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Phytochemical and Nutritive Quality of Dried Seeds of Buchholzia Coriacea

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Research Article

Phytochemical and Nutritive Quality of Dried Seeds of *Buchholzia Coriacea*

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ABSTRACT

The qualitative and quantitative phytochemical analysis of Buchholzia coriacea, proximate composition, the minerals, antibacterial and antifungal activities of ethanol and methanol extracts of dried seeds of B. coriacea were determined using standard methods. The proximate analysis showed that the seeds contained moisture (1.30%), crude fat (2.30%), crude protein (13.34%),Ash content (6.6%), crude fibre (2.19%), carbohydrate (75.43%). The mineral analysis indicated that the dried seeds contained sodium (1.22ppm), potassium (1.34 ppm), phosphorous (0.22mg/g), calcium (0.19%), magnesium (1.62%), zinc (0.18%) iron (1.11%), and manganese (0.46%). The phytochemicals detected where alkaloids (3.16 and 3.32%), glycosides (2.16 and 2.46 %), saponin (2.10 and 2.23%), steroids (0.14 and 0.16%) ,tannin (6.46 and 6.73%), flavonoids (0.68 and 0.79%), terpenes (0.22 and 0.16%), reducing sugars (1.14 and 1.71%) and phenol (1.83 and 1.26%) for ethanol and methanol extract respectively.

KEYWORDS: Phytochemicals, Seeds, Buchhlozia coriacea, Nutritive Quality.

INTRODUCTION

Phytochemicals simply means plant chemicals; they are naturally occurring components in fruits, vegetable, herbs, spices, legumes and grains. They give plants color, flavor, and smell and are part of a plant's natural defense system for the plant (disease resistance) and the consumer. Anderson (2004) defined phytochemical as plant derived chemicals which are beneficial to human health and disease prevention. Plants have basic nutritional importance by their content of protein, carbohydrates, fats and oils, minerals, vitamins, and water responsible for growth and development in man and animals. In addition to vitamins and pro-vitamins in fruits and vegetables, the presence of bioactive plant components often called phytochemicals has been considered of crucial nutritional importance in the prevention of chronic diseases such as cancer, cardiovascular disease and diabetics (Aruona, 2003). It has been discovered that regular consumption of fruits, vegetables, herbs and spices has associated health benefits, but their mechanism has become clear only in recent years. These plants contain a wide variety of biologically active, non nutritive compounds known as phytochemicals (Sheetal and Jamuna, 2009).

A whole range of plants derived dietary supplements, phytochemicals and pro-vitamins that assists in maintaining good health and combating diseases are now been described as functional foods, nutriceuticals and nutraceuticals. Many works have been undertaken, which aim at knowing the different antimicrobial and phytochemical constituents of medicinal plants and using them for the treatment of microbial infection as possible alternation to chemically synthetic drugs to which many infectious microorganisms have become resistant **(**Akinpelu and Onakoya 2006**).** Plants are a primary source of medicines, fibre, food, shelters and other items in everyday use by humans with roots, stems, leaves, flowers, fruits and seeds providing food for humans (Hemingwasy, 2004). Plants serve as an indispensable constituent of human diet supplying the body with mineral salts, vitamins and certain hormone precursors, in addition to protein and energy (Oyenuga and Fetuga, 1975).

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 physiologic 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 ethno-pharmacological information is generally considered an effective approach in the discovery of new infective agents

from higher plants (Duraipandiyan et al, 2006). Knowledge of the chemical constituents of plants is desirable, not only for the discovery of therapeutic agents, but also because such information may be of value in disclosing new sources of such economic materials as tannins oils, gums, precursors for the synthesis of complex chemical substances. In addition, the knowledge of the chemical constituents of plants would further be valuable in discovering the actual value of folkloric remedies (Mojab et al, 2003).

B. Coricea is a forest tree with large, glossy leaves and conspicuous cream white flowers in racemes at the end of the branches (Mbata et al; 2009). The plant is easily recognized by the compound pinnate leaves and the long narrow angular fruits containing large, usually aligned seeds. In Nigeria, B Coricea is a perennial plant which grows as a tree. It belongs to the family capparaceae and its local include "Uwuro" (Yoruba), "esson bossi" (Central Africa), "Uke" (ibo) the plant has various common names including "Ovu (Bini), and Aponmu (Akure). The plant parts commonly eaten are the seeds which are either cooked or eaten raw (Quattrochi-Umbeto, 2007).Wonderful kola as it is commonly called is known worldwide as memory nut because it enhances the memory. 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's 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 (Wikipedia, 2009).

MATERIALS AND METHODS

Collection of Buchholzia coriacea Seeds: **S**eeds of B. coriacea were brought from Oba market, Post office in Ado-Ekiti, Ekiti State and were identified by the herbarium section of the Department of Plant Sciences, University of Ado-Ekiti, Ekiti State.

Processing of the Seeds: The seeds were washed, chopped into pieces and air dried. After drying, the seeds were grounded into powder using a mortar and pestle and stored in well labeled air tight container for proximate, mineral composition of the grounded seeds and phytochemical of the ethanolic and methanolic extracts of the seed.

Extraction of Plant Materials: Ethanol and methanol solvents were used for extraction of the active components of the plant's seed .The method of Alanis et al (2005) was used for both ethanolic and methanolic extraction of the seed active ingredients. Exactly 150g each of the powdered seeds were separately extracted in cold using 60% methanol and 95% ethanol and shaken at 150rpm for 4 days at ambient temperature. The mixture was then filtered. The filtrate was evaporated using vacuum rotary evaporator (BUCHL Rolavapour R200/205 model R205V800) and stored at 4^{o}C in dark sample bottles prior to use.

Phytochemical Screening of the Extracts: The ethanolic and methanolic extracts were subjected to various phytochemical tests to determine the active constituents present in the crude ethanolic and methanolic extracts using the procedures of Parekh and Chanda (2007). The phytochemicals tested for were; alkaloids, glycosides, flavonoids tannins, terpenoid and steriod, reducing sugar, carbohydrates, saponin, phenol.

Proximate composition: The proximate composition of the seeds of B. coriacea was analysed for component such as crude fibre, moisture, crude protein, ash, crude fat and carbohydrate using the method described by the Association of Official Analytical Chemists (AOAC, 2005).

Mineral Determination: The mineral content of the died seeds of B. coriacea was analyzed with the atomic absorption spectrophotometer (AAS) described by Association of official Analytical chemists (AOAC,2005).The minerals analysed were iron, phosphoru**s,** calcium, magnesium, potassium, zinc, sodium.1 of the seed flour was neglected into a oven dried crucibles for each of the elements to be determined. The crucibles were placed in the muffle furnace and the temperature was gradually increased to 200^{o}c .The samples were ashed until they become white. The crucibles were removed and cooled in desiccators. The ashes were dissolved in 6NHCL.The mineral in each solution was determined by reading in the atomic absorption spectrophotometer (AAS).

RESULTS AND DISCUSSION

The results of qualitative and quantitative phytochemical analysis of both ethanolic and methanolic extract of air dried seeds of B. coriacea seeds (wonderful kola) was given in table 1.

Tables 1: Qualitative and Quantitative phytochemicals analysis of B. coriacea Seeds

Parameters	Qualitative Determination		Quantitative Determination	
	Ethanolic Extract	Methanolic Extract	Ethanolic Extract (%)	Methanolic Extract (%)
Alkaloids	++++	++++	3.16	3.32
Glycoside	++	++	2.16	2.46
Sapnin	+++	+++	2.10	2.23
Steroids	++	++	0.14	0.16
Tannin	++++	+++	6.46	6.73
Flavonoids	+++	++	0.68	0.78
Terpenes	++	++	0.22	0.16
Sugars	++	++	1.14	1.17
phenols	++	++	1.83	1.26

Both extract contained alkaloids, glycosides, saponin, tannin, flavonoids, terpenes, reducing compounds, and phenols qualitatively while quantitatively, the extracts showed that alkaloid (%) has 3.16 and 3.32% glycosides has 2.16 and 2.46, saponin has 2.10 and 2.23, steroids has 0.14 and 0.16, Tannins has 6.46 and 6.73, flavonoids has 0.68 and 0.78, terpenes 0.22 and 0.16, reducing compound 1.14 and 1.71 and phenol 1.83 and 1.26 for ethanolic and methanolic extract respectively. It showed from the results that the methanolic extract exhibited better phytochemical result. Table 2 presents the proximate composition of air dried B. coriacea seeds. The parameters analyzed and values were moisture content (%) 1.30+ 0.02 crude fat (%) 2.30 + 0.05, crude protein 13.34+ 0.2 ash content 6.60+ 0.03, crude fibre. 2.19 + 0.00, carbohydrate 75.43+ 0.03 (by difference) while caloric value (Kcal) was given as 375.75+ 0.03.

Table 2: Proximate composition of dried B. coriacea seeds

Parameters	Values (%)
Moisture content	1.30+ 0.02
Crude fat	2.30+0.05
Crude protein	13.34+0.02
Ash content	6.60+0.03
Crude fibre	2.19+0.00
Carbohydrate(by difference)	75.43+0.03
Caloric value (kcal)	375.75+0.03

Caloric value =summation of multiplication of protein, fat, and CHO with their respective water factors 4, 9, 4
i.e CV =13.34 X 4+2.30 X 9 + 75.43 X 4
CV =53.36 + 20.7 + 301.72
CV = 375.75 + 0.03

It showed that the seeds are of good carbohydrate, crude protein and crude fat. The result of mineral composition of B. coriacea seeds are in table 3. The seeds contained sodium (ppm) 1.22+ 0.14, potassium (ppm) 1.34+ 0.17, phosphorus (mg/g)0.22+ 0.01 calcium (%) 0.19+ 0.03, magnesium (%) 1.62+ 0.06 zinc (%) 0.18+ 0.04, Iron (%) 1.11+ 0.01 and manganese (%) 0.46+ 0.07.

Table 3: Mineral content of dried B. coriacea seeds

Parameters	Values
Sodium (ppm)	1.22 +0.14
Potassium (ppm)	1.34 +0.17
Phosphorous (mg/g)	0.22+0.01
Calcium (%)	0.19 +0.03
Magnesium (%)	1.62 +0.06
Zinc (%)	0.18 +0.04
Iron (%)	1.11 +0.01
Manganese (%)	0.46 + 0.07

Values are means of duplicate results ± S.D

Plants are the best sources of active secondary metabolites which are beneficial to mankind. Many plants origin drugs have been reported with biological properties like antibacterial, antifungal, antioxidants, anti inflammatory and hypoglycemic (Sindhu, 2009). According to WHO report, 80% of the world population are taking interest in indigenous herbal medicines usually being seed in form of fruits, vegetables, drugs or their extracts for the treatment of diseases and for maintenance of health (Sahito et al, 2003). The results of this work showed that the seeds extract of B. coriacea inhibited the growth of all the tested isolates at varying concentration of 50, 100, 150 and 200mg/ml. The antimicrobial activity of extracts of medicinal materials has been attributed to the phytochemicals constituents present in them (Aboaba et al, 2006) and the extracts of B. coriacea wont be an exception. The seeds of B. coriacea are rich in phytonutrients such as alkaloids, glycosides, saponins, flavonoids, tannins and phenols both quantitatively and qualitatively. The results of phytochemicals analysis were in agreement with similar study by Ajayeoba et al (2003) and Mbata et al (2009). It is interesting to know that the methanolic extracts exhibits better quantitative and qualitative photochemical. This could be because the active component is extracted better in polar solvent (Chang et al, 1977). Phytochemicals have been considered a crucial nutritional components without official recommendations of how much is to be taken with ability to prevent chronic diseases such as cancer, cardio-vascular diseases, diabetes and ageing (Aruona, 2003) A lot of these researches have come up with the fact that some of these plant chemicals which biologically function as antinutritional or antioxidants have potentials in helping to reduce the risk of several deadly diseases in man (Agte et al, 2000)

The valuable pharmaceutical properties of B. coriacea may be attributed to the presence of bioactive compounds like alkaloid (3.16 and 3.32%for ethanolic and methanolic extract respectively).Alkaloids are heterocyclic nitrogenous compound and has been found to have microbiocidal effects (Trease and Evans, 1978). Alkaloid has been used as CNS stimulant, tropical anaesthetic in ophthalmology, power fuel pain relievers, anti puretic action, and among others (Heikens et al, 1995). Alkaloids ranked as the most efficient therapeutically significant plant substances. Pure isolated plant alkaloids and their synthetic derivatives are used as basic medicinal agents for their analgesic, and antibacteriocidal effects. (Okwu, 2005).The presence of phenolic compounds has been extensively used in disinfection and remains the standard with which other bacterial are compared. Phenolic compounds are electron donors which are readily oxidized to form phenolate ion an electron acceptor. This gives rise to the practical use of protonated phenol as a cleaning agent (Okwu, 2004).

The high tannin content could be partly responsible for the hot taste of B coriacea seeds. Tannin is toxic to filamentous fungi, yeast and bacterial (Jones et al, 1994). It has a stringent property: it hastens the healing of wounds and enflamed mucous membrane (Okwu and Okwu, 2004). The preservation of tannin in B. Coriacea could be responsible for its role as an anti diarrheic and anti heamorrhagc agent (Asquith and Butter, 1986). The biological function of flavonoids includes protection against allergies, inflammation, free radicals, platelet aggregation, microbes, ulcers, hepatoxins, viruses and tumor (Okwu 2004). This may be the reason behind the use of the extracts of this plant in the treatment of intestinal trouble in herbal medicine. The extracts have good quantity of saponin content. Saponins inhibit Na^+ efflux by the lockage of the entrance of the Na^+ out of the cell. This leads to higher Na^+ concentration in the cells, activating a Na^+ –Ca^{2+} anti porter in cardiac muscle. The increase in Ca^{2+} influx through

this anti porter, strengthens the contraction of the heart muscles (Okwu 2004). Some of the general characteristics of saponin include formation of foam in aqueous solutions, hemolytic activity, cholesterol bending properties and bitterness (Trease and Evans, 1985). The presence in this plant could implicate it's having anti hyper-cholesterol; hypotensive and cardiac depressant properties. The extracts also have good concentration of glycosides (2.16 and 2.46%) for ethanolic and methanolic extract respectively. They have been used for more than two centuries as stimulants in treatment of cardiac failure and cardiac disease (Olayinka et al, 1992). Perhaps justifies the use of the plant seeds by localists for treatment and management of hypertension. Flavonoid may help provide protection against diseases such as cancer, ageing, inflammation, atheroscherosis, ischemic injury, neuro degenerative diseases(Anderson,2004) by contributing along with antioxidant vitamins and enzyme, to the total antioxidant defense system to the human body, Epidemiological studies have shown that flavonoid uptake are inversely related to motality from coronary heart disease and to the incidence of heart attacks (Anderson,2004).

The proximate composition of wonderful Kola in table 2 indicted its inclusion in foods .The moisture content (% dry matter) of the air dried seeds of B. coriacea from this work was 1.30 ±0.02 which is close to the work of Amaechi (2009) with the value of 1.34± 0.02. The low moisture content is an indication that the seeds will last long when stored at that condition because of little water activity for microbial proliferation and spoilage. The crude fat was 2.30±0.05 as against 2.50±0.06 recorded by Amaechi (2009). It was lower than fat observed from bitter kola seeds (4.33%) Eleyinmi et al,(2006), but higher than that of kolanut (1.8%) and 0.92% as observed by Arogba (1999) and Jaiyeola, (2009) respectively. It was in close range with the fat content of Gnetum africanum seeds (3.15%) (Ekop, 2007). The result indicates that B. coriacea was 13.34% and is in range with the findings of Amaechi (2009)13.28% when compared with other kola such as kola nut and bitter kola, it was 8.9% (Jaiyeola, 2001) and 3.95% (Eleyinmi et al, 2006) respectively. It showed that the protein content B.coriacea is higher than that of kolanut and bitter kola seeds. It is also interesting to know that it is however, higher than the crude protein content of fluted pumpkin seeds, a popular vegetables seeds with a value of 7% (Ekop, 2007) and so can serve as an alternative source of plants seeds protein. Dietary fat increases the palatability of foods by absorbing and retaining flavours (Anita et al, 2006). A diet providing 1-2% of it's caloric energy as fat is said to be sufficient for human beings as excess fat consumption is implicated in certain cardiovascular disorders (Antia et al, 2006).The ash content of the seeds obtained in this work was 6.60± 0.03 which is higher than 4.33%. , the value obtained by Ameachi (2009). The ash content is a reflection of the mineral contents preserved in the seeds of B. coriacea and therefore the result suggested a fair deposit of mineral elements in the seeds. The value was higher than what is obtained in kolanut (3,1%) (Arogba, 1999) and bitter kola (1.14%) (Eleyinmi, et al 2006). The crude fibre obtained (2.19%) was higher than 1.7%obtained by Ameachi (2009). It was lower than what was obtained in bitter kola (11.4%) (Eleynmi et al, 2006) and kolanut seeds (7.3%) (Jaieola, 2001). Adequate intake of dietary fibre had been reported by Ishida et al (2000) to lower the serum cholesterol level, risk of coronary heart diseases, hypertension, constipation, and diabetes. The seeds in this study are not a good source of good fibre because it doesn't meet the RDA value. The carbohydrate (by difference) of 75.43% was obtained in this study. It was lower than that of Amaechi (2009) (77.18%). Carbohydrate constitutes a major class of naturally occurring organic compounds which are essential for the maintenance of life in both plants and animals and also provide raw materials for many industries (Ebunoluwa et al, 2007). The value was higher than kolanut, 72% (Jaiyeola, 2009) and bitter kola 70% (Eleyinmi, et al, 2006). The seeds are a good source of carbohydrate when consumed because it meets RDA value of 40% for children, 40% for adult 30% for pregnant women and 25% for lactating mothers (FND, 2002). The caloric value (ical) 375.75 was a little bit lower than that obtained by Amaechi (2009) (384.33kcal). It was also*** than the value of G. africanum seeds (448.83kcal (Ekop, 2007) and S. nigrum seeds (403.54kcal) (Akubugwo et al ,2007). It showed that B.coriacea seeds is also a good source of energy that can be utilized as human nutrition.

The mineral composition of B. coriacea seeds shown in table 3 revealed that the magnesium (%) content (1.62) was the highest, followed by potassium (ppm) (1.34) and sodium (ppm) (1.22) respectively. The seeds was least in calcium (%) (0.14) and zinc (%) (0.18), the values obtained for all the elemental minerals were within the values obtained by Ameachi (2009). The values of sodium (Na) content in the seeds are generally low which is in accordance with observation of Aremu et al (2005) that tropical crops carry subnormal concentration of sodium which is a reflection of low sodium content of the soils. The potassium content of the seeds was also low: nevertheless it was in agreement with the report of Aremu et al (2005) that potassium is the predominant mineral in Nigeria agricultural products. The rates of sodium to potassium is less than 1 (0.9), therefore consumption of the seeds would reduce high blood pressure as recommended by FND (2002).The low calcium (0.14%) level in the seeds indicated that the seeds would not be too useful for bone formation calcium in consumption with phosphorous, magnesium, manganese are responsible for bone formation (Akinhanmi et al, 2008). For good calcium and phosphorous intestinal absorption, Ca/P ratio should be close to 1 (Gull-guerrero et al, 1998). The magnesium content of the seeds (1.62%) was low. It is a component of chlorophyll and has been reported to be involved in maintaining the electrical potential and activation of some enzyme systems in plants (Ferro et al, 1987). It is an

important mineral element in connection with ischemic heart disease and calcium metabolism in bones (Ishida et al, 2000). The seeds have low manganese and iron levels (0.46 and 1.11% respectively). This suggests that the seed does not contribute or rather cannot be used as a substitute for blood forming agent as it fell below RDA values (Bogert et al, 1973). Also the zinc value (0.18%) was low in the seeds of B. coriacea. Zinc is involved in normal function of immune system and is a component of over 50 enzymes in the body (Okaka et al, 2006).The low mineral composition of the seeds were quite low and this correlates with the low ash content (6.60%) as shown in table 2. The varying phytochemical proximate and mineral composition reported by other workers on seeds of B. coriacea may vary with season, environment and or condition or time of evaluation.

CONCLUSION

This study showed that B. coriacea seeds contains high percentage of carbohydrate, protein and fat which makes it a good source of energy mineral composition was found to be related to it's low ash content which could be supplemented when utilized in isolation, this suggests low mineral bio availability in the plant. The results also showed that the seed extract of B. coriacea possessed phytochemical substances that can be used as components of new antimicrobial agents. Therefore, there is need for further investigations in terms of toxicological studies and purification of active components with the view to using the plant in novel drug development. The plant extract has great potentials as antimicrobial compounds against microorganisms, thus they can be used in the treatment of infections diseases caused by the tested isolates. The seeds could be used when considering a natural food and feed additives to improve human and animal health.

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