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EVALUATION OF THE PYTOCHEMICAL AND ELEMENTAL COMPOSITION OF *Hura crepitan* SEEDS

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author IRE designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript and managed the analyses of the study. Author EJA managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The present study was designed to determine the phytochemical and elemental composition of *Hura crepitan* seed grown in Akwa Ibom State, Nigeia. Standard methods of analysis were used. The result revealed that the concentrations of the phytochemicals were as follows: alkaloids (6.32± 0.41 mg/100g). saponins (9.07± 0.03 mg/100g), flavonoids (3.79± 0.03 mg/100g), tannins (23.11± 0.24mg/100) and cyanogenic glycoside (1.9 ± 0.01mg/100g). The results of the elemental composition revealed the following: Iron (0.10± 0.00mg/100g), potassium (12.45 ±0.00mg/100g), magnesium (5.73 ± 0.03 mg/100g), zinc (4.20 ± 0.00 mg/100g) , calcium (9.07 ± 0.74 mg/100g), sodium (2.12 ± 0.04mg/100g) and phosphorus (3.29 ± 0.06mg/100g). The study showed that the plant contain very high amount of tannins. This may be responsible for its medicinal properties. The result of the elemental composition indicates that *Hura crepitan* seed could serve as a source of nutrients for human consumption.

Keywords: Phytochemicals; elemental composition; *Hura crepitan*; medicinal properties.

1. INTRODUCTION

Over the years, medicinal plants have been discovered and used in traditional medicine practices since prehistoric time. Plants synthesis had brought hundreds of chemical compounds used by human to defend themselves against diseases and infections. The use of natural products derived from plants for therapeutic purpose is as ancient as human civilization. Okwu and Ezenagu [1], reported the therapeutic values of different phytochemicals to human health and disease prevention. Phytochemicals are present in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices [2]. They are naturally synthesized in all parts of the plant body which include the bark, leaves, stem, root, flower, fruits, seeds, etc. [3]. Phytochemicals are regarded as secondary metabolites, they played important roles in the protection of human health, when their dietary intake is significant [4].

Hura crepitan is one of such plants that had been reported to have many ethnomedicinal applications especially as antimicrobial, anti-inflammatory and anti-hepatotoxic effects [5].

Hura crepitan also known as the Monkey's dinner bell is not indigenous to West Africa, but its point of origin can be traced to America. This is an imported tropical tree which is about 2.5m tall with spiny trunk and branches has long stem, oval leaves which are thin, heart shaped and has red flowers. The tree

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usually brings flower at the beginning of the rainy season and is commonly planted along roads and villages in West Africa.

In most parts of the world, the trees have been used as shades because of its large spreading branches. In some places, the leaves are used for medicinal purposes but the seed has not been fully exploited as there is scanty information on the properties, traditional handling methods and utilization of the seeds. *Hura crepitan* seed shells have been used in the preparation of activated carbon [6].

Recently, a wide range of therapeutic applications have been found in *Hura crepitan* which include a strong purgative, astringent, fungicidal and antimicrobial properties [5]. Phytochemicals or secondary metabolites found in Sandbox plants and other plant extracts are numerous and exhibit various physiological activities.

The research objective of this work is to evaluate the phytochemical and elemental composition of *Hura creptian*.

2. MATERIALS AND METHODS

2.1 Sample Collection and Treatment

The matured seeds of *Hura crepitan* were collected from Ikot Osurua village in Ikot Ekpene Local Government Area, Akwa Ibom State, Nigeria. The seeds hull was removed, leaving only the white fleshly part which were cut into small pieces. The seeds were later air dried for 10 days and then grinded into powdered form using a Thomas Willey, grinding machine. The powder materials were stored in a airtight containers for the analysis.

2.2 Chemical Analysis

The minerals calcium, sodium, potassium, magnesium and trace elements (iron and zinc) were determined according to the method of Shahidi et al., [7]. Phosphorus content of the digest was determined according to the method described by Nahapetain and Bassin [8].

Alkaloid was determined according to the method of Harbone while tannin was determined using the method of Van- Burden and Robinson [9]. Saponin and Flavonoid were determined using the method of Obadoni and Ochuko [10]. Determination of cyanogenic glycosides content of the seeds was done by the alkaline titration method of the AOAC [11].

2.3 Statistical Analysis

All measurements were replicated three times and standard deviations were determined.

3. RESULTS AND DISCUSSION

The result of the phytochemical and elemental analysis carried out on the *Hura crepitan* seed as presented in Table 1 and illustrated in Fig. 1, revealed that *Hura crepitan* seed contains phytochemicals such as alkaloid, flavonoid, tannins, saponin and cyanogenic glycosides. The result shows that the concentration of tannins in the plant was (23.11 ± 0.24 mg/100g). Tannins are important antioxidant and anti-inflammatory agent. This is an indication that the concentration of tannins in this seeds is very high more than other phytochemicals, shown in the result. They have the capacity to protect the tissues from the action of free radicals that causes the cellular aging processes [1].

The flavonoid content in the seeds was (3.79 ± 0.03 mg/100 g). Naturally occurring flavonoids are potentially antiallergic, anticarcinogenic, anti-viral and antioxidant [12]. Flavonoids are widely distributed in plants, fulfilling many functions. Flavonoids are the most important plant pigments responsible for flower coloration, producing yellow, red and blue pigmentation in petals designed to attract pollinator animals. In higher plants, flavonoids are involved in UV filtration, symbiotic nitrogen fixation and floral pigmentation [13]. They may also act as chemical messengers, physiological regulators, and cell cycle inhibitors.

The result reveals that the concentration of saponin was (9.07 ± 0.03 mg/100 g) and alkaloids (6.32 ± 0.41 mg/100 g). However, the concentration of cyanogenic glycosides was (1.92 ± 0.01 mg/100 g). The value of cyanogenic glycosides is really low in the seed of the plant and is unlikely to pose toxicity problems to man, since they are much below the toxic level of 36 mg/kg body weight which is considered lethal to human being [14].

Table 1. The Result of the phytochemical compositions of *Hura crepitan* seeds

Phytochemicals	Concentration (mg/100g)
Alkaloids	6.32 ± 0.41
Saponins	9.07 ± 0.03
Flavonoid	3.79 ± 0.03
Tannins	23.11 ± 0.24
Cyanogenic glycosides	1.92 ± 0.01

Data are means ± standard deviation of triplicate determinations on dry weight

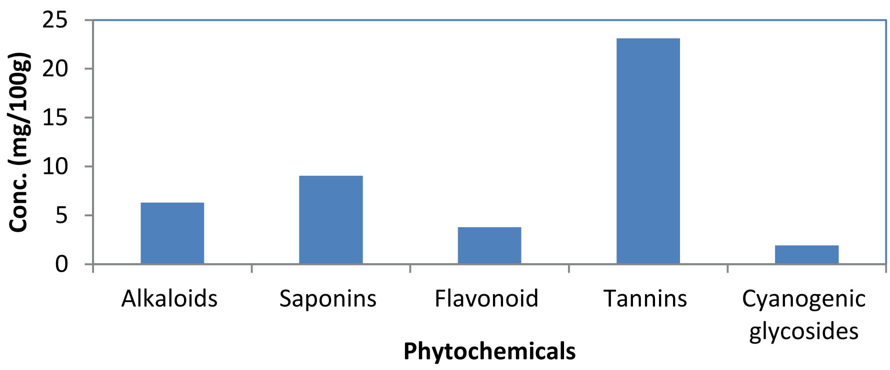

Fig. 1. Phytochemical compositions of *Hura crepitan* seeds

Table 2. The result of elemental composition of *Hura crepitan* seeds

Elements	Concentration (mg/100g)
Iron (Fe)	0.10 ± 0.00
Zinc (Zn)	4.20 ± 0.00
Potassium (k)	12.45 ± 0.00
Magnesium (Mg)	1.73 ± 0.03
Calcium (Ca)	5.73 ± 0.74
Sodium (Na)	2.12 ± 0.04
Phosphorus (P)	3.29 ± 0.06

Data are means ± standard deviation of triplicate determinations on dry weight

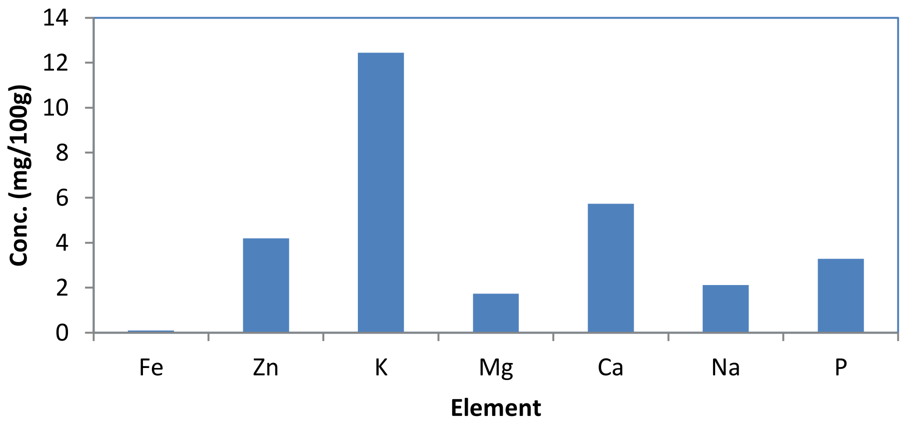

Fig. 2. Elemental composition of *Hura crepitan* seeds

The results of the elemental composition of *Hura crepitan* seeds shown in Table 2 and illustrated in Fig. 2, indicate that the seeds contain elements such as iron, zinc, potassium, magnesium, calcium, sodium and phosphorus. However, a total of seven elements were determined in the seed. The concentration of potassium in the plant was (12.45 ± 0.00 mg/100 g). Potassium is important to maintain several bodily functions. Muscles need potassium to contract. The heart muscle needs potassium to beat properly and regulate blood pressure. The kidney is the main organ that controls the balance of potassium by removing excess potassium from the body.

The concentration of calcium was (5.73 ± 0.74 mg/100 g). Calcium mobility in plants takes place mainly in the xylem together with water. Calcium is an essential plant nutrient; it participates in metabolic processes of other nutrients uptake. Adequate calcium prevents the overall risk of colon cancer and suppresses the growth of polyps that can lead to cancer. Its supplementation reduces the risk of adenomas as well as non-malignant tumors of the colon [15]. The values of sodium, calcium and potassium are comparable with those reported for the seed by Fowomola, [16].

The concentration of zinc was (4.02 ± 0.00 mg/100g). Zinc is used in the treatment of skin diseases and viral infection, also essential for the production of insulin and carbonic anhydrase. Phosphorus was (3.29 ± 0.06 mg/100g). Phosphorus is a mineral that makes up 10% of a person’s total body weight. It is the second most abundant mineral in the body. It is present in every cell of the body. Most of the phosphorus in the body is found in the bones and teeth. It plays an important role in how the body uses carbohydrates and fats. It is also needed for the body to make protein for the growth, maintenance, and repair of cells and tissues. Phosphorus also helps the body to make ATP, a molecule the body uses to store energy [17].

However, the concentration of sodium (2.12 ± 0.04 mg/100 g) and magnesium was (1.73 ± 0.03 mg/100 g). Sodium is one of the body’s electrolytes that the body needs in relatively large amounts. Electrolytes carry an electric charge when dissolved in body fluids such as blood. Magnesium plays a role in over 300 enzymatic reactions within the body, including the metabolism of food, synthesis of fatty acids and proteins, and the transmission of nerve impulses [18].

Magnesium ions function as cofactors for a large variety of enzymes with many functions. Other causes of high serum magnesium are hypothyroidism and lithium therapy.

The result also revealed the concentration of iron in the plant was (0.10 ± 0.00 mg/100 g). Iron is an important component of hemoglobin, the substance in red blood cells that carries oxygen from lungs to transport it throughout your body. Hemoglobin represents about two-thirds of the body’s iron. If the body does not have enough iron, the body cannot make healthy oxygen-carrying red blood cells. A lack of red blood cells causes anemia.

4. CONCLUSION

The mineral contents of *Hura crepitan* indicate that the seed is rich in minerals. The presence of these elements enables the seed to be used in treatment of diseases and infection resulting from mineral deficiencies. Also, the phytochemical contents of this plant show that the concentration of alkaloid, saponin and tannins are high but flavonoid and glycoside are in small quantities. The presence of phytochemicals provides good percentage of the daily requirements as supplements for human and livestock consumption.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Okwu DE, Ezenagu V. Evaluation of the phytochemical composition of mango (*Mangifera indica*) stem back and leaves. International Journal of Chemical Science. 2008;6(2):705-716.
2. Mathai K. Nutrition in the adult years. In Krause’s food, nutrition, and diet therapy, 10th ed., ed. L.K. Mahan and S. Escott- Stump. 2000;271:274-275. Nigeria, Nsukka. 202.
3. Tiwari R, Das K, Shrivastava DK. Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends. Journal of Medicinal Plants Research. 2010;4(2):104-111.
4. Gill AF. Economic botany: A textbook of useful plants and plant products, 2nd edition. McGraw Hill book Co. 1992;242-266.
5. Ajayi OE, Adedire CO. Potential of sandbox, *hura crepitan*s seed oil for protection of cowpea seeds from maculata fabricius (Coleoptera: Bruchidae) infection. Journal of Plant Disease and Protection. 2003;110(6):602-610.
6. Nsi EW, Akpakpan AE, Ukpong EJ, Akpabio UD. Preparation and characterization of activated carbon from *Hura Crepitans Linn*

seed shells. The International Journal of Engineering and Science. 2016;5(9):38 –41.

7. Shahidi FU, Chavan AK, Mckenzie OB. Chemical composition of beach pea, *Lathyrus Maritimum.* Plant Parts Food Chemistry. 2002;64:39 - 44.
8. Nahapatian A, Bassiri A. Changes in concentration and interrelationships of phytate, p, Mg, Cu, Xn in wheat during maturation. Journal of Agriculture and Food Chemistry. 1995;23:1179 -1182.
9. Van-Burden TP, Robinson WC. Formation of complexes between protein and tannic acid. Journal of Agriculture and Food Chemistry. 1981;1:77-82.
10. Obadoni BO, Ochuko PO. Phytochemical studies and comparative Efficacy of some Homeostatic Plants in Edo and Delta States of Nigeria. Global Journal of pure and Applied Sciences. 2001;8:203-208.
11. AOAC. Official methods of analysis. 15 Edition. Association of Official Analytical Chemists, Arlingtion, VA; 1990.
12. Close DC, McArthur C. Rethinking the role of many plants phenolies protection from photo Damage, Oikos. 2002;99:166-172.
13. Galeotti F, Barile E, Curir P, Dolci M, Lauzotti V. Favonoids from carnation (*Drianthus caryophylles*) and their antifungal activity. *Phytocheistry* Letters. 2008;144-1448.
14. Nwinika NM, Ibeh GO, Ekeke GO. Proximate composition and levels of some toxicants in four commonly consumed spice. Journal of Applied Sciences, Environment and Management. 2005;9(1):150 -155.
15. Crimmin MR, Casely IJ, Hill MS. Calcium Medicated intramolecular Hydroamination Catalysis. Journal of the American Chemical Society. 2005;127(7):2042-4043.
16. Fowomola MA. Nutritional quality of sandbox tree (*Hura crpitans*). Department of Biochemistry, School of Science, Federal University of Technology, Akure, Ondo State, Nigeria. J. Med foods. 2007;10(1):159-164.
17. Ellis BD, MacDonald LB. Phosphorus (I) Iodide: A versatile metathesis reagent for the synthesis of low oxidation state phosphorus compounds. Inorganic Chemistry. 2006;45(7):6884-6874.
18. Ajuk J, Gutoes NJ. Contemporary view of clinical relevance of magnesium homeostasis. Annals Clinical Biochemistry. 2014;51(2):176-188.

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