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Nutritive and Anti-Nutritive Evaluation of Wonderful Kola (*Buccholzia coricea*) Seeds

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Abstract: Levels of some nutrients, anti-nutrients and dietary fibre of wonderful kola (*Buccholzia coricea*) seeds were determined using standard analytical methods. Crude protein, crude fat, crude fibre, ash, carbohydrate, moisture contents and calorific values were 13.28%, 2.50%, 1.70%, 4.53%, 77.18%, 1.34%, and 384.33% Kcal, respectively. The total, insoluble and soluble dietary fibre contents were found to be 11.77%, 11.09%, and 0.68%, respectively. Elemental analysis of the seeds indicated that the dried seeds contained magnesium (1.58%), sodium (1.20ppm), potassium (1.26ppm), phosphorus (0.18mg/g) and calcium (0.17%). Anti-nutrient composition of saponin, oxalates, tannins and phytates in mg/100g. The values were 4.03±0.26, 1.06±0.04, 0.11±0.004 and 3.18±0.01, respectively, while trypsin inhibitor was 0.53±0.07 TIU. These results reveal that these seeds contain appreciable amounts of nutrients especially carbohydrates and proteins with good caloric value and low levels of toxicants and should be included in human diets to supplement our daily allowance needed by the body.

Key words: *Buccholzia coricea*, dietary fibre, nutrients, anti-nutrients

INTRODUCTION

Plants are a primary source of medicines, fibre, food, shelters and other items in every day use by humans with roots, stems, leaves, flowers, fruit and seeds providing food for humans (Hemingway, 2004). Plants serve as an indispensable constituent of human diet supplying the body with minerals salts, vitamins and certain hormone precursors, in addition to protein and energy (Oyenuga and Fetuga, 1975). Seeds have nutritive and calorific values which make them necessary in diets (Odoemelam, 2005). Among these plant seeds are the seeds of *Buccholzia coricea* popularly known as "Wonderful kola".

Buccholzia coricea is a perennial plant which grows as a tree. It belongs to the family Capparaceae and its local name include 'uworo' '(Yoruba)', 'owi' (Edo), 'esson bossi' (Central Africa), 'uke' (Ibo), (Quattrochi-Umbeto, 2007). The plant parts commonly eaten are the seeds which are either cooked or eaten raw. There is little or no information on the chemical composition of the seeds of *Buccholzia coricea*. This study is therefore aimed at finding out the nutrient, anti-nutrient and dietary fibre composition of the seeds of *Buccholzia coricea* for the public and dietary awareness of its nutritional status.

MATERIALS AND METHODS

The seeds of *Buccholzia coricea* were procured from Umuahia, Abia State, Nigeria and was identified by a taxonomist, Mr. Ozioko of the Bioresource Development Conservation Programme Centre (BDCPC) Aku, Nsukka, Enugu State, Nigeria. The seeds were washed, chopped into pieces and dried under the sun. After drying, the seeds were ground into a fine powder using a mortar and pestle and stored in a well labeled air-tight container for analysis.

The proximate composition, anti-nutrients, some mineral elements and dietary fibre were analyzed for the dried plant product. Crude protein, crude fibre, moisture, ash and carbohydrate were analyzed according the method described by the Association of Official Analytical Chemists (AOAC, 1984) while the fat content was analyzed by the gravimetric solvent extraction method as described by James (1995).

Moisture content determination involved drying to a constant weight at 103°C of a known weight of the seed sample in an oven (Band T, Germany) type. The moisture content was estimated as the loss in weight after drying for 2 hours. Determination of ash involved incineration in a muffle furnace (Heraeus, Germany) at 600°C for 3 hours. Crude fibre was obtained from loss in weight on ignition of dried residue remaining after digestion of fat free samples with 1.25% each of sulphuric acid and sodium hydroxide solutions.

$$\% \text{ Crude fibre} = \frac{\text{Loss of weight after ignition}}{\text{Weight of sample used}} \times 100$$

Crude fat was determined by defatting a known weight of the seed sample in 25ml petroleum ether for 30 minutes. The supernatant was decanted into weighed crucibles and oven dried for 45 minutes at 103°C.

$$\% \text{ Fat} = \frac{\text{Loss of weight of supernatant}}{\text{Weight of sample used}} \times 100$$

Determination of crude protein was done using the microkjeldahl nitrogen method which involved the digestion of a given weight of the seed sample with concentrated sulphuric acid and a mixture of selenium and copper sulphate catalyst to convert any organic nitrogen to ammonium sulphate in solution, followed by decomposition with NaOH. The nitrogen from ammonia was deduced from titration of the trapped ammonia with 0.1M HCl using methyl red indicator. The value of nitrogen obtained was multiplied by 6.25 to give the percentage protein.

The carbohydrate content was determined by subtracting the total crude protein, crude fibre, ash and crude fat from the total dry matter. The caloric value estimation was done by summing the multiplied values for crude protein, crude fat and carbohydrate (excluding crude fibre) by their respective at Water Factors (4, 9, 4).

Mineral element composition of the pulverized seed was estimated by the method described by Pearson (1976) after acid digestion of the ashed sample of a known weight. The mineral elements determined were sodium, potassium, calcium, magnesium and phosphorus. Sodium and potassium were analyzed using a flame photometer; calcium and magnesium were determined using Vernasate (EDTA) complexometric titration method while phosphorus was determined using UV-Visible spectrophotometer. Tannins was determined by the Vanillin-HCl reagent method modified by Price and Butler (1977); Phytates by the method of Early and DeTurk (1944) modified by Thompson and Erdman (1982); Total oxalate was by the method described by Ukpabi and Ejidoh (1989) as calcium oxalate; saponin by UV-spectrophotometric method by Agawal *et al.* (1967); and Trypsin inhibitors by the method described by Kakade *et al.* (1974). Dietary fibre which includes total, soluble and insoluble dietary fibre was analyzed by the Englyst enzymatic instrumental method as described by James (1995) as Non-Starch Polysaecharides (NSP) with slight modification using amylase, amyloglucosidase and protease enzymes.

RESULTS AND DISCUSSION

The result of proximate composition of Wonderful kola (*Buccholzia coricea*) seeds is represented in the Table 1.

Protein content of the seeds of *B. coricea* from the analysis was 13.28% which is almost in close range with the seeds of *Solanum nigrum* var *virginicum* with protein content of 17.63% (Akubugwo *et al.*, 2007). It is however, higher than the crude protein content of fluted pumpkin seeds (*Telferia occidentalis*), a popular vegetable seed with a value of 7% (Ekop, 2007) and so can serve as an alternative source of plant seed protein. The lipid content (2.50%) observed from the seeds in this study was also quite lower than the lipid content of *S. nigrum* seeds with value of 12.18% (Akubugwo *et al.*, 2007) but almost in close range with the fat content of *Gnetum africanum* seeds (3.15%) (Ekop, 2007). This indicates that *B. coricea* seeds contain low fats. Ash content of the seeds obtained in this study was 4.53%. This value is quite low compared with a reported value of 8.05% for *S. nigrum* seeds (Akubugwu *et al.*, 2007) and some other leafy plants such as *Ipomea batatas* (11.10%) (Antia *et al.*, 2006). It is higher than what is found in some vegetable seeds such as *G. africanum* (1.2%), (Ekop, 2007). *B. coricea* seeds is rich in carbohydrate (77.18%) which is quite comparable with that of *G. africanum* (87.62%) but higher than that of *T. occidentalis* seeds (31.25%) and *S. nigrum* var. *virginicum* (55.85%) (Ekop, 2007; Akubugwo *et al.*, 2007). The crude fibre content observed for *B. coricea* seeds (1.70%) is quite lower than that of *S. nigrum* seeds (6.29%) and *T. occidentalis* seeds (4.6%) but higher than that of *G. africanum* (0.80%), (Akubugwo *et al.*, 2007; Ekop, 2007). Comparing the energy value of *B. coricea* seeds (384.33 Kcal) with that of *G. africanum* (448.83Kcal) (Ekop, 2007) and *S. nigrum* seeds (403.54Kcal) (Akubugwo *et al.*, 2007), it shows that *B. coricea* seeds is also a good source of energy that can be utilized as human nutrition.

Table 1: Proximate Composition of *Buccholzia coricea* seeds

Parameters	% Dry matter
Moisture content	1.34±0.02
Crude fat	2.50±0.06
Ash content	4.53±0.07
Crude protein	13.28±0.38
Crude fibre	1.70±0.09
Carbohydrate	77.18±0.27
Caloric value (Kcal)	384.33±0.52

Values are means of triplicate determinations ±SD.

The seeds of *B. coricea* showed high total dietary fibre content with low soluble dietary fibre as shown in Table 2. Dietary fibre plays important physiological and biochemical roles in digestion. The high total dietary fibre content could have been influenced by low moisture content. This is in line with the findings of Mongeau and Brassard (1989) in a study analyzing dietary fibre in foods showed that foods like oat meal and shredded wheat with low moisture contents had higher dietary fibre contents, while those with high moisture content such as apples, blue berries had low dietary fibre contents. while foods with low moisture contents found in some cereals such as oatmeal, shredded wheat had higher dietary fibre contents.

The mineral composition of the seeds were quite low and this correlates positively ($P > 0.05$) with ash content of 4.53% as shown in Table 1. This implies that seeds of *B. coricea* are no good source of mineral salt nutrition (Table 3).

The results for antinutrient composition (Table 4) revealed low levels of oxalates 1.060.04mg/100g when compared with other plant seeds such as *Solanum*

Table 2: Dietary Fibre Content of *B. coricea* seeds

Parameter	Value
Total Dietary Fibre (TDF)	11.77±0.00
Insoluble Dietary Fibre (IDF)	11.09±0.34
Soluble Dietary Fibre (SDF)	0.68±0.34

Values are means of triplicate determinations ±SD.

Table 3: Mineral composition of *B. coricea* seeds

Parameter	Value
Sodium (ppm)	1.20±0.12
Potassium (ppm)	1.26±0.15
Phosphorus (mg/g)	0.18±0.02
Calcium (%)	0.17±0.02
Magnesium (%)	1.58±0.05

Values are means of triplicate determinations ±SD.

Table 4: Antinutrient composition of *B. coricea*. seeds

Parameter	Value
Saponin mg/100g	4.03±0.26
Oxalates mg/100g	1.06±0.04
Tannins mg/100g	0.11±0.004
Phytates mg/100g	3.18±0.01
Trypsin inhibitor (TIU)	0.53±0.07

Values are means of triplicate determinations ±SD.

nigrum which had a value of 58.81mg/100g and *Gnetum africanum* with value of 209.00mg/100g, (Akubugwo *et al*., 2007; Ekop, 2007). Tannins and Trypsin inhibitors were quite low, while the saponin content was quite higher with a value of 4.03mg/100g than the value of saponin content of *S. nigrum* seeds as discovered by Akubugwo *et al*., 2007 was 0.66±0.01mg. Saponin as an antinutrient has been reported to posses both beneficial (i.e. cholesterol lowering) and deleterious properties and exhibit structure dependent biological activity, (Savage, 1993).

Conclusion: This study showed that *B. coricea* seeds contain high percentage of carbohydrate 77.18% which makes it a good source of energy for human nutrition. It's low mineral composition needs to be supplemented when utilized in isolation. The result of this finding also showed low levels of oxalates and tannins but appreciable quantities of saponins and phytates. Pretreatment of *B. coricea* seeds such as boiling could be beneficial before it is consumed by either humans or animals. This work has also shown that this plant seed with appreciable quantities of saponin could be a good medicinal plant for the management of certain health conditions such as hypercholesterolemia.

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