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Digestibility of Cassava/Blood Meal Based-Diet and its Effect on Growth and Economics of Starter Broilers

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Abstract
This study determined the effect of dietary treatments on growth performance, digestibility coefficient, haematological and biochemical indices and economics of production of starter broilers. Four broiler starter diets were formulated with different inclusion levels of a mixture of cassava flour and abattoir blood code-named "cassablood". Diets 1, 2, 3 and 4 contained 0%, 15%, 25% and 35% cassablood respectively. One hundred and four 1-day old Anak broiler chicks were randomly assigned to the four dietary treatments (T_1 T_2 T_3 T_4). Each treatment was replicated 3 times in a completely randomized design (CRD). Parameters measured include growth indices, digestibility coefficient, and economics of production. The experiment lasted for 28 days. Treatment effects on final body weight, final weight gain, feed intake and feed conversion ratio were significant ($p<0.05$). Birds fed cassablood-based diets compared favourably with the control diet. 15% cassablood inclusion performed equally with the control diet in feed intake, body weight gain and feed conversion ratio. Starter broilers on cassablood based diets were better digested and produced significantly ($p<0.05$) higher economic gains than the control in terms of feed cost per kilogram of the broiler. Therefore, 15% cassablood dietary inclusion level was recommended in starter broiler diet for production and profit maximization.

Keywords: Cassablood, broilers, growth performance, digestibility coefficient, economics of production

Introduction

The future of the poultry industry in most developing countries will undoubtedly depend on the ability of the sector to survive stiff competition with humans for the available food supply. This perennial problem has necessitated the search for alternatives to the expensive grains and protein concentrates. The utilization of non-conventional feeds with acceptable nutritive value to either augment or replace the conventional feed ingredient like maize and fish meal has shown good results (Onu et al, 2011; Aniebo *et al*, 2016). The world cassava production in 2011 was estimated at about 250 million tonnes, 47% of which was produced in Africa and about 30% of Africans production comes from Nigeria (FAO, 2011). The abundance of cassava in southern Nigeria, attributable to high yielding varieties developed by research institutes in the country (FAO, 1988; IITA, 2017; Abdoulaye *et al*, 2014), has made it a very attractive feedstuff. Past research results had earlier confirmed the suitability of cassava for animal feeding including poultry and the potential of cassava meal as a feed substitute for maize had been reported (Aniebo, 2011; Bhuiyan and Iji, 2015). However, the improvement of its protein content has received very little attention while its dustiness in mash still persists. Cassava meal is composed almost entirely of carbohydrate with a metabolizable energy value of 2600 – 2844 Kcal/kg ME (Olomu, 2011) and contains 1-3% CP depending on cultivars (Stupak et al, 2006). Hence the need for fortification with abattoir blood which contains about 86% proteins (John Roth et al, 2011).

Blood is rich in protein, cheap and mostly free at slaughter houses and it is an important source of lysine. However, its regular and efficient use as a major animal protein source in poultry diet is hampered by its processing challenges, low palatability and digestibility probably caused by unavailability of special processing equipment in Nigeria.

This study is aimed at determining the digestibility of cassablood based diets and its effect on growth indices and economics of starter broiler production.

Materials and Methods

The experiment was carried out at the Poultry Research Unit of the Department of Animal Science Teaching and Research Farm, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, South Eastern Nigeria. Peeled, dried cassava (NR 01/0004) was milled with a hammer mill of 10 mm mesh size into floor

while fresh cattle blood was collected with clean plastic containers from Odumodu abattoir, Umunya in Oyi LGA, of Anambra State. The cassava flour was mixed with the cattle blood at a ratio of 1:2 respectively and sun-dried for four days to 90% dry matter. The dried crumbs (test ingredient) were ground to a meal with the same hammer mill and code-named "cassablood". Proximate analysis of the processed cassablood was carried out (AOAC, 2000) (Table 1). The metabolizable energy (Kcal/kg) of cassablood was estimated using Pauzenga (1985) formula: ME ~ 35xCP% + 81.8 x EE% + 35.5 x NFE. Four broiler starter diets were formulated with different inclusion levels of cassablood (Table 2). The control diet (T_1) contained 0% cassablood, while diets 2, 3 and 4 contained 15%, 25% and 35% cassablood, respectively.

Table 1. Proximate composition of cassablood

Nutrient composition	Percentage
Moisture	18.00
Crude protein	27.39
Crude fibre	4.00
Ether extract	0.50
Ash %	4.50

Table 2. Composition of cassablood-based broiler starter diets

Ingredient	T_1	T_2	T_3	T_4
Cassablood	-	15.0	25.0	35.0
Maize	48	37.0	35.0	30.0
Soya bean meal	24.0	20.0	14.0	12.0
Local fish meal	8.0	8.0	7.0	7.0
Wheat bran	15.0	15.0	14.0	11.0
Bone meal	3.5	3.5	3.5	3.5
Vitamin/mineral premix	0.6	0.6	0.6	0.6
Methionine	0.2	0.2	0.2	0.2
Lysine	0.2	0.2	0.2	0.2
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100
Crude protein (%)	23.55	23.27	23.27	23.21
M E (Kcal/kg)	2818.5	2813.4	2723.3	2736.16

Vitamins and Mineral premix provides per kilogram; Vitamin A. 4000000IU, Cholecaciferol 800000IU: Vitamin K_3. 76 mg: Vitamin B_2 2800mg: Vitamin B_6, 1520; Vitamin B_{12}, 7.6 mg: Nicotinic acid 1800 mg. Folic acid, 560 mg: Pantothenic acid 4400 mg: Choline chloride, 190000 mg: Biotin. 45.3 mg: Zinc, 16000 mg; Magnesium, 25600 mg: Iron 12800 mg Copper, 3200 mg: Selenium, 64 mg: Iodine, 320 mg:

One hundred and twenty, 1-day old Anak broiler chicks were procured from Zartech farms for the study. At 7 days of age, one hundred and four birds were randomly allocated to four diets comprising 26 birds per treatment. Each treatment group was further subdivided into two replicates of 13 birds each. The birds were distributed to eight experimental partitions measuring 94 cm x 440 cm (4.14 m^2) in a completely randomized design (CRD). Each of the birds was weighed using Ohaus digital balance and their weights were recorded as initial weights. Each treatment group was fed their respective starter diets with portable water supply *ad libitum* for a period of 21 days. Quantity of feed fed to each replicate in each experimental group was weighed every morning by 7am; left-over of the previous day was also weighed before a new feed was added in order to determine the daily feed intake. Birds in each experimental group were weighed on a weekly basis to determine the weight gain. All the experimental birds were subjected to the same management and housing condition. At the end of the 4th week, two birds were selected from each treatment group and put in metabolic cages for digestibility trial. Feaces were collected daily and dried. The difference between the weight of the feaces and weight of feed intake showed their digestibility coefficient. Data

collected were subjected to analysis of variance with SAS General Model (2002), and means were separated at P < 0.05 using New Duncan's Multiple Range Test (Obi, 2002).

Results and Discussion

The results of the experiment are presented in Tables 3-7. Treatment effects on final body weight, final weight gain, feed intake and feed conversion ratio (Table 3) were significantly ($p<0.05$) different. Birds fed cassablood-based diets compared favourably with the control diet. Birds fed diet T_1 (1.94 kg) and T_2 (1.92 kg) recorded significantly ($p<0.05$) higher feed intake when compared to those on T_3 (1.78 kg) and T_4 (1.74 kg).

Table 3; Effects of cassablood-based diets on the growth parameters of starter broilers

Measurement	T_1	T_2	T_3	T_4	SEM
Initial weight (kg)	0.18	0.16	0.17	0.17	0.01
Final weight (kg)	0.76[a]	0.69[a]	0.61[b]	0.54[b]	0.02
Bodyweight gain (kg)	0.58[a]	0.53[a]	0.44[b]	0.37[c]	0.02
Feed intake (kg)	1.94[a]	1.92[a]	1.78[b]	1.74[b]	0.06
Feed conversion ratio	1.25[b]	1.32[b]	1.35[a]	1.41[a]	0.13

SEM; abc, means with different superscripts on the same row are significantly different ($p > 0.05$)

Final body weight, final weight gain and feed conversion ratio also followed similar trend. The similar performance of 15% cassablood inclusion performed with the control diet in feed intake, body weight gain and feed conversion ratio agrees with the findings of Aniebo (2016) that 20% inclusion level of cassablood in finisher broilers diet compared favourably with control diet. It goes to affirm that young and adult broilers could handle a range of 15% and 20% cassablood respectively in their diets. Digestibility coefficient (Table 4) of all treatment groups showed significant differences ($p< 0.05$). Digestibility coefficient increased with increase in inclusion levels of the test ingredient. It could be that the mixture of abattoir blood and cassava enhanced the quality and feed value of the new product as digestibility is the percentage of intake of nitrogen that is absorbed (Olomu, 2011)

Table 4. Digestibility coefficient of cassablood-based diets fed starter broilers.

Parameter	T_1	T_2	T_3	T_4	SEM
Total feed intake (g)	2680[a]	2700[b]	2150[c]	1625[d]	4.71
Total feaces (g)	1725[a]	1615[b]	1175[c]	820[d]	6.54
Feed intake – feaces (g)	955[c]	1085[a]	975[b]	805[d]	5.23
Digestibility coefficient (%)	35.63[d]	40.19[c]	45.35[b]	49.54[a]	3.24

[abcd] means within the same row with different superscript are significantly different ($p<0.05$)

Result of economic analysis of cassablood-based diets fed starter broilers is presented in Table 5. Starter broilers on cassablood based diets produced significantly ($p<0.05$) higher economic gains than the control in terms of feed cost per kilogram of broiler. To be profitable, poultry farming must produce for a market in good conditions of quality and price (Say, 1987). Therefore, 15% cassablood dietary inclusion level is recommended in starter broiler diet for quality production and profit maximization.

Table 5. Economic analysis of cassablood-based starter broiler diets.

Parameter	T_1	T_2	T_3	T_4	SEM
Cost of starter diet, N/kg	97.00[a]	94.91[b]	81.22[c]	77.53[d]	2.34
Feed intake, kg/bird	1.94[a]	1.92[a]	1.78[b]	1.74[b]	0.15
Body weight, kg/bird	0.76[a]	0.69[a]	0.61[b]	0.54[b]	0.11
Cost of feed, N/bird	73.72[a]	65.49[b]	49.54[c]	41.87[d]	3.34
Cost of feed, N/kg body wt	141.5[a]	125.7[b]	88.2[c]	72.9[d]	2.21
Feed cost N /ton	97,000[a]	94,910[b]	81,220[c]	77,530[d]	2.34

[abcd] means within the same row with different superscript are significantly different ($p<0.05$)

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