±1.30[a]	14.65 ± 1.48[a]

Results are means of five replicates. Values followed by same alphabet within each column are not significant at p = 0.05.

Fasidi (1975). The quantity of hydrolysed starch was determined using the phenol sulphuric acid method of Gilles et al. (1956).

The qualitative analysis of the individual sugars was carried as previously described (Alabi, 1987). Pure protein and cellulose content were determined using the method described by Rajhan and Copal-Krishina (1980). The ether extractive was determined using the method of Block (1956) while the total oxalate was determined using the method of Oke (1966). The hydrocyanic and ascorbic acids were determined according to AOAC (1980). The dry matter, moisture content, crude fibre, total ash and cellulose contents were determined as described by Alabi (1990). All data collected were subjected to standard statistical analysis in order to determine the level of significance.

RESULTS AND DISCUSSION

The proximate analysis of the nutritive contents of *P. biglobosa* seeds is depicted in Table 1. The cotyledon contains the highest amount of lipid, crude protein, pure protein, carbohydrates, total soluble sugar and starch. The dry matter content of the testa was significantly higher than that of the pulp while that of the cotyledon is the lowest. However, the moisture content of the cotyledon is significantly higher than that of the pulp and testa (Table 2). The cellulose content of the testa and pulp are significantly higher than that of the cotyledon.The cotyledons have significantly higher saponification value than both the pulp and the testa (Table 3). On the other hand, the acid and iodine values of both pulp and testa are significantly higher than those of the cotyledon. The total Oxalate and hydrocyanic acid contents of both the testa and the pulp are significantly higher than that of the cotyledon (Table 4). However the ascorbic acid content of the cotyledon is significantly higher than those of the pulp and the testa. Cotyledon contains all the seven simple sugars analysed (Table 5). The pulp too contains six simple sugars except maltose. The testa contains only five simple sugars; there were no lactose and maltose. The raffinose, lactose, glucose, galactose, fructose and maltose contents of the cotyledon were significantly higher than those of the pulp and the testa. The sucrose contents of both the pulp and testa are higher than that of the cotyledon.

The high protein content of the cotyledon of *P. biglobosa* seeds (34.02%) is similar to that of Okpala

Table 4. Qualitative analysis of oxalate, hydocyanic acid and ascorbic acid contents of *P. biglobosa* seeds.

Seed parts evaluated	Total Oxalate content mg/100 g	Total hydrocyanic acid content mg/100 g	Total Ascorbic acid content mg/100 g
Cotyledon	1.15 mg/100 g 0.04 ^{c}	0.96 ± 0.04 ^{c}	2.5 . ± 1.13^{a}
Pulp	3.40 ± 0.72 ^{ab}	6.85 ± 0.81 ^{ab}	9.85 ± 0.31 ^{b}
testa (seed cover)	4.96 ± 1.00 ^{a}	6.99 ± 0.72 ^{a}	8.46 ± 0.42 ^{bc}

Results are means of five replicates.
Values followed by same alphabet within each column are not significant at p = 0.05.

Table 5. Qualitative analysis of simple sugars in seeds of *Parkia biglobosa*.

Seed parts used	Raffinose mg/100 g	Lactose mg/100 g	Sucrose mg/100g	Glucose mg/100 g	Galactose mg/100g	Fructose mg/100 g	Maltose mg/100 g
Cotyledon	0 .74 ± 06 ^{a}	0.71 ± .03 ^{a}	0.45 ± 0.02 ^{ab}	0.68 ± 0.02 ^{a}	0.65 ± .05 ^{a}	0.50 ± .03^{a}	0.52 ± .0.01 ^{a}
Pulp	0.43 ±0 .05 ^{b}	-	0.48 ±0 .02^{a}	0.25 ± 0.04^{b}	0.10 ± .0.03^{b}	0.20 ±0 .02	-
Testa	0.13 ± .03 ^{c}	-	0.46 ± .02^{ab}	0.03 ± 0.01 ^{c}	0.08 ± .003 ^{c}	0.12 ± 0.01 ^{c}	-

Results are means of six replicates.
Values followed by the same alphabet within the each column are not significant at p = 0.05**.**

(31.60%; 1990), Alabi (35.0%, 1993) and Obizoba (34.3%, 1998). This indicates that consumers of fermented products of *P. biglobosa* seeds such as 'Iru' and 'Ogiri' would obtain enough high protein. The total carbohydrates found left was 20.70% while the total soluble sugars obtain is 25.66% making a total of 46.36%. This result is similar to that of Okpala (1990) and Alabi (1993). This large value of soluble and insoluble carbohydrates obtained from the edible aspect of the seeds would afford the consumers to gain enough energy needed for the biochemical and biological reactions with the body systems which would promote growth and development. The higher amount of crude fibre obtained from the testa and the pulp may be due to tough texture, especially at maturity and probably due to presence of waxy substances (Zoberi, 1973). This may also be responsible for the higher ash and cellulose contents of the pulp and testa.

The amount of lipid obtained (16.86%) is similar to results obtained by Balogun and Fetuga (1986), Odunfa (1983) and Alabi (1993). The lipids were observed to contain saturated fatty acid and hence could solidify as fats at temperatures below 20°C. Ayelaagbe et al. (1996) and Alabi et al. (2004) reported that oils derived from the cotyledons of the seeds have significantly high saponification value 160.60 mg/100 g, low iodine value of 1.05 mg/100 g, and low acid value of 1.90 mg/100 g, which will make *P. biglobosa* seed oil very useful for soap making. Further, the low Iodine and acid values show it is suitability for consumption. Oke (1966) reported that large amount of total oxalate and hydrocyanic acid in any tissue lowers the nutritive values. The fermented seeds contain a lot of reducing sugars, which are very sweet. Significantly noticeable among the reducing sugars is the lactose, which is a constituent of breast milk.

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