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Bioeconomic Indices of Broiler Chicks Fed Varying Ratios of Cassava Peel/Bovine Blood

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Abstract: An experiment was conducted to evaluate the performance of early growing broilers (2-6 weeks old) fed diets in which cassava peel/bovine blood mixed at varying ratios replaced 50 percent of the soyabean meal in the control Diet. One hundred and twenty broiler chicks were randomly allotted to six treatments replicated twice in a completely randomized design. Diet 1 served as the control, while Diets 2, 3, 4, 5 and 6 had cassava peel/bovine blood mixed in the ratios of 1:1; 1:2; 1:3; 2:1; and 3:1; respectively. The feeding trial lasted for 28 days. Results showed that the effect of treatments on Average Daily Feed Intake (ADFI) was significant ($P<0.05$). Birds on the test diets had significantly higher intake than the control group. Treatment effect on Average Final Body Wt (g), Average Daily Body Wt Gain (g) and Feed Conversion Ratio were not significant ($P>0.05$). Economic analysis showed that feed cost per bird was lower in the cassava/bovine blood based groups. Revenue from these groups were also higher than in the control. Benefit from birds on Diet 4 (1:3 ratio of cassava peel/bovine blood) was highest-₦ 495.62 as against ₦ 385.23; ₦ 413.28; ₦ 459.95; ₦ 462.43 and ₦ 445.32 for birds on the control, Diets 1, 2, 3, 5 and 6 respectively. It was concluded that feeding early growing broilers cassava peel/bovine blood can effectively replace 50 percent of soyabean meal in the control without any adverse effect on the performance of the birds, while cassava peel/bovine blood at the 1: 3 rate gave the highest economic return.

Key words: Broilers, cassava peel, bovine blood

Introduction

A serious competition exists between the feed industry and other channels in the food chain (especially man) over conventional feed ingredients such as Maize and Soyabean. This had resulted in the high cost and scarcity of these conventional feedstuffs. Poultry feed producers are thus faced with the task of finding alternative feedstuffs that will not compromise quality. The search of such alternatives has exercised Animal Nutritionists in Nigeria for over a decade (Onyimonyi and Okeke, 2005; Onyimonyi and Onukwufor, 2003; Onyimonyi and Okeke, 2002; Tuleun *et al*., 2005; Oke *et al*., 2005).

Such alternative feedstuffs as cassava peel and bovine blood (by products of garri processing and abattoir respectively) do not have any direct food requirement by man. They are waste and even constitute nuisance in waste disposal of these industries. There is evidence in literature that cassava peel and blood meal could be utilized to a great extent in the feeding of pigs and poultry (Ewane, 1996). Cassava peel constitute about 8-15 percent of the whole root. Research results indicate that cassava peel if properly processed can constitute up to 40 percent of the diets of rabbits (Omole and Sonaiya, 1981). Onyimonyi and Okeke (2005) reported that 20 percent of the maize content of the diets of grower pigs can be replaced by cassava peelmeal without any deleterious effect on the carcass, organ and pathological characteristics. Bovine blood meal is very high in protein containing about 80 percent crude protein (Ewane, 1996). It's protein is the richest natural source of lysine (Odukwe and Njoku, 1987). Earlier reports indicated that 1.5 percent bloodmeal supplementation is better than a synthetic lysine-methionine mixture (Njoku, 1985). Obioha (1992) reported that an upper limit of bloodmeal inclusion in monogastric animals rations should not exceed 5 percent of the total.

It is in view of these inherent potentials of cassava peel and bovine blood that the present study was designed with the following objectives:

1) To determine the best ratio at which cassava peel/bovine blood could be incorporated in the diets of broiler starters.
2) To determine the economic benefit of feeding cassava peel/bovine blood to broiler starters.

Materials and Methods

Location and duration of study: This experiment was conducted at the Poultry Research Unit of the Department of Animal science, University of Nigeria, Nsukka. The study lasted for six weeks.

Experimental birds and management: A total of one hundred and twenty unsexed day old chicks of the Anak strain were used for the experiment. The birds were randomly selected from a population of one hundred and fifty day old chicks purchased from a Distributor in

Table 1: Percentage Composition of the Experimental Diets

	Dietary levels					
Ingredients	Control	C_1B_1	C_1B_2	C_1B_3	C_2B_1	C_3B_1
Maize	31.10	31.20	31.20	31.20	31.20	31.20
Wheat offal	15.60	15.60	15.60	15.60	15.60	15.60
Palm kernel cake	5.30	5.30	5.30	5.30	5.30	5.30
Soyabean meal	36.80	18.40	18.40	18.40	18.40	18.40
Cassava peel	-	9.20	6.10	4.60	12.30	13.80
Blood meal	-	9.20	12.30	13.30	6.10	4.60
Fish waste	4.10	4.10	4.10	4.10	4.10	4.10
Bone meal	4.10	4.10	4.10	4.10	4.10	4.10
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
NaCl	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin mineral premix (a)	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00

(a) Provided per kg of feed: Vit A, 15, 000, iu; Vit D3, 3,000,000 iu, Vit.E, 30,000; Vit.K; 2,5000mg; Thiamin, 2000mg; Riboflavin, 6000mg; Pyridoxine, 4000mg; Niacin, 40, 000mg; Pantothenic acid, 10,000mg; Folic acid 1,000mg; Biotin, 80mg; Choline Chloride, 500mg; Antioxidant, 125mg, Manganese, 9mg; Zinc, 60mg; Iron, 24mg; Copper, 6g; Iodine, 1-4g; Selenium, 240mg; Cobalt 240mg

Nsukka town and brooded together under deep litter for two weeks. Feed and water were given *ad libitum*. Strict veterinary care and vaccination schedules typical of the birds were routinely adhered to.

Collection and processing of test feeding stuffs: Cassava peels were collected from garri processing plants in Nsukka town. The peels were put in jute sacks and left to ferment for four days after which they were sun dried. The peels were latter crushed in a hammer mill fitted with a 2mm screen.

Bovine blood: Fresh bovine blood was collected from the central abattoir in Nsukka town.

Mixing of cassava peel/bovine blood: The fresh blood was weighed according to the desired ratio and poured into a cooking pan. The appropriate quantity of cassava peel was weighed and mixed with the blood to form a homogenous mixture. The mixture was then heated over fire in an aluminum pan for 30 minutes with constant turning. The heating temperature ranged between 75 and 85°C. The heated mixture was subsequently allowed to cool before sun-drying.

Experimental diets: Six broiler starter rations were formulated using the varying ratios of heated cassava peel/bovine blood. Diet one served as control. Diets 2-6 had cassava peel and blood meal mixed at the following ratios.

Diet 2: 1 part of cassava peel to 1 part of blood meal (C_1B_1).
Diet 3: 1 part of cassava peel to 2 parts of blood meal (C_1B_2).
Diet 4: 1 part of cassava peel to 3 parts of blood meal (C_1B_3).
Diet 5: 2 parts of cassava peel to 1 part of blood meal (C_2B_1).
Diet 6: 3 parts of cassava peel to 1 part of blood meal (C_3B_1).

The varying mixtures were used to replace 50 percent of soyabean in the control diet (Table 1).

Experimental procedure: The one hundred and twenty birds were randomly assigned to six dietary treatments. There were twenty birds per treatment. Each treatment was replicated twice with 10 birds per replicate. Each replication was housed on a separate deep litter pen measuring 1m×2m.

Experimental design: The experimental design used was a completely randomized design with the model

$Y = \mu + T_j + \sum e_{ij}$
Where Y_{ij} = J^{th} measurement on the i^{th} treatment
μ = Overall mean
T_j = Effect of the i^{th} treatment
$\sum e_{ij}$ = Random error

Significantly different means were separated using the method of Duncan (1955).
A simple Linear regression was fitted against body weight on age to get the growth equation Y = a+bx

Chemical analysis: The proximate composition of the test feeding stuffs; cassava peel and blood meal were determined by the methods of AOAC (1990).

Results and Discussion

Table 2 shows the proximate composition of the test feeding stuffs and the experimental diets. The crude protein of the experimental diets increased from 24.31 to

Table 2: Proximate Composition of the Test Feeding Stuffs and Diets

	Dietary Treatment							
Parameters	Cassava peel	Blood meal (heated)	Control	C_1B_1	C_1B_2	C_1B_3	C_2B_1	C_3B_1
Crude Protein (%)	4.5	81.0	24.77	24.31	26.75	27.89	22.04	20.9
Crude fibre (%)	7.0	0.0	4.15	3.87	3.65	3.55	4.09	4.19
Ether Extract (%)	2.0	2.0	3.80	3.49	3.53	3.55	3.44	3.42
Ash (%)	5.0	12.6	4.33	4.71	4.83	4.93	4.39	4.29
Nitrogen Free Extract (%)	81.5	4.4	63.05	63.62	61.00	60.08	66.04	67.20

Table 3: Performance of Broiler Chicks fed Varying Ratios of Cassava Peel/Bovine Blood Meal

	Dietary Treatments						
Parameters	Control	C_1B_1	C_1B_2	C_1B_3	C_2B_1	C_3B_1	SEM
Average Initial Body wt (g)	400	405	400	395	400	400	0.003
Av. Final Body wt (g)	1480	1515	1614	1690	1620	1580	0.040
Av. Daily Body wt Gain (g)	36.4	39.6	43.4	43.4	43.57	42.2	0.010
Av. Daily Feed Intake (g)	61.1[a]	73.4[b]	72.2[b]	74[b].8	77.9[b]	77.1[b]	0.070
Feed Conversion Ratio	1.68	1.82	1.76	1.72	1.79	1.82	0.060

[ab]Rows means with different superscript are significantly different (P<0.05)

Table 4: Result of regression analysis of response of body weight on age of broiler starters fed varying ratios of Cassava Peel/Bovine Blood

Dietary treatments	Growth equation	R^2	SEM
1. Control	Y =0.7108 + 0.3804x	0.998	0.098
2. C_1B_1	Y =0.7733 + 0.3965x	0.996	0.019
3. C_1B_2	Y =0.8774 + 0.4192x	0.998	0.069
4. C_1B_3	Y =0.8250 + 0.4143x	0.992	0.087
5. C_2B_1	Y =0.8495 + 0.4185x	0.990	0.056
6. C_3B_1	Y =0.8877 + 0.4311x	0.997	0.031

27.89 as the ratio of bloodmeal in the experimental diets increased and decreased from 22.04 to 20.9 as the ratio of cassava peel in the diets was increased. This trend is understandable since the crude protein of bloodmeal is high (81%). It follows that increasing the proportion of bloodmeal in the diet will results in an increase in the crude protein of the composite diet.

The crude fibre component decreased as the bloodmeal fraction increased (from 3.87 in diet 2 to 3.53 in diet 4). However when the proportion of cassava peel increased, the crude fibre fraction increased from 4.09 in diet 5 to 4.19 in diet 6: The Ether Extract fraction showed no particular trend whereas the Ash component followed a similar trend as the Crude Protein component.

Results in Table 3 showed that the effect of treatments on Average Daily Feed Intake (ADFI) was significant (P<0.05). The birds on the experimental diets (Diets 2 to 6) differed from the birds on the control diet in their ADFI (P<0.05). Control birds had an ADFI of 61.1g which differed from 73.4, 72.2, 74.8, 77.9, 77.1 recorded for birds on Diets 2, 3, 4, 5 and 6 respectively. Birds on Diet 5 and 6 with increased proportion of cassava peel had higher feed intake. It would appear that the binding effect of bovine blood on the cassava Peel reduced the fluffy or powdery constitution of the feed and its attendant respiratory problem thereby causing improvement in feed intake. This view agrees with the earlier observations of Ewane (1996) that feed intake of pigs fed CABLO were significantly different (P<0.05) from those of the control pigs.

The effect of treatments on Average Final Body weight; Average Daily Body weight Gain and Feed Conversion Ratio were not significant (P>0.05).

In this study the experimental diets were prepared by heating a mixture of cassava peel meal and bovine blood. As earlier stated the coagulation of blood had a binding effect on the cassava peel meal thereby producing a combination that was less powdery, denser and having a better nutritional profile. This suggests that the experimental diets sufficiently satisfied the nutrient requirements of the broilers. Thus, it supported the growth of the broilers as the control diet. The regression of body weight of the birds against age, gave the growth equation on Table 4 which further supports this fact. This is evidenced from the high R^2 value and the small standard error of mean.

However, as shown in Table 5 the feed cost/bird was lower in the cassava peel/bovine blood based diets than in the control. Similarly revenue from cassava peel/bovine blood based diets was higher than the control. It follows that feeding broiler chicks diets based on cassava/bovine bloodmeal improved cost savings. Cassava peel and bovine blood are cheaper feedstuffs than soyabean meal. This explains the reduction in cost and the high revenue from the birds on the cassava/bovine blood diets. Ewane (1996) observed that cassava peel mixed with appropriate high protein feedstuffs produces cheaper feedstuffs than when cereal alone was used. The results show that the benefit accruing from feeding broiler chicks cassava peel/bovine blood at a 1:3 ratio (Diet 4) was highest-N495.62 This benefit will definitely results to more income coming to a farmer who adopts this ratio of cassava peel/bovine blood in feeding starting broilers.

Table 5: The Effect of Feeding Cassava Peel/Bovine Blood Meal at Varying Ratios on Economic Parameters of Broiler Starters

	Dietary Treatment					
Parameter	Control	C_1B_1	C_1B_2	C_1B_3	C_2B_1	C_3B_1
Av. Final Body wt (g)	1480	1515	1614	1690	1920	1580
Cost of Day Old Chicks (₦)	150	150	150	150	150	150
Feed Cost/Bird (₦)[1]	175.17	163.92	164.75	165.58	165.17	163.08
Cost of Production/Bird (₦)[2]	325.17	313.92	314.75	315.58	315.17	313.08
Revenue (₦/bird)[3]	710.40	727.20	774.72	811.20	777.60	758.40
Benefit (₦/bird)[4]	385.23	413.28	459.97	495.62	462.43	445.32
Differences (₦/bird)[5]	-	28.05	74.74	110.39	77.2	60.09

[1]Computed from the total amount of feed eaten/bird multiplied by feed cost/kg, [2]Feed cost plus cost of day-old-chicks (other costs are assumed constant), [3]Cost of 1kg of life chicken (N480) multiplied by final body weight, [4]Revenue minus cost of production, [5]Benefit of experimental birds minus benefit of control

For example a farmer with a production size of 1000 birds will be saving N 110, 310 using Diet 4 as against using the control Diet.

Conclusion: It is concluded that feeding starting broilers cassava peel/bovine blood at the various ratios supported effective growth of the broilers. However, from the analysis of economic benefits of these combination, it is evident that 1:3 ratio gave optimum economic returns.

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