

PROXIMATE AND ANTINUTRIENT COMPOSITION OF  
*Hura crepitans* (SANDBOX TREE) SEEDS

ABSTRACT

Analysis of proximate and antinutrient composition of *Hura crepitans* (Sandbox tree) seeds obtained from campus of Akwa Ibom State Polytechnic Ikot Osurua, Ikot Ekpenewere carried out using standard analytical procedures. The result of the proximate composition analysis showed that *H. crepitans* seeds contain moisture content ( $13.875 \pm 0.176\%$ ), crude fat ( $36.750 \pm 1.060\%$ ), crude fibre ( $0.5 \pm 0.000\%$ ), crude protein ( $36.625 \pm 0.884\%$ ), ash content ( $0.25 \pm 0.000\%$ ) and carbohydrate ( $25.875 \pm 0.200\%$ ). The result of the antinutrient analysis showed that *H. crepitans* seeds contain phytic acid (phytate) ( $0.615 \pm 0.002 \text{ mg/100g}$ ), hydrocyanide ( $3.289 \pm 0.003 \text{ mg/100g}$ ), oxalate ( $1.386 \pm 0.001 \text{ mg/100g}$ ) and tannins ( $8.130 \pm 0.003 \text{ mg/100g}$ ). Tannin had the highest concentration while phytate had the lowest concentration of all the antinutrients analyzed for. The antinutrients can be removed during processing. The result of the proximate composition reveals high crude fat and protein contents of the seed of *H. crepitans*, showing that the seed is nutritional. Findings from this study therefore suggest intensified research on these seeds of *H. crepitans* so as to harness its potentials in the production of animal feed.

Keywords: Antinutrient, proximate composition, Sandbox tree, seeds.

Comment [001]:

Comment [002]: Remove

## Introduction

*Huracrepitans*, commonly referred to as sandbottle tree (Fig. 1) is a tropical plant of **Euphorbiaceae** family (Abdulkadir *et al.*, 2013). The tree is native to Tropical America (Owojuyigbe *et al.*, 2020), and is traditionally grown as a shade tree. (Ola and Jekayinfa, 2015), and also has been found to be useful in many ethnomedicinal applications such as its use in the treatment of leprosy and antimicrobial among others (Owojuyigbe *et al.*, 2020). Sandbottle tree can grow above 40 metres (Azubuike *et al.*, 2016).



Fig. 1: Sandbottle Tree ( **Move the photograph to appendix** )

It has many dark, pointed spines and smooth brown bark. Because of these spines, it is normally called “Monkey-no-climb” (Oyeleke *et al.*, 2012).

Comment [OO3]: Italicize

Comment [OO4]: Move to appendix

The fruits of this tree resemble small pumpkin pods with 16 seeds enclosed and because the fruit sexplode on maturation, it is usually called dynamite tree (Okolie *et al.*, 2012). These seeds are small and brown in colour with an average diameter of about 1-5 cm (Mohammed, 2004).

*H. crepitans* seed has been found to contain glucosamine, lectin that has mitogenic and haemagglutinating properties (Owojuyigbe *et al.*, 2020). These seeds while still green have strong purgative effect. The juices secreted by sandbox tree had been used to poison darts (Azubuike *et al.*, 2016).

Fowomola and Akindahunsi (2007) observed that the seeds of *H. crepitans* cause burning sensation to the throat and induces vomiting, but noted that it is a good protein source for animal feeds when properly treated.

Although sandbox trees are being used as shade in most part of the world (Idowu *et al.*, 2012), the tree is one of the underutilized trees in Nigeria (Otoikhian *et al.*, 2016). Hence, this study was carried out to determine the proximate and anti-nutritional composition of the seeds of *H. crepitans*.

## Materials and Methods

### Sample Collection and Preparation

The seeds of *Huracrepitans* (Sandbox tree seeds) were collected from matured dry pods (fruits) of *Huracrepitan* tree around the campus of Akwa Ibom State Polytechnic, Ikot Osurua, in Ikot Ekpene Local Government Area of Akwa Ibom State.

The seeds were decorticated and pounded into powder using mortar and pestle, and the analysis was carried out in the Chemistry laboratory of Akwa Ibom State Polytechnic, Ikot Osurua.

### Proximate Analysis

The recommended methods of ~~AOAC (2000)~~ were used for the determination of moisture, ash, crude fat, crude fibre and crude protein contents while carbohydrate

**Comment [005]:** Write the method of determination for each parameter ranging from moisture content to carbohydrate. Also include the formula for the determination

**Comment [006]:** Out dated. Please use current method

was calculated by difference by subtracting total sum of crude protein, crude fibre, crude fat, moisture and ash content from 100% dry weight sample.

**Antinutrient Analysis:**

The method described by Ola and Oboh (2000) was used for the determination of Phytate, while the methods described by AOAC (1990), Krishna and Ranjhan (1980) and Allen *et al.* (1974) were used to determine the level of hydrocyanic acid, oxalate and tannins respectively. (comment: Include the procedure used in detail and include the formula)

**Comment [007]:** Include the procedure used in detail and include the formula

**Results**

The result of the proximate composition of *Huracrepitans* seeds is shown in Table 1 while that of antinutrient analysis of *Huracrepitans* seeds is shown in Table 2.

Table 1: Proximate Composition of *Huracrepitans* Seeds.

Parameter	Percentage (%)
Moisture	13.875±0.176
Crude fat	36.750±1.060
Crude fibre	0.5±0.000
Crude protein	36.625±0.884
Ash	0.25±0.000
Carbohydrate	25.875±0.200

**Comment [008]:** Change this to mean and standard deviation (X±SD) since the values are in mean and standard deviation

**Comment [009]:** This is in mean and standard deviation and not in percentage. Please correct.

Mean of 2 Determinations ± S.D.

Table 2: Antinutrient Composition of *Huracrepitans* Seeds

Antinutrient	Composition (mg/100g)
Phytic acid	0.615±0.002
Hydrocyanide	3.289±0.003
Oxalate	1.386±0.001
Tannins	8.130±0.003

**Comment [0010]:** This should be written this way X±SD(mg/100g)

Mean of 2 Determinations ± S.D.

## Discussion

The result of the proximate composition of *H. crepitans* seeds as shown in Table 1, revealed the moisture content to be  $13.875 \pm 0.176\%$ , which is higher than  $3.10\%$  reported by Abdulkadire *et al.* (2013), and that of Ige *et al.* (2019) which varied from  $5.123 - 8.23\%$ . The value was also higher than  $7.89\%$  reported by Nasir and Usman (2019) for the seed of *Vigna membranacea*. This high moisture content shows that the seeds of *H. crepitans* will not have a long shelf-life. High moisture content has been implicated in food spoilage (Okezie *et al.*, 2017).

The crude fat was found to be  $36.750 \pm 1.060\%$  which was lower than  $53.61\%$  reported by Okolie *et al.* (2012). This value was within the range reported by Auta and Anwa (2007) for oil seeds from  $18\%$  in soya bean to  $43\%$  in groundnut oil. As such, *H. crepitans* seed can be seen as an oil seed.

Crude fibre content of the sand box seeds was found to be  $0.5 \pm 0.000\%$ . This value is lower than  $1.45\%$  reported by Okolie *et al.* (2012). The crude protein content of the sample was found to be  $36.625 \pm 0.884\%$ . The value was higher than  $22.36\%$  reported by Okolie *et al.* (2012), but lower than  $25.16 \pm 0.22\%$  as reported by Fowomola and Akindahunsi (2007) and  $10.50\%$  reported by Akpabio *et al.*, (2012) for *Cassia hirsute* seeds. Oyeleke *et al.* (2012) reported  $25.76 \pm 0.04\%$  crude protein in *H. crepitans* seed and noted that high crude protein content of these seeds suggests it to be a good protein source. Nwokenkwo *et al.* (2020) also suggested that the seeds of *H. crepitans* should be used in areas of food industries where protein (amino acids) is critically needed since it contains significant amount of essential amino acids.

Esonu *et al.* (2014) reported that sand box seed meal could enhance the performance of broiler finishers of  $10\%$  dietary levels as these seeds contain amino acids (the building units for body protein) at levels comparable to soybean and groundnut seeds.

The ash content was  $0.25 \pm 0.000\%$  which is lower than  $3.54 \pm 0.02\%$  obtained by Oyeleke *et al.* (2012) and  $7.70\%$  reported by Akpabio *et al.*, (2012) for *Cassia hirsute* seeds. This value was very small when compared to that of *Vigna membranacea* ( $25.67\%$ ) (Nasir and Usman, 2019). The carbohydrate content of the seed of *H. crepitans* was  $25.875 \pm 0.200\%$  which is higher than  $0.69 \pm 0.2\%$  reported by Abdulkadire *et al.* (2013).

Comment [0011]: italicize

### ***Antinutrients***

Antinutrients are substances from plants which can affect the availability of nutrients by interfering with metabolic processes (Okezie *et al.*, 2017). Nutritional deficiencies, headaches, rashes and nausea are some of the symptoms of large amount of antinutrients in the body (Essack *et al.*, 2017). Level of antinutrient can be reduced by traditional processing methods such as cooking (Sha' *et al.*, 2019). The result of the antinutrient composition of *H. crepitans* seeds are represented in Table 2. From the result, phytic acid was found to be  $0.615 \pm 0.002$  mg/100g, this value is lower than  $20.28 \pm 0.90$  mg/100g obtained by Hassan *et al.* (2018). Phytic acid can bind calcium, zinc, magnesium, manganese and iron to form indigestible complexes and thereby reduce the bioavailability of the elements for absorption (Umar *et al.*, 2007). Hydrocyanic acid was found to be  $3.289 \pm 0.003$  mg/100g. This value is higher than 0.18 mg/100g of hydrocyanic acid reported by Hassan *et al.* (2018). Oxalate was found to be  $1.386 \pm 0.001$  mg/100g. This value is higher than 0.017 mg/100g obtained by Hassan *et al.* (2018). Regular consumption of food with excess amount of oxalic acid may result in nutritional deficiencies and severe irritation of the living of the gut (Gemed and Ratta, 2014).

Tannin was found to be  $8.130 \pm 0.003$  mg/100g which is higher than 0.43 mg/100g reported by Hassan *et al.* (2018). Tannin decreased protein digestibility in humans and animals (Gemed and Ratta, 2014). Certain studies have indicated tannins for healing of wounds (Ukpong *et al.*, 2014; Ambreen and Mirza, 2020; Ene and Ukpong, 2021), treatment of urinary tract infection, diarrhoea and dysentery (Fahey, 2005; Akinpelu and Onakoya, 2006; Godfrey, 2015), and in the production and storage of some foods in order to increase the products' shelf life because of the anti-microbial activity of tannins (Bajaj, 1999).

### ***Conclusion***

The results of this work show that sand box tree seeds possess all the analysed antinutrients which can even be removed during processing. The proximate composition results reveal high crude fat and protein contents of the seeds of *H. crepitans*, showing that the seed is nutritional. Findings from this study therefore suggest intensified research on the seeds of *H. crepitans* so as to harness its

potentials in the production of animal feed.

## REFERENCES

- Abdulkadir, M.N., Amoo, I.A. and Adesina, A.O. (2013). Chemical composition of *Huracrepitans* seeds and antimicrobial activities of its soil. *International Journal of Sciences and Research*, 2(3):440-445.
- Akinpelu, D.A. and Onakoya, T.M. (2006). Antimicrobial Activities of Medicinal Plants used in Folklore Remedies in South-western. *African Journal of Biotechnology*, 5, 1078-1081.
- Akpabio, U.D., Wilson, L. A., Akpakpan, A. E. and Obot, I. B. (2012). Phytochemical screening and proximate composition of *cassia hirsute* seeds. *Elixir Appl. Chem.* 47 8704-8707
- Allen, E.S., Grimshaw, H.M., Parkinson, J. A. and Quarmby, C. (1974). *Chemical Analysis of Ecological Materials* Blackwell Scientific Publication, London. Pp.52-62.
- Ambreen, M. and Mirza, S.A. (2020). Evaluation of Anti-inflammatory and Wound Healing Potential of Tannins Isolated from Leaf callus Cultures of *Achyranthes aspera* and *Ocimum basilicum*. *Pak. J. Pharm. Sci.* 33(1 (supplementary)), 361-369.
- Association of Official Analytical Chemist (AOAC) (1990). *Official Methods of analysis*, 14<sup>th</sup> Edition. Association of Analytical Chemists Washington D.C. pp. 1112-1114.
- Association of Official Analytical Chemist (AOAC) (2000). *Official methods of analysis of the AOAC* 17<sup>th</sup> Horwitz W. ed. AOAC. International Published. Maryland USA.
- Auta, J. and Anwa, P. (2007). Preliminary Studies on Albizzialebeck Seeds - Proximate Analysis Phytochemical Screening. *Medwell Research Journal of Biological Sciences*, 2(1), 33-35.
- Azubuikwe, A.E., Iheanyichukwu, E., Stanley, O. and Ogwo, J.I. (2016). Comparative Antihypertensive Properties of Aqueous Extracts of Leaves, Stem Bark and Roots of *Huracrepitans* (L) in Adrenaline induced Hypertensive Albino Rats. *International Journal of Technical Research and Applications* 4(1): 185-193.
- Bajaj, Y.S. (1999). *Medicinal and Aromatic Plants V*. Biotechnology in Agriculture and Forestry Berlin, Heidelberg. Springer, pp.24.
- Eneh, G.D.O. and Ukpogor, E.G. (2021). Comparative Study of Phytochemical Analysis of Two Generic Species of Cocoyam (*Xanthosoma sagittifolium* and *Colocasia esculenta*). In: Albayrak, H. (ed.) *Full Text Book, Cukurova 7th International Scientific Research Conference, 7th-8th September, 2021*. Adana: IKSAD Global Publications p. 1182
- Esonu, B.O., Ozeudu, E., Emenalom, O.O., Nnaji, C., and Onyeikegbulem, I.K. (2014). Nutritional value of sand box (*Huracrepitans*) seed meal for Broiler Finisher Birds. *Journal of Natural Sciences Research*. Pp.4(23):95-99.

- Essack, H., Odhar, B., and Mellen, J. J. (2017). Screening of Traditional South African Leafy Vegetables for Selected Anti-nutrient Factors before and after Processing. *Food Sci. Technol.* 3, 462-1.
- Fahey, J. W. (2005). *Moringa oleifera*: A Review of the Medicinal Evidence for its Nutritional, Therapeutic and Prophylactic Properties. *Tree of Life Journal*, 15, 1-5.
- Fowomola, M. A., and Akindahunsi, A. A. (2007). Nutritional Quality of Sandbox Tree (*Hura crepitans* Linn.). *Journal of Medicinal Food* 10(1), 159-164.
- Genede, H. F. and Ratta, N. (2014). Antinutritional factors in plant foods: Potential Health Benefits and Adverse Effects. *International Journal of Nutrition and Food Science*, 3(4), 284-289.
- Godfrey, N. E. (2015). Proximate and Phytochemical Composition of the Pulp of *Tetrapleura tetraptera* Fruits Consumed in Abakaliki, Nigeria. *International Journal of Engineering Research & Technology*, 4(6), 1286-1294.
- Hassan, L. G., Sokoto, A. M., Ngaski, M. A. and Anka, S. A. (2018). Nutritional and Antinutritional Analysis of *Hura crepitans* seeds cultivated in Sokoto North L. G. A., North-North-Western Nigeria. *Bayero Journal of Pure and Applied Sciences* 11(1), 126-130.
- Iidowu, D. O., Abegunrin, T. P., Ola, F. A., Adediran, A. A. and Olaniran, J. A. (2012). Measurement of some Engineering Properties of Sandbox seeds (*Hura crepitans*). *Agriculture and Biology Journal of North America*, 3(8), 318-325.
- Ige, M. M., Gbadamosi, S. O. and Solam, O. I. (2019). Proximate composition and functional properties of sandbox seeds as influenced by processing methods. *The Journal of Science*, 21(1), 129-144.
- Krishna, G. and Ranjhan, S. K. (1980). Laboratory manual for nutritional research. Vikas Publishing House Pvt Ltd, Gaziabad India. Pp. 76-89.
- Mohammed, A. A. (2004). Chemical composition and characteristic of pumpkin (*Curcubita moxima*) seed kernels, Res. Bult No. 129, 5-8.
- Nasir, A. and Usman, M. I. (2019). Proximate analysis and Elemental composition of Vigna membranacea seeds. *Food Science and Quality Management*, 91, 65-68.
- Nwokenkwo, E. C., Nwosu, J. N., Onuegbu, N. C., Olawuni, I. A. and Ofoedum, A. F. (2020). Evaluation of the Antinutrients, Amino Acid Profile and Physicochemical Properties of *Hura crepitans* seeds. *Archives of Current Research International*, 2(5), 1-17.
- Okezie, E., Ubogu, A. E., Odungide, A. A. and Atani, C. S. (2017). Proximate, Antinutritional and Mineral Estimation of some selected consumed Green Vegetables in Afaha Eket, Akwa Ib

omState, Nigeria. *American Journal of Food Science and Technology*, 5(5), 182-191.

- Okolie, P.N., Uaboi-Egbenni, P.O. and Ajekwene, A.E. (2012). Extraction and Quality Evaluation of Sandbox Tree Seed (*Huracrepitans*) oil. *World Journal of Agricultural Sciences* 8(4), 359-365.
- Ola, F.A. and Jekayinfa, S.O. (2015). Pyrolysis of Sandbox (*Huracrepitans*) shell: Effect of Pyrolysis parameters on biochar yield. *Res. Agr. Eng.* 61, 170-176.
- Ola, F.L., and Oboh, G. (2000). Food value of two Nigerian Edible Mushrooms (Termitomyces Stratus and termitomyces robustus). *The J. Technol. Sci.* 4, 1-3.
- Otoikhian, S.K., Aluyor, E.O. and Audu, T.O.K. (2016). Mechanical Extraction and Fuel Properties Evaluation of *Huracrepitans* seed oil. *Chemical Technology: An Indian Journal*, 11(6), 1-11.
- Owojuyigbe, O.S., Firemong, C.K., Larbie, C., Komlaga, G. and Emikpe, B.O. (2020). Hepatoprotective potential of *Huracrepitans* L. A Review of Ethnomedical, Phytochemical and Pharmacological Studies. *Journal of Complementary and Alternative Medical Research*, 8(2), 1-10.
- Oyeleke, G.O., Olayiwola, O.A. and Latona, D.F. (2012). Chemical Examination of Sandbox (*Huracrepitans*) seed: Proximate, Elemental and Fatty Acid Profile. *IOSR Journal of Applied Chemistry (IOSRJAC)*, 1(2), 10-13.
- Sha'a, K.K., Clarkson, G.P. and Artimas, S.P. (2019). Phytochemical Analysis, Proximate Composition and Antinutritional Factors of *Corchorus olitorius* plant. *International Journal of Biological and Chemical Sciences*, 13(4), 2147-2157.
- Ukpong, I.J., Abasiokong, B.O. and Etuk, B.A. (2014). Phytochemical Screening and Mineral Elements Composition of *Xanthosoma sagittifolium* Inflorescence. *Asian Journal of Plant Science and Research*, 4(6), 32-35.
- Umaru, H.A., Adamu, R., Dahiru, D., and Nadro, M. (2007). Level of Antinutritional factors in some wild Edible, Fruits of Northern Nigeria. *African Journal of Biotechnology* 6(16), 1935-1938.