Available online at www.elixirpublishers.com (Elixir International Journal)

Food Science

Elixir Food Science 64 (2013) 19350-19356

ISSN: 2229-712X

Antifungal properties and effects of fresh, oven dried uncooked and cooked seeds of *Buchholzia coriacea* on haematology and kidney

Nwachukwu, M. I[1], Duru, M.K.C[2,*] and Nwachukwu, I. O[1]

[1]Food and Microbiology Unit, Department of Microbiology, Imo State University Owerri, Nigeria.

[2]Department of Biochemistry, Abia State University, Uturu, Abia State, Nigeria.

ARTICLE INFO

Article history:

Received: 25 September 2013;

Received in revised form:

3 November 2013;

Accepted: 12 November 2013;

Keywords

Buchholzia coriacea,

Fungal properties,

Haematological parameters,

Kidney,

Medicinal plants.

ABSTRACT

Antifungal properties, and effects of fresh, oven dried uncooked and cooked seeds of *Buchholzia coriacea* on haematology and kidney was evaluated. The haematology and kidney studies were carried out using Wistar albino rats. Antifungal property result revealed the following order fresh seed > oven dried uncooked seed > cooked seed for the studied seed samples. Effects of the studied seed samples on haematology and kidney followed the order cooked seed<oven dried uncooked seed< fresh seed in rats. Processing of the seed samples could be behind the reduced effects. The present study has shown the antifungal properties and effect of fresh, oven dried uncooked and cooked seed samples of *Buchholzia coriacea* on haematology and kidney.

Introduction

The importance of plants to humans cannot be overstated. From time immemorial, the use of plants for different purposes has been in existence. The early man depended on plants medication for survival. He handled different disease conditions with plants. Such plants are known as medicinal plants. Wurochekke *et al*., (2008); and Sofowora (1993) noted that a medicinal plant is any plant used for the extraction of pure substances either for direct medicinal use or for hemisynthesis of medicinal compounds which can be used for therapeutic purposes or as precursors for the synthesis of useful drugs. Medicinal plants provide the major raw materials for folkric medicine, a practice which has been given more acceptable names such as botanical medicine, traditional medicine, herbalism, alternative medicine or complimentary medicine in recent times (Okpuzor *et al*., 2008; Welzel *et al*., 2003; Ninmh,1996; Sofowora, 1993; Iwu, 1983).

Since the recognition of folkric medicine after the international conference on primary health care declaration at Alma-Ata, on the 12th day of September 1978 in USSR (WHO, 1978), the practice of folkric medicine has continued to play significant role in medical and dental primary health care services especially in Africa and Asian countries where the practice is prevalent (Duru *et al*., 2012a; Okigbo and Nmeka, 2006; Ritchie, 2001; Ninmh, 1996). Research studies have reported the potency of some medicinal plants against microorganisms (Oladunmonye, 2006; Saudhakar *et al*., 2006; Ezeifeka *et al*., 2004; Opara and Ansa, 1993); and diseases such as malaria, typhoid, dysentery, hypertension, etc (Harnafi and Amrani, 2007; Okwu and Josiah, 2006; Okwu and Ekeke, 2003; Oliver, 1959). Many authors have also noted the active constituents responsible for the potency of medicinal plants against microorganisms and diseases (Owolabi *et al*., 2010; Okpuzor *et al*., 2008; Osuagwu *et al*., 2007; Okwu and Josiah, 2006; Okwu, 2004; Okwu, 2003; Okeke and Elekwa, 2003; Okwu and Ekeke, 2003; Adesina *et al*., 2000; Sandberg and Bruhn, 1979). In all, the search for more plants of medicinal importance is still on the increase.

In recent times, there are existing reports of toxicity after the use of some medicinal plants (Agomuo *et al*., 2011). Reports on toxic effects of either consuming any part of medicinal plant (Duru *et al*., 2012b; Agomuo *et al*., 2011) or using formulations, infusions, or concoctions made from medicinal plants are on the increase (Duru *et al*., 2012a; Ibegbulem *et al*., 2011; Wurochekke *et al*., 2008). Studies on toxic effect of products of medicinal plants on cells, tissues and organs of the body have noted some levels of toxicity inherent from them.

Since Nigeria is among the countries in African continent abound by trees of medicinal importance, and as well where the practice of folkric medicine is prevalent (Duru *et al*., 2012b; Akubugwo *et al*., 2007), there is need to increase the toxicity study on these plants of medicinal importance.

Among such plants is *Buchholzia coriacea* also known as musk tree (Ezikiel and Onyeoziri, 2009). The plant is named after R. W. Buchholz who collected the plant in Cameroon in the late 19th century (Keay *et al*., 1989). Different diseases are remedied with different parts (leaf, seed, bark, root, etc) of *Buchholzia coriacea* (Sofowora, 2008). Diseases such as cough, chest pain, waist pain, irregular menstruation, internal piles, malaria, quick ejaculation, headache, hypertension, dysentery, premature ageing, etc, are treated with the plant (Oseto, 2010; Sofowora, 2008; Gill, 1992). The most frequently used part of the plant is the seed. The potency of the seed product of *Buchholzia coriacea* against diseases earned it the name "wonderful kola". The seed is also called memory nut because of its ability to enhance the memory (Oseto, 2010). The seed acts as blood cleanser, strengthens the nervous system and is used against migraine headache especially in Africa (Oseto, 2010).

Tele:

E-mail addresses: kelechukwuduru@rocketmail.com

Burkill (1985) noted that *Buchholzia coriacea* is known as "uworo", and "uke" among Yoruba and Igbo tribes of Nigeria respectively. Other existing tribes in Nigeria also have different local names such as "owi" in Edo; "ovu" in Bini, and "aponmu" in Akure (Ibrahim and Fagbohun, 2013a) for the plant. Other countries in African such as Ivory Coast, Ghana, Gabon, Cameroon, etc, also have names in recognition of the potency of the plant. Quattroachi-Umbelto, (2007) noted that *Buchholzia coriacea* is known as "esson bossi" among the people of Central Africa.

Buchholzia coriacea is a perennial tree of lowland rain forest region. It is a shrub or medium-sized tree, evergreen, with a dense crown, large glossy leathery leaves arranged spirally and clustered at the ends of the branches, and conspicuous cream-white flowers in racemes at the end of the branches. The leaves of *Buchholzia coriacea* can be described as follows: large, obovate, oblanceolate to elliptic, shortly acuminate or acute at apex, cuneate at base, 15-30×5-11 cm, thinly coriaceous, glabrous, midrib very prominent below, about 10 lateral nerves, each running directly into the one above and forming distinct loops close to the margin, prominent below, stalk 10-15 cm long, swollen for about 1 cm at both ends, pale green (Chinedu *et al*., 2012; Gbile *et al*., 1993; Burkill, 1985). The seed of *Buchholzia coriacea* is normally covered in a purple aril. It is eaten raw or cooked. The extract of the seed is also taken when it is allowed to ferment in water, dry gin or any other drinkable alcohol aside beer. The seed has sharp pungent taste with hot spicy flavour when it is fresh (Frie-Jaiyesimi *et al.,* 2011; Adisa *et al.*, 2011; Ezekiel and Onyeoziri, 2009) and also produces hot painful sensation when placed on eyelid and other areas of the skin with soft tissues. Since research studies have affirmed the importance of *Buchholzia coriacea* plant and its product in folkric medicine (Chinaka *et al*., 2012; Okoli *et al*., 2010; Mbata *et al*., 2009; Nweze and Asuzu, 2009; Ajaiyeoba *et al*., 2001; Bartram, 1998), it is therefore pertinent to investigate the possible toxic effect of the plant or its product in the body following consumption.

With emphasis on the seed as the most frequently used part of *Buchholzia coriacea* plant in folkric medicine. The present study evaluated the antifungal properties and effect of fresh, oven dried uncooked and cooked seeds of *Buchholzia coriacea* on haematology and kidney. The idea is to find the form of the seed that people can consume with little or no toxic effect in the body.

Materials and methods

Sample collection and preparation

Buchholzia coriacea seeds used in the present study were obtained from Orie Amaraku market in Isiala Mbano L.G.A of Imo State, Nigeria. The seeds were identified by Dr. Mbagwu, F. N in Department of Plant Science and Biotechnology, Imo State University, Owerri, Nigeria. The identified seeds were washed with distilled water to free them from dirts. The washed seeds were also cleaned by double disinfection methods. The disinfected and washed seeds were immersed in 80% ethanol for half an hour before they were removed and washed with sodium hypochlorite in aqueous form to reduced surface contamination. The seeds were finally wished with distilled water to free them from sodium hypochlorite. After the final washing of the seeds, a portion was taken and boiled using pressure cooker until confirmed done, another other portion was kept under sterile condition to preserve the freshness. A portion was also oven dried at 50^{o}C for 72 hours. The ground powder of the prepared samples was obtained with the help of Thomas-Wiley milling machine and use for preparation of extracts for fungal study, while the ground samples were used for compounding feed for rat study.

Extract preparation

The method described by Ezeifeka *et al.* (2004) and Azuzu (1986) was used for preparation of the extract used in the present study.

Test organisms

The fungal species used in this study were obtained from Microbiology unit of Imo State University, Owerri, Nigeria. The method of Fawole and Oso (1986) was used for antifungal properties. Species of fungi used were *A. niger, T. interdistale, T.viride* and *F. solanni*.

Experimental animals

One hundred and four male albino rats of Wistar strain weighing between 60-70 grams were purchased from the animal colony of University of Port Harcourt River State, Nigeria and housed in the animal house of Imo State University, Owerri, Nigeria under required condition. The animals were allowed free access to pelletized commercial rat feed (Pfizer Livestock Co., Ltd, Aba, Nigeria) and water *ad libitum*. After acclimatization of four weeks, the animals were allocated to three major groups A, B, and C. Each of the major groups had subgroups. Each of the subgroup housed eight rats. Group A rats were placed on compounded feed of fresh *B.coriacea* seed, group B rats were placed on compounded feed of oven dried uncooked *B. coriacea* seed, and group C rats were placed on compounded feed of cooked *B. coriacea* seed. Eight rats were used as control (control group). The rat weights were equalized as nearly as possible. The feed and water administration lasted for twenty-eight days. Treatments of the rats were as follows

Control group= Normal feed+ portable water.

Group A_5= 5% of fresh *B. coriacea* seed + 95% of normal feed + portable water; Group A_{10} = 10% of fresh *B. coriacea* seed + 90 of normal feed + portable water; Group A_{15}= 15% of fresh *B. coriacea* seed + 85% of normal feed + portable water; Group A_{20}= 20% of fresh *B. coriacea* seed + 80% of normal feed + portable water.

Group B_5= 5% of oven dried uncooked *B. coriacea* seed + 95% of normal feed + portable water; Group B_{10} = 10% of oven dried uncooked *B. coriacea* seed + 90 of normal feed + portable water; Group B_{15}= 15% of oven dried uncooked *B. coriacea* seed + 85% of normal feed + portable water; Group B_{20}= 20% of oven dried uncooked *B. coriacea* seed + 80% of normal feed + portable water.

Group C_5= 5% of cooked *B. coriacea* seed + 95% of normal feed + portable water; Group C_{10} = 10% of cooked *B. coriacea* seed + 90 of normal feed + portable water; Group C_{15}= 15% of cooked *B. coriacea* seed + 85% of normal feed + portable water; Group C_{20}= 20% of cooked *B. coriacea* seed + 80% of normal feed + portable water.

The treatment of experimental animals was in accordance to the National Institute of Health (NIH) guidelines for the care and use of laboratory animals.

Haematology test

The packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), White blood cell (WBC) and its differentials (neutrophils, monocytes, lymphocytes, basophils and eosinophil), were analysed according to the standard methods of Cheesbrough (2000); and Baker *et al.*, (1998). The methods described by Hassan *et al*., (2010) were used for mean cell volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC)

Kidney function test

Urea was analysed using the Bethlot Searcy's method (Searcy, 1967). Creatinine was determined by the method described by Larsen (1971). Sodium ions, potassium ion, chloride and bicarbonate were determined using the instructions on their kits respectively.

Statistical analysis

Results were presented as means and standard error of eight determinations. Haematology and kidney function results from each test group were directly compared to the corresponding control using students t- distribution.

Results and discussion

Table 1: Antifungal properties of fresh, oven dried uncooked and cooked seed samples of *Buchholzia coriacea*.

	Zone of Inhibition (mm) and standard deviation			
Test organism	Control	Fresh seed	Oven dried uncooked seed	Cooked seed
A. niger	+	_	22.0±0.11	6.1±0.05
T. interdistale	+	_	29.0±0.08	3.0±0.05
T.viride	+	_	34.0±0.17	+
F. solanni	+	_	14.0±0.03	1.0±0.01

A.niger is less likely to cause human diseases but becomes deadly when large amounts of spores are inhaled due to serious lung disease (Joanne *et al*., 2011; Samson *et al*., 2001). It is also implicated in fungal ear infections (Samson *et al*., 2001). *T. interdistale* is among the fungi that can cause ringworm, tinea infection and zoonotic skin disease (Masako *et al*., 2008; Zaias and Rebell, 2003). Both *T.viride* and *F. solanni* are agents of plant diseases. From the result of antifungal properties presented in Table 1, it could be observed that fresh seed sample produced total inhibition on the fungal activities. Such total inhibitory effect on the test fungal organisms by the studied seed on fungal activities was reported earlier by Ezekiel and Onyeoziri (2009) on *T.viride* and *A. niger*. Total inhibitory effect on test fungal organisms has also been reported from other plants by Azzouz and Bullerman (1982) on selected herbs, spices, plant components and antifungal agents; and Hitokoto *et al*., (1980) on *Allium species*. Oven dried uncooked seed was the next in terms of inhibitory zones (14.0-34.0 mm) while the cooked seed was the least (1.0-6.0) (Table 1). The observed inhibitory effects of the studied seed samples on the test fungal organisms followed the order fresh seed > oven dried uncooked seed > cooked seed.

Assessment of haematological parameters can be used to determine the extent of deleterious effect of plant extract or its products in the blood of an animal. Haematological study is therefore important in evaluating the clinical state of health of the body (Hoff brand and Pettit, 2000). The indices are diagnostic tools of clinical importance. Duru *et al*., (2013); Duru *et al*., (2012a); and Yakubu *et al.*, (2007) noted that assessment of haematology is used to explain blood relating functions of substances that enter the body. Erythropoietin is known to stimulate the red bone marrow for red blood cell (RBC) production, through a series of events. The entire process is known as erythropoiesis (Palis and Segel, 1998). Substances that enter the body influence the process of erythropoiesis either negatively or positively (Barker *et al*., 1998).When the influence is negative, it then means that the substances can induce anaemic condition in the body. This could be the case with the consumption of fresh seed or oven dried uncooked seed samples of *Buchholzia coriacea* as observed in this study (Table 2). Though their effects on RBC levels in rats placed on the seed samples (A_5-A_{20} and B_5-B_{20}) were insignificant ($p>0.05$) against the control but the observed effects were on reducing trend (Table 2). This could lead to anaemic condition in the body with time when the balance between the rate of production (erythropoiesis) and destruction of the blood corpuscles becomes affected (Dacie and Lewis, 1991). An increasing trend was observed in rats fed cooked sample of the studied seed (C_5-C_{20}), when compared to the control (Table 2). The increase in subgroups C_{10}-C_{20} rats was significant ($p<0.05$) against that control. This could be indication that cooked seed of *Buchholzia coriacea* stimulates erythropoiesis following consumption. Processing (cooking) of the seed may have inactivated the anti-nutritional factors such as trypsin inhibitors, etc, present in the seed when uncooked (Onwuka, 2005) hence the observed erythropoietic effect of the cooked seed sample in rats. The Hb levels in rats placed on fresh seed (A_5-A_{20}) and oven dried uncooked seed (B_5-B_{20}) were insignificantly affected ($p>0.05$) when compared to the control (Table 2), whereas Hb levels in rats placed on cooked seed sample (C_5-C_{10}) significantly increased ($p<0.05$) against the control rats in the present study (Table 2). This could further prove the earlier observation made on RBC levels of experimental rats in this study. Packed cell volume (PCV) levels of the blood relates with Hb in blood (Hoff-brand and Pettit, 2000). Such relationship was also observed in the present study. A decrease in packed cell volume (PCV) levels could be indication of anaemia. PCV in rats placed on fresh seed sample (A_5-A_{20}) reduced insignificantly ($p>0.05$) against the control. Rats fed oven dried uncooked seed sample (from subgroups B_{10}-B_{20}) and cooked seed sample (C_5-C_{20}) had significant increase ($p<0.05$) when compared to the control. Evaluation of white blood cell (WBC) is very important in determining a healthy body to a large extent (Barker *et al*., 1998). An increase in WBC total implies presence of foreign substance and possibly disease condition in the body (Murray, 2000; Barker *et al*., 1998). The WBC levels of test rats in the present study increased significantly ($p<0.05$) against the control rats. Celik and Suzek (2008) noted that white blood cell production (leucocytosis) may be directly proportional to the severe effect of the causative stress condition. Following the observation made on WBC levels in this study (Table 2) and according to Celik and Suzek (2008), the severe effect of the consumed seed samples followed the order fresh seed>oven dried uncooked seed > cooked seed sample in test rats. The observed lymphocyte levels in test rats increased significantly ($p<0.05$) when compared to the control. Duru *et al.*, (2013); and Agomuo *et al*., (2011) noted that mean cell volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) are important blood indices that are used in determining the future disease state of the body. The observed MCV levels in test rats significantly increased ($p<0.05$) against the control. MCHC and MCH relate to individual red blood cells. The MCHC and MCH levels in test rats in the present study were insignificantly affected ($p>0.05$) when compared to control rats. Hassan *et al*., (2010) attributed normocytic and hypochromic anaemia to reduction of MCH or MCHC.

Urine formation, tubular secretion and excretion are among the known functions of the kidney (Akubugwo and Duru, 2011; Moss *et al*., 1996). The functional integrity of the kidney is related to its ability to excrete substances.

Table 2: Haematological result of fresh, oven dried uncooked and cooked seed samples of *B.coriacea.*

		Fresh sample				Oven dried uncooked sample				Cooked seed sample.			
parameters	**control**	**A_5**	**A_{10}**	**A_{15}**	**A_{20}**	**B_5**	**B_{10}**	**B_{15}**	**B_{20}**	**C_5**	**C_{10}**	**C_{15}**	**C_{20}**
PCV (%)	38.36 ± 1.18	37.76 ± 1.10	37.45 ± 1.25	37.39 ± 1.02	37.51 ± 0.70	39.93 ± 2.30	40.41 ± 1.82	40.63 ± 2.01	41.20 ± 1.79	45.96 ± 1.15	47.79 ± 0.20	48.79 ± 1.02	48.20 ± 0.91
Hb (g/dl)	12.70 ± 0.37	12.34 ± 0.53	12.28 ± 0.17	12.22 ± 0.39	12.18 ± 0.81	13.05 ± 1.37	13.21 ± 1.90	13.28 ± 0.37	13.48 ± 2.06	15.12 ± 0.80	15.72 ± 0.53	15.79 ± 1.10	15.89 ± 1.60
RBC ($\times10^{12}$/L)	4.88 ± 0.10	4.59 ± 0.22	4.31 ± 0.17	4.29 ± 0.40	4.21 ± 0.58	4.70 ± 0.81	4.62 ± 0.19	4.41 ± 0.30	4.37 ± 0.64	5.75 ± 1.93	6.18 ± 0.13	6.40 ± 0.25	7.03 ± 0.56
WBC ($\times10^{14}$/L)	64.09 ± 3.02	80.11 ± 2.85	87.42 ± 2.20	93.61 ± 3.09	94.01 ± 2.94	75.19 ± 3.01	90.27 ± 2.11	91.04 ± 1.30	91.75 ± 2.13	70.22 ± 1.32	72.40 ± 2.10	71.65 ± 1.12	74.15 ± 2.73
Monocyte (%)	0.43 ± 0.05	0.45 ± 0.02	0.45 ± 0.01	0.47 ± 0.04	0.44 ± 0.02	0.43 ± 0.01	0.44 ± 0.09	0.43 ± 0.02	0.43 ± 0.05	0.44 ± 0.08	0.45 ± 0.02	0.45 ± 0.06	0.45 ± 0.09
Lymphocyte (%)	51.05 ± 0.15	63.34 ± 1.02	64.60 ± 0.52	65.14 ± 1.91	65.84 ± 1.30	63.28 ± 0.89	63. 81 ± 2.05	64.27 ± 1.38	64. 69 ± 1.21	57.25 ± 2.32	56.50 ± 1.18	56.70 ± 1.96	59.13 ± 1.73
MCV (fl)	78.65 ± 2.11	81.32 ± 1.34	86.89 ± 1.01	87.16 ± 0.84	79.81 ± 1.23	84.96 ± 1.52	87.46 ± 1.38	92.13 ± 1.18	94.28 ± 1.47	79.93 ± 0.70	77.33 ± 1.82	76.23 ± 1.03	68.56 ± 2.14
MCH (pg)	26.02 ± 0.37	26.88 ± 0.02	28.49 ± 0.83	28.48 ± 0.67	28.93 ± 0.48	27.76 ± 0.40	28.59 ± 0.31	27.85 ± 0.19	30.85 ± 0.72	26.30 ± 0.61	25.43 ± 0.29	24.67 ± 0.35	22.60 ± 0.28
MCHC (g/L)	33.11 ± 1.10	32.68 ± 2.23	32.79 ± 1.32	32.68 ± 1.41	32.47 ± 1.25	32.68 ± 1.61	32.69 ± 1.09	32.69 ± 1.18	32.71 ± 1.39	32.90 ± 1.51	32.89 ± 1.83	32.36 ± 1.14	32.96 ± 2.85

Results are means and standard error of mean.

Key: PCV= Packed Cell Volume; Hb=Haemoglobin, RBC= Red Blood Cell; WBC= White Blood Cell; MCV=Mean Cell Volume; MCH= Mean Corpuscular Haemoglobin (MCH) and MCHC = Mean Corpuscular Haemoglobin Concentration.

Table 3: Kidney function result of fresh, oven dried uncooked and cooked seed samples of *B.coriacea.*

		Fresh sample				Oven dried uncooked sample				Cooked seed sample.			
parameters	**control**	**A_5**	**A_{10}**	**A_{15}**	**A_{20}**	**B_5**	**B_{10}**	**B_{15}**	**B_{20}**	**C_5**	**C_{10}**	**C_{15}**	**C_{20}**
Creatinine (mg/dl)	0.67 ± 0.08	0.67 ± 0.01	0.66 ± 0.10	0.66 ± 0.03	0.64 ± 0.08	0.65 ± 0.01	0.66 ± 0.05	0.65 ± 0.02	0.65 ± 0.01	0.67 ± 0.03	0.67 ± 0.01	0.66 ± 0.03	0.66 ± 0.09
Urea (mg/dl)	49.45 ± 3.10	49.30 ± 2.10	48.50 ± 1.11	48.10 ± 1.19	48.37 ± 1.04	48.96 ± 2.83	48.54 ± 2.01	47.54 ± 2.83	47.33 ± 1.28	49.13 ± 2.36	48.57 ± 3.02	48.21 ± 2.18	48.19 ± 2.14
Potassium ion (mEq/L)	5.08 ± 0.32	7.13 ± 0.15	7.60 ± 0.21	7.91 ± 0.14	7.98 ± 0.11	6.13 ± 0.10	6.35 ± 0.57	7.20 ± 0.84	7.41 ± 0.71	5.35 ± 0.35	5.15 ± 0.93	5.75 ± 0.49	5.93 ± 0.18
Sodium ion (mEq/L)	104.04 ± 3.10	104.12 ± 3.08	104.05 ± 2.90	103.85 ± 3.01	104.65 ± 3.75	103.78 ± 3.13	103.93 ± 3.18	104.60 ± 3.03	104.44 ± 1.50	104.61 ± 1.40	104.19 ± 1.30	104.26 ± 1.74	104.52 ± 1.09
Chloride (mEq/L)	76.07 ± 1.90	76.10 ± 1.32	76.12 ± 1.20	76.50 ± 1.38	76.19 ± 1.94	76.70 ± 1.51	76.11 ± 1.35	76.24 ± 1.42	77.13 ± 1.27	76.10 ± 1.42	77.04 ± 1.05	76.13 ± 1.19	76.35 ± 1.04
Bicarbonate (mmol/L)	20.12 ± 0.10	21.18 ± 0.20	21.03 ± 0.52	20.46 ± 0.80	21.37 ± 0.38	22.03 ± 0.41	21.16 ± 0.73	21.08 ± 0.20	20.30 ± 0.19	19.96 ± 0.45	20.17 ± 0.83	21.95 ± 0.25	19.86 ± 0.22

Results are means and standard error of mean

Creatinine is the major catabolic products of the muscle by creatine metabolism and it is excreted in the kidney (Wurochekke *et al*., 2008). Creatinine retention in the kidney is an indication of renal failure (Wurochekke *et al*., 2008; Robert *et al*., 2003; Haper, 1975). Increase in tissue protein metabolism catabolism, excess breakdown of blood protein and reduced excretion of urea could result in increased level of high blood urea (Nduka, 1999). Urea varies directly with protein intake and inversely with the rate of excretion. The concentration of urea in the red blood cells is lower than its concentration in the plasma (Wurochekke *et al*., 2008). Urea retention results due to poor glomerular filtrate. Poor glomerular filtrate results when the functional integrity of the kidney has been affected by a disease condition (Ranjna, 1999). Creatinine and urea levels were insignificantly ($p>0.05$) affected in test rats when compared to those of the control rats (Table 3). The kidney regulates fluid and ion balance of the plasma by excretion of urine (Robert *et al*., 2003). Though the reabsorption processes depend on mineralocorticoid aldosterone, which is monitored by the kidney; and ion pumps in the body (Harper *et al*., 1975). The observed potassium ion (K^+) levels increased significantly ($p<0.05$) in rats fed fresh seed of *Buchholzia coriacea* (Group A; subgroups A_5-A_{20}) against the control (Table 3). The same effect ($p<0.05$) was also observed in rats of subgroups B_{15}-B_{20} placed on oven dried uncooked seed of *Buchholzia coriacea* against the control (Table 3).

Potassium ion (K^+) levels in rats placed on cooked *Buchholzia coriacea* were insignificantly affected ($p>0.05$) against the control (Table 3). The observed reduced effect of potassium ion in rats fed cooked seed sample could be due to processing (cooking) of the seed which may have affected potassium level of the seed (Onwuka, 2005). The levels of sodium ion (Na^+), chloride (Cl^-) and bicarbonate (HCO_3^-) observed in the present study were insignificantly ($p>0.05$) affected in test rats against those of the control. The non-significant effect on these electrolyte ions could be that the severe effects of their high or low levels in the body may not be possible following the consumption of any of the studied seed samples on the kidney.

Conclusion

Conclusively the antifungal properties of *Buchholzia coriacea* seed samples followed the order fresh seed > oven dried uncooked seed > cooked seed. This is in line with previous studies on the seed. The observed severe effects on haematology and kidney followed the order cooked seed<oven dried uncooked seed< fresh seed in rats placed on them. Processing of the seed samples could be behind the reduced effects of the seed samples as observed in the present study. Based on the results of this study and due to the fact that results obtained with animals have higher predictive values for human toxicity when the data are translated from animals studies, those that consume the uncooked seed of *Buchholzia coriacea* indiscriminately (maybe due to its potency as a medicinal plant) should take note of the possible inherent effects.

This study has shown the antifungal properties and effects of fresh, oven dried uncooked and cooked seed samples of *Buchholzia coriacea* on haematology and kidney.

References

Agomuo, E.N., Amadi B. A and Duru M.K.C. (2011). Some biochemical studies on the leaves and fruits of *Persea Americana.* IJRRAS 11 (3): 565-569.

Adesina, S.K., Ogundainin, H., Oladimeji, H and Olugbede, T. A. (2000). Antimicrobial constituent of the leaves of Acalypha milkisina. John Wile and Sons, pp.120.

Adisa, R. A., Choudharyb, M.I and Olorunsogo O.O. (2011). Hypoglycemic activity of *Buchholzia coriacea* (Capparaceae) seeds in streptozotocin-induced diabetic rats and mice. Elsevier Gmbh , Exp Toxicol Pathol. 63(7-8); 619-25.

Ajaiyeoba, E.O., Onocha P.A and Olanrewaju O.T. (2001). In vitro anti-helminthic properties of *Buchholzia coriacea* and Gynandropsis gynandra. Pharm Biol. 39: 217–20.

Akubugwo, E. I and Duru M.K.C. (2011). Biochemical implications of the consumption of water from Otamiri River, Owerri, Imo State, Nigeria. JETEAS 2(6) :934-937.

Akubugwo, E.I., Obasi, A.N., Chinyere G.C and Ugbogu A.E (2008). Mineral and phytochemical contents in leaves of *Amarantus hybridus* L and *Solanum nigrum* L. Subjected to different processing methods. African Journal of Biochemistry Research 2(2):040—044.

Azuzu, I. U. (1986). Pharmacological evaluation of folkore of *sphenostylia slenocarpa.* J.Ehnophamacol 16 *:* 236-267.

Azzouz, M. A and Bullerman, L. B. (1982). Comparative antimycotic effects of selected herbs, spices. Plants components and commercial antifungal agents. J. Food Prot. 45:1298-1301.

Baker, F.J., Silverton, R.E and Pallister, C.J (1998). Baker and Silverton's Introduction to Medical Laboratory Technology, seventh ed. pp. 356-360.

Bartram, T. (1998). Encyclopedia of herbal medicinal Macmillian London.

Burkill, H. M. (1985). The useful plants of West Africa.Royal garden,Kew.p.319.

Celik, I and Suzek, H (2008). The hematological effects of methyl parathion in rats. J. Haz. Mat. 153: 1117-21.

Cheesbrough, M. (2000). District Laboratory Practices in Tropical Countries, part 2. Low price edition, pp. 267-334.

Chinaka, O.N., Okwuoche, J. O., Florence, C. N and Nkeiruka, E. U. (2012). Effects of methanol extarcts of *Buchholzia coriacea* fruit in streptozotocin-iduced diabetic rats. Journal of Pharmacology and Toxicology 7 (4): 181-191.

Chinedu, F.A., Chibeze I., Uchechukwu, A. U and Chukwuenweiwe E. (2012). Phytochemical analysis and antipyretic properties of the methanol extract of the leaves of *Buchholzia coriacea* (Capparaceae). Asian Journal of Biochemical and Pharmaceutical Research 2 (2):340-345.

Dacie, J.V and Lewis, S.M. (1991). Practical heamatology, churchhill living stone, Edinburgh. pp.41-57.

Duru, M., Ugbogu A and Amadi B. (2013). Effect of *Solanum macrocarpon* fruit on haematology, hepatic and renal function. Advances in Biochemistry 1(2):28-32.

Duru, Majesty K. C., Amadi Benjamin A, Eze Adindu E, Ugbogu Amadike E and Onuoha Nchekwube (2013). *In vivo* studies of *Solanum aethiopicum* fruit on some biochemical parameters using rats. Journal of Chemical and Pharmaceutical Research 5(2):1-4.

Duru, M.K.C., Agomuo, E. N and Amadi, B. A. (2012a). Biochemical studies on "udu" an antimalarial concoction used in Umunchi village, Isiala Mbano L.G.A of Imo State, Nigeria. Continental J. Pharmacology and Toxicology Research 5 (2): 28 – 34.

Duru, M.K.C., Amadi, B. A., Amadi, C. T., Lele, K. C., Anudike, J. C., Chima-Ezika, O.R and Osuocha, K. (2012b): Toxic effect of *Carica papaya* bark on body weight, haematology, and some biochemical parameters. Biokemistri 24 (2): 67-71.

Ezeifeka, G. O., Orji, M. U., Mbata, T.I and Patrick, A. O. (2004). Antimicrobial activities of *Cajanus cajan, Garcinia kola* and *Xylopia aethiopica* on pathogenic microorganisms. Biotechnology 3(1): 41-43.

Ezikiel, O. O and Onyeoziri, N. F. (2009). Preliminary studies on the antimicrobial properties of *Buccholzia coriacea* (wonderful kola). African Journal of Biotechnology 8 (3) 472-474.

Fawole, N. V and Oso, E. A. (1986). Laboratory manual of Microbiology spectrum books ltd. Ibadan, Nigeria.pp:18-22.

Gbile, Z. O., Adesina, S.K., Odukoya, O.A and Akinwusi, D.D. (1993). Survey on indegenous useful plants of West Africa with special emphasis on medicinal plants and issues associated with their management.

Gill, L.S. (1992). Ethno medical uses of plants in Nigeria. University of Benin Press Benin, Nigeria.

Harnafi, H and Amrani, S. (2007). Review Article Flavonoids as Potent Phytochemicals in Cardiovascular Diseases Prevention. Phcog. Rev.1: 193-202.

Harper, H.A., Rodwell, V. M and Maryers P.A. (1975). Review of physiological chemistry, 16th edition, Large medical Publishers. Los Altos, California.

Hassan, D.I., Ogah, D.M.,Yusuf, N. D., Musa, M.M and Saidu, G. M. (2010). The effect of acute and chronic oral administrations of black pepper (*Piper guineense*) aqueous extract on the body weight and haematological values of albino Wistar rat. Journal of Medicinal Plant Research 4(12):1122-1125.

Hitokoto H, Morozumi S., Wanke T., Sakai S and Kuratia H. (1980). Inhibitory effect of spices on growth and toxin production of toxigen fungi. Appl. Environ. Microbiol. 39:318.

Hoff-brand, A.V and Pettit, J.E. (2000). Haematological parameters in essentials of Haematology, 4th edition, Blackwell Science. pp. 21-25.

Ibrahim T. A and Fagbonun, E. D. (2013a). Phytochemical and mineral quality of dried seeds of *Buchholzia coriacea*. Journal of Applied Hytotechnology in Environment Sanitation 2(4):121-126.

Ibrahim, T. A and Fagbonun, E. D. (2013b). Antibacterial and Antifungal Activity of Ethanolic and Methanolic Extract of Dried Seeds of *Buchhlozia coriacea*. Greener Journal of Agricultural Sciences 3 (6): 458-463.

Joanne, M.W., Linda, M. S and Chritopher, J. W. (2011). Prescott`s microbiology, eight edition. McGraw-Hill International. New York.

Ibegbulem, C. O., Eyong, E. U and Essien, E. U. (2011). Biochemical effects of drinking *Terminalia catappa* Linn. decoction in Wistar rats. African Journal of Biochemistry Research 5(8):237-243.

Iwu, M.M. (1983). Traditional Igbo medicine Institute of African studies publication, University of Nigeria, Nsukka, pp.112-144.

Keay, R. W.J. (1989). Tress of Nigeria, Clarendon press, Oxford. pp. 42-44.

Larsen, K. (1971). Creatinine assay by a reaction-kinetic principle. Clin. Chim. Acta 41: 209-217.

Mbata, T.I., Duru C.M and Onwumelu H.A. (2009). Antibacterial activity of crude seed extract of *Buccholzia Coriacea E.* on some pathogenic bacteria. Journal of Developmental Biology and Tissue Engineering. 1(1):1-5.

Masako, K., Kazushi, A., Asako, W., Kiminobu, T., Hiroshi, T., Takashi , M., Hiroshi I and Basavaraj M.H (2008). Different Genes Can Result in Different Phylogenetic Relationships in *Trichophyton* Species. Nippon Ishinkin Gakkai Zasshi 49 (4): 311-318.

Moss, D. W and Henderson, A.R. (1996): Enxymes In: Tiez fundermental of clinical chemistry, 4th eds. Tiez N W (ed) W.B. Saunders Company, Philadelphia, pp. 283-335.

Murray, R.K. (2000). Red and white blood cells in: Harpers Biochemistry (R.K. Granner, P.A. Mayes and V.W. Rodwelleds). McGraw-Hill, USA.

National Institute of Health (1985). *Guide for the Care and Use of Laboratory Animals.* (U.S. Department of Health Education and Welfare, NIH Publication, pp. 85-123.

Nduka, N. (1999). Clinical biochemistry for students of pathology, Animo Press Ltd, Nigeria, pp. 142-143.

Ninmh, A.C. (1996). The encyclopedia of medicinal plants. Dorling Kingdersley, London.

Nweze, N.E and Asuzu, I.U. (2009). The anthelmintic effects of *Buchholzia coriacea* seeds. Nigerian Veterinary Journal 27(2): 60-65.

Okeke, C. U and Elekwa, I. (2003). Phytochemical study of the extract of *Gongronema latifolium* Benth (*Asclepiadaceae*). J. Health and Visual Sci. 5:47-55.

Okigbo, R. N and Nmeka, E.C. (2006). An appraisal of phytomedicine in Africa. KMITL Sci. Tech. J. 6(2): 83-94.

Okoli, B.J., Okere, O.S and Adeyemo, S.O. (2010). The antiplasmodic activity of *Buccholzia Coriacea*. Journal of medical and applied Biosciences 2: 21-29.

Okpuzor, J., Adebesin,O., Ogbunugafor, H and Amadi,I .(2008). The potential of medicinal plants in sickle cell disease control; A review. International Journal of Biomedical and Health Sciences 4(2): 47-54.

Okwu, D. E. (2004). Phytochemicals, vitamins and mineral contents of two Nigeria medicinal plants. J.Mol.Med. Adv. Sci. 1:378-381.

Okwu, D.E. (2003). Phytochemicals and vitamin content of indigenous species of South Eastern, Nigeria. J .Sustain Agric. Environ. 6: 30-34.

Okwu, D. E and Ekeke, O. (2003). Phytochemical screening and mineral composition of chewing sticks in south Eastern, Nigeria. Global J Pure and Applied Sci. 9:235-238.

Okwu, D. C and Josiah, C. (2006). Evaluation of chemical composition of two Nigerian medicinal plants. African Journal of Biotechnology 5(4):357-581.

Oladunmoye, M. K. (2006). Comparative evaluation of antimicrobial activities and phytochemical screening of two varieties of Acalypha wilkesiana. Trend in Applied Sciences Research 1(5): 538-541.

Oliver, B. (1959). Nigeria`s useful plants. Nig. Field 24: 13-34.

Onwuka, G.I. (2005). Food analysis and instrumentation (Theory and practice). 1stedn, Napthal prints, Surulere, Lagos–Nigeria.

Opara, A. A and Ansa, M. A. (1993). The antibacterial activity of tea and coffee on selected organisms. J. Medi Laboratory Sci., 3: 45-48.

Oseto, J. (2010). Medicinal uses of wonderful kola. Ezinne article.com. http://ezinearticles.com?/Medicinal-uses-of-wonderful-kola. (Retrieved 7/April/ 2010).

Osuagwu, G. G. E., Okwulehie, I. C and Emenike, J. O. (2007). Phytochemical and mineral content of leaves of four Nigeria *Pterocarpus* (JACQ) *species*. International Journal of Molecular Medicine and Advance Science 3(1): 6-11.

Owolabi, M.A., Coker, H.A.B and Jaja, S.I.(2010).Bioactivity of Phytoconstituents of leaves of *Persea americana*. Journal of Medicinal Plants Research 4(12): 1130-1135.

Palis, J and Segel, G. B. (1998). Developmental biology of erythropoiesis. Blood Rev. 12 (2): 106–14.
Quattroachi-Umbelto, F.L.S. (2007). C.R.C. World Dictionary of plant names-common names scientific names, eponyms, synonyms, and entomology. C.R.C. Press. pp.367-368.
Ranjna, C. (1999). Practical clinical Biochemistry Methods and Interpretation, 2nd edn. pp.117.
Ritchie, H.E.(2001). The safety of herbal medicine used during pregnancy. Frontier in fetal Health.3: 259-266.
Robert, K.M., Daryl K.G., Peter, A.M and Victor, W.R. (2003). Harper`s illustrated Biochemistry 26th edition. McGraw Hill, New York.
Sandberg, F and Bruhn, J. G. (1979). Screening of plants for Biological active substances in African plants Edited by A. Sofowora, university of Ife press, Nigeria.
Searcy, R.L., Reardon, J.E and Foreman, J.A.(1967). Enzymatic serum urea determination. Am. J. Med. Technol. 33:15-20.
Sofowora, E.A. (2008). Medicinal Plants and Traditional medicine in Africa. John Wiley and Sons Ltd; pp. 1-10.
Sofowora, A. (1993). A medicinal plants and traditional medicine in Africa. Ibadan, Spectrum Books, pp. 289-320.
Sudhakar, M., Rau, C.V., Rao, P.M and Raju, D.B. (2006). Evaluation of antimicrobial activity of *Cleome viscose* and *Gmelina asiatica*. Fitoteapia 77: 47-49.
World Health Organization (1978). Promotion and development of traditional medicine. Tech. Rep. Series. p. 622.
Welzel, M. S., Kaptenk, T.J., Haramati, A and Einsenbeng, D. M. (2003). Complementing and alternative medical therapies; Implication for medical education. Ann Intl.Med 138:191-196.
Wurochekke, A.U., Anthony, A.E and Obidah, W. (2008). Biochemical effects on Liver and kidney of rats administered aqueous stem bark extract of *Xemenia americana. African* Journal of Biotechnology **7** (16): 2777-2780.
Yakubu, M.T., Akanji, M. A and Oladiji, A.T. (2007). Haematological evaluation in male albino rats following chronic administration of aqueous extract of *Fadogia agrestis*stem. *Pharmacog. Mag.*3: 34.
Zaias, N and Rebell, G. (2003). Clinical and mycological status of the *Trichophyton mentagrophytes* (interdigitale) syndrome of chronic dermatophytosis of the skin and nails. Int. J. Dermatol. 42 (10): 779–88.