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EFFECTS OF VARYING LEVELS OF COOKED KIDNEY BEAN MEAL (*Phaseolus Vulgaris*) AS REPLACEMENT OF SOYABEAN MEAL OR GROUNDNUT CAKE ON THE PERFORMANCE OF BROILER CHICKEN

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ABSTRACT

The experiment was conducted to assess the effects of different inclusion levels of cooked kidney bean meal as non-conventional feedstuff on the growth performance of broilers chicks. The test diets were formulated such that, diet T1 (control diet) contained no kidney bean meal, diet T2 contained 20% cooked kidney bean meal, diet T3 contained 40% cooked kidney bean meal and diet T4 contained 60% cooked kidney bean meal. The trial lasted for eight weeks and the following parameters were measured weekly during the course of the experiment. Feed intake, body weight, weight gain, feed conversion ratio, nutrient digestibility and length of body parts. The result showed that there were significant differences ($p < 0.05$) in the Final body weights and average mean body weights. The birds fed 20% cooked kidney bean meal diets had the highest mean body weight (1220g) while birds fed 60% cooked kidney bean meal had the lowest mean body weight (941.20g). There was no significant difference ($p > 0.05$) in the feed intake of birds fed cooked kidney bean meal diets. There were no significant differences ($p > 0.05$) in the length of body parts except the thigh. Significant differences ($P > 0.05$) were not observed in the dry matter, ether extract, crude fibre and ash digestibilities except in crude protein and NFE (Nitrogen Free Extract). It was concluded that the addition of cooked kidney bean meal had a positive effect on the performance as well as CP digestibility of the birds when the inclusion in the diet is within the range of 20-40% replacement of conventional plant protein sources.

Keywords: Kidney bean meal, Broiler, Replacement, Performance, digestibilities.

INTRODUCTION

The over dependence on soyabean and groundnut cake in most developing countries as the key conventional protein concentrates for feeding livestock is currently threatening the development of livestock industry. The heavy demands for these feed items has resulted in an increase in their prices and consequently cost of livestock feeds and its products (Emiola *et al.*, 2007). There is the need to source for alternative protein sources of feed for monogastric animals, hence the use of kidney bean whose consumption is limited to man and has no industrial use and could meet the nutritional requirements of livestock. Kidney bean (*Phaseolus vulgaris*) is a productive tropical legume that is little known and utilized as human and livestock feeds (Emiola *et al.*, 2007). Kidney bean is an annual leguminous food crop, twinning and climbing bushy plant of about 20-60cm tall. The aims and objectives of this research work is to assess the growth response of broilers fed graded levels of cooked kidney bean meal and to determine the degree of nutrient digestibility by broilers fed cooked kidney bean meal.

MATERIALS AND METHODS

The experiment was conducted at the poultry unit of the Teaching and Research Farm of the Department of Animal Production, School of Agriculture and Agricultural Technology, Federal



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University of Technology, Minna, Niger State, Nigeria. Minna is situated in Guinea Savannah and lies at latitude 9° 37' North and longitude 6° 33' East. The town has a mean annual precipitation of 1300mm with temperature that rarely falls below 22°C. A total number of one hundred and forty four (144) day old (Anak Strain) broiler birds were used for this experiment. White kidney beans were purchased from Agaie market in Agaie Local Government Area of Niger State, other ingredients were purchased in Minna, Niger state. Kidney beans were washed, poured in to boiled water of 100°C and boiled for another 30 minutes. These kidney beans were sun dried to reduce the moisture content. Complete Randomized Design (CRD) was used in this experiment. The birds were randomly allocated to four (4) treatments. Each treatment was replicated thrice with each replicate having 12 birds. The birds were fed with the diet that contained inclusion of different levels of cooked white kidney bean meals. Treatment one (T1) which was the control experiment was supplemented with 0% cooked kidney bean meal (CKBM). Treatment two (T2) 20% cooked kidney bean meal. Treatment three (T3) 40% cooked kidney bean meal and Treatment four (T4) 60% cooked kidney bean meal in the diet.

Table 1. Composition of the Experimental Diets Fed to the Broiler Birds at Finisher Phase (%)

Ingredients	Diets				
	T ₁	T ₂	T ₃	T ₄	
Maize	54	40	32	22	
Kidney bean meal	-	20	40	60	
Soyabean meal	10	8	6	2	
Groundnut cake	14	11	8	3	
Fish meal	5	6	3	2	
Rice bran	10	7.5	4	3	
Bone meal	3	3	3	3	
Limestone	3	3	3	2	
Palm oil	-	0.5	0.5	2	
Premix	0.25	0.25	0.25	0.25	
Lysine		0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	
Salt	0.25	0.25	0.25	0.25	
Total	100	100	100	100	
%CP	20.13	22.26	21.80	20.50	
ME/Kcal/kg	3266.01		3173.99	3169.30	
	3222.11				

Samples of the feed were collected from each treatment for proximate analysis to determine their nutrient composition of the diets. Routine vaccination, anti – stress and vitamin/ mineral premix were given to the birds from the first week of the experiment. Feed and water were provided *ad-libitum*. Nutrient digestibility was carried with two birds from replicate placed in the metabolic cages. The birds were allowed to acclimatized in the metabolic cage for a period of 3 days before the collection of the faeces started. A 4 day collection trial was carried out, the weight of the birds were recorded at the beginning and at the end of the trial. The faeces collected were weighed on the wet basis and wrapped in the aluminum foil and taken to the laboratory for analysis. At the end of the experiment, one bird per replicate (three per treatment) were randomly selected and slaughtered, body parts were measured and recorded, using a flexible measuring



tape. The data collected were statistically analyzed for interpretation and to draw inference. One way (ANOVA) and Duncan Multiple Range test was used to separate the means at 5% level of probability.

RESULTS AND DISCUSSION

The data collected were subjected to one way ANOVA in a completely randomized designed using SAS 2.1 (2000) and significant means were separated using Duncan multiple range test. Significant differences were observed in the body weights, body weight gain, feed conversion ratio and nutrient digestibility of birds.

The proximate composition of the experimental diets on table 2 shows that the crude protein of the diets were slightly higher than the 24.70% and 23.70% as reported by Emiola and Ologhobo (2006) and Emiola *et al.* (2007) respectively. Emiola *et al.* (2007) reported that a higher protein feed enhance feed consumption and utilization, resulting in higher weight gain. The experimental diets have moderate crude fiber content. This is in agreement with the findings of (Emiola and Ologhobo (2006) who observed that low crude fibre content in the feed makes it ideal for poultry. The ether extract of the feed maintained higher values, T4 had a higher value (9.00%) T3 (8.5%), T2 and T1 (7.5%) respectively and therefore the metabolizable energy was equally higher among all treatments diets.

Table 2. Proximate composition of raw and cooked kidney bean (%)

	%Moisture	%CF	%CP	%Ash	%EE	%NFE	M.E.KCAL/kg
Raw Kidney Beans	11.00	8.37	23.80	7.5	10.50	49.83	3508.97
Cooked Kidney Beans	12.33	9.38	23.43	9.3	11.04	43.85	3326.66

Table 3. Proximate Composition of the Experimental Feeds (%)

VARIABLES	FEEDS			
NUTRIENT	T ₁	T ₂	T ₃	T ₄
Moisture content	7.00	6.8	7.8	8.6
Crude protein	22.25	22.30	22.25	22.05
Ether extract	9.5	8.5	8.5	9.00
Crude fibre	10.33	10.67	11.25	11.12
ASH	11.00	11.00	11.50	11.62
NFE	46.92	46.58	46.50	46.21

Table 4 shows performance Birds Fed Varying Levels of Cooked Kidney Beans Diets at Finisher Phase

Parameters	T1	T2	T3	T4	SEM
Initial weight	362.22 ^b	429.70 ^a	354.85 ^b	361.11 ^b	10.13
Final body weight	1150.93 ^b	1220 ^a	1075.92 ^b	941.2c	33.47
Body weight gain	1069.76	1137.96	994.02	859.03	33.16
Avg daily weight gain	19.1 ^{ab}	20.32 ^a	17.75 ^b	15.34 ^c	0.77
Average feed intake	1780.36 ^a	1708.68 ^a	1709.68 ^a	1712.19 ^a	69.99



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Avg daily feed intake	31.79^a	30.51^{ab}	30.53^{ab}	30.57^{ab}	1.22
Feed conversion ratio	1.66	1.50	1.72	1.99	0.33

Table 3 shows performance Birds Fed Varying Levels of Cooked Kidney Beans Diets. The result shows no significant difference ($P > 0.05$) in their feed intake. At the end of the experiment, birds fed diet T1 recorded the highest mean value of feed intake (1780.36g) followed by T4 with a value of 1712.19g. T3 had a value of 1709.65g while T2 recorded the lowest mean value of feed intake (1708.68g). This shows that the feeds were generally acceptable to the birds. This confirms the potential of kidney bean as a feed stuff which is in line with the findings of Ofongo and Ologhobo (2007) who observed that cooking was a better processing method for kidney bean. This is in agreement with Emiola and Ologhobo (2006) observed that cooking and dry heating (toasting) increases the digestibility of nutrients available to young non ruminant animals, especially young chicks resulting in improved growth. Significant differences ($P < 0.05$) were observed in the body weights of birds fed CKBM diets with the birds fed 60%CKBM having the least body weight. This is in line with Arija *et al.* (2006) who observed that as the amount of kidney bean is increased in the diet, body weight decreases or reduces compared to those fed control diet. The authors reported that as the inclusion level of cooked kidney bean meal increases in the diet, residual trypsin inhibitors and heamagglutinin (ANFs) increases. Significant differences ($P < 0.05$) was observed among treatments in the average body weight gain. Progressive improvements in the weight gain observed among treatments was in agreement with Emiola and Ologhobo, (2006) observed that improvement in average daily gain (ADG) in growth recorded in groups fed cooked and toasted kidney bean could be attributed to the inactivation or reduction in ANFs in the meals. There were significant differences ($P < 0.05$) in the efficiency of feed utilization. Improvement was noticed in the efficiency of feed utilization among all treatments which is reflected in the weight gain. T2 (20% CKBM) performed better in feed conversion ratio while T4 (60% CKBM) had poor performance in feed conversion ratio, this was evidenced in the body weights and body weight gain. So as the level of inclusion of CKBM increases, the feed utilization decreases. This is in agreement with Arija *et al* (2006) findings in which the level of weight gain and feed efficiency increases as the level of extrusion kidney bean decreases in its inclusion in the diets of broiler chicks.

Table 5. The Digestibility of Nutrient in Birds Fed Cooked Kidney Bean Meal Diets (CKBM) (%) at Finisher Phase

VARIABLES	FEEDS			
NUTRIENTS	T₁	T₂	T₃	T₄
Dry matter	95.13 ^a	94.67 ^{ab}	94.27 ^a	95.00 ^a
Crude protein	79.87 ^a	78.54 ^a	77.12 ^a	74.92 ^b
Ether extract	94.17 ^a	94.67 ^{ab}	95.33 ^a	95.83 ^a
Crude fibre	74.00 ^{ab}	74.11 ^{ab}	74.34 ^a	74.44 ^a
ASH	81.17 ^{ab}	81.50 ^{ab}	83.00 ^a	83.17 ^a
NFE	67.63 ^b	71.64 ^{ab}	69.54 ^{ab}	73.46 ^a
M.E. Kcal/kg	2370.84	2236.79		
	2309.90	2211.24		

Means followed by the same letter indicated in columns are not significant at 5% level

Table 5. shows the result of nutrient digestibility by broiler birds fed CKBM diets. Significant difference ($P>0.05$) was not observed in the dry matter, ether extract, crude fibre and ash digestibilities except, crude protein and NFE. Their digestibilities decreases ($P<0.05$) with increasing level of CKBM in the diets. The observed decrease could be due to the anti-nutritional factors and fibre. High fibre is not only largely indigestible itself, but it also lowers the digestibility of other complex carbohydrates and nutrient (Jokthan *et al*, 2006).

CONCLUSION AND RECOMMENDATION

The addition of cooked kidney bean meal had a positive impact on the performance as well as CP digestibility of the birds when their inclusion in the diet is within the range of 20-40%. This positive impact is in terms of feed intake, body weights, body weight gain, feed conversion ratio. However, up to 60% inclusion of CKBM in the diets of broilers will counteract this positive impact. From the result of this experiment, the study indicated 40% protein replacement of cooked kidney bean meal for Soyabean meal or Groundnut cake as a plant protein source of feed. It was recommend that other processing method could be employed in order to adequately remove the anti-nutritional factors to the barest minimum.

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