

EFFECT OF VARYING LEVELS OF SUNDRIED CASSAVA PEEL MEAL SUPPLEMENTED WITH ENZYME AS A REPLACEMENT FOR WHEAT BRAN ON HAEMATOLOGY, BLOOD SERUM AND SERUM ENZYMES OF BROILER STARTER

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Abstract

A total of 150 day old broilers chicks (Arbo acre) were used to evaluate haematology, blood serum and serum enzymes of broiler starters fed varying levels of sundried cassava peels meal (SCPM) supplemented with enzyme. The birds were allotted into five dietary treatments of three replicates each with each replicate consisting of 10 birds. The treatments were fed with cassava peels meal supplemented with enzyme at inclusion rates of 0%, 10%, 20%, 30% and 40% respectively. The duration of the experiment was eight (8) weeks. Data collected were subjected to the analysis of variance using SPSS 2021.. All blood parameters observed were not significantly ($p > 0.05$) differed except albumin, cholesterol and alanine transaminase (ALT) that were significantly ($p < 0.05$) influenced. Albumin recorded highest ($P < 0.5$) value of 4.95g/dl from T4 (30% SCPM+E) while T1 (0%SCPM - E) gave least ($P < 0.05$) value of 3.05g/dl. Least 109.65mg/dl for cholesterol was observed in the birds fed on 40% SCPM+E (T5) while highest ($P < 0.05$) value of 135.45mg/dl was obtained in 30% SCPM+E (T4). Alanine transaminase (ALT) gave highest significant ($p < 0.05$) value of 66.50(u/l) in the birds fed on T2 (10%SCPM+E) while least significant ($p < 0.05$) value of 52.50(u/l) was obtained for the birds placed on T1 (0%SCPM-E). The parameters studied indicated good health status of the broiler starters in this study. This suggest that supplementation of sundried cassava peel meal diets with enzyme supplementation as a replacement for wheat bran was not deleterious to the health status of the broiler starter. Therefore, sundried cassava peel meal with enzyme supplementation is recommended to replace wheat bran up to 40% inclusion level in the diets of broiler starters

Keywords: Broilers starter, cassava peels meal, haematology, blood serum and enzyme

Introduction

Broiler farming plays a vital role in agricultural economy both in the developed and developing countries. This could be attributed to its short generation interval (1 – 4 weeks), fast growth rate, efficient feed utilization, good meat quality and quick return on investment. However, broiler industry is faced with high cost of feed and competition between man and animal for conventional feed resources which have led to increase in the cost of producing broilers. This requires intensification of research into cheaper alternatives that would support a commensurate performance of the birds.

In recent years, the African continent produced approximately 60% of the global cassava crop (256 million tonnes) through targeted efforts to develop improved varieties, though only a small fraction is utilized for animal feeding programs throughout

Africa (Okike, 2014). The potential for increased utilization of cassava is enormous, particularly of unused or under used fractions and residues such as cassava peels. Cassava peels is usually obtained when the outer cover (peels) of the tuber is removed. Its fractions represent primary fibre source in feeding programs. Lebot (2009) documented the replacement value of processed cassava root as an energy ingredient when substituting for maize at up to 10 to 40% in various poultry diets. Similarly, cassava peels have been revealed to be a viable ingredient at up to 15% inclusion in the diets of broilers (Nwokoro and Ekahosuehi., 2005) when combined with a variety of locally available feed resources (groundnut cake, cashew nut meal, palm oil and methionine) to meet amino acid requirements. However, fibre is one of the major feed ingredients and it is essential in the diets. Agro industrial by products that yield fibre are yam

peels, rice bran, wheat bran, brewery dried grain and pkc.

Ahaotu *et al.* (2012) established that agro industry by-products such as cassava pulp, cassava peels, maize offal, wheat offal, cassava, yam and plantain peels, leaf meals and animal wastes which hitherto were discarded as waste are now used as livestock feed to partially or totally substitute a proportion of conventional energy, fibre and protein sources such as maize, soya bean and *groundnut* whose prices have risen. However, these conventional feed ingredients and their high costs are also causing a hike in the costs of animal products such as eggs and meat (Ahaotu *et al.*, 2009).

Enzymes are chemicals or biological catalysts which speed up biochemical reactions and do not get used up in the process. Characteristically, most enzymes are proteins and so display the properties of protein. The activity of enzymes can be affected by several factors including the concentration of the specific enzyme, substrate, pH, time and temperature as well as the salts, activator or inhibitor in the reaction buffer among others.

The activity of enzyme is obvious in all catabolic and anabolic aspects of metabolism beginning with digestion of the nutrient. Usually, the enzymes added to animal's feed to produce a desirable effect are referred to as exogenous while those secreted by the animal are called endogenous (Cowieson *et al.*, 2006). These exogenous enzymes are produced industrially for commercial purposes among which are the inclusion in animal feed as additive (Zou *et al.*, 2013; Bedford and Cowieson, 2012). The commercial enzymes may be manufactured from microorganisms, plants and animals, however, enzymes from plants and animals are limited in production for several reasons. Cultivation of plants is limited to regions where planting such a plant is suitable and this is predominantly seasonal and this can impede stable production from plant source. Additionally, the total concentration of enzymes in the tissues of plant are considerably low, therefore, producing a large amount of plant material would be required to meet stable enzyme production. Conversely, the enzymes produced from animal are mostly by-products of meat industry and so it is limited in supply. Moreover, there is competition with other end users for the supply glands.

In contrast, microorganisms are enriched with degree of potentials. Microorganisms can produce large collection of series of enzymes. This singular benefit has been exploited commercially over the years

(Oumer and Abata, 2018). The microbial enzymes can be produced in amounts sufficient to meet the market demands.

Hematological responses are good indicators of the physiological status (Khan *et al.*, 1994) and acts as a pathological reflector of the status of exposed animals to toxicant and other conditions (Olafedehan *et al.*, 2010). Hence animals with good blood composition are likely to show good performance (Isaac *et al.*, 2013) as well as provides a good nutritional assessments of diets (Egbunike *et al.*, 2009).

Materials and methods

Experimental site

The experiment was carried out at the Poultry Unit, Teaching and Research Farm of Oyo State College of Agriculture and Technology Igbo-ora, Oyo State, Nigeria. The experiment site is in savannah forest zone of Latitude 7.43oN and Longitude 3.8oE, with an elevation 140m above sea level. The average minimum temperature is about 21.50oC and maximum temperature of 32.50oC. The average humidity in the area is 58.0%. The double maximum rainfall is about 214.3mm in June and 165.2mm in September. (Sanusi, 2011)

Procurement and processing of fresh cassava peels:

The fresh cassava peel was procured from garri processing factory at Oyo State College of Agriculture and Technology, Igbo-ora and was sundried on polythene nylon until dried to touch while enzyme and other ingredients were obtained from a reputable feed mill in Igboora.

Milling of the experimental ingredients

Sun-dried cassava peels and other ingredients were separately milled at the feed mill unit of Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igbo-ora, before they were mixed with other feed ingredients for each treatment.

Experimental diets and treatments

Five experiment diets were formulated and contained cassava peel meal as source of fiber to replace wheat offal at 0%, 10%, 20%, 30% and 40% and designated as T1, T2, T3, T4 and T5 respectively. Treatment 1 was the control diet without cassava peels meal and enzyme while treatments 2, 3, 4 and 5 contained cassava peel meal supplemented with enzyme at the rate of 6g/100kg. The experimental diets compositions are presented in Table 1.

Table 1: Feed formulation for broiler starter (0 – 4 weeks) Ingredients

	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)
Maize	56.00	56.00	56.00	56.00	56.00
Soya bean meal	34.00	34.00	34.00	34.00	34.00
Wheat bran	5.00	3.00	2.50	2.00	1.50
C.P.M	0.00	0.00	1.00	1.50	2.00
Limestone	2.00	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Enzyme (g)	0.00	6.00	6.00	6.00	6.00
TOTAL	100	100	100	100	100
Calculated values					
ME (Kcal/kg)	2934.54	2943.05	2951.55	2960.06	2969.56
Crude Protein (%)	21.75	21.69	21.63	21.57	21.51
Crude Fibre (%)	1.67	1.67	1.67	1.66	1.66

C.P.M = Cassava Peel Meal M.E = Metabolizable Energy

* Supplemented with enzyme at the rate of 6g/1000kg

Experimental birds, design and management:

A total of 150 day old broiler chicks (Arbor acres) were obtained from farm support. Birds were divided into five treatments group, each treatment had thirty six (36) birds while each treatment was replicated thrice with ten birds per replicate in a Completely Randomized Design (CRD). Birds were brooded for 2 weeks on floor pens littered with wood shavings, using coal pot as the heat source. Daily routine of feeding, water supply, observation of sick birds, mortality and record keeping were carried out throughout the experimental periods (4 weeks). Vaccinations and medication were carried out as and when due.

Data collection

Blood sample was collected through wing vein of the experimental birds at the 4th weeks of the feeding trials. 3mls blood was collected from one bird per replicate with the aid of disposable needle and syringe and pour into the bottle that contained EDTA while another 3mls blood was collected from another bird into plain bottle and transferred to the laboratory for assay

Statistical analysis: Data obtained in the study were arranged in a completely randomized design (CRD) and subjected to one way analysis of variance (SPSS, 2021), mean value of variables showing significant ($p < 0.05$) differences were separated using Duncan's multiple range test (Duncan's 1955).

Results

The results of blood serum indices of broiler starter fed experimental diets are shown in table 2. There were no significant ($P > 0.5$) differences on total protein, globulin, creatinine, uric acid and triglyceride while albumin and cholesterol were significantly ($P < 0.5$) affected. Total protein showed least ($P > 0.5$) value of 4.70g/dl in the broiler starter fed 40% cassava peel meal with enzyme supplementation (SCPM + E) while birds fed T4 (30% SCPM + E) had highest ($P > 0.05$) value of 6.30g/dl. Globulin revealed highest ($P > 0.05$) 2.10g/dl on T3 (20% SCPM+E) but least ($P > 0.05$) value of 0.63g/dl was recorded on T5 (40% SCPM+E). Glucose revealed least $P > 0.05$ value of 131.60mg/dl from T1 (0%SCPM-E) while highest $P > 0.05$ value of 155.20mg/dl was observed from T5 (40%SCPM+E). Triglyceride gave least ($P > 0.05$) value of 110.45mg/dl while highest ($P > 0.05$) value of 166.85mg/dl was noticed from T3 (20% SCPM +E). Least (13.35mg/dl) non-significant ($P > 0.05$) of uric acid was obtained from T3 (20% SCPM+E) while highest (15.30mg/dl) was observed from T4 (30% SCPM). Creatinine showed lowest ($P > 0.05$) value of 0.32g/dl T4 (30% SCPM + E) but highest ($P > 0.05$) value of 0.61g/dl was observed for T3 (20% SCPM+E). Albumin recorded highest ($P < 0.5$) value of 4.95g/dl from T4 (30% SCPM+E) while T1 (0%SCPM - E) gave least ($P < 0.05$) value of 3.05g/dl. Least ($P > 0.05$) 109.65mg/dl of cholesterol was observed in the birds fed on 40% SCPM+E (T5) while highest ($P < 0.05$) value of 135.45amg/dl was obtained on 30% SCPM+E (T4).

Table 2: Blood serum parameters of broiler starter fed experimental diets (0-4 weeks) 5

Parameters	T1 (0% SCPM-E)	T2 (10%SCPM+E)	T3 (20% SCPM+E)	T4 (30%SCPM+E)	T5 (40%SCPM+E)	SEM
Total protein (g/dl)	5.05	5.15	5.55	6.30	4.70	0.31
Albumin (g/dl)	3.05b	3.80ab	3.45b	4.95a	3.85ab	0.24
Globulin (g/dl)	2.05	1.35	2.10	1.35	0.63	0.26
Glucose (mg/dl)	131.60	136.20	140.20	149.40	155.20	6.40
Cholesterol(mg/dl)	119.70ab	120.05ab	125.45ab	135.45a	109.65b	3.58
Triglyceride(mg/dl)	116.10	141.35	166.85	140.45	110.45	4.50
Uric acid (mg/dl)	13.85	13.70	13.35	15.10	13.90	0.35
Creatinine(mg/dl)	0.40	0.37	0.61	0.32	0.39	0.08

Results of heamatological parameters of broiler starter fed experimental diets are presented in the Table 3. All heamatological parameters measured (packed cell volume, heamoglobin, red blood cell, white blood cell and platelets) were not significantly ($P>0.05$) influenced. Packed cell volume of T5 (40% SCPM+E) showed least value (21.67%) and not significant ($P>0.05$) to the highest (27.33%) that was obtained from birds placed on T1 (0%SCPM-E). Birds on T5 (40%SCPM+E) had least (7.07%) heamoglobin while those on T1 (0%SCPM-E) had highest non-significant

($P>0.05$). Red blood cell revealed least ($1.8 \times 10^{12}/l$) non-significant ($P>0.05$) while highest ($2.79 \times 10^{12}/l$) was observed from birds placed on T2 (10% SCPM). White blood cell showed least ($13.20 \times 10^3/mm^3$) non-significant ($P>0.05$) from birds fed on T5 (40%SCPM) while highest ($14.63 \times 10^3/mm^3$) was obtained from birds placed on T2 (10% SCPM+E). Platelets showed least (113333.33) non-significant ($P>0.05$) from T5 (40% SCPM) while highest (131000.00) was obtained from birds placed on T2 (10%SCPM+E).

Table 3: T1 (0% SCPM-E) T2 (10% SCPM+E) T3 (20% SCPM+E) T4 (30% SCPM+E) T5 (40% SCPM+E) SEM
Heamatological parameters of broiler starter fed experimental diets (0-4 weeks)
Parameters

Packed cell volume (%)	27.33	26.33	25.33	24.67	21.67	0.86
Hemoglobin (g/dl)	8.97	8.53	8.33	8.10	7.07	0.27
Red blood cell ($\times 10^{12}/l$)	2.39	2.79	2.50	2.38	1.85	0.14
White blood cell ($\times 10^3/mm^3$)	14.00	14.63	14.00	13.13	13.200	2.91
Platelets	118333.33	131000.00	117333.33	118666.67	113333.33	3178.00

Results of serum enzymes of broiler starter fed experimental diets are presented on Table 4. There were no significant ($P>0.05$) differences on aspartate transaminase (AST), alkaline transaminase (ALP) while alanine transaminase (ALT) was significantly ($P<0.05$) influenced. Birds fed T4 (30% SCPM+E) had highest value of Aspartate transaminase (159.00u/l) while birds placed on T5 (40%SCPM+E) had least value (141.00u/l) Alkaline phosphate (ALP) showed highest non-significant ($P>0.05$) value of 45.00u/l for the birds placed on T4 (30%SCPM+E) while least value ($p>0.05$) was observed in T3 (20%SCPM+E). Alanine transaminase (ALT) gave highest significant ($P<0.05$) different of 66.50(u/l) in the birds fed T2 (10%SCPM+E) while least significant ($P<0.05$) value of 52.50(u/l) was obtained from the birds placed on T1 (0%SCPM-E).

Parameters	T1 (0%SCPM-E)	T2 (10% SCPM +E)	T3 (20% SCPM +E)	T4 (30%SCPM+E)	T5 (40% SCPM+)	SEM
AST (U/L)	149.50	151.50	157.50	159.00	141.00	4.01
ALT (U/L)	52.50b	66.50a	57.50ab	63.50ab	54.50ab	2.15
ALP (U/L)	38.00	40.50	31.50	45.50	40.00	3.03

a,b,c = Means within the same row with different superscripts are significantly different ($P<0.05$).

SEM= Standard error of mean, NS = Not significant ($P>0.05$), * = Significant difference ($P<0.05$)

ALP = Alkaline phosphate, ALT = Alanine transaminase, AST = Aspartate transaminase

Discussion

Blood is an important index of physiological, pathological and nutritional status in the organism

(Olorode *et al.*, 2007; Ewuola *et al.*, 2004). The non-significant ($P>0.05$) differences in the blood serum parameters across the dietary treatment in this study

showed the adequacy of nutrients in the diets as documented by Eggum (1986) and Cheesbrough (1986). Albumin was fluctuating across dietary treatments. This may be due to increase in the level of crude protein available from the test ingredient at all levels of inclusion in the diets, since albumin synthesis has been reported to be related to the amount of available protein (Iyayi and Tewe, 1998) in the diet. Similarity of serum albumin values of experimental broiler starter also means the presence of a healthy and functioning liver, protein: energy balance in the diets and absence of parasitic infection, Cheesbrough, 1999. Serum proteins in this study imply that animals on the test ingredient utilized and synthesized the dietary protein from sun dried cassava peels meal supplemented with enzyme adequately. The higher similarity in the cholesterol level of control diet and experimental diets in this finding showed that all diets have tendencies for fat accumulation. This finding is not in line with report of Ehebha and Eguaioje., 2018 who reported significant ($P<0.05$) effect on cholesterol of broiler chicken when broiler chicken fed varying dietary levels of sundried cassava peel meal supplemented with enzyme.

Haematological parameters of this study showed a non significant ($P>0.05$) different in all parameters measured (packed cell volume, haemoglobin, red blood cell, white blood cell and platelets). Similarity ($P>0.05$) obtained in the packed cell volume of broiler fed SCPM+E made it cleared that there was an effective use of the fibre sources. This research is in agreement with report of Ehebha and Eguaioje 2018 who opined a non-significant ($P>0.05$) difference in the packed cell value of broiler chickens fed varying dietary levels of sundried cassava peel meal supplemented with enzyme. However, haemoglobin, red blood cell and white blood cell in this study negated report of Ehebha and Eguaioje 2018 who reported significant ($P<0.05$) differences in their values but corroborate with the report of Okosun and Eguaioje 2017 who submitted no significant ($p>0.05$) different in the haematological indices value of cockerel chickens fed varying levels of cassava grits supplemented with moringa leaf meal. The blood characteristics findings from this study was also in line with the report of Unigwe *et al.*, 2016 who placed broiler chickens to diets with varying levels of cassava root meal and observed no significant ($P>0.05$) differences. Haemoglobin observed were within the normal range for chickens (7 - 13g/l) as stated by Banerjee, (2008). This result indicated that the nutrients were adequately utilized by the broilers starter and posed no problem to the birds. It explains that the birds were healthy, not anaemic and were capable of withstanding stress.

Both AST and ALP in this study were in agreement with report of Nwosu and Igugo 2019 who reported a non-significant ($P>0.05$) differences on AST and ALP when broiler chickens fed varying levels of cassava peel meal

supplemented with exogenous enzyme. ALT had higher significant ($P<0.05$) difference between treated broiler (10- 40% of SCPM+E) over the control which was however not significantly ($P>0.05$) different from 20% - 40% SCPM+E. ALT in this study contradicted report of Nwosu and Igugo, 2019 who reported a non-significant ($P>0.05$) different when broiler chickens were fed varying levels of cassava peel meal supplemented with exogenous enzyme as replacement for maize.

Conclusion and recommendation.

The parameters studied gave good health status of the broiler starters in this study. This suggest that sundried cassava peel meal diets with enzyme supplementation is good replacement for wheat bran and not deleterious to the health status of the broiler starter. Therefore, sundried cassava peel meal with enzyme supplementation is recommended to replace wheat bran up to 40% inclusion level in the diets of broiler starter

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