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Phytochemical and Nutritive Qualities of Dried Seeds of *Buchholzia Coriacea.*

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ABSTRACT

The qualitative, quantitative phytochemical analyses, proximate and the minerals composition of dried seeds of *Buchholzia 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.

INTRODUCTION

Phytochemicals simply means plant chemicals; they are naturally occurring components in fruits, vegetables, herbs, spices, legumes and grains. They give plants color flavor, smell and are part of a plant naturally defense system for the plant (disease resistance) and the consumer. [1] defined phytochemical a 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 provitamins in fruits and vegetables the presence of bioactive plant components often called phytochemicals have been considered of crucial nutritional importance in the prevention of chronic disease such as cancer, cardiovascular disease and diabetics [2] . It has been discovered that regular consumption of fruits, vegetables, herbs and spices have 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 [3] .

A whole range of plant 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 which aim at knowing the different antimicrobial and phytochemicals constituent of medicinal plants and their use for the treatment of microbial infection as possible alternative to chemically synthetic drugs to which many infectious microorganism have become resistant [4]. Plants are 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 [5] .Plants serve as indispensable constituent of human diet supplying the body with mineral salts, vitamins and certain hormone precursors, in addition to protein and energy [6].

According to WHO, more than 80% of the world population relied on traditional medicines for their primary health care needs. The medicinal value of plants lie in some chemical substances that produce a definite physiologic action on the human body [7] . 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 pants [8] . 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 [9].

B. coricea is a forest tree with large, glossy leaves and conspicuous cream white flowers in racemes at the end of the branches [10] . 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 names 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 [11] .Wonderful kola as it is commonly called is known in the world as memory nut because it enhances the memory. It act as cleanser of the blood, facilitates learning absolutely and strengthens the nervous system, and also effective in the treatment of menstrual problems. It is a brain food which promote memory, it's also useful in 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 [12] . This work was carried out to assess the phytochemical, proximate and mineral composition of dried seeds of *B. corieacea.*

MATERIALS AND METHODS

Collection of *Buchholzia coriacea* Seeds

Seeds of *B. coriacea* were bought from Oba market, Ado-Ekiti, Ekiti State and were identified by the herbarium section of the Department of Plant Sciences, Ekiti State University , Ado-Ekiti, Ekiti State.

Processing of the Seeds

The seeds were washed, chopped into pieces and air dried. After air dried, 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 were used for the extraction of the active components of the plant's seed .The method of Alanis [13] 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 in Rotary shaker 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 [14] . 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 crude fibre, moisture, crude protein, ash, crude fat and carbohydrate using the method described by [15] .

Mineral Determination

The mineral content of the air dried seeds of *B. coriacea* atomic absorption spectrophotometer (AAS) described by Association of Official Analytical Chemists [15] .The minerals analysed for were iron, phosphorus, calcium, magnesium, potassium, zinc, sodium.

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) are shown in table 1. 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 presented the proximate composition of air dried *B. coriacea* seeds. The parameters analyzed and value 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. It showed that the seeds are good source of carbohydrate, crude protein and crude fat. The result of mineral composition of *B. coriacea* seeds are shown 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.

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 [16] . 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 plants have been attributed to the phytochemicals constituents present in them [17] and the extracts of *B. coriacea* is not 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 [18][10] . It is interesting to know that the methanolic extracts exhibits better quantitative and qualitative photochemical. This could be because the active component must be a extracted better in polar solvent [19] . Phytochemicals have been considered a crucial nutritional components without official recommendations of how mush to be taken with ability to prevent chronic diseases such as cancer, cardio-vascular diseases, diabetes and ageing [2] much more than these researches have come up with the fact that some of these plant chemicals which biologically function as antinutritional or antioxidants have potentials to reduce the risk of several deadly diseases in man [20] .

The valuable pharmaceutical properties of *B. coriacea* may be attributed to the presence of bioactive compound like alkaloid (3.16 and 3.32% for ethanolic and methanolic extract respectively).Alkaloids are heterocyclc nitrogenous compound and has been found to have microbiocidal effects [21] . Alkaloid has been used as CNS stimulant, tropical anaesthetic in ophthalmology, power fuel pain relievers, anti puretic action, and among others [22]. Alkaloids ranked 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 [23] .The presences of phenolic compounds have been extensively used in disinfection and remain 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 practical use of protonated phenol as cleaning agent [24].

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 [25]. It has stringent property, it hasten the healing of wounds and enflamed mucous membrane [24]. The preservation of tannin in *B. Coriacea* could be responsible for its role as anti-diarrheic and anti heamorrhagic agent [26] .The biological function of flavonoids includes protection against allergies, inflammation, free radicals, platelet aggregation, microbes, ulcers, hepatoxins, viruses and tumor [23]. 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+} in flux

through this anti porter, which strengthens the contraction of heart muscle [23] . Some of the general characteristics of saponin include formation of foam in aqueous solutions, hemolytic activity, cholesterol bending properties and bitterness [21] . The presence in this plant could implicate it in 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 [27] perhaps justified 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, atherosclerosis, ischemic injury, neuro degenerative diseases [1] 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 [1] .

The proximate composition of wonderful Kola should in table 2 indicted that its inclusion in foods .The moisture content (% dry matter) of the air dried seeds of *B. coriacea* from this study was 1.30 ±0.02 which s close to the work of [28] with the value of 1.34± 0.02 . The low moisture content s an indication that the seeds can 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 [28] , It was lower than fat observed from bitter cola seeds (4.33%) [29] but higher than that of kolanut (1.8%) and 0.92% as observed by [30][19] respectively. It was in close range with the fat content of *Gnetum africanum* seeds (3.15%) [31] . The result indicate that *B. coriacea* was 13.34% is in range with the findings of [27] 13.28% when compared with other kola such as kolanut and bitter kola, it was 8.9% [19] and 3.95% [28] respectively. It showed that the protein content *B.coriacea* is higher than that of kolanut and better 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% [31] and so can serve as an alternative source of plants seeds protein. Dietary fat increases the palatability of foods by absorbing and retaining flavours [31] . A diet providing 1-2% of it's caloric of energy as fat is said to be sufficient for human beings as excess fat consumption is implicated in certain cardiovascular disorders [31] .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 [28] . 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%) [31] and bitter kola (1.14%) [28] . 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%) [28] and kolaut seeds (7.3%) [19] . Adequate intake of dietary fibre had been reported by [32] to lower the serum cholesterol level, risk of coronary heart diseases, hypertension, constipation, and diabetes. The seeds in study are not a good source of good fibre because it doesn't meet RDA value. The carbohydrate (by difference) of 75.43% was obtained in this study. It was lower than that of [28] (77.18%). Carbohydrate constituents a major class of naturally occur organic compounds which are essential for the maintenance of life in both plants and animals and also provide raw materials for many industries [33] . The value was higher than kolanut, 72% [19] and bitter kola 70% [29] . 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 [34] . The caloric value (kcal) 375.75 was a little bit lower than that obtained by [28] (384.33kcal). It was also lower than the value of *G. africanum* seeds (448.83kcal [31] and *S. nigrum* seeds (403.54kcal) **[35]** .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 has 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 [28] . The values of sodium (Na) content in the seeds are generally low which is in accord with observation of [36] that tropical crops carry subnormal concentration of sodium which is a reflection of low sodium content of the soils. The potassium content of was also low, nevertheless it was in agreement with the report of [36] 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 [[34] .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 [37] . For good calcium and phosphorous intestinal absorption, Ca/P ratio should be close to 1 [38] .The magnesium content of the seeds (1.62%) was low.It is a component of chlorophyll and has been reported to be involved in maintain the electrical potential and activation of some enzyme systems in plants [38] . It is an

important mineral element in connection with ischemic heart disease and calcium metabolism in bones [32]. The seeds have low manganese and iron level (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 at fell for below RDA values [39] . 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 5o enzymes in the body [40] ..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 plants extract have great potentials as antimicrobial compounds against pathogenic microorganisms, thus they can be used in the treatment of infections diseases caused by the tested isolates. The seeds could be used as a natural food and feed additives to improve human and animal health.

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

++ fairly present, +++ moderately present , ++++ strongly present

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

Table 3: Mineral content of dried *B. coriacea* seeds

Parameters	Values (mg/g)
Sodium	1.22 +0.14
Potassium	1.34 +0.17
Phosphorous	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

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