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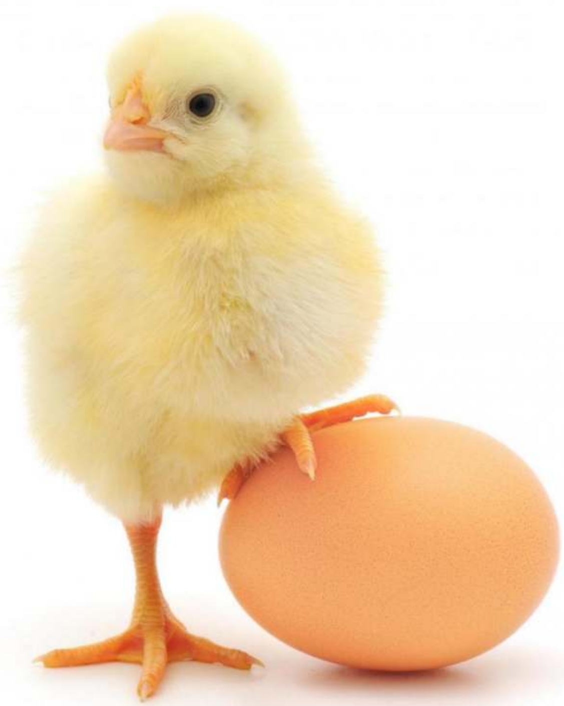

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Effect of Raw and Roasted Wild *Afzelia africana* Seed Meal Based Diets on Broiler Chickens

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Abstract: An experiment was carried out to evaluate the effect of raw and roasted wild *Afzelia africana* seeds on the performance, nutrient utilization of broilers and the cost – benefit of feeding the seeds to broilers. The feeding lasted for 9 weeks. A total of 99 day-old Arbor acre broiler chicks were used for the work. They were randomly divided into 3 experimental groups in 3 replicates. Group 1 was given a diet containing neither raw nor roasted wild *Afzelia africana* seed meal (diet T_1). Diet T_1 is the control. Diets T_2 and T_3 contained raw and roasted *Afzelia africana* seed meal (AAM) respectively. Experimental design was randomized complete block design. The results indicated that the seeds of wild *Afzelia africana* can be fed as a source of protein to broilers. Feeding of raw seed based diets significantly ($p<0.05$) reduced feed intake, body weight gain, apparent nutrient digestibility and profit margin of the broilers. The results were attributed, possibly to the effective of phytates and alkaloids contained in the *A. africana* seeds. It was recommended that for optimum performance of broilers, proper nutrient utilization and greater profit margin wild *A. africana* seeds should be roasted before feeding to broilers.

Key words: Roasted *wild Afzelia africana*, seed meal, broiler diets

Introduction

One of the major constraints towards the supply and consumption of adequate animal protein in developing countries is the high cost of finished (ready for market) poultry products arising from scarcity and high cost of feed ingredients. The search for high quality but cheap animal feed ingredients has continued to be the concern of governments and bodies charged with responsibility for food and nutrition in different parts of the developing world. This problem, however, has been blamed more than anything else, on lack of information on the composition and utilization of many of the various sources of feed ingredients indigenous to the tropical Africa.

The unavailability of protein of animal origin, in adequate quantities, makes the use of protein rich legumes to be essential alternatives in poultry nutrition (Akanji, 2002). Groundnut cake (GNC) and soyabean meal (SBM) which used to play a significant role in poultry nutrition as sources of protein have suddenly become scarce in view of their high demand. This situation creates the obvious need to exploit and expand the production and utilization of other relatively unknown non-conventional and cheaper legumes as sources of protein in poultry feeds. One of such legumes is *Afzelia africana*. The tree is known in the major Nigerian languages of Ibo, Hausa and Yoruba as “Akparata”, “Kawo” and “Apa” respectively.

Afzelia africana belongs to the family of leguminosae (Keay *et al.*, 1964). The authors reported that the tree is abundant in the savanna region fruiting between December and March (harmattan period) every year. Very small quantities of the seeds are traditionally used ascondiment by few Nigerian communities while large quantities are allowed to waste in the fields. The use of this leguminous seed (*A. Africana*) as a protein source in livestock feeds is not widely reported in the literature. The scarcity and high cost of the conventional protein sources (GNC, SBM) in poultry feeds necessitate the need for conducting this study, in order to, examine the nutrient utilization and general performance of boilers fed *A. africana* meal (AASM). Also the study will determine the cost/benefits of feeding AASM based feeds to broilers.

Materials and Methods

Preparation of *afzelia africana* meal (AABM): *Afzelia africana* seeds, obtained from Federal College of Wildlife Management Reserve Estate, New Bussa, Nigeria were used for this study. The seeds, whose pods split open mechanically, were collected, decorticated, washed and sun-dried. A portion of the seeds was roasted at a temperature of 100°C until they start to crack open and the white endosperm turned crispy brown at about 25 minutes of roasting. The roasted seeds were ground in hammer mill to particle size which can pass through 0.02mm sieve. This formed the *Afzelia africana* seed meal (AASM). Proximate composition of the raw and roasted seeds were determined prior to ration formulation.

Experimental diets: Three experimental diets were

Table 1: Composition of the experimental starter and finisher diets (%)

Ingredients	Starter diets			Finisher diets		
	Afzelia africana level			*Afzelia africana* levels		
Maize	51.00	44.00	44.00	56.00	49.00	5100
Wheat offal	10.00	8.00	8.00	12.00	10.00	10.00
GNC	25.00	22.00	22.00	18.00	15.00	13.00
AAM	0.00	12.00	12.00	0.00	12.00	12.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00
Blood meal	3.00	3.00	3.00	3.00	3.00	3.00
PKC	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
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

Premix to provide the following per kg diet: Vitamin A, 10, 500 iu; vit. D3, 2,00 iu; vit E, 20g Vit K_3 3mg; vit $B1_2$, 0.05g; micotnic acid, 35mg; pantothenate, 15mg; chorine chloride, 500mg; folic acid, long; riboflau in, bing; Mn, 55mg; Iron, 55mg; Zn, 80g; Cu, 12mg; I_2, 1-5g; cabalt, 0.3g; Selemium, 0.15g; anti-oxidant, 70mg

GNC = groundnut cake; AASM = *Afzelia africana* seed meal; PKC = palm kernel meal.

Table 2: Proximate compositions of the raw, and roasted *Afzelia africana* and the experimental diets (%)

Afzelia africana seeds.	DM	CP	CF	EE	ASH	NFE
Raw	89.53	24.00	7.06	21.00	3.22	34.25
Roasted	91.75	26.00	5.20	24.40	3.90	32.00
Starter diets						
1 (Control)	91.21	23.05	4.00	5.50	3.54	55.10
2	89.46	22.99	5.88	6.93	3.98	50.00
3	90.92	23.08	4.56	7.64	3.52	52.00
Finisher diets						
1 (control)	89.00	21.00	5.00	5.20	3.70	54.10
2	88.65	21.04	5.08	5.88	4.50	52.00
3	88.05	21.05	5.25	5.60	3.55	52.60

DM = dry matter, CP = crude protein; CF = crude fibre; EE=ether extract and NFE = Nitrogen free extract.

formulated for three groups of experimental broilers. Diet T_1 (control) contained 0.0% AAM while diets T_2 and T_3 contained raw and roasted (AAM) at 12.00 % level of inclusion (Table 1) at starter and finisher phases.

Experimental birds and their management: A total of 99 day – old Arbor Acre broiler chicks were used for this study. They were divided into 3 experimental treatment groups in 3 replicates in a randomized complete block design: Deep litter system was used with wood shavings serving as the litter material. Heat was supplied from electricity and coal pots between 29-32°C for the first week and reduced to 26°C as from 2nd week till the end of the 4th week. Feed and water were given to the broilers *ad-libitum*. The birds were vaccinated against Gumboro (infections bursal disease) and Newcastle diseases at 2nd and 4th week respectively by dissolving a tablet of each vaccine in 2 litres of chlorine free water. The broilers were prophylactically treated against bacterial infection using terramycin chick formula soluble powder (50g of the powder in 50 litres of water). Embazin forte was used to treat coccidiosis at the rate of 30g per litre of water. The starter phase lasted for 28 days while finisher phase was between 29-63 days of birds age.

Data collection: Data were collected on feed in take, body weight gain, feed /gain ratio, protein efficiency ratio, nutrient digestibility and cost/benefit values.

Analytical procedures: Digestibility trial was carried out using the total collection method (Longe, 1980).

Chemical analysis: The proximate and energy values of *Afzelia africana* and the experimental diets were determined by A.O.A.C. (2000) methods. The result of the chemical analysis is shown in Table 2.

Data analysis: The various data collected were statistically analyzed using analysis of variance (ANOVA) with Graph Pad Instat (Window version 3.05). Mean separation was carried out by Duncan multiple range test as reported by Ayanwale and Aya (2006).

Results and Discussion

While Table 1 shows the gross composition of the experimental diets Table 2 indicates the proximate composition of the raw and roasted wild *Afzelia africana* seeds and the experimental diets for the starter and finisher phases. Roasted *A. Africana* seeds had slightly higher crude protein (26.00%), ether extract (24.40%)

Table 3: Apparent nutrient digestibility and nitrogen retention of brinlers fed Afzelia Africana based diets at (8 weeks). (%)

Dietary	DM	CP	CF	EE	ASH	NFE
Treatments						
1.	84.34^a	86.33^a	81.75^a	82.81^a	73.45^a	86.27^a
2	70.38^b	66.38^b	77.80^b	70.68^b	57.75^b	66.03^b
3.	84.54^a	84.07^a	83.63^a	85.00^a	70.68^a	84.01^a
SEM	5.76	7.76	2.15	5.47	5.86	7.88
Finisher phase (29 – 63)						
1. (control)	88.55^a	90.35^a	85.13^a	87.53^a	77.00^a	88.23^a
2.	85.50^b	81.69^b	73.92^b	77.26^b	68.38^b	81.72^b
3.	88.80^a	87.89^a	87.88^a	89.14^a	87.94^a	87.83^a
SEM	2.76	3.17	4.44	4.57	3.95	2.60

a,b means in the same column with different alphabets are significantly (p<0.05) different.

Table 4: Performance and nutrient utilization of broiler chickens fed Afzelia Africana diets

Parameters	Starter phase (0-400ks)			finisher phase		
	T_1	T_2	T_3	T_1	T_2	T_3
Initial body weight (g/bird)	30.00	30.02	30.01± 01	607.60	580.60	586.11±3.02
Final body weight (g/bird)	607.60	580.60	586.11±3.02	2104.33	1809.00	1875.33±12.0
Body weight gain (g/bird)	20.63	19.66	19.86±0.36	42.76^a	35.10^c	36.83^b±2.93
Feed intake (g/bird/day)	41.85	39.56	37.60±1.52	108.15^a	93.49^b	83.00^c±8.00
Feed conversion efficiency	2.03	2.01	1.89±0.05	2.53	2.66	2.25±0.11
Protein intake (g/bird/day)	9.64	9.08	8.97±0.35	22.75	20.69	20.83±2.10
Protein efficiency ration	2.14	2.17	2.9±0.06	1.88^b	1.70	1.77±0.16

a,b,c: means in the same row denoted by different alphabets are significantly (p< 0.05) different.

Table 5: Cost / benefit evaluation of feeding Afzelia Africana to boiler chickens

Dietary treatments	Starter phases			Finisher phase (5-9 wks)		
	T_1	T_2	T_3	T_1	T_2	T_3
Cost per kg diet	0.41	0.40	0.40	0.41	0.38	0.39
Cost of feed in take/bird	0.48	0.42	0.44	1.56	1.08	1.30
Cost pen kg body wt gin	0.24	0.22	0.24	0.62	0.49	0.46
Revenue (83.08lkg live wt)	1.78	1.69	1.71	5.18	4.22	4.44
Profit	1.26	1.29	1.29	3.62	2.92	3.39

a,b,c: means denoted by different alphabets in the same row are significantly (p< 0.05) different.

and lower crude fibre (5.20%) and NFE (32.00%) compared with the raw *Afzelia africana* seeds.

Table 3 gives an indication of the apparent nutrient digestibility of the experimental birds. The results show that diet T_2 containing raw wild *Afzelia africana* significantly ($p < 0.05$) reduced dry matter (DM), crude protein (CP) ether extract (EE) and nitrogen free extract (NFE) digestibility. Availability of minerals measured by ash value was also significantly ($p<0.05$) reduced at the starter phase (0-4 weeks). A similar trend in the reduction of nutrient digestibility by the raw wild AAM was observed at the finisher phase.

McDonald *et al.* (1994) stated that digestibility of any feed is closely related to its chemical composition. Scott *et al.* (1976) identified anti-nutritional factors (ANF^S) to be responsible for decreased digestibility in soyabeans. Biobaku (1993) reported that during the process of digestion, toxic substances present in the raw legume diet may associate with the protein of the diet thereby causing increased protein excretion and reduced apparent protein digestibility in monogastric animals. A combination or any of these factors may be responsible for the low apparent digestibility obtained in diet T_2.

Table 4 reveals the performance and nutrient utilization of broilers fed wild *Afzelia africana* meal (AAM). No significant (p.0.05) difference was observed in the performance of the birds at the starter phase. However, broilers fed raw and roasted AAM had significantly ($p>0.05$) reduced daily feed intake and daily body weight gain compared to the control at the finisher phase (5-9weeks). Other parameters measured (feed conversion efficiency, protein intake and protein efficiency ratio) were not significantly ($p>0.05$) different. It is likely that the wild *Afzelia africana* feeds used contained some phytates and alkaloids which might have affected feed palatability, mineral availability and consequently depressed the growth of the broilers as feed intake increased with age. It has been explained that phytic acid is hexa-phosphate ester of inositol which can form complexes with divalent cations, thereby reducing bioavailability of Ca, Cu, Fe, Mg and Zn (Liener, 1989, Smith and Annison, 1996; Apata and Ologbobo, 1994). So the presence of phytate and alkaloids in the wild *Afzelia africana* might be the major factor responsible for the feed intake and weight again of the birds fed diets T_2 and T_3.

In Table 5, the benefits derived from feeding each of the feeds to the broilers are indicated both at starter and finisher phases. They are very similar and followed a particular trend. The cost of feed intake was higher in the control diets than in the diet containing AAM. This is attributed to the higher cost of the groundnut cake (GNC), which is in higher demands than the *Afzelia africana* seeds which were obtained from the wild. The higher cost of the diets T_3 was attributed to the additional cost incurred during roasting. The profit obtained was significantly ($P<0.05$) reduced in broilers fed diets T_2 containing raw AAM.

Conclusion: wild *Afzelia africana* seeds can be fed as a source of protein to broiler chickens. However, feeding of the roasted seeds enhanced feed intake, body weight gain and gave higher profit than feeding the raw Afzelia Africana seed meal. It is feared that the wild Afzelia seeds may contain some phytates and alkaloids which might be the cause of the low performance of the broilers that consumed the raw and the roasted meal.

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