J. Vet. Anim. Sci. (2012), Vol. 2: 95-100

Performance and Hematological Parameters of Broilers Fed Graded Levels of A Mixture of Sun-Dried Cassava Tuber Meal, Brewers' Dried Grain and Palm Oil as a Substitute for Maize

U. Okpanachi, A. A. Musa and K.E. Idachaba

Department of Animal Production, Kogi State University, Anyigba, Nigeria

ABSTRACT

The present study was conducted to evaluate the growth performance and hematological parameters of broilers fed graded levels of a mixture (mix) of sun-dried cassava tuber meal, brewers dried grains and palm oil as a substitute for maize. The sun-dried cassava tuber meal, brewers' dried grains, and palm oil were mixed in a ratio of 60%, 35% and 5% respectively. Day old unsexed broilers (Anak strain, n = 120) were randomly divided into four dietary groups (T_1, T_2, T_3, and T_4) of 30 broiler birds per treatment in a complete randomized block design with 3 replicates for each treatment. The T_1 contained 0% CBP-mix +45% maize, T_2 15% CBP-mix +30% maize, T_3 30% CBP-mix +15% maize and T_4 45% CBP-mix +0% maize. The experiment lasted for 63 days. Results revealed that daily weight gain was significant ($p<0.01$) at both the starter and finisher phase. Daily feed intake, FCR and feed cost per Kg feed were significant ($p<0.05$) at the starter phase. There was no significant differences ($p>0.05$) in the hematological parameters measured at both starter and finisher phases of the study. It was concluded that 30% CBP-mix can be included in the diet of broilers at both phases without adverse effect on performance and hematological parameters of the birds.

Key words: Sun-dried cassava tuber meal, brewers dried grains, palm oil, maize, broilers.

INTRODUCTION

Animal production in the tropics is adversely affected by high cost of feed and inadequate feed supply (Raviundran et al., 1982), and this feed contributes to the total cost of production. Madubuike and Ekenyem (2001) mentioned broiler production as the quickest ways of rapid protein supply in a short run. This is because it has a shorter market cycle and is much faster in growth than other non-ruminant livestock. Esonu (2000) also mentioned that one of the most important factors militating against increased commercial poultry production in Nigeria is the high cost of conventional feedstuffs. The problem is attributed to competition between livestock and man for grains. For example, maize is a major feedstuff and it is in high demand for consumption by both humans and livestock. The competition and adequate supply have invariably led to their constant increasing market price. The high cost of maize and Soya beans is a major contributor for increase in the cost of poultry production. This has made many farmers to reduce their flock or completely shift to other business with lesser financial involvement (Esonu, 2000).

Fetuga et al. (1975) reported that a major factor militating against the rapid development of the livestock industry in Nigeria is the lack of adequate supplies of the feedstuff at economic prices. The implication is that animal protein intake among the populace is reduced. It therefore,

Corresponding Author:
mailraheem2003@yahoo.com

becomes imperative to look for alternatives that may be cheaper than maize, readily available and easy to digest and utilize by poultry for productive purposes. The use of non-conventional feed material is one of the ways to reduce the cost of finished feeds (Apata, 1994). One of such feed material is a mixture of sun- dried cassava tuber meal, Brewers' dried grains (burukutu waste) and palm oil, (CBP-mix). Enyenihi et al. (2008) described the sundried cassava tuber meal as a good source of carbohydrate, and brewer dried grains to be rich in protein, while palm oil as a stabilizer with high energy source. Furthermore, Udedibie et al. (2008) also stated no side effects and mortality occurred from the consumption of CBP–mix in a ratio of 60%, 30% and 10% respectively. The study, therefore, aimed at evaluating the growth performance and hematological parameters of broilers fed graded levels of CBP-mix.

MATERIALS AND METHODS

Experimental Location and Diets

The experiment was carried out at the Poultry units of the Kogi State University Livestock Teaching and Research Farm of the Department of Animal Production, Anyigba, Nigeria. The sun-dried cassava tuber meal, brewers' dried grains and palm oil were mixed in a ratio of 60%, 35% and 5%, respectively. Day old unsexed broilers (Anak strain; n = 120) were randomly distributed into four dietary groups (T_1, T_2, T_3, and T_4), each containing 30 broilers per treatment in a complete randomized block design with 3 replicates for each treatment. Feed and water were given ad-libitum. Four iso-nitrogenous diets were formulated with CBP–mixture replacing maize at 0, 15, 30, and 45% levels of inclusion at both starter and finisher diets. Treatments were as follows:

T_1 = 0% CBP-mix +45% maize,
T_2 = 15% CBP-mix +30% maize
T_3 = 30% CBP-mix +15% maize
T_4 = 45% CBP-mix +0% maize.

The experimental diets are as shown in Tables 1 for both starter and finisher phases.

Data Collection

At the beginning of the experiment, the broiler chicks were weighed and subsequently on a weekly basis. The initial live weights were subtracted from the final live weight to determine the weight gain of the bird. Feed offered to the birds were weighed weekly and left over were also weighed to determine the feed intake of the birds. The whole study lasted 63 days.

Hematological analysis

At the end of the feeding trial, blood samples were collected labelled EDTA coated test tubes from 2 birds per replicate via the wing veins of chickens. The collected samples were taken immediately to the laboratory for hematological analysis. The blood was analyzed for red blood cell count (RBC), Hemoglobin concentration (Hb), packed cell volume (PCV), white blood cell count (WBC) and white cell differential count by following the methodology described by Barker and Silverton (1985), while the mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC), RBC, Hb and PCV were analyzed according to the procedure of Hameaning (1992).

Statistical Analysis

Data collected were subjected to a one way analysis of variance in a completely randomized design (CRD) and LSD was used to separate the means. The whole analysis was done by using SPSS package – version 15. The significance level was predetermined at less than 0.05 ($p < 0.05$)

RESULTS

The proximate composition of the four experimental diets (both starter and finisher phase) is shown in Table 2. The crude protein values and fat contents did not show any marked difference between diets. Diet T_3 had slightly lower value at both the starter and finisher phase. The diet with 30% level of CBP-mix had the highest value of NFE compared to other diets. Thirty percent inclusion of CBP-mix had the highest crude fiber and ash; and lower maize content at the finisher phase. T_4 had the highest level of crude fiber at the starter phase due to the high level of inclusion of CBP-mix.

Performance characteristics of broilers at starter and finisher phases are shown in Tables 3 and 4, respectively. There were significant differences ($p < 0.05$) in the daily weight gain across the treatment groups at both starter and finisher phase while daily feed intake was only significant ($p < 0.05$) at the starter phase. There was no significant difference ($p > 0.05$) in the feed cost per kg at both phases of the study. The hematological parameters measured at week 4 and 9 are shown in Tables 5 and 6, respectively. There was no significant difference ($p > 0.05$) in all the hematological parameters measured at both phases of the experiments.

Table 1 Composition of the Experimental Diets

Ingredients	Starter phase				Finisher phase			
(%)	T1	T2	T3	T4	T1	T2	T3	T4
CBP – mix	0.00	15.00	30.00	45.00	0.00	15.00	30.00	45.00
Maize	45.00	30.00	15.00	0.00	45.00	30.00	15.00	0.00
GNC	36.80	37.28	36.41	36.38	27.68	28.02	28.02	27.11
Maize Offal	11.46	10.97	11.84	11.87	21.07	20.73	20.73	21.64
Fish meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Bone meal	3.50	3.50	3.50	3.50	3.00	3.00	3.00	3.00
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	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	100.00	100.00
Calculated analysis								
ME (Kcal/ Kg)	2787.88	2688.53	2610.35	2521.18	2824.68	273.58	2645.33	2558.35
Protein	23.00	23.23	23.00	23.00	20.00	20.00	20.00	20.00
Calcium	1.312	1.35	1.38	1.42	1.33	1.39	1.39	1.43
Phosphorus	1.22	1.05	1.03	1.01	1.01	0.98	0.98	0.96

Table 2 Composition for Experimental Diets by Proximate analysis

Nutrients	Starter phase					Finisher phase			
(%)	T1	T2	T3	T4	Test diet	T1	T2	T3	T4
CP	15.48	17.34	12.55	13.68	5.95	11.79	13.05	7.65	10.98
CF	9.40	10.70	10.80	11.50	8.39	9.78	8.78	10.02	9.33
EE	5.20	4.89	5.00	4.90	6.19	4.56	4.19	4.37	3.96
ASH	7.12	5.89	7.50	6.84	5.52	6.11	4.87	6.40	5.83
NFE	65.50	70.04	71.56	70.20	73.95	67.76	72.11	71.56	71.10
DM	91.04	93.88	92.57	95.40	92.22	91.66	94.88	93.56	94.57

DM= dry matter, CP=crude protein, CF=crude fiber, EE= ether extract, NFE= nitrogen free extract

Table 3 Performance of broilers birds fed graded levels of CBP-mix (0-4weeks)

Parameter	Treatment				Probability
	T1	T2	T3	T4	
Initial body weight (g)	80.0±0.0	80.0±0.0	80.0±0.0	80.0±0.0	NS
Final body weight (g)	750±17.3[a]	655±29.6[b]	656.7±19.6[b]	550±11.6[c]	**
Total weight gain (g)	670±17.3[a]	566.7±29.6[b]	566.7±17.0[b]	470±11.5[c]	**
Daily weight gain (g)	11.9±0.3[a]	10.3±0.5[b]	10.3±0.3[b]	8.4±0.2[c]	**
Total feed intake (g)	752.9±39.2[a]	703.9±11.2[b]	679.6±10.0[b]	666.0±41.2[b]	*
Daily feed intake (g)	26.89±0.70[a]	25.14±0.19[b]	24.3±0.2[b]	23.68±0.7[b]	*
F C R	2.25±0.09[a]	2.45±0.12[a]	2.4±0.1[a]	2.83±0.2[b]	*
Feed cost/kg gain (₦)	213.14±1.76	223.57±10.63	204.0±6.3	227.26±12.4	NS

[a,b,c,d]Treatment means with different superscript in a same row differ significantly (p< 0.05 ** = highly significance (P< 0.01); *= significant (P< 0.05). NS= Not Significant

Table 4 Performance and bio-economics of broilers fed graded levels of CBP-mix (4-9weeks)

Parameters	**Treatment**				Probability
	T1	**T2**	**T3**	**T4**	
Initial body weight (g)	655.5±1.10	655.1±1.12	655.3±1.21	655.0±1.11	NS
Final body weight (g)	2510±70.00	2420±75.72	2366±70.82	1870±62.43	N.S
Total weight gain (g)	1854±47.26[a]	1764±46.19[a]	1710±10.00[a]	1215±37.56[b]	**
Daily weight gain (g)	134.81±0.87[a]	129.63±0.83[b]	119.05±0.18[c]	119.16±0.67[c]	**
Total feed intake (g)	3774.81±138.06	3629.64±129.64	3333.3±88.2	3336.5±143.9	N.S
Daily feed intake (g)	67.41±2.47	64.82±2.32	59.52±1.58	59.58±2.57	N.S
F C R	2.03±0.20	2.06±0.14	2.01±0.92	2.65±0.34	N.S
Feed cost/kg gain (₦)	254.24±17.75	239.09±11.85	220.67±7.4	249.15±9.39	N.S

[a,b,c,d]Treatment means with different superscript on the same row differ significantly (P< 0.05). ** = highly significance (P< 0.01); *= significant (P< 0.05). N.S= Not Significant

Table 5 Hematology profile of broilers fed graded levels of CBP-mix at week 4

Parameters	**Treatment**				Probability
	T1	**T2**	**T3**	**T4**	
PCV	39.26±0.94	35.55±4.57	33.39±1.57	39.51±1.23	N.S
RBC	6.94±0.57	5.17±2.19	6.44±0.52	6.21±1.77	N.S
WBC	8.64±1.77	5.23±0.87	4.48±0.57	6.90±0.97	N.S
Hb	192.00±22.74	174.67±37.16	103.00±3.51	167.33±21.79	N.S
MCV	99.33±6.06	83.67±8.17	88.33±12.98	112.67±11.85	N.S
MCH	306.80± 90.05	333.67±34.52	162.50± 14.98	288.77±67.75	N.S
MCHC	492.17±68.55	479.17±50.69	330.27±20.99	420.97±43.11	N.S

RBC= red blood cell count; Hb= Hemoglobin concentration; PCV= packed cell volume; WBC= white blood cell count; MCV= mean corpuscular volume; MCH= mean corpuscular hemoglobin; MCHC= mean corpuscular hemoglobin concentration; N.S = Not significant

Table 6 Hematology profile of broilers fed graded levels of CBP-mix at week 9

Parameters	Treatment				-
	T1	T2	T3	T4	Probability
PCV	39.26±0.94	35.94±4.79	33.25±1.53	39.20±1.25	N.S
RBC	6.93±1.17	5.16±0.88	6.44±0.57	6.21±0.94	N.S
WBC	8.62±0.56	5.23±2.20	4.47±0.56	6.90±1.76	N.S
Hb	191.00 ±23.30	174.67±37.16	103.33±3.38	167.33±21.79	N.S
MCV	72.00±32.19	87.00±12.01	88.67±12.91	112.00±11.37	N.S
MCH	306.77±90.55	333.70±34.50	162.43±14.93	288.70±67.75	N.S
MCHC	492.17±68.55	479.13±50.67	310.93±26.22	420.97±43.14	N.S

RBC= red blood cell count; Hb= Hemoglobin concentration; PCV= packed cell volume; WBC= white blood cell count; MCV= mean corpuscular volume; MCH= mean corpuscular hemoglobin; MCHC= mean corpuscular hemoglobin concentration; N.S = Not significant

DISCUSSION

The crude protein of the test diet obtained in this study was 5.95% that was lower than the 10% CP as reported by Udedibie and Enang (2009). The difference might be due to the proportion of CBP-mix (60:35:5) used in this study was different from the 60:30:10 used by Udedibie and Enang (2009). Daily feed intake showed significant differences ($p< 0.05$) among treatment means at the starter phase, with T_1 having the highest feed intake value and T_4, the lowest. These results contradicted with the findings of Udedibie and Enang (2009) who reported that feed intake was higher in diets containing CBP-mix. These differences might be due to the lower proportion of palm oil inclusion in CBP-mix used in this study, ingredients used, season during which the experiment was conducted and method of preparation. However, this was in line with the findings of Oluyemi and Roberts (1979) who reported that the feed intake of broilers at starter phase could adversely be affected due to high fiber contents in diet. Feed intake did not show significant ($p > 0.05$) difference among treatments at the finisher phase. This was in accordance with the findings of Udedibie and Enang (2009). Daily weight gain at the starter phase showed significant difference ($P< 0.05$) among treatment means, with T_1 having a total weight gain of 750g and T_4 with 550g. Daily weight gain at the finisher phase showed no significant difference among treatment means. This agreed with the study of Udedibie and Enang (2009). The result on feed conversion ratio at the starter phase was in line with that of Udedibie and Enang (2009) where the feed conversion ratio was significant at the starter phase but not significant at the finisher phase.

The results of the hematological parameters showed that there was no significant difference for all the parameters measured. Values of PCV, Hb, MCH, WBC, RBC, MCV, and MCH in this study were similar to the values earlier reported by Abimbola (2007) for broilers. The results obtained are also in line with the findings of Lucas and Jamroz (1961).

It was concluded that 30%CBP-mix can be included in the diet of broilers at both phases without any adverse effect on the growth performance and hematological parameters of the birds.

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