
Nutritional and Chemical Analysis of *Buchholzia coriacea* and *Garcinia kola* (Wonderful Kola and Bitter Kola)

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ABSTRACT

The qualitative and quantitative phytochemical analysis of *Buchholzia coriacea* and *Garcinia kola*, proximate composition and mineral contents were determined using standard analytical methods. The proximate analysis showed that these seeds of *Buchholzia coriacea* and *Garcinia kola* contained moisture (9.10 and 9.65%), Crude protein (17.17 and 7.23%), crude fibre (6.10 and 5.10%), crude fat (2.65) and 4.45%), Ash content (4.35 and 1.15%) and Carbohydrate (60.63 and 72.42%)per 100g of the dried sample respectively. The phytochemicals detected were Saponin spp (2.15 and 1.98%), Tannin (6.14 and 0.35%), Steriod (0.11 and 0.92%) per 100g of the dried ethanolic extract respectively. The mineral analysis indicated that the dried seeds of *Buchholzia coriacea* and *Garcinia kola* contained calcium (0.53 and 0.30%), phosphorous (0.05 and 0.01%), zinc (0.0510ppm), Potassium (1.62 and 3.83ppm), and Lead (0.19 and 0.35ppm) per 1g of the dried powdered sample respectively. From the analysis it is observed that both *Buchholzia coriacea* and *Garcinia kola* are good sources of energy, protein, fibre and also the phytochemical extract could have antimicrobial compounds against microorganisms which could be used as alternative medicine for diseases and for the treatment of diseases since they are readily available and cheap.

Keywords: Phytochemical, *Buchholzia coriacea*, *Garcinia kola*, sample

INTRODUCTION

Plants are a primary source of medicines, fibre, food, shelters and other items in everyday 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 (Odoemelum, 2005). Among these plant seeds are the seed of *Buchholzia coriacea* popularly known as “Wonderful Kola” and *Garcinia kola* also known as “Bitter Kola”.

Plants have basic nutritional importance by their contents of proteins, carbohydrate, fats and oils, minerals, development in man and animals. In addition to vitamins and pro-vitamins in fruits and vegetables the presence of bioactive plant component often called phytochemical has been considered of crucial nutritional importance in the prevention of chronic diseases such as cancer, cardiovascular disease and diabetes (Qauttrochi – Tembetto, 2007).

Many works have been undertaken, which aimed at knowing the different antimicrobial and phytochemical constituents of medicinal plants and using them for the treatment of microbial infection as possible alternatives to chemically synthetic drugs to which many infectious microorganisms have become resistant (Akinpelu and Onakoya, 2006).

According to W.H.O more than 80% of the world population relies on traditional medicines for their primary health care needs. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body (Himal, *et al.*, 2008). The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins, and phenolic compounds. The phytochemical research based on ethano-pharmacological information is generally considered as effective approach in the discovery of new infective agents from higher plants (Duraipundiyam, Ayganar, and Ignacimuthu, 2006).

In Nigeria, *B. coriacea* is a perennial plant which grows as a tree. It belongs to the family *Capparaceae* and its local include “Uwuro”

(Yoruba), “essonbossi” (central Africa), “Uke” (Ibo) the plant has various common names including “Ovu (Binin), and Aponmu (Akure). It acts as cleanser of the blood, facilitates learning absolutely and strengthens the nervous system, and is also effective in the treatment of menstrual problems. It is a brain food which promotes memory, it is also useful in the treatment of hypertension and also prevents premature aging; it has also been proved in Africa that wonderful kola has the ability to stop migraine headache on the forehead for about 10 minutes.

Garcinia kola is regarded as a wonder plant because every part of the (bark, leaves, root and wood) has been found to be of medicinal importance. The medicinal importance of bitter kola is based mainly on the phytochemical component of the plant. From its roots to its leaves, the plant is known to contain several phytochemicals noted for their medicinal importance (Iwu, Igboko, Okunji, and Tempesta, 1990).

It is used as cough medicine and in the treatment of ulcer. It is also used in the treatment of hypertension by drinking the fluid squeezed out of the leaves with pea leaves and small salt. In the Ivory Coast the twig decoction of the plant *Buchholzia coriacea* is used for the treatment of rheumatism and kidney pain, it is also used for the treatment of infections of the eye (bark gruel poured into the flat of the hand and inhaled) and for the treatment of pain in the back (fruit pulp massaged in), for the treatment of earache, the seeds are pounded in a little bit of water and the resulting liquid is dropped into the ear. The Ebri tribes bathe small pox victim with the bark decoction of the plant *Buchholzia coriacea*.

The seeds or kernels of the plant *Buchholzia coriacea* are edible and that they have a spicy taste and that can be used as a condiment. The African plant *Buchholzia coriacea* is used as stimulant, tonic, aphrodisiac, natural in blocker (artery and fallopian tubes), weight controller, fat burner, detoxifier, worm expellant, anti-aphrodisiac

natural wound dressing, etc. (Pascal, 2014). This work aims at determining the nutritional components of the plant seeds, carrying out the phytochemical screening on the plant seeds and comparing the chemical and nutritional component of the plant seeds.

Bitter kola is a potent antioxidant which could be efficacious in the treatment of HIV and AIDS. Bitter kola could be used in treating opportunistic infections associated with HIV. Bitter kola is highly recommended in the treatment of HIV and AIDS because of its antibacterial, detoxification, and cleaning properties. The chemical saponin is mainly used as tonic for the liver; it enhances the function of the liver and gall bladder.

Bitter kola is often used to treat the symptoms of colds. It is suggested, in particular for coughs and sneezing. *Garcinia kola*, also called bitter kola is sometimes believed to cure impotence. Frequent taking bitter kola boost men performance in bed with a woman. Bitter kola is known for its anti-inflammatory and anti-oxidant properties. It can used to prevent infections and viruses, especially in relation to the immune system. *Garcinia kola* is used as a substitute for hops in brewing larger beer. It is especially useful in preventing beer spoilage. *Garcinia kola* has been known to be a natural hunger suppressant and also increases the urge of drink more water (Globerlaneblog, 2013).

MATERIALS AND METHOD

Sample Collection

The *Bucholizia coriacea* seed was purchase from Mararaba Jama'a Junction and the seed of *Garcinia kola* from Bukuru market all in Jos South Local Government Area of Plateau state.

Proximate Analysis

The methods of the Association of Official analytical chemist (AOAC, 1900), was used for the determination of percent moisture content, crude fat, crude protein, ash, crude fibre and carbohydrate (NFE).

Phytochemical Test

Both qualitative and quantitative test were carried out on the seeds to determine the presence and the amount of the phytochemicals in the powdered seeds.

Determination of Minerals in the Seeds

5ml of concentrated HNO_3 was added to 1g of the dried extract in a conical flask and few anti-bombing granules were added to it. The mixture was placed in a fume cupboard and gradually heated on a heating mantle with addition of more of the acid until a light colored solution was obtained the solution was then cooled and filtered in a 100ml volumetric flask and made to the mark with de-ionized water. The mixture was then analyzed for lead, magnesium, potassium and zinc using pyeunicam 969, Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

Proximate Composition Results

The results of proximate composition of *Buchholzia coriacea* and *Garcinia kola* (Wonderful kola and Bitter Kola) seeds are presented in the Table below:

Table 1: Proximate Composition of *Buchholzia coriacea* and *Garcinia kola* Seed

Parameters	Buchholziacoriacea (%)	Garcinia Kola (%)
Moisture content	9.10	9.65
Crude protein	17.17	7.23
Crude fibre	6.10	5.10
Crude fat	2.65	4.45
Ash content	4.35	1.15
Carbohydrate	60.63	72.42

Phytochemical Analysis Results

The phytochemical analysis indicated the qualitative and quantitative results of Saponin, Tannins, steroid, glycoside, flavonoid and alkaloid of the ethanolic extract of the dried seeds of *Buchholziacoriacea* and *Garcinia kola*.

Table 2: Qualitative and Quantitative phytochemical Analysis of *Buchholzia coriacea*

Parameters	Qualitative	Quantitative (%)
Saponin	+	2.15
Tannins	+	6.14
Steroid	+	0.11
Glycoside	+	+
Flavonoid	+	0.66
Alkaloid	+	3.13

Table 3: Qualitative and quantitative Phytochemical Analysis of *Garcinia kola*

Parameters	Qualitative	Quantitative %
Saponin	+	1.98
Tannin	+	0.35
Steroid	+	0.92
Glycoside	+	+
Flavonoid	-	
Alkaloid	+	0.54

+ = Present

- = Absent

Table 4: Mineral content of dried *Buchholzia coriacea* and *Garcinia kola* Seeds

Parameters	<i>Buchholzia coriacea</i>	<i>Garcinia kola</i>
Calcium %	0.53	0.30
Phosphorus %	0.05	0.01
Zinc (ppm)	0.0510	ND
Potassium (ppm)	1.6190	3.8311
Lead (PPm)	0.1850	0.3476
Iron (ppm)	ND	ND

ND = Not detected

DISCUSSION

The results of proximate composition of *Buchholzia coriacea* and *Garcinia kola* seed are represented in the Table 1.

The protein content of the seeds of *Buchholzia coriacea* and *Garcinia kola* from the analysis are 17.17 and 7.23% per 100g in which *buchholzia coriacea* which is almost in close range with the seeds of *Solarium nigrum varlarginicum* with protein content of 17.63% (Akubugwo, Obasi, and Genill. 2007). It is however, higher than the crude protein content of *Garcinea kola* which is almost the same with 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 fat content of *Buchholzia coriacea* and *Garcinia kola* observed from the seeds were 2.65 and 4.45% in this study, *Buchholzia coriacea* was quite low and also *Garcinia kola* compared with the fat content of *S. nigrum* seeds with value of 12.18% (Akubugwo *et al.*, 2007, but higher in range than the fat content of *Gnetuma faricanum* seeds 3.15% (Ekop, 2007). This indicates that *Buchholzia cariacea* and *Garcinia kola* seeds contain low fats. Ash contents of the seeds of *Buchholzia coriacea* and *Garcinia kola* was 4.35 and 1.15%, for *S. nigrum* seeds an ash value of 8.05% was recorded (Akubugwu *et al.*, 2007) and some other leafy plants such as *Ipomea batatas* 11.10% (Anita, Akpan, Okon, and Umoren, 2006). *Buchholzia coriacea* and *Garcinia kola* are rich in carbohydrate 60.63 and 72.42%. This is quite comparable with that of *G. africanum* (87.62%), and both seeds have higher values than that of *T. occidentalis* seeds (31.25%) and *S. nigrum varvirginicum* 55.85% (Ekop, 2007; Akubugwo *et al.*, 2007). The crude fibre content observed for *Buchholzia coriacea* and *Garcinia kola* seeds, 6.10 and 5.10% are in comparable with 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). It shows that *Buchholzia coriacea* and *Garcinia kola* seeds are also good sources of energy that can be utilized as human nutrition.

The valuable pharmaceutical properties of *B. coriacea* and *Garcinia kola* may be attributed to the presence of bioactive compounds like alkaloid (3.13% and 0.5% per 100g for ethanolic extract). Alkaloids are heterocyclic nitrogenous compound and have been found to have microbiocidal effects (Trease and Evans, 1973). Alkaloid had been used as CNS stimulant, tropical anaesthetic in ophthalmology, power fuel, pain relievers, anti puritic action, and among others (Heikens, Fherse, Ender, Asckermans, 1995). Pure related plant alkaloid and their synthetic derivatives are used as basic medicinal agents for their analgesic, and antibacteriocidal effects (Okwu and Josiah, 2005). The alkaloid contents of *Buchholzia coriacea* is highly greater than that of *Garcinia kola* which means that *Buchholzia coriacea* will have greater valuable pharmaceutical properties. The high tannin content of *Buchholzia coriacea* of 6.14% per 100g could be partly responsible for the hot taste of the seed, while *Garcinia kola* has a low tannin content of 0.35 per 100g (Akubugwo *et al.*, 2007). Saponin contents of the seeds of both *Buchholzia coriacea* and *Garcinia kola* which is 2.15% and 1.98% per 100g of the powdered seeds sample. The extracts have good quantity of Saponins content. Saponin inhibits Na^+ efflux by blocking of the entrance of the Na^+ out of the cell. This leads to higher Na^+ concentration in cells, activating a Na^+ - Ca^{2+} anti-porter in cardiac muscles. The increase in Ca^{2+} influx through this anti-porter strengthens the contraction of the heart muscles (Okwu, 2006). Some of the general characteristics of saponin include formation of foam in aqueous solution, hemolytic activity, cholesterol bending properties and bitterness (Trease and Evan, 1989). The presence in these plants could implicate its having anti-hyper-cholesterol; hypotensive and cardiac depressant properties. Both *B. coriacea* and *g. kola* seeds have glycosides. Both plants seeds have been used for more than two centuries as stimulants in treatment of cardiac failure and cardiac diseases (Olayinka *et al.*, 1992). Perhaps, this justifies the use of these plant seeds by localists for treatment and management of hypertension. Flavonoid may help provide protection against diseases such as cancer,

ageing inflammation, atherosclerosis, ischemic injury, neurodegenerative diseases (Anderson, 2004) by contributing along with antioxidant vitamins and enzymes, to the total antioxidant defense system to the human body; Epidemiological studies have shown that flavonoid uptake are inversely related to mortality from coronary heart diseases and to the incidence of heart attacks (Anderson, 2004). From the results in Tables 2 and 3 of *Buchholzia coriacea* and *Garcinia kola*, *Buchholzia coriacea* contain 0.66% flavonoid which can be used to treat related heart diseases and while *Garcinia kola* has no flavonoid from the analysis.

Table 4 shows the mineral composition of *Buchholzia coriacea* and *Garcinia kola* seeds. It revealed that potassium (ppm) content (3.83) was the highest in *Garcinia kola* followed by 1.62ppm of *Buchholzia coriacea*. And calcium (%) content in both *Buchholzia coriacea* and *Garcinia kola* are 0.53 and 0.30 and Lead (ppm) contents in *Buchholzia* and *Garcinia* followed with 0.185 and 0.35ppm while *Buchholzia coriacea* have 0.05ppm of zinc and from the analysis *Garcinia kola* contained no zinc in its seeds. The amount of phosphorus (%) is the least of the plants seeds analysis, in which *Buchholzia coriacea* has 0.05% and *Garcinia kola* with 0.01%. The Potassium content of the seeds were low, nevertheless it was in agreement with the report of Aremu *et al.*, (2005) that Potassium is the predominant mineral in Nigeria agricultural products. Therefore, the consumption of these seeds would reduce high blood pressure as recommended by FND (2002). Particularly the *Garcinia kola* seeds, the low calcium contents of 0.53% and 0.30% in the seeds indicated that these seeds would not be too useful for bone formation. Calcium in consumption with Phosphorus, Magnesium, and Manganese are responsible for bone formation (Akinhanmi, Akintokun, and Atare, 2008). For good Calcium and Phosphorus intestinal absorption, ca/p ratio should be close to one (1) (Guil-Guerrero, Gumenez-Gimenez, Rodriguez-Garcia, and Torija-Isasa, 1998). These seeds do not have Iron in its contents which suggests that these seed

does not contribute or rather cannot be used as a substitute for blood forming agent as it fell below RDA values (Bogert, Briggs and Galloway, 1973). Also the Zinc value of 0.051ppm of the *Buchholzia coriacea* was low in the seeds. Zinc is involved in normal function of immune system and is a component of over 50 enzymes in the body (Okaka, and Okaka, 2006). The value of toxic metals such as Zn and Pb detected in the seeds were far below their toxicity levels when compared with WHO (1993) permissible limits consequently, these kola remain safe for dietary consumption.

CONCLUSION

This study showed that *Buchholzia coriacea* and *Garcinia kola* seeds contain high percentage of carbohydrate, protein, crude fibre and crude fat which makes it a good source of energy. These results also showed that the seeds extract of *Buchholzia coriacea* and *Garcinia kola* possessed phytochemical substances that can be used as components of new antimicrobial agents. Also, the mineral composition was found to be relatively low in contents which could be supplemented when utilized in isolation, this suggests low mineral bio-availability in the plants. The plants extract could have great potential as antimicrobial compounds against microorganisms, thus they can be used in the treatment of infectious diseases caused by the tested isolated. These seeds could be used when considering a natural food and feed additives to improve human and animal health.

RECOMMENDATION

In view of the high nutritional and medicinal importance and values of this kola, I wish to recommend that people consume more of this kola since it has no side effects.

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