

Nutritional Value of Sandbox (*Hura crepitans*) Seed Meal for Broiler Finisher Birds

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ABSTRACT

A feeding trial was conducted for 21-day to evaluate the nutritional value of raw and cooked Sand box (*Hura crepitans*) seed meal for broiler finisher birds. Sand box seeds were divided into two batches, the first batch was processed raw undecorticated, the second batch was cooked for 60 minutes also undecorticated, sun dried for 48 hours and milled into a meal, decanted (with ethanol 98%) and sun-dried again for another 48 hours. processed sand box meals were used to formulate five broiler finisher diets at 0%, 10% and 15% dietary levels respectively. Each diet was fed to forty-five, 5-week- old broiler finisher birds for 21 days. Data were collected on feed intake, body weight gain, feed conversion Ratio and internal organ characteristics At the end of the experiment, there were significant difference ($P < 0.05$) in body weight, feed intake and feed conversion ratio among the treatment groups. There was no significant difference ($P > 0.05$) in the relative organ characteristics among the treatment groups. The results of these studies suggested that sand box (*Hura crepitans*) Seed meal could enhance the performance of broiler finisher at 10% (raw or cooked) dietary levels.

INTRODUCTION

Poultry production represents the fastest means of correcting the shortage of animal protein intake because apart from their high rate of production, poultry has the best efficiency of nutrient transformation into high quality animal protein, although the cost of this transformation is very high, nutrient supply has to be judiciously manipulated to ensure the production of meat at economic rates. One of the most serious constraints facing developing tropical countries is scarcity of food coupled with the unprecedented rise in human population and the alarming drop in food production particularly in the last decade. (FAO, 2010)

The widening gap between estimated protein requirement and actual protein consumption in many developing tropical countries including Nigeria is as a result of lack of basic information and or improper harnessing of available and abundant non-conventional feed resource which has limited their usage in balanced and economical rations for fishes and livestock, (FAO, 2010). This has therefore resulted in an astronomical increase in the price of grains in recent times. Soya beans (*Glycine max*) and groundnut (*Arachis hypogea*) meal are protein sources which play vital roles in the feeding of monogastric animals in Nigeria (Agbabiaka 1999). However, with these commodities becoming scarce and consequently expensive as a result of high demand due to stiff competition between humans and animal, it becomes imperative to turn attention to the exploitation of other protein sources mostly those that are indigenous or can be propagated in the tropical environment and not directly consumed by humans.

The search for locally available, unconventional, low cost but nutritionally adequate feed stuff has therefore become intensive, one of such target feed resources is the Sand box (*Hura crepitans*). The tree (Hura) is a shade tree with a thorny trunk commonly found on roadsides in towns and villages in Nigeria

There have been reports of observations of some free ranging turkeys scrambling to pick and swallow whole seeds as they burst forth from dehiscing fruits (Keay, 2010, Yaakugh *et al* 2001). Similarly, children are seen cracking and consuming the endosperm of the seeds in both cases no adverse effect was reported from these actions. (Yaakugh, 2001)

The woody segment fruit is like a garden egg in shape and when dry burst with a large report releasing several flattened circular seeds of about 18 – 20mm in diameter from its chamber (Keay 2010). The DM of the seed (91–95%) is quite comparable to those of the conventional feedstuff. It is also a good indicator of a long store life of the seed devoid of moldy growth associated with low DM feedstuff. The CP reflects a value that although is lower than that for soyabean and groundnuts, but its amino acid levels compared favourable with these conventional feed materials. (Yaakugh *et al*, 2001). The EE of the seed is remarkably over 100 times the value for the conventional oilseed (38.95 – 51.24 %). This seed represents a very important oil source as well as a conventional energy feed source. Hura seeds contain amino acids at levels that compared favourable with the other conventional seeds and even better in terms of some like lysine, methionine, cystine, threonine and Histidine.

The nutritive value of a protein is dependent on the extent to which the composition of its essential amino acids fulfilled the requirement of the animal being fed, (Benitez 2001; Esonu, 2006; and Yaakugh *et al*, 2001). It is thus apparent that decorticated Hura seed in partial or full replacement of some conventional feed such as soyabean would reduce dietary protein level while satisfying Amino acid requirement. This study was therefore designed to evaluate the nutritive value of sandbox (*Hura crepitans*) seed meal for broiler finisher

birds.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research farm of the School of Agric and Agric Technology of the Federal University of Technology Owerri, Imo State, Nigeria.

Matured sand box seeds were collected from trees in villages around Ohaji / Egbema local government Area of Imo State. The seeds were divided into two batches of 50kg each.

The first batch was sun dried for 2 days, crushed raw in a hammer mill and decanted using ethanol 98% solution and sun dried again for 2 days to produce the raw sand box meal (RSBM).

The second batch was cooked for one hour at temperature of 100, sun dried for 2 days and crushed in a hammer mill. The crush seed was decanted using ethanol 98% solution and sun dried again for 2 days, to have cooked sand box meal (CSBM).

Sample of the processed meals were subjected to chemical analysis (AOAC, 1980)(Table 1) to determine its proximate composition and also phytochemical studies(Table 2). Five experimental broiler finisher diets were formulated incorporating sand box (*Hura crepitans*) seed meal at 0% , 10% and 15% dietary level respectively for both raw and cooked seed.(Table 3).

Other ingredients were adjusted in such a way that the diets were iso-nitrogenous and iso-caloric and met nutrient requirements of the broiler birds.(Table 4).

Two hundred and twenty-five (225), five-week old Hubbard broiler chicks were divided into five groups of 45 birds each and each group randomly assigned to the five treatment diets in a completely randomized design (CRD). Each group was further sub – divided into three replicates of fifteen (15) birds and kept in a compartment measuring 6x4m. Feed and water were provided ad-libitum .Other routine poultry management procedures were maintained. The feeding trial lasted for 21days.

Feed intake was recorded daily, the birds were weighed weekly and feed conversion ratio computed accordingly. At the end of the feeding trial, 5 birds were randomly selected from each treatment, slaughtered and eviscerated for organ weight determination.

Data collected were subjected to analysis of variance (Snedecor and Cochran 1978). When analysis of variance indicated significant difference, means were compared using Duncan New Multiple Range Test (DNMRT) as outlined by Obi (1990).

Table:1: Proximate composition of Raw and cooked sand box seed

Components (%)	RSBM	CSBM
DM	90.38	90.97
Crude protein	23.69	21.50
Crude fibre	5.65	16.30
Ether extract	2.71	7.58
Ash	6.02	5.24
NFE	52.89	45.63

All values expressed on 100% DM

Table: 2: phytochemical analysis of processed hura crepitans

Treatment	Raw	Toasted	Boiled	Soaked&Boiled
Tannin	0.48	0.42(0.0006)	0.32(0.0016)	0.30(0.0018)
Alkaloid	0.36	0.28(0.0008)	0.26 (0.001)	0.22(0.0014)
Saponin	0.24	0.18(0.0006)	0.18(0.001)	0.16(0.0008)
Flavonoid HCN	0.28	0.26(0.0002)	0.26 (0.006)	0.18 (0.001)
	9.22	9.07(0.0015)	9.07(0.0015)	8.73(0.0049)

* () = Figures in Brackets are reduction levels.

Table: 3: COMPOSITION OF THE TREATMENT DIETS OF BROILER FINISHER

Ingredients	Dietary levels of sand box seed meal (%)					
	Control		RSBM		CSBM	
	0	10	15	10	15	
Maize	52.0	50.0	47.0	50.0	47.0	
Soyabean meal	19.50	11.50	9.50	11.50	9.50	
Sand box	0.0	10.0	15.0	10.0	15.0	
P K C	10.0	10.0	10.0	10.0	10.0	10.0
Wheat offal	10.0	10.0	10.0	10.0	10.0	10.0
Blood meal	3.0	3.0	3.0	3.0	3.0	3.0
Fish meal	2.0	2.0	2.0	2.0	2.0	2.0
Bone meal	3.0	3.0	3.0	3.0	3.0	3.0
*Vit / premix	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
Chemical Analysis						
Crude protein	20.08	20.0	20.75	19.8	20.45	
Ether extract	4.00	3.96	3.81	3.93	3.81	
Crude fibre	4.84	4.86	4.74	4.86	4.74	
Ash	3.36	3.56	3.74	3.56	3.74	
ME(kcal/kg)	2982.0	2894.5	2858.5	2904.5	2873.5	

*To provide the following per kg of feed vitamin A-10,000iu, Vitamin D₃- 2000iu, Vitamin D- 0.75mg nicotinic acid- 25mg, calcium pantothenate- 12.50mg, Vitamin B₁₂- 2.5mg, Vitamin K₃- 2.5mg, Vitamin E- 2.5mg, Folic acid- 1.00mg, Choline chloride- 25mg, Copper- 8.0mg, Manganese- 64mg, Iron-32mg, Zinc-40mg, Iodine- 0.8mg, Flavomycin-100gm, Spiromycin- 5mg, DL- methionine 50mg, Selenium- 0.16mg, L-Lysine-120mg

RESULTS AND DISCUSSION

The Proximate analysis of the test material, Phytochemical analysis, ingredient composition of the experimental diets, Performance and Organ characteristics of the birds on the dietary levels of sand box seed meal are presented on tables 1, 2, 3, 4 and 5 respectively.

The feed intake of the birds was inconsistent with increase in level of sand box seed meal for both raw and cooked. It increased at 10% dietary level and significantly ($p < 0.05$) dropped at 15% dietary level. The group on the 10% cooked sand box meal recorded the highest feed intake (170.5g) while the group on 15% raw sand box meal recorded the least feed intake (140.3g).

The daily weight gain of the groups followed the same trend as in feed intake. The group on 10% RSBM recorded the highest weight gain (47.3g) while the group on 15% CSBM recorded the least weight gain (37.0g) It is interesting to observe that the groups on 10% dietary level for both raw and cooked sand box meal recorded higher body weight than the control group.

The relative organ weight of the group on 10% CSBM was significantly ($P > 0.05$) higher than the other groups on the other treatments.

Table: 4: Performance of broiler finisher fed sand box seed meal raw and cooked

Parameters	Dietary levels of sand box seed meal (%)						
	Control		RSBM		CSBM		SEM
	0.00	10	15	10	15		
Initial wt(g)	1363.0	1329.0	1392.0	1404.0	1383.0	3.58	
Final wt(g)	2061.0	2086.0	2006.0	2148.0	1975.0	5.88	
Body gain(g)	698.0 ^a	757.0 ^b	614.0 ^b	744.0 ^a	592.0 ^b	2.30	
Daily gain(g)	43.6 ^a	47.3 ^b	38.4 ^a	46.5 ^b	37.0 ^a	0.06	
feed intake(g)	155.4 ^a	163.4 ^b	140.3 ^a	170.5 ^b	149.9 ^a	4.85	
F C R	3.56	3.43	3.65	3.66	4.02	0.8	
Mortality	0.00	0.00	0.00	0.00	0.00	0.00	

^{ab} means within row with different superscripts are significantly ($P < 0.05$) different

Table: 5: Effect of sand box (*hura crepitans*) seed meal on internal organ weights of finisher broiler birds

Internal organ	Dietary levels of sand box seed meal (%)					
	Control		RSBM		CSBM	
	0	10	15	10	15	SEM
Live wt (g)	2616.0	2283.0	2250.0	2516.0	2266.0	0.75
Dressed wt (g)	2300.0	2150.0	2050.0	2360.0	2050.0	1.15
Carcass wt (g)	1760.0	1716.0	1700.0	1860.0	1616.0	0.55
Heart (%)	0.47	0.50	0.45	0.55	0.55	0.003
Kidney (%)	0.12	0.13	0.14	0.15	0.10	0.04
Gizzard (%)	3.34	3.35	3.35	3.38	3.35	0.20
Liver (%)	1.51	1.54	1.56	1.59	1.52	0.001

DISCUSSION.

Generally, the experimental birds (finisher) on 10% raw and cooked sand box seed meal performed better than the groups on control (0%). This improved performance could be attributed to the fact that Hura seeds contain amino acids at levels that compared favourably well with soybean and groundnut seeds and even better in terms of levels of essential amino acids. (Yaakugh et al, 2001) The nutritive value of a protein is dependent on extent to which the composition of its essential amino that fulfilled the requirement of the animal being fed. (Benitez, 2001, Esonu, 2006.). Amino acids are the building units from which body protein is built. (Olomu, and Oboh, 1995). It is thus apparent that Hura seed in partial or full replacement of some conventional feeds such as soyabean and groundnut cake would enhance better performance of birds.

Hura crepitans seeds also contain oil which enhances the energy density of the diet for normal maintenance and productive functions, it also serve as a source of essential fatty acids as well as carrier of the fat-soluble vitamins, (Esonu, et al 2004) This probably may have influenced the general improved performance of the birds on the test material at 10% dietary level over the group on control diet. This is in agreement with previous work conducted in this station on sandbox (Onyeikegbulem, 2011 and Nnaji, 2010).

The poor performance of the birds at 15% cooked *Hura crepitans* seed dietary level could be as a result of denaturation of proteins due to heat treatment, solubilization and leaching of some nutrients from the test material, (Esonu et al, 2001 and Udedibie et al, 1994). The birds were able to tolerate the phytochemicals in the sandbox at the dietary levels evaluated.

The results of these experiments suggest therefore that raw and cooked sand box seed meal could enhance the performance of broiler finisher at 10% dietary level.

REFERENCES

- Agbabiaka, L.A. (1999). Comparative performance of broilers fed diets containing variously processed Jackbean meals. M.Sc thesis. Federal University of Technology Owerri, Nigeria.
- AOAC, (1980). Official methods of Analysis of the Association of Official Analytical Chemist. 16th edition Association of analytical chemist. Washington D.C.
- Benitez, L.V. (2001); Amino acid, Fatty acid profile in Aquaculture nutrition Studies. Fish Nutrition research in Asia. Pp 23-25.
- Esonu, B. O., Ihekweumere, F. C., Iwuji, T. C., Akanu, N. and Nwugo, H. O. (2001). Evaluation of microdesmis *Puberula* leaf as feed ingredients in broiler starter diets. Nigerian journal of Animal production 30; 3-8.
- Esonu, B.O., Azubuike, J.C. and Ukwu, H.O. (2004). Evaluation of *Microdesmis puberula* leaf as feed ingredient in laying hen diets. International journal of poultry science 3(2); 96-99.
- Esonu, B.O. (2006). Animal Nutrition and Feeding. A functional approach 2nd Edition by Rukzeal and Ruksons Associate Memory Press Owerri, Nigeria.
- FAO. (2010). Food and Agricultural Organisation. The state of food and Agricultural world review, livestock production a world perspective. Antalya turkey. Pp 83.
- Keay, R.W.J. (2010) Tree of Nigeria. Caledon press oxford. Nordic journal of Botany, 11; 322. Doi
- Nnaji, C. (2010): Effect of different processing methods on some antinutritional compounds in sandbox (*Hura Crepitans*) seeds. B. Agric. Tech thesis. Federal University of Technology, Owerri, Nigeria.
- Obi, I.U (1990); Statistical method of detecting differences between treatment means. 2nd Edition, snap press
- Olomu, J.M. and Oboh, S.O. (1995) Pig production in Nigeria, Principles and practice 1st Edition. Ajachem publication.
- Onyeikegbulem, I. K. (2011): Studies on nutritional evaluation of raw and boiled Sandbox (*Hura Crepitans*) seed meal for broiler starter. B. Agric. Tech thesis. Federal University of Technology, Owerri, Nigeria.
- Snedecor, G.W. and Cochran, W.G. (1978); Statistical methods. The Iowa state University press, Ames Iowa 6th Edition.
- Udedibie, A.B.I., Esonu, B.O., Obaji, C.N. and Durunma, C.S. (1994.) Dry urea treatment prior to toasting as a

method of improving the nutritive value of Jackbean (*C.ensiformis*) for broilers. Anim .Fd.Sc.Tech48; 335-345.,
Yaakugh, I.D.I, Tuleun, C.D, and Kaankuka, F.G. (2001); Nutrient composition of hura. Department of Animal Production. University of Agriculture Markurdi,. Nigeria

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