



Proximate and Antinutrient Composition of *Hura crepitans* (Sandbox Tree) Seeds

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Analysis of proximate and antinutrient 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 ($13.875 \pm 0.176\%$), 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) ($0.615 \pm 0.002 \text{mg}/100\text{g}$), hydrogen cyanide ($3.289 \pm 0.003 \text{mg}/100\text{g}$), oxalate ($1.386 \pm 0.001 \text{mg}/100\text{g}$) and tannins ($8.130 \pm 0.003 \text{mg}/100\text{g}$). Tannins had the highest concentration while phytate had the lowest concentration of all the antinutrients analyzed. The antinutrients can be removed during processing. The result of the proximate composition reveals high crude fat and

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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.

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

1. INTRODUCTION

Hura crepitans, commonly referred to as sandbox tree (Fig. 1) is a tropical plant of *Euphorbiaceae* family [1]. The tree is native to Tropical America [2], and is traditionally grown as shade tree [3], 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 [2]. Sandbox tree can grow above 40 metres [4].

It has many dark, pointed spines and smooth brown bark. Because of these spines, it is normally called “Monkey no-climb” [5].

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 [6]. The seeds are small and

brown in colour with an average diameter of about 1-5cm [7].

H. crepitans seed has been found to contain glucosamine, lectin that has mitogenic and haemagglutinating properties [2]. The seeds while still green have strong purgative effect. The juice secreted by sandbox tree had been used to poison darts [4].

Fowomola and Akindahunsi [8] 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 [9], the tree is one of the underutilized trees in Nigeria [10]. Hence, this study was carried out to determine the proximate and antinutritional composition of the seeds of *H. crepitans*.



Fig. 1. Sandbox Tree

2. MATERIALS AND METHODS

2.1 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.

2.2 Proximate Analysis

The recommended methods of AOAC [11] were used for the determination of moisture, ash, crude fat, crude fibre and crude protein contents while carbohydrate was calculated by difference by subtracting total sum of crude protein, crude fibre, crude fat, moisture and ash content from 100% dry weight sample.

2.3 Antinutrient Analysis

The method described by Ola and Oboh [12] was used for the determination of Phytate, while the methods described by AOAC [13], Krishna and Ranjhan [14] and Allen et al. [15] were used to

determine the levels of hydrocyanic acid, oxalate and tannins respectively.

3. 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.

4. 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 Abdulkadir et al. [1], and that of Ige et al. [16] which varied from 5.123 - 8.23%. The value was also higher than 7.89% reported by Nasir and Usman [17] 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 [18].

The crude fat was found to be $36.750 \pm 1.060\%$ which was lower than 53.61% reported by Okolie et al. [6]. This value was within the range reported by Auta and Anwa [19] 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.

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 \pm 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 \pm S.D.

Crude fibre content of the sandbox seeds was found to be $0.5\pm 0.000\%$. This value is lower than 1.45% reported by Okolie et al. [6]. 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. [6], but lower than $25.16\pm 0.22\%$ as reported by Fowomola and Akindahunsi [8] and 10.50% reported by Akpabio et al. [20] for *Cassia hirsute* seeds. Oyeleke et al. [5] reported $25.76\pm 0.04\%$ 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. [21] 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. [22] 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 $0.25\pm 0.000\%$ which is lower than $3.54\pm 0.02\%$ obtained by Oyeleke et al. [5] and 7.70% reported by Akpabio et al. [20] for *Cassia hirsute* seeds. This value was very small when compared to that of *Vigna membranacea* (25.67%) [17]. 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 Abdulkadir et al. [1].

5. ANTINUTRIENTS

Antinutrients are substances from plants which can affect the availability of nutrients by interfering with metabolic processes [18]. Nutritional deficiencies, headaches, rashes and nausea are some of the symptoms of large amount of antinutrients in the body [23]. Levels of antinutrient can be reduced by traditional processing methods such as cooking [24]. 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. [25]. Phytic acid can bind calcium, zinc, magnesium, manganese and iron to form indigestible complexes and thereby reduce the bioavailability of the elements for absorption [26]. Hydrogen cyanide was found to be 3.289 ± 0.003 mg/100g. This value is higher than 0.18 mg/100g of hydrocyanic acid reported by

Hassan et al. [25]. 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. [25]. Regular consumption food with excess amount of oxalic acid may results in nutritional deficiencies and severe irritation of the living of the gut [27].

Tannins was found to be 8.130 ± 0.003 mg/100g which is higher than 0.43mg/100g reported by Hassan et al. [25]. Tannins decreased protein digestibility in humans and animals [27]. Certain studies have indicated tannins for healing of wounds [28,29,30], treatment of urinary tract infection, diarrhoea and dysentery [31,32,33], 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 [34-35].

6. 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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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