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


## ABSTRACT

Analysis of proximate and anti-nutrient composition of *Hura crepitans* (Sandbox tree) seeds obtained from campus of Akwa Ibom State Polytechnic Ikot Osurua, Ikot Ekpene were carried out using standard analytical procedures. The result of the proximate composition analysis showed that *H.crepitans* seeds contain moisture content (13.875 ± 0.176%), crude fat (36.750±1.060%), crude fibre (0.5±0.000%), crude protein (36.625±0.884%), ash content (0.25±0.000%) and carbohydrate (25.875±0.200%). The result of the antinutrient analysis showed that *H.crepitans* seeds contain phytic acid (phytate) (0.615±0.002mg/100g), hydrogen cyanide (3.289±0.003mg/100g), oxalate (1.386±0.001mg/100g) and tannins (8.130±0.003mg/100g). Tannins 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 the seeds of *H.crepitans* so as to harness its potentials in the production of animal feed.


Comment [D1]: Rewrite and include the objective of study


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

Introduction

*Hura crepitans*, commonly referred to as sandbox 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 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 as antimicrobial among others (Owojuyigbe *et al.*, 2020). Sandbox tree can grow above 40 metres (Azubuike *et al.*, 2016).

Fig.1: Sandbox Tree

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).

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

*H. cripitans* seed has been found to contain glucosamine, lectin that has mitogenic and haemagglutinating properties (Owojuyigbe *et al.,* 2020). The seeds while still green have strong purgative effect. The juice 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 antinutritional composition of the seeds of *H. crepitans.*

## Materials and Methods

### *Sample Collection and Preparation*

The seeds of *Hura crepitans* (Sandbox tree seeds) were collected from matured dry pods (fruits) of *Hura crepitans* 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 powdered form 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 fiber and crude protein contents while carbohydrate

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

***AntinutrientAnalysis:***

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 levels of hydrocyanic acid, oxalate and tannins respectively.

***Results***

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

Table 1: Proximate Composition of *Hura crepitans* 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 |

Mean of 2 Determinations ± S.D.

Table 2: Antinutrient Composition of *Hura crepitans* Seeds

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

Mean of 2 Determinations ± S.D.

## *Discussion*

Comment [D2]: Results are not Discussed only compared with previous study.

The result of the proximate composition of *H. crepitans* seeds as shown in Table 1, revealed the moisture content to be 13.875± 0.176%, which is higher than 3.10% reported by Abdul Kadir *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 seeds of *Vigna membranacea*. This high moisture content shows that the seeds of *H. crepitans* will not have a longer shelf-life. High moisture content has been implicated in food spoilage (Okezie *et al.*, 2017).

The crude fat was found to be 36.750±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 beans to 43% in groundnut oil. As such, *H. crepitans* seed can be seen as an oil seed.

Crude fibre content of the sandbox seeds was found to be 0.5±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±0.884%. The value was higher than 22.36% reported by Okolie *et al.* (2012), but lower than 25.16±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±0.04 % crude protein in *H. crepitans* seed and noted that high crude protein content of the seed 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 sandbox seed meal could enhance the performance of broiler finishers of 10% dietary levels as the seeds contain amino acids (the building units for body protein) at levels comparable to soya bean and groundnut seeds.

The ash content was 0.25±0.000% which is lower than 3.54±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±0.200% which is higher than 0.69±0.2% reported by Abdulkadir *et al.* (2013).

***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 anitnutrients in the body (Essack *et al.*, 2017). Levels of antinutrient can be reduced by traditional processing methods such as cooking (Sha'a *et al.*, 2019). The result of the antinutrient composition of *H. crepitans* seeds are presented in Table 2. From the result, phytic acid was found to be 0.615±0.002 mg/100g, this value is lower than 20.28±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 (Umaru *et al.*, 2007). Hydrogen cyanide was found to be 3.289±0.003mg/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±0.001 mg/100g. This value is higher than 0.017 mg/100g obtained by Hassan *et al.* (2018). Regular consumption food with excess amount of oxalic acid may results in nutritional deficiencies and severe irritation of the living of the gut (Gemede and Ratta, 2014).

**Comment [D3]:** Mention the safe concentration of cyanide

Tannins was found to be 8.130±0.003 mg/100g which is higher than 0.43mg/100g reported by Hassan *et al*. (2018). Tannins decreased protein digestibility in humans and animals (Gemede and Ratta, 2014). Certain studies have indicated tannins for healing of wounds ( Ukpong *et al.*, 2014; Ambreen and Mirza, 2020; Eneh 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 sandbox 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.

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