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Evaluation of haematological and blood serum indices of broiler starter fed varying levels of sun dried cassava peels meal as partial replacement for wheat bran

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Abstract

This study was carried out to examine the effect of sun dried cassava peels meal on haematological and blood serum indices of broiler starter chicks. A total of 150 unsexed, day old broiler chickens (Arbor acre) were randomly allotted into 5 dietary treatments (T1, T2, T3, T4 and T5) containing 0, 10, 20, 30 and 40% sun dried cassava peal meal (SDCPM), respectively as replacement for wheat bran. Each treatment consisted of 3 replicates of 10 birds each in a Completely Randomized Designed (CRD). At four (4) weeks of age, experimental birds were starved overnight, and blood was harvested for hematological and serum assays. The results showed no significant difference ($p>0.05$) among parameters examined except globulin and albumin globulin ratio that were significantly ($p<0.0$) different. Globulin ranged between 5.43g/dl (T1, 0%) to 7.04g/dl (T5, 40%). Albumin globulin ratio ranged from 0.50in T4 and T5 to 0.63 in T2. It could be concluded that SDCPM performed favourably with control at all levels of inclusions (10,20, 30 and 40%SDCPM), therefore, it could be used to replace wheat bran in the diet of broiler starter without any deleterious effect on health status of chickens.

Keywords: Broiler starter, haamatological, blood serum, parameters and sun dried cassava peels meal.

Introduction

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, particularlyof unused or underused fractions and residuessuch as cassava peels. Cassava peels 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, 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 e t c. Researchers have recently discovered that agro 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 (Ahaotu *et al.,* 2011).

Cassava peels is usually obtained when the outer cover (peels) of the tuber is removed. 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 (Isikwenu*et al.,* 2000; Iheukwumere, 2001; Ahaotu*et al.,* 2010). Therefore, this research is directed toward evaluation of heamatological and blood serum indices of broiler starter fed varying levels of sun dried cassava peels meal as partial replacement for wheat bran

Materials and methods

Location of the study

The experiment was carried out at the poultry unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora, Oyo State Nigeria, latitude 7°15`N and longitude 3°30`E with average annual rainfall of 1278mm and average temperature of 27°C (Sanusi, 2011).

Procurement and processing of cassava peels and other feed ingredients

Cassava peels were procured from a starch processing farm (Psaltry farms) along Iseyin-Maya road in Iseyin Local government, Oyo State Nigeria. It was sundried on polythene nylon until dried to touch. Other feed ingredients like maize, soybean meal, methionine, lysine, di-calcium phosphate, limestone, salt and broiler pre-mix were procured from a reputable feed-mill at Igboora, Oyo State, Nigeria.

Milling of experimental ingredients

Sun-dried cassava peels and other ingredients were milled separately at the feed mill unit of Training and Research Farm, Oyo State College of Agriculture and Technology, Igbo-ora. Thereafter, they were mixed with other feed ingredients as designed.

Experimental diets

Five diets were formulated having percentage crude protein ranged between 21.75% - 21.51% with energy ranged between 2934.54ME kcal/kg – 2968.57ME kcal/kg at starting phase. Wheat bran was main fibre source for the control diet while the other four diets (T2, T3, T4 and T5 were partially replaced with varying levels of sundried cassava peels meal at 10, 20, 30 and 40%SDCPMin nutrient to nutrient inclusion rates respectively as shown on Table 1.

Experimental birds, design and management

A total of 150, one-day old broiler chicks were purchased fromGlobus farms, Oshodi, Lagos, Nigeria. Before the arrival of the birds, the brooding house was washed, disinfected and fumigated with Formalin to get rid of micro-organisms present in the pen. Drinkers, feeders and other equipment were also cleaned and washed. The pen was also demarcated with chicken nets into five treatments in which contain 30 birds each. Each treatment was sub-divided into three replicates containing 10 birds in each replicate. On arrival the birds were gently unboxed into the brooding house that had previously been heated few hours prior to the arrival of the birds. Birds were randomly allocated to five dietary treatments, 30 birds per treatment consisting of 3 replicates with 10 birds each in a completely randomized design (CRD). The birds were fed *ad-libitum* throughout experimental period. Daily routine of feeding, water supply, observation of sick birds, mortality and record keeping were carried out throughout experimental period.

Vaccination and medication

On arrival of the birds, they were given glucose + water. Afterwards, combination of antibiotics and vitamins were given for 7 days, orally administered via water. All other vaccines and medications were administered as and when due.

Table 1: Gross composition of experimental for broiler starter diets (0-4 weeks)

Ingredients (kg)	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)
Maize	56.00	56.00	56.00	56.00	56.00
S.B.M	34.00	34.00	34.00	34.00	34.00
Wheat offal	5.00	4.50	4.00	3.50	3.00
C.P.M	0.00	0.50	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
Total (kg)	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis					
ME (kcal/kg)	2934.54	2943.05	2951.55	2960.06	2968.57
Crude Protein (%)	21.75	21.69	21.63	21.57	21.51
Ether Extract (%)	3.61	3.62	3.63	3.64	3.65
Crude Fibre (%)	1.67	1.67	1.67	1.66	1.66
Calcium (%)	54.16	54.14	54.13	54.13	54.14
Phosphorus (%)	9.25	9.25	9.24	9.24	9.24
Ash (%)	0.35	0.35	0.35	0.34	0.34
Lysine (%)	0.01	0.01	0.01	0.01	0.01
Methionine (%)	2.31	2.31	2.31	2.31	2.31

C.P.M –Cassava Peels Meal, S.B.M – Soya Bean Meal)
M.E – Metabolizable Energy

Data collection

At three weeks of age, birds were starved overnight and selected randomly per replicate and about 5ml of blood samples were collected early in the morning from wing webwith sterilized disposable needle and syringe into tubes with anti-coagulant (Ethylene Diamine Tetra Acetic Acid) and bottles without anticoagulant for hematological test and blood serum analysis, respectively and were transported to the laboratory for assay according to AOAC (2010). Data collected were: Haemoglobin, pack cell volume, red blood cell. White blood cell, total protein, albumin, globulin albumin globulin ratio, creatinine, cholesterol etc.

Statistical analysis

Data collected were subjected to the analysis of variance using SPSS (2012) while means were separated using Duncan's multiple range test of the same package.

Results

Haematological indices of experimental birds are shown in Table 2. There were no significant differences ($p<0.05$) among pack cell volume (PCV), heamoglobin (g/dl), red blood cell (RBC), white blood cell (WBC), platelets, lymphocytes, heterocytes, eosinophil and basophil. Pack cell volume ranged between 24.33 to 28.00 %. The least value (24.33%) was observed from chickens fed on T2 while highest value (38.00%) was obtained in those on T3. Haemaglobin ranged between 8.03 (T2) to 9.10 (T3). Red blood cell ranged between 2.57 to 2.99 x 10^{12}, least value (2.57x 10^{12}) was obtained from T2 while highest value of 2.99 x $10^{12}$was obtained on T5. Platelets ranged between 107.00 to 134.67. Least value (107.33) was obtained on T2 while highest value of 134.67 was obtained on T5. Lymphocytes revealed between 58.67 to64.67% with least value of 58.67% from T1 while highest value of 64.67% was obtained from T3. Monocytes ranged between 2.67 to 3.33%, least value of 2.67% was obtained on T1 while highest value of 3.33% was obtained from both T2 and T3. Results of the blood serum of the

experimental birds were shown on table3. There were no significant different ($p>0.05$) among total protein, albumin, cholesterol, creatinine except globulin and albumin globulin ratio that were significantly ($p<0.05$) different. Total protein (TP) ranged between 8.73g/dl to 10.40 g/dl with least value (8.73g/dl) obtained on T1 while highest value (10.40g;/dl) was obtained from T5. Albumin varied between 3.30g/dl to 3.63g/dl least value (3.30g/d) was recorded on both T1 and T4 while highest value (3.63g/dl) was recorded on T5. Globulin ranged between 5.43g/dl to 7.04g/dl, T1 recorded least value of 5.43g/dl while T5 recorded highest value of 7.03g/dl. Albumin globulin ratio revealed between 0.50 to 0.63, both T4 and T5 had least value of 0.50 while T2 had 0.63. Cholesterol varied between 195.33 to 230.00, least value (195.33) was obtained on T1 while T5 recorded 230.00. Creatinine ranged between 0.77 to 3.47, least value (0.77) was obtained from T1 while T5 had highest value of 3.47.

Table 2: Haematological parameters of experimental birds (0-4 weeks)

Parameters	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	SEM
PCV (%)	26.00	24,33	28.00	27.67	26.67	1.09
Heamoglobin (g/dl)	8.60	8.03	9.10	9.00	8.83	0.37
Red blood cell (x 10^{12})	2.87	2.57	2.88	2.87	2.99	0.18
WBC (x10^9)	14100.00	14250.00	16450.00	14366.67	15233.33	446.08
Platelets (x 10^9/l)	114.00	107.33	111.67	127.67	134.67	4328.72
Lymphocyte (%)	58.6	63.33	64.67	63.00	61.00	1.37
Heterocytes (%)	35.33	29.67	28.00	29.67	32.00	1.52
Monocytes (%)	2.67	3.33	3.33	3.00	3.00	0.25
Eosinophils (%)	5.00	3.67	4.00	4.00	4.00	0.34
Basophils (%)	0.33	0.33	0.00	0.33	0.00	0.11

a,b, c Means: with different superscripts along rows are significantly different ($P<0.05$)
PCV= Pack cellvolume. WBC= White bllood Cell. SEM= Standard Error of Mean

Discussion

Blood is an important index of physiological, pathological and nutritional status in the organism (Olorode *et al*., 2007; Ewuola *et al*., 2004). Reports by Aletor (1989) and Aletor and Egberongbe (1992) indicated that blood variables most consistently affected by dietary influence includes RBC, PCV and plasma protein. Packed Cell Volume (PCV) were within the physiological range of 27.0 -45.5 reported by Jain (1993) and 15 - 30% reported by Puls (1994). Hemoglobin (Hb) opined in this study was higher than 5.6g/dL obtained by Belewu and Ogunsola (2010). PCV is a blood toxicity reduction index and its abnormal level point to the presence of a toxic factor which has a drastic effect on blood formation (Oyawoye and Ogunkunle, 1998). As a result, the non-significant ($p>0.05$) difference among the treatments for PCV suggest good detoxification of cassava peels meal. The haematological parameters especially PCV and Hb were positively correlated with the nutritional status of the animal as opined by Adejumo (2004). The normal WBC in all treatments indicated that all broiler chicks were healthy throughout the experimental period, being an indication of non-allergic conditions, free parasitism and any foreign body in circulate.

The non-significant differences in biochemical 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 utilization and synthesis was enhanced across treatments.This may be due to increase in

the level of **crude protein** available from the test ingredient at higher inclusion level in the diet, 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.Results of the serum proteins imply that animals on the test ingredient utilized and synthesized the dietary protein from sun dried cassava peels meal adequately with the control group fed convectional ingredient.

Table 3: Blood serum of experimental birds (0-4 weeks)

Parameters	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	SEM
Total Protein (g/dl)	8.73	9.40	9.73	9.27	10.40	0.25
Albumin (g/dl)	3.30	3.53	3.47	3.30	3.63	0.90
Globulin (mg/dl)	5.43^{b}	5.80^{b}	6.27ab	5.97^{ab}	7.03^{a}	1.92
A/G Ratio	0.57^{ab}	0.63^{a}	0.53^{ab}	0.50^{b}	0.50^{b}	0.20
Cholesterol (mg/dl)	195.33	223.00	222.67	215.00	230.00	6.33
Creatinine (mg/dl)	0.77	0.83	1.03	3.20	3.47	0.65

a,b, c Means: with different superscripts along rows are significantly different ($P<0.05$
A/G= Albumin globulin ratio

Conclusion and recommendation

Conclusion

From the outcome of this study, it could be concluded that sun dried Cassava peels meal performed favourably with control at all levels of inclusions (10,20, 30 and 40%).Therefore, it could be used to replace wheat bran in the diet of broiler starter without any deleterious effect.

Recommendation

40% inclusion levels of sun dried cassava peels meal is recommended to replace wheat bran as source of fibre in the diet of broiler chickens.

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