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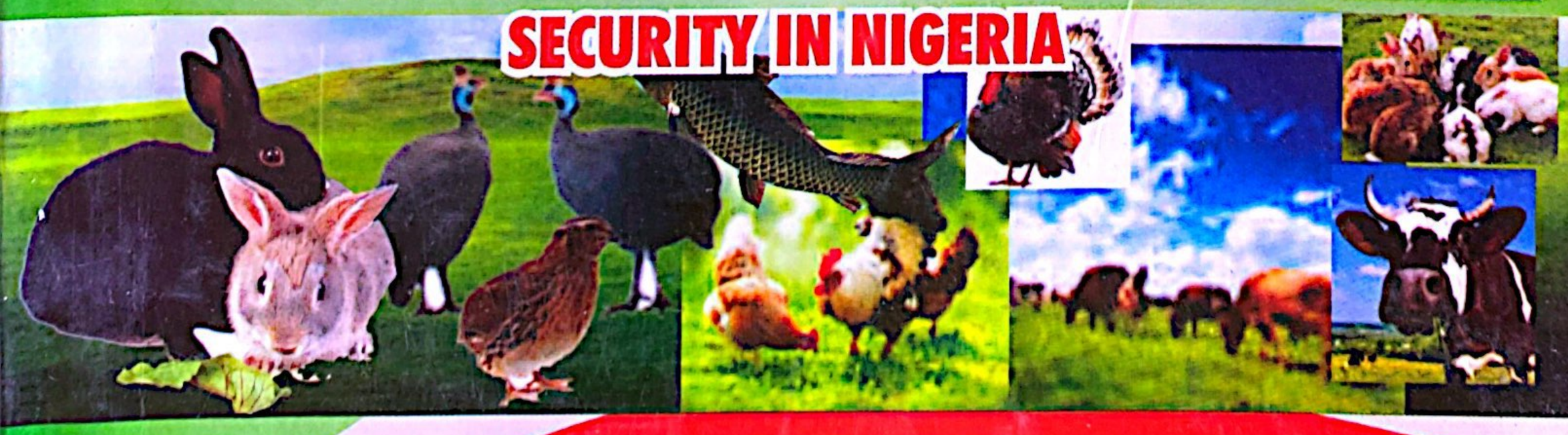

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GROWTH PERFORMANCE AND ECONOMIC CHARACTERISTICS OF BROILER CHICKEN FED DIETS CONTAINING VARYING LEVELS OF COWPEA (*Vigna unguiculata*) MILLING WASTE AT THE STARTER PHASE

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ABSTRACT

An experiment was conducted to determine the effects of feeding diets containing varying inclusion levels of cowpea milling waste (CMW) on the growth performance and economic characteristics of broiler chicken at the starter phase. A total of 180 one-week-old Arbor Acre broiler chicks were used for the Study; they were randomly allotted into three dietary treatments, T_1, T_2 and T_3 containing 0, 20 and 40 % dietary inclusion level of CMW respectively. Each treatment was replicated thrice and made up of 20 birds per replicate. The birds were fed ad-libitum for three weeks under a deep litter management system and data collected on their growth performance. Results show that though there were no significant ($p>0.05$) differences in body weight gain and feed conversion ratio among the dietary treatments, T_3 (having 40 % dietary inclusion level of CMW) showed a slightly better performance over the Control Diet (T_1) with feed conversion ratio of 2.72 and final body weight of 583.33g.On the economic analysis, cost savings per kg was highest for T_3, followed by T_2. Therefore, it can be concluded that CMW can be included up to 40 % in the diets of broiler starter as a protein and energy source with no detrimental effect on their growth performance and economic characteristics.

Key words: Cowpea milling waste, growth performance, economic characteristics, broiler chicken

INTRODUCTION

Poultry production holds a prominent place in the economy of many developing countries including Nigeria. The broiler chicken industry especially occupies the second place in volume in the world just after pork (Yang and Jiang, 2005), representing about 29 % of the total meat production from farm animals and is rising every year (McKay *et al.*, 2000). Adequate nutrition and feeding, as a factor of production, is the major obstacle facing livestock industries (Apata and Ojo, 2000). This has increased the feeding cost of livestock in Nigeria to about 80 % of the total cost of production, especially for poultry and pigs (Fanimo *et al.*, 2007). Therefore, efforts are increasingly been made to search for alternative protein and energy sources that can meet the nutrient requirements of farm animals; are cheaper than the conventional feed ingredients and are less competed for by man (Akinmutimi, 2004). Crop by-products have been the object of focus, and an efficient use of these by products could significantly reduce the cost of production of poultry. Cowpea or common bean (*Vigna unguiculata*) is a legume crop that is indigenous to West Africa. It is widely cultivated in the Middle Belt of Nigeria and is often interplanted with other crops like maize in the Southern Part of Nigeria. Cowpea milling waste is a by-product obtained from the processing of cowpea seeds to obtain bean flour. The milling waste is that portion of the seed which remains after the extraction of the flour. Hence, the main objective of this research study is to determine the most optimum dietary inclusion level of cowpea milling waste in the diets of broiler chicken at the starter phase that will produce their best growth performance, with the least cost.

MATERIALS AND METHODS

The Experimental Diets

Three experimental diets were formulated to meet the nutritional requirements of broiler starter birds. The Control Diet, T_1, contained 0 % dietary inclusion level of cowpea milling waste (CMW); T_2 contained 20 % dietary inclusion level of CMW, while T_3 contained 40 % dietary inclusion level of CMW. The feed ingredients used to formulate the diets were purchased from the Central Market, Minna, and from other commercial feed ingredients depots within Minna metropolis; while the CMW was purchased from

Kitchen Friendly Limited, a cowpea processing factory located at the Gurara Area of Minna, Niger State. The percentage composition of the experimental diets is shown in Table 1.

Experimental birds and their Management

180 day-old Arbor Acre broiler chicks obtained from CHI FARMS LIMITED, located at km 20 Lagos- Ibadan express way, Ibadan, were used for this Study. Two weeks before the arrival of the birds, the deep litter pens were thoroughly washed and disinfected, and then quarantined. Hours to their arrival, all equipment including feeders and drinkers were put in place and heated to about 32^0C using a suitable heating source. On arrival, the birds were unboxed, counted and put in the pens. They were then supplied with drinking water containing glucose and medications. From the following day, they were then supplied with a commercial broiler starter feed *ad libitum* up to the end of one week. Thereafter, the birds were weighed and allocated randomly into three dietary treatment groups of 60 birds per treatment made up of three replicates of 20 birds per replicate. The birds were fed *ad libitum* with the experimental diets for three weeks. Routine management operations such as daily removal of left-over feed, cleaning and washing of drinkers and feeders, provision of clean drinking water, vaccinations and cleaning of the environment were carried out.

Parameters Determined

The following parameters were determined using the procedures of Adesida *et al.* (2010) as follows: Average daily feed intake was obtained by subtracting the quantity of the left-over (uneaten) feed from the quantity of feed supplied to the birds per day. Weekly body weight gain was determined by subtracting the body weight of the birds the preceding week from the body weight of the birds the following week. Feed conversion ratio (FCR) was obtained by dividing the average feed intake per bird per week by the body weight gained per bird per week for each treatment. Protein efficiency ratio (PER) was determined by dividing the weight gained by the birds per week by the protein intake for that week, while cost of feed per kg live weight gain (in □) was obtained by dividing the total cost of feed consumed per bird by the total body weight gain per bird (kg).

Chemical Analysis

The cowpea milling waste and the experimental diets were analyzed for their proximate composition using the procedures of AOAC (1990).

Statistical Analysis

The data obtained from this research study was subjected to a one-way analysis of variance (ANOVA) based on the Completely Randomized Design (CRD) model using the SPSS Package (Statistical Package for the Social Sciences, Version 16.0, 2000). Where treatment means were significant, they were separated using the Least Square Difference based on the procedures of Steel and Torrie (1980).

RESULTS AND DISCUSSION

The proximate composition of the cowpea milling waste and the experimental diets are presented in Table 2. Cowpea milling waste (CMW) has a crude protein content of 20.30 % and an estimated metabolizable energy content of 3177 Kcal/kg, showing that it is a promising protein and energy source. The diets, containing 0, 20 and 40 % CMW had determined crude protein contents of 24.50, 24.38 and 24.15 % respectively (Table 2) and estimated metabolizable energy contents of 2952, 2955 and 2958 Kcal/kg respectively (Table 1) which satisfies the nutrient requirements of broiler chicken at the starter phase as recommended by Aduku (1993) and Olomu (2011) for the tropics. The growth performance and economic characteristics of broiler chicken fed diets containing varying levels of cowpea milling waste at the starter phase are shown in Table 3.There were no significant ($p>0.05$) differences in initial body weight, final body weight, total body weight gain, feed conversion ratio and protein efficiency ratio; only feed intake showed significant ($p<0.05$) differences across the dietary treatments. The increased feed intake recorded by birds fed diet containing 40 % CMW translated into a slightly higher weight gain by these birds showing a satisfactory utilization of the CMW by the birds. After all, boiled cowpea seeds have been used to replace meat meal in broilers when included at 11% in starter and at 14% in finisher diets. The broilers finished with cowpea seeds had a higher carcass yield (Defang *et al.*, 2008). In terms of economic characteristics, there were no significant ($p>0.05$) differences in cost/kg weight

gain among the dietary treatments, however, there was a cost saving of □11.20 over the Control Diet for every kg of feed compounded for Diet 3 (containing 40 % dietary inclusion level of CMW). This could go a long way in reducing the cost of production of poultry due to reduction in the cost of feed.

Conclusion

CMW can be included up to 40 % in the diet of broiler starter birds, as a valuable protein and energy source, with no detrimental effect on growth performance and economic characteristics.

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Table 1. Percentage composition of the experimental diets at the starter phase

Feed ingredients	T_1	T_2	T_3
Maize	49.00	35.00	21.00
Groundnut cake (GNC)	40.00	34.00	28.00
Cowpea milling waste (CMW)	0.00	20.00	40.00
Maize offal	2.00	2.00	2.00
Fishmeal	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00
Limestone	1.00	1.00	1.00
Palm oil	2.00	2.00	2.00
Salt	0.25	0.25	0.25
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
*Premix	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated composition			
Crude protein (%)	23.89	24.00	24.11

Metabolizable energy (Kcal/kg)	2952	2955	2958
Crude fibre (%)	3.08	3.70	4.27
Lysine (%)	0.92	1.25	1.32
Methionine (%)	0.32	0.35	0.38
Calcium (%)	1.73	2.39	2.32
Phosphorus (%)	0.92	0.96	1.01

*Each 2.5 kg of premix contains vitamin A = 12, 500,000 (IU), vitamin D_3 = 2, 500,000 (IU), vitamin E = 40,000 (mg), vitamin K = 2, 000 (mg), vitamin B_1 = 3,000 (mg), vitamin B_2 = 5,500 (mg), vitamin B_6 = 5,000 mg, vitamin B_{12} = 25 mg, Niacin = 55,000 mg, Calcium pantothenate = 11,500 mg, choline chloride = 500,000 mg, folic acid = 1,000 mg, biotin = 80 mg, manganese = 120,000 mg, iron =100,000 mg, zinc = 80,000 mg, copper = 8,500 mg, iodine = 1,500 mg, cobalt = 300 mg, selenium = 120,000 mg, anti-oxidant = 120,000 mg.
T_1 = 0 % cowpea milling waste; T_2 = 20 % cowpea milling waste; T_3 = 40 % cowpea milling waste

Table 2 Proximate composition of cowpea milling waste and the experimental diets

Parameters (%)	0 % CMW Diet 1	20 % CMW Diet 2	40 % CMW Diet 3	CMW
Dry matter	92.30	91.38	95.00	88.40
Crude protein	24.50	24.38	24.15	20.30
Crude fibre	3.35	3.60	3.55	6.00
Ether extract	7.40	7.90	7.50	9.50
Ash	9.65	8.70	8.30	5.00
Nitrogen free extracts	47.40	46.80	51.50	47.00

CMW = cowpea milling waste

Table 3. Growth performance and economic characteristics of broiler chicken fed diets containing varying levels of cowpea milling waste at the starter phase

Parametrers	0 % CMW	20 % CMW	40 % CMW	SEM	LS
Initial body weight(g)	70.00	76.67	70.00	1.47	NS
Final body weight (g)	506.67	486.67	583.33	23.58	NS
Total body weight gain(g)	436.67	410.00	513.33	24.21	NS
Feed intake /bird/day (g)	62.17^b	62.84^b	66.00^a	0.71	*
Feed intake/bird/week(g)	433.32^b	439.90^b	462.05^a	5.17	*
Feed conversion ratio	3.03	3.30	2.72	0.17	NS
Protein efficiency ratio	1.36	1.38	1.59	0.61	NS
Cost/kg (₦)	103.70	98.10	92.50	-	NS
Cost/kg weight gain (₦)	314.41	290.59	251.67	12.76	NS
Cost savings (₦)	-	5.60	11.20	-	-

CMW = cowpea milling waste SEM = Standard error of the mean, LS = Level of significance
NS = Not significant