Effect of Feeding Fortified Composite Cassava Stump Meal-based Diets on Haematology and Serum Biochemical Indices in Broiler Chickens

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Abstract

This trial was designed to study the effects of Fortified composite cassava stump meal (FCCSM) as energy source in the diets of broiler chickens diets using haematology and biochemical indices as response criteria. Five diets were formulated in which FCCSM was added at 0. 5. 10, 15 and 20% and designated diets I, II, III, IV and V, respectively. 150 broiler chicks (Abor-Acre breed) were assigned to 5 treatments of 3 replicates with 10 chicks per replicate in a Completely Randomized Design. Feed and water were offered to the chicks from 1 – 49 days. At the end of the trial, 2 birds per replicate were slaughtered and their blood collected for haematology and biochemical indices studies. All data collected were subjected to analysis of variance. Results showed that highest Erythrocyte sedimentation rates (5.67mm/hr) and lowest Erythrocyte sedimentation rates (3.00mm/hr) were recorded in birds fed diets I and V, respectively. Highest packed cell volume (30.00%), highest haemoglobin concentration (9.98g/100ml) were recorded in bird fed diet V while lowest packed cell volume (23.50%), lowest haemoglobin concentration (7.83g/100ml) were recorded in bird fed diet I. Highest total protein (5.53g/dl) was observed in bird fed diet V, while lowest total protein (4.25g/dl) was recorded in bird fed diet. Generally, there was no deleterious effect of the treatments on the haematological and biochemical indices of the broiler chickens. Consequently, it was recommended that FCCSM could be included up to 20% in the diets for broiler-chickens.

Keywords: Fortified, cassava stump, cassava leaf, hematology and serum

Introduction

In many developing countries, most of the cereal that is grown is for human consumption, and hopefully, surpluses are used for animal feeding. However, the reality is that whatever is available is competed for by humans and livestock for food and feed, respectively. This competition raises the cost of poultry production. It is, therefore, imperative to find local agricultural residues and by-products to use as alternative feed ingredients in poultry production and these by-products should be cheap, readily available and not be detrimental to the birds' health and productivity (Teguia and Beynen 2004). Many studies investigating the effects of various feed on the haematology and serum biochemistry of livestock concluded that feed ingredients including alternative sources affect the physiology of animal. The blood contains several metabolites which provide useful information on nutritional status and clinical investigation on an individual. Thus, the use of blood parameters for medical and nutritional assessments has been recommended (Egbunike *et al*., 2009, Adeyemo and Sani, 2013).

Materials and Methods

The experiment was carried out at the Poultry Unit of Teaching and Research Farm (T&RF), Federal University of Technology, Akure Nigeria. Cassava stumps were collected, crushed and subjected to heat treatment by frying. The cassava leaves were obtained in large quantities and air-dried. The cassava

stumps and cassava leaves were milled separately. The cassava leaf meal and cassava stump meal were mixed together in ratio 1: 9 (1kg cassava leaf meal meal+ 9kg cassava stump meal) to produce the fortified cassava stump meal. Five experimental diets were produced in such a way that the fortified cassava stump meal was used as one of the feed ingredients at 0, 5, 10, 15 and 20% and each diet was designated Diets I, II, III, IV and V, respectively. The diets were thoroughly mixed. The same procedure was followed for the finisher phase. The gross composition of the starter and finisher diets are as presented in Tables 1 and 2, respectively.

Table 1: Gross Composition of broiler chicken Experimental Diet (g/100g) (Starter)

INGREDIENTS	DIET I	DIET II	DIET III	DIET IV	DIET V
Maize	54.00	49.00	44.00	39.00	34.00
Wheat offal	3.30	3.30	3.30	3.30	3.30
Soybean meal	21.00	21.00	21.00	21.00	21.00
Groundnut cake	12.00	12.00	12.00	12.00	12.00
Fish meal	5.00	5.00	5.00	5.00	5.00
FCCSM	0.00	5.00	10.00	15.00	20.00
Lysine	0.10	0.10	0.10	0.10	0.10
Methione	0.10	0.10	0.10	0.10	0.10
DCP	1.00	1.00	1.00	1.00	1.00
Limestone	1.50	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Vegetable oil	1.50	1.50	1.50	1.50	1.50
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 2: Gross Composition of broiler chicken Experimental Diet (g/100g) (Finisher)

INGREDIENTS	DIET I	DIET II	DIET III	DIET IV	DIET V
Maize	54.00	49.00	44.00	39.00	34.00
Wheat offal	5.80	5.80	5.80	5.80	5.80
Soybean meal	21.00	21.00	21.00	21.00	21.00
Groundnut cake	12.00	12.00	12.00	12.00	12.00
FCCSM	0.00	5.00	10.00	15.00	20.00
Lysine	0.10	0.10	0.10	0.10	0.10
Methione	0.10	0.10	0.10	0.10	0.10
DCP	1.50	1.50	1.50	1.50	1.50
Limestone	2.00	2.00	2.00	2.00	2.00
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Vegetable oil	3.00	3.00	3.00	3.00	3.00
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

FCCSM = *Fortified composite cassava stump meal*, DCP = *Dicalcium phosphate*

One hundred and fifty Abor-Acre breed were assigned to five treatments of three replicate and ten chicks per replicate in a Completely Randomized Design. Their respectively starter finisher diets were fed *ad libitum* from 1 – 49 days. At the end of the trial, two (2) birds were randomly selected per replicate were stunned, slaughtered by severing the jugular vein, for blood collection for the haematological and serum indices studies. For haematology, blood samples were collected into sterilized bottles containing Ethylene Diamine Tetra-acetic Acid (EDTA). Blood samples for serum biochemical studies were collected into test

tubes (without anticoagulant) and placed in test tube racks in the microscopy laboratory of Animal production and health Department, FUTA. After some hours, the serum was obtained by centrifugation and serum samples were stored in a deep freezer prior further study. All data collected was subjected to Analysis of Variance (ANOVA) using SPSS version 17 package. Where significant difference existed, Duncan Multiple Range Test (DMRT) of the same package was used to separate the means.

Results and Discussion

Table 3 shows that among all the parameters measured, only the mean cell haemoglobin concentration, mean cell haemoglobin, lymphocytes and basophils were significantly (P>0.05) affected by the dietary treatments. Highest Erythrocyte sedimentation rates (5.67mm/hr) and lowest Erythrocyte sedimentation rates (3.00mm/hr) were recorded in birds fed diets I and V, respectively. Highest packed cell volume (30.00%), highest haemoglobin concentration (9.98g/100ml) were recorded in bird fed diet V while lowest packed cell volume (23.50%), lowest haemoglobin concentration (7.83g/100ml) were recorded in bird fed diet I. With an increase in the inclusion level of fortified cassava stump meal in the diet, Haemoglobin (Hb), RB and PCV increased and this agrees with the result of Tewe and Egbuinike, (2009). Increased in this parameters indicates that the ingredients were not capable of inflicting anaemia on the birds. Albumin and Albumin/Globulin ratio were significantly (P<0.05) influenced by the treatments as presented in Table 4. Highest total protein (5.53g/dl) was observed in bird fed diet V, while lowest total protein (4.25g/dl) was recorded in bird fed diet. Highest albumin/globulin ratio (1.12) was recorded in bird fed diet II and lowest albumin/globulin ratio in bird fed diet V. Albumin, globulin and creatinine are measures of adequacy of protein quality, quantity and degree of protein utilization (Okorie *et al.*, 2011). Elevated globulin levels are mostly due to production of antibodies to fight infections (Agboola *et al*., 2013). Report of this study is similar to the findings of Ogunwole *et al*., (2017) in most of the sera parameters.

Conclusion and recommendations

From this study, using the fortified composite cassava stump meal as feed ingredient in broiler chicken diets compared favourably with the control diets which indicates that the FCCSM do not pose any deleterious effects on the health status of the birds.

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Table 3: Effects of varying levels of Fortified Composite Cassava Stump Meal on haemotological indices of broiler chickens

Parameter	Diet I	Diet II	Diet III	Diet IV	Diet V
Erythrocyte sedimentation rates(mm/hr)	5.67±1.73	4.17±1.58	3.25±0.63	4.67±0.80	3.00±0.01
Pack cell volume (%)	23.50±3.92	26.33±3.44	28.00±1.23	28.50±1.88	30.00±0.55
Red blood cell ($\times 10^6 mm^{-3}$)	1.91±0.48	2.26±0.44	2.36±0.18	2.48±0.23	2.62±0.09
Haemoglobin concentration (g/100ml)	7.83±1.32	8.77±1.15	9.30±0.41	9.52±0.62	9.98±0.18
Mean cell haemoglobin concentration (%)	33.31±0.08^{ab}	33.30±0.06^{ab}	33.21±0.01^{b}	33.41±0.05^{a}	33.27±0.03^{ab}
Mean cell haemoglobin (pg of Hb)	30.05±0.07^{ab}	30.06±0.06^{ab}	30.11±0.01^{a}	30.03±0.04^{b}	30.06±0.03^{ab}
Mean cell volume (μ^3)	168.12±40.28	148.75±35.05	119.78±3.96	135.54±8.23	114.62±2.12
Lymphocytes (%)	61.00±0.63^{ab}	60.67±0.88^{ab}	60.00±0.82^{ab}	62.00±0.37^{a}	59.60±0.51^{b}
Heterophils (%)	20.83±1.97	22.17±2.26	23.25±2.29	19.67±1.36	25.80±1.56
Monocytes (%)	13.67±0.96	13±1.24	13±1.29	13.67±0.67	11.2±1.02
Basophils (%)	3.17±0.31^{ab}	3.00±0.26^{ab}	2.75±0.25^{ab}	3.33±0.21^{a}	2.4±0.25^{b}
Eosinophils (%)	1.33±0.21	1.17±0.17	1.00±0.00	1.33±0.21	1.00±0.00

a-b: Mean within rows having different superscripts are significantly different (P<0.05)

Table 4: Effects of varying levels of Fortified Composite Cassava Stump Meal on serum metabolites of broiler chickens

Parameters	Diet I	Diet II	Diet III	Diet IV	Diet V
Total Protein (g/dl)	4.25±0.22	4.4±0.31	4.56±0.66	4.38±0.51	5.53±0.79
Albumin (g/dl)	1.97±0.12^{ab}	2.19±0.18^{a}	1.62±0.17^{b}	1.62±0.09^{b}	1.78±0.16^{ab}
Globulin (g/dl)	2.28±0.19	2.21±0.33	2.93±0.68	2.75±0.44	3.75±0.64
Albumin/Globulin Ratio	0.89±0.09^{ab}	1.21±0.32^{a}	0.7±0.13^{b}	0.64±0.07^{b}	0.51±0.05^{b}
Cholesterol (mg/dl)	47.75±11.97	67.02±19.13	69.32±10.65	52.42±12.61	71.15±14.89
Creatinine (mg/dl)	2.64±0.6	2.88±0.72	4.19±1.15	3.49±0.78	4.53±1.06
Alkaline Phosphatise (IU/l)	18.93±3.21	15.17±3.2	15.57±4.86	17±1.9	19.9±2.69
Aspartate Aminotransferase (IU/l)	59.17±7.77	76.75±19.21	111.75±30.59	93.17±20.81	120.83±28.28
Total Bilirubin (IU/l)	18.93±3.21	15.17±3.2	15.57±4.86	17.00±1.9	19.90±2.69

a-b: Mean within rows having different superscripts are significantly different (P<0.05)