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Profile of the African Bread Fruit (*Treculia africana)*

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Abstract: The African bread fruit is produced by *Treculia,* a wild tropical evergreen tree and has immense potential as a nutritional source for man. We evaluated its chemical and nutritional properties as a first step in realizing its food value. The seed [Dry Mass (DM) basis] contained 8% moisture, 12.5% crude protein, 4.2% fat 2.3% ash 1.6% fibre and 73% carbohydrate. The carbohydrate and protein contents in it were much higher than other parameters studied. Compositions of toxicants in seeds were quite low with levels (mg/100 g) of 0.06±0.12 for hydrocyanide 3.0±0.11 for oxalate and 0.76±0.01 for phytate. For mineral elements, the contents (mg/100 gDM) were 587±0.2 for potassium (K), 186±0.2 for Magnesium (Mg) and 850±0.02 for zinc (Zn). The sodium (Na), Calcium (Ca), iron (Fe) and Copper (Cu) contents were negligible. Results of phytochemical screening of the extract showed, that it contained appreciable amounts of flavonoid, polyphenols, anthraquinones, saponins and cardiac glycosides. These secondary metabolites are known to have microbial activity as well as other physiological activity.

Key words: *Treculia africana*, seeds, secondary metabolites

INTRODUCTION

The nutritional and anti nutritional potentials of a number of wild tropical seeds and fruits have assessed by several workers (Grant *et al*., 1983; Alabi *et al*., 2005; Ejidike and Ajileye, 2007). Seeds often contain naturally occurring substances which are deleterious to man and animal (Checke and Scchull, 1985; Liner, 1986; Huisman *et al*., 1989; Osagi, 1998). These antinutritional factors need to be removed or inactivated by extensive washing and heat treatment of the seeds or seed meal prior to use in the diet. Rincon *et al*. (1990) and Nikdel *et al*. (1991) showed that commercial processing of food changed the composition of food including the loss of major constituents like polysaccharides, protein, vitamins and minerals.

Ukpabi and Chukwuma (1999) reported on the production of the African bread fruit and soybean (Glycine max) sed based food formulation, Chukwuma and Ukppabi (1999) studied the effects of germination and fermentation on nutritional and organoleptic quality. Lin and Shieh (1992) noted the presence of pyrono flavonoids in bread fruits (*Artocarpuss comunis*) which also contained strong inhibitory effects Shittu *et al*. (2004) studied the water absorption process during soaking of the African bread fruit seeds at five typical soaking temperatures. Ranging between 30 and 70^{o}C and found that water absorption increase exponentially with an increase in temperature.

Treculia africana is native to many parts of West and tropical Africa. The bread fruit tree is of the family, Moracene and is one of the four members of the genera. Treculia. It grows commonly in evergreen and deciduous forests, often by streams but may sometimes be planted as in Nigeria where it is very common in the Western and Eastern states (Hatchinson, 1973). The seeds is used for soup thickening and making bread fruit cakes, snacks and cookies, A decoction of the breadfruit leaf is believed to lower blood pressure and may relieve asthma. Crushed leaves are applied on the tongue as a treatment for throat and the leaf juice is used locally as ear drops. The leaf ash is used as a remedy for enlarged spleen.

Despite, the great nutritional and medicinal potential of the African bread fruit, there is little analytical information on the chemical profile of the fruit and seed. Here we analyzed the food value of the African bred fruit and seeds to support their use in food and feed formulation.

MATERIALS AND METHODS

Mature fruit samples of *Treculia africana* were collected from a rainforest in Calabar, Nigeria and properly, identified at the University of Calabar Botanical Garden. Seeds were manually separated from five freshly plucked fruits and oven dried in an Astell Hearson type oven at 60^{o}C for 24hr. The dried samples were ground into power with an electric grinder and stored in a dissector prior to analysis.

Proximate analysis: The proximate composition of seeds was determined using the methods of the AOAC (1990). These analyses included moisture, crude protein, fibre, ash, fat and carbohydrate.

Toxicant analysis: Hydrocyanic acid (HCN) was estimated by the alkaline titration method (AOAC, 1975).

Phytic acid was determined by the method of McCance and Widdowson (1953) while oxalate was determined according to Dye (1956).

Analysis of mineral contents: Milled samples (5 g) were dry-ashed in a furnace at 550^o for 24 h. The resulting ash was cooled in a desiccator and later weighed. Two mL of concentrated HCl, were added to dissolve the ash and a few drops of concentrated HNO_3 were added (AOAC, 1990). The solution was placed in a boiling water bath and evaporated almost to dryness. The contents were then transferred to 100 mL volumetric flask and diluted to volume with deionized water and appropriate dilutions were made for each element before analysis.

A Pye Unicam atomic absorption spectrophotometer with acetylene flame was used to analyze calcium, magnesium, zinc, iron and copper as described in AOAC (1990). Sodium and potassium were determined with a flame photometer (Gallenkamp) as described in Vogel (1962). Emarck concentrated volumetric solutions were used as standard metallic ions solution for the calibrations. All reagents used were of analytical grade and the water used for the analysis were double distilled.

Phytochemical screening: This was carried out according to Sofowora (1980), Harborne (1973) and Oyoyede (2005). The seeds were screened for alkaloids, saponins, tannins, anthraquinones, anthranoids, flavonoids, polyphenols, phlobotanin and cardiac glucossides. To obtain the crude uaqueous extract 200 g of dried powered samples were soaked in 500 cm^3 of deionized water for 8 h. This was then filtered through whatman No. 1 filter paper and the excess water removed by concentration, using a rotary evaporator to 50 cm^3 and stored in the refrigerator for use. The ethanolic extract was obtained by soxhlet extractor followed by evaporation and concentration to remove the alcohol (Harborne, 1973). The extracts were tested for alkaloids, anthraquinones, saponins tannins polyphenols cardiac glycosides and anthraquinone using procedures described in Harborne (1973). Phlobatanninss were determined according to Oyeyede (2005).

RESULTS

Table 1 shows the proximate compositions of the seeds of *Treculia africana*. The seeds contained 8.01±0.10% moisture, 12.27+0.01% crude protein 2.26+0.02% ash, 4.23+00.02% fat and 73.26+0.01% carbohydrate. Table 2 shows the toxicant composition of the seed; the HCN, oxalate and phytate levels (mg/100gDM), were 0.06±0.12, 3.01±0.11 and 0.7±0.01, respectively. The levels of toxicants were considered relatively low. The mineral contents (mg/100 gDM) in seeds ranged from 7.10±0.01 for Na to 587±0.02 for K (Table 3). The heavy metal contents ranged from 1.66±0.01 for Fe to 8.50±0.02 for Zn. Results of phytochemical screening of seeds showed the presence of flavonoids, polyphenols, anthraquinone, saponins and cardiac glycosides (Table 4).

Table 1: Approximate compositions of the seeds of African breadfruit (*Treculia afriicana)*

Chemical property	Composition (%)
Moisture	8.01±0.10
Crude protein	12.47±0.10
Fat	4.23±0.02
Ash	2.26±0.02
Fibre	1.62±0.02
Carbohydrate	73.26±0.01

Results are means of 3 determinations±SD

Table 2: Toxicant composition of seeds of African bread fruit (*Treculia africana*)

Toxicants	Composition (mg/100 g DM)
Hydrocyanide	0.06±0.12
Oxalate	3.01±0.11
Phytic acid	0.76±0.01

Mean of 3 determinations±SD

Table 3: Mineral elements composition of the seeds of African bread fruit (*Treculia africana)*

Elements	Composition (mg/100 g DM)
Sodium	7.10±0.10
Potassium	587±0.02
Calcium	165±0.01
Magnesium	186±0.01
Iron	1.66±0.01
Zinc	8.50±0.02
Copper	3.67±0.01

Mean of 3 determinations±SD

Table 4: Phytochemical screening of the seeds of African bread fruit (*Treculia africana)*

Phytochemicals	Alcoholic extract	Water extract
Alkaloids	-	-
Flavonoids	++	+
Polyphenols	++	+
Anthraquinone	++	+
Saponins	++	+
Phlobotanins	-	-
Tannins	-	-
Cardiac glycosides	++	+
Anthhrraroids	-	-

+ = Positive in moderate quantity, - = Negative (absent), ++= Positive in large quantity

DISCUSSION

The study was carried out to maximize the utilization of the seeds of Treculia africana for food and medicine. The moisture content was low when compared with other parts f fruits as reported previously (Jeremiah). The moisture level of food is usually a measure of stability and susceptibility to microbial contamination (Scott, 1980). The seed protein was quite high as reported in Umoh (1998) that seeds of Treculia were usually higher in nitrogeneous components than other part of the plants. Our seed protein value (Table 1) was closer to the 13.43% DM reported in Edet (1982).

The fat content was generally low, as noted in an earlier report Sheila (1978) that fruits were not a very good source of fat and were usually recommended as part of weight reducing diet. However, our fat level was considerably higher than the 1.2 g% reported in Ekpenyong (1985) for *Treculia africana*. The crude fibre level was very low but close to the value of 1.42% DM determined in Edet (1982). Thus Treculia seeds may not be an efficient source of dietary fibre, which is important for reducing cholesterol levels In the body to minimize risks of cardiovascular diseases caused by high plasma cholesterol (Umoh, 1998). The ash contents of the seeds were low in the present study and partly reflected the mineral composition (Oyoyede, 2005). *Treculia africana* may be ranked as carbohydrate rich due to its high carbohydrate contents. Thus, it could serve as a good source of energy. The seeds may also serve as a raw material for production of snacks cookies.

The HCN levels were 2-5 g oxalate much lower than the 36 mg/100 gDM considered to be lethal to man. The oxalate level was also low and unlikely to pose toxicity problems in food since it is far below the toxic levels of (Munro and Bassir, 1969; Oke, 1996). Excess consumption of oxalic acid can cause corrosive gastroenteritis (Fasset, 1973; Eastwood, 1986). The low seed phylate level may not cause adverse effects on digestibility as when present in high levels (Nwokolo and Bragg, 1977). The results of the mineral contents (Table 3) clearly showed that itriculais Africana may be a rich source of some mineral elements notably Mg, K and Ca but not of others like Na Fe and Cu. The mineral compositions were comparable those reported in the literature (Oyenuga, 1968; Edet, 1982; Ejidike amd Ajileye, 2007). Based on the phytochemical screening, seeds of *Treculia africana* were rich in bases such as flavonoids polyphenols, cardiac glycoside, saponins and authraquinones, which are known to have antimicrobial activity (Sofowora, 1980). The presence of these secondary metabolites accounts for the usefulness of the seed medicinal purposes (Ebana *et al.*, 1995).

Conclusion: The African bread fruit seed contain high level of carbohydrate and protein but is relatively low in fat, ash and fibre. The low content of hydrocyanide, oxalate and phytate in the seed makes it both non toxic and non-poisonous when used as food or feed. In addition the seeds were high in K, Mg and Ca but may need to be fortified with Na, Fe and Zn when used in food formulation because of their low inherent levels.

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