EFFECT OF PRO-VITAMIN A CASSAVA (UMUCASS 36) ON THE HAEMATOLOGICAL AND SERUM BIOCHEMISTRY OF FINISHING BROILER CHICKENS

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ABSTRACT

A 4-week study was conducted using 120 unsexed Anak broilers to determine the effect of unpeeled and peeled fermented pro-vitamin A cassava meal (UMUCASS 36) on the haematological and serum biochemical indices of finishing broilers chickens. Fresh pro - vitamin A cassava was harvested and divided into two batches. The first batch was unpeeled and the second one was peeled. Both were soaked separately in a plastic vat with clean water and allowed to ferment for 72 hours. Thereafter, they were washed with clean water, sundried and milled to produce;(i)unpeeled fermented pro - vitamin A cassava meal (UFPC), (ii) Peeled fermented pro vitamin A cassava meal (PFPC). Three diet were formulated such that diet 1 contained maize as source of energy, diets 2 and 3 contained unpeeled pro-vitamin A cassava meal and peeled pro-vitamin A cassava meal as source of energy. The birds were divided into three groups of 40 birds and each group was randomly assigned to one of the diets. Each group was further replicated in a completely randomized design (CRD). Feed and water were provided ad libitum. All the haematological parameters determined in the study were not significantly (P>0.05) affected by the diet. The RBC values of the control were slightly higher than the UFPC and PFPC group. The serum biochemical analyzed in the study followed the same trend with slight increase in values for total protein. It was concluded that unpeeled and peeled fermented pro-cassava A cassava meal could be fed to finishing broiler chicken without any negative effect on the haematology and serum biochemical parameters of broilers.

Keywords: Broilers , pro vitamin A cassava, Haematology, and Serum biochemistry.

INTRODUCTION

Shortage and high costs of feedstuff are limiting factors to increasing the production of poultry in developing countries. The shortage of major cereal like maize, often prevent any significance development of poultry industry as the depend largely on a constant supply of these energy sources. Bello (1988) has it that maize has the highest inclusion rate of 400-500kg/MT as compared to other cereal grains. The demand for maize has always exceeded its supply, this results in high cost of grain and has made it uneconomical to be used as a major source of energy in poultry diets (Udedibie and Asoluka, 2008), therefore there is need to search for cheaper and readily available feed ingredient that can replace maize in poultry diet. One of the energy sources that have great potentials in poultry feed is cassava. It is one of the alternative energy source that can considerably replace proportion of maize in the poultry feed industry. Cassava is a woody perennial shrub with edible root tubers. The crop grows in tropical and sub-tropical areas of the world and is a major staple food that is capable of providing very high yields of energy per hectare than maize (Oke,1978). There are two main cultivars of cassava in Nigeria. The sweet cassava (Manihot palmate) and bitter cassava

(Manihot utilissima). The later Manihot utilissima contains high amount of hydrogen cyanide (HCN) that makes it extremely toxic to human and livestock (Abimbola, et al., 2004).
In order to reduce the level of toxic cyanogenic glycoside, increase shelf life and vitamin A content, pro-vitamin A (UMUCASS 36) variety of cassava was bred and introduced. This variety is preferred to other existing ones.

The use of blood examination to access physiological, pathological, nutritional and health status of animals have been well documented. The routine collection and processing of blood sample allow the evaluation of serum biochemical and hematological response to nutrition and diseases (Jaime and Hewlett, 2008). The potential of pro-vitamin A (UMUCASS) has not been fully explored as animal feed stuff. Based on this, the aim of this study was to examine the effect of pro–vitamin A cassava on the haematological and serum biochemical indices of finisher broiler chickens.

Materials and methods

Experiment site

The experiment was carried out at the Poultry and Research Unit of the Department of Animal Science, Akwa Ibom State University, Obio Akpa campus. Obio Akpa is located between latitudes $5^{0}17^{1}$N and $5^{0}27^{1}$N and between longitudes $7^{0}27^{1}$N and $7^{0}58^{1}$E with an annual rainfall ranging from 3500mm – 5000mm and average monthly temperature of 25^{0}C, and relative humidity between 60-90%. (Wikipedia, 2016).

Source and processing method

The fresh pro-vitamin A (UMUCASS) variety of cassava tubers were obtained from Cross River Basin Authority in Abak LGA of Akwa Ibom State. The fresh tubers were divided into two batches. One batch was unpeeled and the other was peeled. The unpeeled and peeled tubers were washed and later soaked separately in a plastic vat containing clean water and allowed to remained for 72 hours.

Thereafter the tubers were washed with clean water; sun dried for four days and ran through a hammer mill using 2mm sieve to homogenized it thereby producing the following;
(i) Unpeeled fermented pro- vitamin A cassava tuber meal(UFPC)
(ii) Peeled fermented pro-vitamin A cassava tuber meal(PFPC)

Proximate composition

Samples of both unpeeled and peeled vitamin A cassava were analysed as follow: the moisture content of the cassava were determined following the method of Rajaran and Janarhdanan(1990). Nitrogen content was determined according to kjeldahl method (Humphriies,1956) and the percentage of crude protein was calculated using the factor 6.25, ether extract, crude fibre and ash content were determined in accordance with the standard method of the AOAC(1990). Carbohydrate was obtained by difference. The energy value of the meal was determined in (KJ) according to Siddhuraju et al (1996) by multiplying the percentage of crude protein, crude fat and carbohydrates by the factor 16.7, 37.7 and 16.7 respectively.

Experimental Diets

Three experimental diets were formulated T_1, T_2, and T_3, such that T_1 (control) had maize as source of energy. T_2 and T_3 contained 100% of unpeeled and peeled fermented pro-vitamin A cassava meal respectively completely replacing maize in the diet. Other feed ingredients

were adjusted such that the diet met the nutrient requirement of finishing broilers. The ingredient composition of experimental diet is shown in table 1.

Experimental Birds and Design

One hundred and twenty (120) broiler chickens of mixed sexes (Anak strain) obtained from a local hatchery were used for the experiment. The birds were brood for 3 weeks and fed cassava meal free commercial starter diets. At 35-day of age the chickens were divided into 3 groups of 40 birds each and each group randomly assigned one of the three experimental diets using completely Randomized Design (CRD). Each group was further replicated 4 times and each replicate of 10 birds were housed in pens measuring 2mm x 2mm. Wood shavings were used as litter material. Feed and water were provided ad-libitum. All necessary prophylactic medications and vaccinations were also provided.

Haematology and Serum Chemistry Evaluation

Two (2) birds were randomly selected from each replicate, weighed and sacrificed by severing their jugular vein with a knife. 5ml of blood were collected using a 6cm needle and emptied into a labeled bijoule bottle containing a speck of dried ethylene-diaminetetracetic acid (EDTA) powder. The bottles were capped immediately and the content mixed gently for about a minute by repeated inversion. The blood collected was used to evaluate haematological parameters such as red blood cell (RBC), white blood cell (WBC) pack cell volume (PCV), haemoglobin (Hb),mean corpuscular heamoglobin count (MCHC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), neutrophil, lymphocyte using the method of Coles (1986).

Another 5ml of blood was also collected in labeled test tubes without EDTA and allowed to stand in a test tube rack in the laboratory in a slant position. The serum separated from each sample was decanted after centrifuging at 200 r.p.m for 4 minutes. The sera were later analyzed for serum parameters such as cholesterol, protein, glucose, urea, Albumin, globulin and alkaline phosphatase using the method of Coles (1986).

Data Analysis

Data generated from this study were subjected to analysis of variance (ANOVA) in a statistical analysis system package (SAS 2002). Where ANOVA detected treatment effects, means were compared using Duncan New Multiple Range Test (DNMRT) as outlined by Obi (1990).

RESULTS AND DISCUSSION

All the haematological parameters evaluated in the study were not significantly ($P>0.05$) affected by the diet. Numerical increase existed in the values of red blood cells (RBC) within the treatment group. The control recorded the highest of (RBC) values, followed by PFPC group and UFPC groups respectively.

Packed cell volume (PCV) and haemoglobin (Hb) values of the different treatment followed the same trend. The white blood cells (WBC), lymphocytes and neutrophils were not significantly ($P>0.05$) affected by the diets. Values obtained in all the haematological parameters determined in the study fell within the range recommended by Mitruka snd Rawnsley (1977) for broilers.

The haematological parameters of broiler birds fed unpeeled and peeled fermented pro vitamin A cassava meal is presented in table 3.

Jean (1993), reported that the number of red blood cells (RBC) of animals in good health varies between species, individual and in the same individuals according to its condition and health. Therefore, since there was no reduction in the number of RBC in this study but rather an increase across the dietary group, this indicated that the experimental diets were of good quality especially the control. This further implies that crude protein content of maize is higher and of better quality than cassava.

Packed cell volume (PCV) is known to be an indicator of blood dilution (Wilson et al 1981) and haemoglobin measures the ability of an animal to withstand stress Sainsbury(1981) and also packed cell volume (PCV) and haemoglobin (Hb) is reported to be correlated with the quality of diet and nutritional status of animal Adejumo et al (2012), therefore the non-reduction of packed cell volume and haemoglobin in the blood of the birds used in the study indicated the absence of toxic factors which could have adverse effect in blood formation of the birds.

The white blood cells, lymphocytes and neutrophils values in the study indicated that the birds were not as stressed and had no bacterial or viral illness hence the non-significant values observed among the treatments. This is to show that birds in all the treatments performed their normal phagocytes functions.The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration were not affected by the diets.

The serum biochemistry of finishing broiler chickens fed unpeeled and peeled fermented pro-vitamin A cassava meal completely replacing maize is presented in table 4.

None of the serum biochemical parameters determined in the study were significantly ($P>0.05$) influenced by the diets, slight increase in total protein was observed in the control group. Normal values for urea, creatinine, alkaline phosphatase, albumin, globulin, cholesterol and glucose were observed in the study.

CONCLUSION

The results of the study revealed that pro-vitamin A cassava (UMUCASS 36) could completely replace maize in finishing broilers diet without affecting their haematological and serum biochemical indices.

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Table 1 Ingredients and Nutrient Composition of Peeled and Unpeeled Fermented Pro-Vitamin A Cassava (UMUCASS 36)

Ingredients	T_1(control)	T_2 UFPC	T_3 PFPC
Maize	60.00	0.00	0.00
Pro-vit A cassava	0.00	55.00	55.00
Blood meal	2.00	4.00	4.00
Fish meal	2.00	4.00	4.00
Soya bean meal	18.00	20.00	20.00
Palm kernel cake	4.00	6.00	6.00
Wheat offal	9.00	8.00	8.00
Bone meal	4.00	4.00	4.00
Common salt	0.25	0.25	0.25
Tm/vit. Premix	0.25	0.25	0.25
L- lysine	0.25	0.25	0.25
L- methionine	0.25	0.25	0.25
total	100	100	100
Calculated chemical	**Composition (%DM)**		
Crude protein	19.18	20.71	19.28
Crude fat	4.03	7.97	6.43
Crude fibre	3.38	4.75	5.74
Ash	3.06	3.88	3.57
NFE	70.35	62.69	64.98

*UFPC- Unpeeled fermented pro-vitamin A cassava meal

*PFPC- Peeled fermented pro-vitamin A cassava meal
To provide the following per kg of feed; vitamin A, 10,000iu; vitamin D3 2000iu; vitamin E, 5iu; vitamin K, 2mg; riboflavin, 4.2mg; vitamin B1, 15mg; vitamin B6, 1.5mg**;** vitamin B12, 0.01mg;Nicotinic acid, 20mg; pantothenic acid, 5mg; folic acid, 0.5mg; biotin, 2mg; choline , 3mg; manganese, 56mg; zinc,5mg, iron, 20mg; copper, 1.0 mg; iodine, 0.8mg; selenium, 2.0mg; cobalt, 1.25mg; Antioxidant, 125mg.

Table 2: Proximate composition of peeled and unpeeled fermented pro-vitamin A Cassava (UMUCASS 36)

Parameter(%)	UFPC	PFPC
Dry Matter %dm	90.05	91.07
Crude Protein %dm	2.56	2.30
Crude Fibre %dm	5.71	4.31
Crude fat % dm	1.25	1.14
Ash%dm	6.20	5.01
Nitrogen Free Extract %dm	84.28	87.24

*UFPC- Unpeeled fermented pro-vitamin A cassava meal
*PFPC- Peeled fermented pro-vitamin A cassava meal

Table 3: Haematological indices of finishing broilers fed unpeeled and peeled pro-vitamin A Cassava meal (UMUCASS36)

Parameters	T1(control)	T2 UFPC	T3 PFPC	SEM
RBC($\times10^6$/ul)	2.45×10^6	2.31×10^6	2.36×10^6	1.08×10^5
PVC(%)	30.15	29.03	29.73	0.88
Hb(g/dl)	9.51	8.87	9.11	0.33
WBC($\times10^5$/ul)	6.21	6.17	6.35	2.01×10^3
MCV(%)	135.00	133.33	131.01	1.63
MCHC(g/dl)	30.10	30.31	30.17	0.80
MCH(pq)	41.87	40.47	42.11	1.33
Lymphocyte	94.91	95.13	94.75	0.28
Neutrocytes	9.03	10.11	9.07	0.37

*UFPC- Unpeeled fermented pro-vitamin A cassava meal
*PFPC- Peeled fermented pro-vitamin A cassava meal

Table 4: Serum Biochemistry of finishing broiler fed unpeeled and peeled fermented pro-vitamin A Cassava

Parameters	T1(control)	T2 UFPC	T3 PFPC	SEM
Total protien(g/dl)	6.20	5.78	5.50	0.53
Urea (mg/dl)	1.68	2.05	1.83	0.41
Creatin(g/dl)ie	0.51	0.67	0.58	0.23
Ablinium(g/dl)	2.11	2.34	2.15	0.29
Globulin(g/dl)	4.09	3.44	3.35	1.03
Glucose(g/dl)	118.11	115.33	118.14	1.12
Cholesterol(mg/dl)	4.52	4.18	4.14	0.25
Alkaline phosphate	242.71	247.94	254.32	2.71

*UFPC- Unpeeled fermented pro-vitamin A cassava meal
*PFPC- Peeled fermented pro-vitamin A cassava meal