COMPARATIVE ANALYSIS OF THE NUTRITIVE VALUES OF DECORTICATED AND NON-DECORTICATED SANDBOX (*Hura crepitans*) SEEDS

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ABSTRACT
This study was carried out to compare the nutritive values of decorticated and non-decorticated sandbox (Hura crepitans) seeds. The matured and ripe seeds were gathered, sundried and divided into two portions. One portion was decorticated while the other was not decorticated. The two portions were later milled and subjected to proximate analysis, phytochemical analysis and amino acids profile determination. Poultry metabolizable energy values were also estimated from the proximate compositions. Each analysis was carried out in replicates of three and all data collected were subjected to Independent Sample T-test analysis. Results showed that decorticated sandbox seeds were significantly higher ($p<0.05$) in crude protein, ether extract and metabolizable energy values while the non-decorticated seeds were significantly higher in crude fibre and nitrogen-free extract values. Both seeds have statistically similar ash content. The decorticated seeds have significantly higher ($P<0.05$) levels of alkaloids and flavonoids while the non-decorticated seeds have significantly higher levels of oxalates and tannins. Both seeds were not significantly different in their contents of saponin, cyanide and phytate. The ten essential amino acids are present in the two forms of the seeds and the decorticated seeds have significantly higher values of these amino acids than the non-decorticated seeds. It is concluded that decorticated sandbox (Hura crepitans) seeds have better nutritional value than non-decorticated sandbox (Hura crepitans) seeds
Keywords: Sandbox seeds, Decorticated, Proximate, Amino acid profile, Phytochemicals, Metabolizable Energy

INTRODUCTION

The need for alternative feedstuffs in poultry nutrition cannot be overemphasized. Feed accounts for about 70% of production cost (Atteh, 2003; Etuah *et al*., 2021) and this has greatly affected the price and subsequent affordability of poultry products. For a feedstuff to be useful in poultry nutrition, such feedstuff needs to be evaluated for its chemical composition and anti-nutritional or toxic substances. Presence of anti-nutritional substances could necessitate the need for further processing, thereby increasing the cost of such feedstuff. Thus, several materials are being evaluated as alternative feed resources for poultry nutrition. One of these is sandbox (*Hura crepitans*) seeds. Sandbox tree belongs to the *Euphorbiaceae* family and is a perennial crop with large and garden egg-shaped fruits that are 3-5cm long and 5-8cm in diameter. Each fruit has carpels numbering about 16 and are arranged radially with flattened seed inside each carpel. The seeds are of no nutritional importance to human beings. Upon maturity and ripening, the green fruits become brown and explode thereby splitting into segments and catapult the seeds as far as 100 meters from the tree. (Feldkamp, 2006). Several studies have been carried out on sandbox seeds (Fowamola and Akindahunsi, 2017; Archibong *et al.*, 2022; Jimoh *et al*., 2023). However, there is a need to compare the nutritive values of the decorticated and non-decorticated seeds. This is essential to justify the need or otherwise for further processing because feedstuffs that undergo additional processing will be more costly. So, there is the need to look at the nutritive potentials of alternative feedstuffs especially without processing. This study was therefore carried out to compare the nutritive values of decorticated and non-decorticated sandbox seeds with special focus on proximate composition, metabolizable energy values, essential amino acids profile and phytochemical components.

MATERIALS AND METHODS

Matured and brown sandbox fruits were plucked from trees or picked from the ground and broken to obtain the seeds. The seeds were sundried and divided into two groups. Seeds of one group were decorticated manually by removing the shell to expose the flat milky endocarp while the seeds of the other group were not decorticated. Seeds from each group were later milled and subjected to chemical analyses. Proximate analysis was done in accordance with the procedure of AOAC (2006). Amino acids profile was done in accordance with the procedure of Benitez (1989). Poultry metabolizable energy values were estimated from the determined proximate compositions as described by Pauzenga (1985). Phytate analysis was done using the method reported by Yahaya *et al.* (2013). Tannin and cyanide content were determined in line with the procedure of AOAC (2006). Saponin content was determined using the procedure of Kaur *et al.* (2015). The determinations were done in replicates of

three. All data collected were analysed using the procedure of Independent sample t-test and means were separated at 5% significance level using Statistical Package for Social Science (SPSS, 2011).

RESULTS AND DISCUSSION

The proximate compositions of the decorticated and non-decorticated sandbox seeds are as shown in Table 1. The decorticated seeds were significantly higher ($P<0.05$) than the non-decorticated seeds in terms of moisture, crude protein, ether extract and metabolizable energy while the non-decorticated seeds were significantly higher than the decorticated seeds in terms of dry matter, crude fibre and nitrogen-free extract (NFE). However, the two forms of the seeds were not significantly different ($P\geq0.05$) in the content of their ash. The values of crude protein obtained here portray the two forms of the seeds as protein supplements. The crude protein value for non-decorticated seeds in this study is similar to the value obtained by Fowamola and Akindahunsi (2017). However, the crude protein and crude fibre values obtained for the decorticated seeds in this study are higher than the values of 37.64% and 1.21%, respectively obtained by Abdulkadir *et al*. (2013). Similarly, the crude fibre of the non-decorticated seeds was significantly higher than that of the decorticated seeds. The cortex (epicarp) is made up of high fibre content and this may be responsible for the high crude fibre content of the non-decorticated seeds and this portrays the non-decorticated seeds as not suitable for monogastric nutrition. The crude fibre content of 6.04% for the decorticated seeds is slightly lower than the 7.0% crude fibre content of soya meal (Ogundipe *et al*., 2022). Despite its higher level of NFE, the non-decorticated seed is lower than the decorticated seed in term of metabolizable energy values. This could be due to the high proportion of lipid (ether extract) in the decorticated seeds. Ether extract is known to have 2.25 times more energy than equal amount of carbohydrate. On the basis of this metabolizable energy, decorticated sandbox seeds can be used as a source of energy especially during hot weather because the specific dynamic action (heat increment) from carbohydrates is higher than that from lipids.

Table 1: Proximate composition and estimated metabolizable energy values of decorticated and non-decorticated sandbox (*Hura crepitans*) seeds

Proximate content	Decorticated SBS	Non-decorticated SBS	P-value
Moisture (%)	3.63	3.05	0.01
Dry matter (%)	96.39	96.95	0.01
Crude protein (%)	42.21	26.56	0.00
Ether extract (%)	21.06	12.02	0.00
Crude fibre (%)	6.04	10.91	0.00
Ash (%)	4.99	4.49	0.05
Nitrogen-free extract (%)	25.91	42.98	0.00
Metabolizable energy* (Kcal/Kg)	4187.25	3481.74	0.00

*Estimated using the procedure of Pauzenga (1985), SBS= Sandbox seeds

The phytochemical contents of the two seeds are shown in Table 2. The decorticated seeds had significantly higher levels of alkaloids and flavonoids while the non-decorticated seeds had significantly higher levels of oxalates and tannins. Both seeds were not significantly different in their contents of saponin, cyanide and phytate. The findings of this study align with the fact that oxalate and saponin are more prominent in the seed coat (epicarp) than the endocarp of seeds. Oxalate is not metabolizable and is known for binding with calcium and may precipitate to form kidney stone (Massey *et al.*, 2001). Values of oxalate obtained in this study are lower than the value for soya meal (Massey *et al*., 2001).

Table 2: Phytochemical composition of decorticated and non-decorticated sandbox (*Hura crepitans*) seeds

Phytochemical	Decorticated SBS	Non-decorticated SBS	P-value
Oxalate (mg/100g)	2.04	2.63	0.00
Saponin (%)	0.51	0.42	0.21
Alkaloids (%)	12.11	8.75	0.00
Flavonoids (%)	8.00	5.46	0.00
Tannins (mg/100g)	2.17	3.10	0.00
Cyanide (mg/100g)	1.37	1.41	0.22
Phytate (mg/100g)	1.12	0.93	0.05

SBS= Sandbox seeds

Phytate is the storage form of phosphorus in plants and it can form chelate or complex with nutrients like carbohydrate, protein and ether extract as well as with other minerals like Calcium and Magnesium thereby making them unavailable for digestion and/or retention (Bello, 2008). According to Schlemmer *et al*. (2009), phytate is

more prominent in the endosperm and decortication of seeds could increase the concentration in the decorticated seeds. However, the phytate content of the two forms of seeds in this study were not significantly different although the value for decorticated (1.12mg/100g) was numerically higher than the value for non-decorticated (0.93mg/100g). The tannin level of the decorticated seeds was significantly lower than that of the non-decorticated (2.17 vs. 3.10). Tannin is a phenolic compound known to affect the protein digestibility of feed.

The amino acids profile revealed that all the essential amino acids are present in the two forms of sandbox seeds as shown in Table 3. The decorticated seeds had significantly higher values of the essential amino acids than the non-decorticated seeds. Values of methionine and lysine obtained in this study for both forms of the seed are higher than values of 0. 6 and 2.70%, respectively for soya meal and 0.45and 1.30%, respectively for groundnut cake (Ogundipe *et al*., 2022)

Table 3: Essential amino acids' content of decorticated and non-decorticated sandbox (*Hura crepitans*) seeds

Essential amino acid (g/100g protein)	Decorticated SBS	Non-decorticated SBS	P-value
Methionine	1.21	0.43	0.00
Lysine	5.53	3.80	0.00
Threonine	2.70	2.30	0.00
Histidine	2.29	1.83	0.00
Tryptophan	0.68	0.39	0.00
Leucine	5.32	3.96	0.00
Isoleucine	2.85	2.20	0.00
Phenylalanine	3.12	2.32	0.00
Arginine	4.07	3.28	0.00
Valine	3.24	2.29	0.00

SBS= Sandbox seeds

CONCLUSION

From the findings of this study, it is concluded that both decorticated and non-decorticated sandbox seeds are protein feedstuffs. However, decorticated sandbox seeds have more nutritive values than non-decorticated sandbox seeds in terms of crude protein, metabolizable energy values and essential amino acids profile. It is therefore recommended that sandbox seeds should be decorticated before use in poultry nutrition.

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