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GROWTH PERFORMANCE AND ECONOMICS OF PRODUCTION OF BROILER CHICKS FED GRADED LEVELS OF BAOBAB *(ADANSONIA DIGITATA)* PULP MEAL AT THE STARTER PHASE

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ABSTRACT

The experiment was conducted to evaluate the performance of broiler chickens fed graded levels of baobab (Adansonia digitata) pulp meal (BPM) at the starter phase. Three hundred broiler (Anak) chickens were allotted to five treatments replicated thrice with 20 birds per replicate in a completely randomized design (CRD). The inclusion levels of the BPM in the diets were 0, 5, 10, 15 and 20% for treatment 1 (Control), 2, 3, 4 and 5 respectively. The experiments lasted for four weeks. Data collected were subjected to analysis of variance and significant differences among treatment means were compared using the Dunnet Test. Results showed a significantly higher feed intake (47.29 - 47.64g) ($P<0.05$) in birds fed 10, 15 and 20 % baobab pulp meal (BPM). Higher ($P<0.05$) daily weight gains of 24.36g - 24.66g were recorded in birds fed 0%, 5% and 10% BPM. Birds fed 0%, 5% and 10% BPM were more efficient in feed utilization. It can be concluded that Baobab pulp can be included in broiler chickens diets up to 20% but the optimum levels of inclusion were5%.

Keywords: Baobab pulp, Performance, Economics of production, Broiler chicks, Starter phase

INTRODUCTION

Animal protein is crucial for normal physical and mental development of human being, as the deficit has serious adverse effects on the economic development of the country in terms of reduction in human productivity, the incidence of high infant mortality, malnutrition, and related diseases. Broiler industry represents the fastest and most economical means of bridging the animal protein shortage gap. In addition, it contributes to the Gross domestic products (GDP), it provides gainful employment and income to a sizeable proportion of the populace. This will go a long way to alleviate poverty and improve the welfare of the population (Adebayo and Adeola, 2005). The broiler industry in Nigeria is characterized by high production cost which is the major constraint resulting in low profit margins. Most often in an attempt for producers to break even, the broiler products become so expensive that they are always unaffordable to majority of the citizenry. It is therefore, necessary to look for cheaper and simple ways of getting animal protein required for normal body growth and function (Ayanwale *et al.*, 2006). The prices of animal products are therefore beyond the reach of the average Nigerian owing to the increase in the production and maintenance cost of farm animals. This has necessitated the renewal of interest in exploring the feasibility of incorporating neglected or underutilized energy feedstuff. Several workers have emphasized the need for utilizing unconventional feedstuff as an alternative feed ingredient as well as

human and industrial waste (Durunna *et al*., 1990; Fanimo *et al*., 2007). Not much has been done in evaluating the potential feed value of some multipurpose tree products such as baobab *(Adansonia digitata).* Medugu *et al.* (2011) reported that the tremendous decrease in poultry production is as a result of high cost of protein and energy feedstuffs especially cereal grains (maize) which form the bulk of energy in poultry feeds and are in short supply as a result of industrial and human needs. This has resulted in competition between human and animals for the available feed resources coupled with constant drought. Hence, the high cost of poultry feed has continued to be a major problem in developing countries. These necessitated the present study, in order to replace the expensive ingredients in livestock feeds especially for the monogastric animals. The objectives of the study are to; determine the effect of feeding baobab (*Adansonia digitata*) pulp on the performance of broiler chickens and the cost-effectiveness of including baobab (*Adansonia digitata*) pulp in broiler chicken diets.

MATERIALS AND METHODS

Source of Baobab Fruit

Baobab fruit used for this experiment were harvested at the mature stage which was indicated by the hard brown colour of the ectoderm from the trees using locally made equipment around Mamudo, Danchuwa, Alaraba, and Mele in Potiskum Local Government area of Yobe State, Nigeria.

Processing

Dried baobab fruits were processed by cracking open the hard shell of the baobab fruits using a small hammer to remove the inner contents (epicarp), and pounded using a mortar and pestle while the seed and pulp were separated using a sieve. The pulp was slightly milled and separated from the unwanted coarse material using a fine mesh.

Experimental Site

The study was conducted at the Teaching and Research farm (Poultry unit) of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University Zaria. Zaria is located within the Northern Guinea Savannah of Nigeria with average annual rainfall, relative humidity and temperature of 1,100 mm, 75% and 24.4^{O} C respectively, on Latitude 11^{o} 12'N and Longitude 7^{o} 33'E at an altitude of 610m above sea level (Ovimap, 2014).

Experimental design and management

Three hundred (300) broiler chicks (Anak) were purchased from Zarm Farm. The birds were vaccinated against Newcastle disease (intra ocularly) on the day of arrival and brooded together for three days using kerosene stoves and electric bulbs as sources of heat and light. They were fed a common diet during this period. The birds were subsequently weighed and allotted to five dietary treatments. The birds were housed in a deep litter system in a completely randomized design. The treatments were replicated three times with twenty chicks per replicate. The feeding trial lasted for four weeks. Birds were vaccinated against Newcastle and Gumboro diseases. Feed and water were provided *adlibitum.*

Experimental Diets

The composition and calculated analysis of the experimental diets are presented in Tables 1. The test ingredient was included at 0, 5, 10, 15 and 20% representing 1 (control), 2, 3, 4 and 5 respectively for broiler starter (23% CP; 2900 Kcal/Kg). The diets were isonitrogenous and isocaloric and met the recommended crude protein and metabolisable energy requirements as stated by NRC (1994)

Table 1: Composition and calculated analysis of the experimental diet (starter)

	Inclusion levels of baobab pulp meal (% BPM)				
Ingredient (%)	**0**	**5**	**10**	**15**	**20**
Maize	57.00	51.65	46.35	41.85	35.40
BPM	0.00	5.00	10.00	15.00	20.00
G/nut cake	20.00	20.45	20.95	20.45	21.90
Soya bean meal	18.65	18.65	18.65	18.65	18.65
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.30	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.30	0.20	0.00	0.00	0.00
*Pre-mix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated					
ME (Kcal/Kg	2907.80	2908.98	2909.29	2910.58	2912.15
Crude protein	23.26	23.17	23.00	23.01	23.01
Crude fibre	3.83	4.09	4.35	4.61	4.87
Ether extract	4.07	4.28	4.50	4.71	4.92
Calcium	1.22	1.24	1.26	1.29	1.31
Av. Phosphorus	0.81	0.81	0.82	0.83	0.84
Lysine	1.24	1.27	1.22	1.33	1.44
Methionine	0.54	0.57	0.59	0.61	0.63
Cost (₦/Kg)	92.16	90.12	87.48	86.13	84.74

*Bio-mix: starter, unit/kg: Vit.A = 2500IU, Vit.D_3 = 500IU, Vit.E = 5.75mg, Vit.K_3 = 0.50mg, Vit.B_1 = 0.45mg, Vit.B_2 = 1.375mg, Niacin = 6.875mg, Panthothenic Acid = 1.875mg, Vit.B_6 = 0.75mg, Vit.B_{12} = 0.038mg, Folic Acid = 0.188mg, Biotin H2 = 0.015mg, Choline = 0.25mg, chloride = 750mg, Cobalt = 0.05mg, Copper = 0.75mg, iodine = 0.25mg, Iron = 5.00mg, Manganese = 10.00mg, Zinc = 7.50mg, Selenium = 0.05mg, Anti-oxidant = 0.313mg, BPSM = Baobab pulp-seed meal, G = Ground, Av = Available

Parameters determined in the experiment

Performance

The birds performance such as feed intake, weight gain, feed conversion ratio was measured weekly while mortality was recorded as it occurred and the cost of experimental diets were calculated based on the prevailing market price at the time of the experiment.

Economic Analysis

A simple analysis was conducted to assess the cost-effectiveness of the experimental diets. Only the cost of feed was used in the calculations with the assumption that all other operating costs remained constant. Cost of the feeds was calculated based on the market prices of ingredients as at the time of the experiment.

Data analysis

All data collected were subjected to analysis of variance (ANOVA) using the General Linear Model Procedure of SAS 9.2 (2002). Significant differences among treatment means were compared using Duncan Multiple ranged Test in the SAS Package.

RESULTS AND DISCUSSION

The effects of feeding graded levels of baobab (*Adansonia digitata*) pulp meal are shown in Table 2. The average daily feed intake ranged from 46.08 – 47.64g. Significantly (P<0.05) lower values 46.08g and 46.34g daily feed intake were recorded in birds fed 0% and 5% BPM while significantly (P<0.05) higher values 47.29g, 47.59g and 47.64g were recorded in birds fed 10%, 15% and 20% BPM respectively. The average daily feed intake increased linearly across the treatment groups as BPM increased in the diets. This observation is in line with the findings of Bola and Olatunde (2009) who reported a proportionate increase in feed intake when birds were fed increasing levels of baobab fruit pulp and also Ilori *et al.* (2013) who reported that baobab pulp meal only had a higher relative average feed intake than for whole fruit meal and suggested that pulp meal only is more acceptable to the animals than the whole fruit meal. According to Fairchid *et al.* (2005), birds have a sensor for sweet, salt and bitterness, it may therefore, be natural for the birds to consume more feed if it has a sweet taste or less feed if it has a bitter taste. The average final weight and daily weight gain ranged from 726.36 - 757.91g and 23.54 – 24.66g respectively. Significantly (P<0.05) higher values 749.61g, 755.85g and 757.91g final weight were recorded in birds fed 0%, 5% and 10% BPM while significantly (P<0.05) lower values 732.83 and 726.36g final weight were recorded in birds fed 15% and 20% BPM respectively and average daily weight gain follows a similar trend as final weight. This agrees with the work of Rafiu *et al.* (2012) who reported the overall performances for final weight and daily weight gain were comparable across the treatment groups when broiler chicken was fed BPSM. This study also confirms the findings of Adeosun *et al.* (2013) who reported significant effects on final weight and body weight gain when baobab fruit pulp meal was included as a supplement (source of natural ascorbic acid) in laying hens but contrary to the suggestion that laying hens can tolerate only 3.5% level of inclusion and any further increase to 10.5% baobab pulp meal lead to a decrease in almost all the mention parameters (Adeosun *et al.*, 2013). The major differences could be as results of differences in the source of test material, management practice, and breed used in the two studies which affect the performance of the birds. Feed Conversion ratio (FCR) ranged from 1.89 – 2.03. Significantly (P<0.05) higher values of 2.01 and 2.03 were recorded in birds fed 15% and 20% BPM and significantly (P<0.05) lower values 1.90, 1.89 and 1.90 were recorded in birds fed 0%, 5%, 10% BPM. This indicates that birds fed 0% –10% BPM is more efficient than those fed 15% BPM and beyond. This implies that feed utilization efficiency was better at 0% BPM, 5% BPM and 10% BPM, inclusion level, while poor utilization feed was observed at 20% BPM and 15%BPM inclusion.

Table 2: Performance of broiler chickens (starter) fed graded levels of baobab pulp meal

	Inclusion levels of baobab pulp meal (% BPM)					
Parameter	**0**	**5**	**10**	**15**	**20**	**SEM**
Live weight (g)	67.57	67.57	67.42	65.57	67.42	0.17
F/intake/Day (g)	46.08[b]	46.34[b]	47.29[a]	47.59[a]	47.94[a]	0.51
Final Weight (g)	745.61[a]	755.85[a]	757.91[a]	732.83[b]	726.36[b]	7.83
Wt/G/Day (g)	24.22[a]	24.58[a]	24.66[a]	23.76[b]	23.54[b]	0.28
Feed conversion	1.90[a]	1.89[a]	1.92[a]	2.01[b]	2.03[b]	0.03
Feed Cost (₦)	102.00	90.12	87.48	86.13	84.74	
T/Feed Cost (₦)	122.60	116.93	114.97	114.77	113.04	
C/Red. (₦)	0.00	5.67	6.96	8.30	9.56	
Cost/Gain (₦/g)	0.18	0.17	0.17	0.17	0.18	
Mortality (%)	3.33[a]	1.67[b]	1.66[b]	1.67[b]	1.61[b]	0.06

[abc] = Means within a row with different superscript differ significantly (P<0.05).
G = Gain; Red = Reduction; C = Cost

CONCLUSION

The inclusion of BPM in broiler chicken diets significantly (P<0.05) increased feed intake and weight gain by 3.88% and 1.62% respectively while feed cost and mortality were decreased by 20.37% and 50.15% respectively in the starter phase. It can be concluded that Baobab pulp can be included in broiler chickens diets up to 20% but the optimum levels of inclusion were 5%.

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