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The effects of replacing groundnut cake with *Afzelia africana* (Mahogany) seed meal on performance, organ weights and haematological indices of finisher broiler chickens

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Abstract

A 56-days feeding trial involving 200 day-old Marshal broilers was carried out in a completely randomized design to evaluate the performance, organ characteristics and blood indices of broilers fed *Afzelia africana* seed meal (ASM) as a replacement for ground nut cake at dietary levels of 25, 50, 75 and 100%, respectively. The results showed that feed intake, body weight gain, feed conversion ratio, organ weights and blood indices of birds on the control (0 %), 25 and 50 % ASM were significantly ($P<0.05$) superior to the groups on 75 and 100 % ASM. It is concluded that ASM could replaced GNC at level not exceeding 50% in broiler diets without any deleterious effects.

Keywords: *Afzelia africana*, Broilers, Performance, Blood Indices

Introduction

The used of groundnut cake (GNC) and soybean in poultry diets has resulted in the increasing cost of production and livestock products. The need to find alternative and cheaper ingredients to replace the expensive ones is inevitable. *Afzelia africana* is a drought resistant leguminous tree found throughout the tropics. It is a multipurpose tree of significant economic importance because of its several industrial and medicinal uses. *A. africana* seed had been reported to contain 24 % protein, 4.29 % crude fibre, 3.43% ash and 21 % lipid (Obun and Ayanwale, 2006), indicating good nutritional value. The inclusion of 10% raw and roasted *Afzelia africana* seed meal (ASM) in diets of broiler chicks has been investigated by Ayanwale et al. (2007). The results revealed raw ASM have detrimental effect on the performance of chickens due to the presence of various biologically active compounds in the seeds usually referred to as anti nutritional factors/toxic substances such as oxalate, tannin, saponin and phytates (Madubuike et al., 1994). Most foods whether of plant or animal origin, are rarely fit for direct consumption. Thus processing of legume grains has been a necessary step before consumption for a variety of reasons. These include increasing stability, improving flavour, decreasing the toxicity and introducing functionality (Ene-obong and Obizoba, 1996). The *Afzelia africana* seeds have been shown to improve performance roasted and incorporated in broiler chicks diets (Ayanwale et al., 2007). Roasting is a conventional method of detoxification of legume grains among the rural dwellers. Hence, this study was designed to evaluate the effects of replacing GNC with roasted *A. africana* seed meal on performance, organ characteristics and blood constituents of finisher broilers.

Materials and methods

This study was conducted in the poultry unit of the Federal College of Wildlife Management, New Bussa, Niger state. The *A. africana* seeds were obtained from the College Reserved Estate during the months of December-March, when they pods split open mechanically. The seeds were cleaned of dirt and poured into a frying pan mixed with sand in ratio 2:1 under control open fire. Turning was constantly made (to avoid the seeds burning off) until the white endosperm seed turns crispy brown in colour after 25-30 min. The roasted seeds were decorticated and then ground to form *Afzelia africana* seed meal (ASM).

Five isonitrogenous and isoenergetic diets were formulated with diet 1 to serve as the control while diets 2, 3, 4 and 5 to replaced GNC at 25, 50, 75 and 100% ASM, respectively. The ASM was incorporated into the starter and finisher diets (Table 1). Two hundred day-old Marshal broiler chicks were allocated

Table 1: Composition of the treatment diets

Ingredients	Starter phase					Finisher phase				
	0	25	50	75	100	0	25	50	75	100
Maize	55.00	55.00	55.00	55.00	55.00	57.5	57.5	57.5	57.5	57.5
Maize offal	5.00	5.00	5.00	5.00	5.00	10.0	10.0	10.0	10.0	10.0
GNC	28.00	21.00	14.00	7.00	0.00	23.0	17.25	11.5	5.75	0.0
ASM	0.00	7.00	14.00	21.00	28.00	0.0	5.75	11.5	17.25	23.0
PKC	5.00	5.00	5.00	5.00	5.00	3.0	3.0	3.0	3.0	3.0
Fish meal	3.00	3.00	3.00	3.00	3.00	2.0	2.0	2.0	2.0	2.0
Bone meal	2.00	2.00	2.00	2.00	2.00	2.0	2.0	2.0	2.0	2.0
Oyster shell	1.20	1.20	1.20	1.20	1.20	1.5	1.5	1.5	1.5	1.5
Vit/Premix	0. 50	0.50	0.50	0.50	0.50	0.5	0.5	0.5	0.5	0.5
Salt	0.30	0.30	0.30	0.30	0.30	0.5	0.5	0.5	0.5	0.5
Calculated chemical composition (% in DM)										
CP	23.02	22.53	22.50	22.48	22.30	20.02	19.66	19.52	19.52	19.51
CF	4.33	4.40	4.50	4.58	4.63	4.76	4.80	4.90	4.97	5.21
ME(MJ/kg)	12.82	12.78	12.64	12.58	12,52	12.76	12.79	12.87	12.91	12.04
Analyzed chemical composition (% DM)										
Moisture	9.02	10.30	10.25	10.32	10.18	9.54	10.08	9.46	9.87	10.55
CP	22.46	22.30	22.26	22.20	22.07	19.32	19.26	19.33	19.24	19.11
CF	4.21	4.32	4.36	4.40	4.54	4.58	4.61	4.64	4.72	4.77
EE	4.05	4.11	4.20	4.45	4.60	4.32	4.34	4.62	5.87	4.89
Ash	4.00	4.16	4.16	4.22	4.32	4.18	4.04	4.07	4.54	4.23
ME(MJ/kg)	12.82	12.78	12.64	12.58	12.52	12.76	12.79	12.87	12.91	12.74

to 5 treatments of 40 chickens each, replicated four times with 10 birds each in a completely randomized design. The birds were reared on deep litter system. The birds were given feed and water *ad libitum.* Feed intake was recorded daily and the birds were weighed weekly and were used to calculate the feed conversion and protein efficiency ratios.

At the end of the experimental trial (56 days), eight birds were randomly selected from each of the treatment groups, starved of feed (but not water) for a day, slaughtered and eviscerated for organ weight determination. The blood was drained into sample bottles with diaminetetra-acetic acid (EDTA) after slaughtered.

The experimental diets were analyzed for moisture, crude protein (CP), crude fibre (CF), ash; ether extracts (EE) using AOAC (1990) method. The blood was analyzed for packed cell volume, red blood count; haemoglobin and white blood cell counts using Jain (1986) method.

Statistical analysis

The data collected were subjected to analysis of variance (Steel and Torrie, 1980). Means were compared using Duncan's New Multiple Range Test as outlined by Obi (1990).

Results and Discussion

The results of the performance, organ characteristics and blood constituents of the birds are presented in Table 2. Feed intake (FI), growth rate (GR) and feed conversion ratio (FCR) were similar for the birds on the control (0%), 25 and 50% dietary replacement of ASM and were significantly better compared with those on 75 and 100% replacement. The performance of broiler chicks in this study recorded an improvement over previous observations by Ayanwale et al. (2007). The depressed FI, GR and FCR could possibly be that the ASM at high replacement level imparted an unpalatable taste to the feed, which consequently inhibited the birds from consuming adequate quantities. Similarly, the relative organ weights and haematological indices of the broilers on the control (0%), 25 and 50% replacement diets were significantly ($P<0.05$) better than those on 75 and 100 % ASM. The decreases observed in the organ weights and haematological indices as more of the ASM was replaced with GNC in the diet may have been due the effects of traces of anti nutritional substances present in ASM. No mortality was recorded during the feeding trial.

In conclusion, the present studies have demonstrated that broiler birds have the capacity to utilize the nutrients and energy of *Afzeli africana* seed meal up to 50 % replacement for GNC without any deleterious effects on performance, organ weights and haematological indices. Further research is necessary to determine how to increase the nutritive value of ASM for monogastric animals.

Table 2: Performance, organ weights and blood constituents of broilers fed experimental diets

Parameters	Dietary replacement levels of *A. africana* seed meal (%)					SEM
	0.00	25	50	75	100	
Initial body weight of birds (g)	40.19	40.22	40.21	40.18	40.18	0.11
Final body weight of birds (g)	2180.2^{a}	2168.2^{a}	2168.2^{a}	1897.2^{b}	1707.2^{c}	4.55
Body weight changes (g)	2140^{a}	2128^{a}	2128^{a}	1857^{b}	1667.0^{c}	3.12
Daily body weight gain (g)	38.2^{a}	38.0^{a}	38. 0^{a}	33.2^{b}	29.8^{b}	0.06
Daily feed intake (g)	70.03^{a}	71^{a}	72.6^{a}	64.2^{b}	61.4^{b}	0.06
Feed conversion ratio	1.83	1.87	1.9	2.02	2.04	0.32
Organ weight (% body weight)						
Heart	0.54	0.54	0.53	0.50	0.46	0.06
Liver	2.10^{a}	2.17^{a}	2.13^{a}	2.04^{a}	1.87^{b}	0.07
Gizzard	2.55^{a}	2.54^{a}	2.56^{a}	2.33^{b}	2.10^{c}	0.10
Abdominal fat	2.45^{a}	2.44^{a}	2.46^{a}	2.16^{b}	1.68^{c}	0.12
Analyzed haematological indices						
Packed cell volume (%)	33.28^{a}	33.21^{a}	33.18^{a}	30.45^{b}	28.43^{c}	0.12
Haemoglobin (g/dl)	11.03^{a}	11.00^{a}	10.98^{a}	9.6^{b}	8.90^{c}	0.05
Red blood count (mm $\times 10^{6}$)	2.87^{a}	2.67^{a}	2.80^{a}	2.45^{b}	2.22^{c}	0.10
White blood count (mm $\times 10^{3}$)	20.34^{a}	20.07^{a}	19.43^{a}	18.20^{b}	17.80^{c}	0.2

^{abc} Mean on the same row with different superscripts is significantly ($P<0.05$) different

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